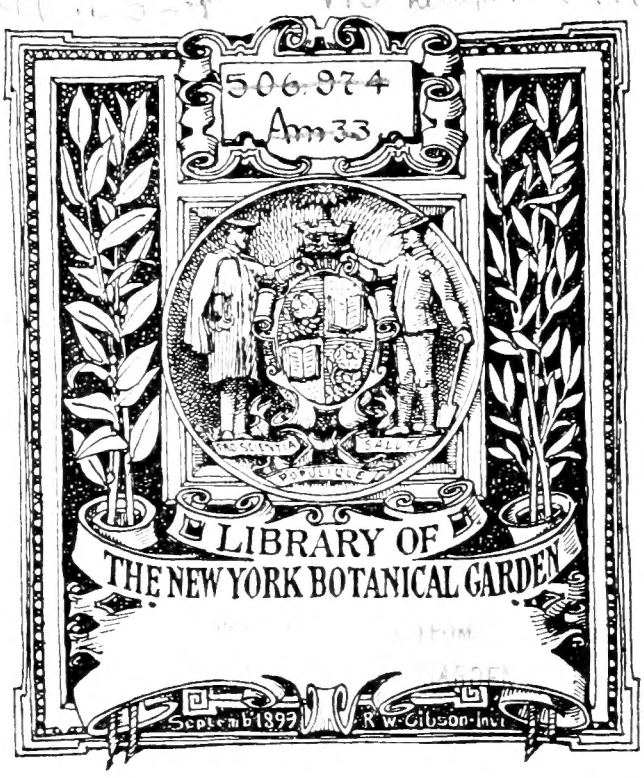
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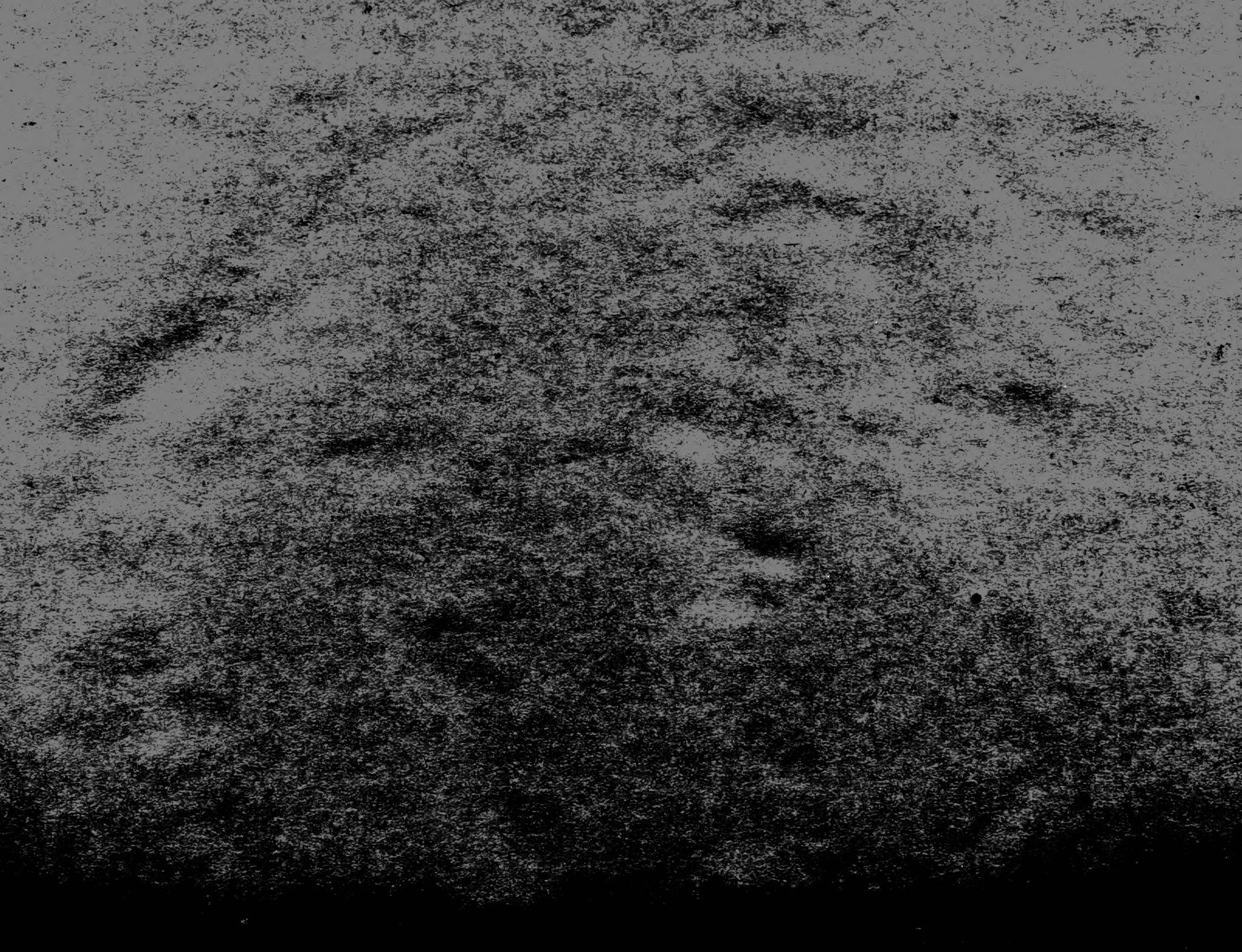

MEMOIRS

OF THE

AMERICAN ACADEMY

OF

ARTS AND SCIENCES.

NEW SERIES.

VOL. VI.—PART I.

CAMBRIDGE AND BOSTON:

METCALF AND COMPANY,

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MEMOIRS

OF THE

AMERICAN ACADEMY.

I.

On the Practicability of Constructing Cannon of Great Caliber, capable of enduring long-continued Use under full Charges.

By DANIEL TREADWELL,

VICE-PRESIDENT OF THE ACADEMY, AND LATE RUMFORD PROFESSOR IN HARVARD UNIVERSITY.

Communicated February, 1856.

The importance of constructing cannon of a size larger than any now in use, to every nation that may be called upon to encounter the trials of war, is one of those facts acknowledged alike by the soldier and the civilian; and to obtain such instruments, capable of throwing projectiles larger and heavier, and to greater distances than have hitherto been attained, is now occupying the attention of the scientific engineers and projectors of Europe more than any other question open to them. The present age has witnessed a remarkable increase in the size of all the great instruments of human industry. Ships within twenty years have been doubled in their dimensions, and steam-engines are now constructed which compare with those of the last age as giants compare with common men. But although the want is fully acknowledged, and attempts have been made in hundreds of forms, no one has succeeded in producing a cannon essentially more powerful than those used in the days of Napoleon and Wellington.

I propose, in this paper, to search for the causes of these failures, to examine the action of the forces, both active and passive, which are called into operation in throwing shot and shells by gunpowder, and, at last, shall endeavor to show that our present cannon do not approach the size and power of those that may be constructed.

I have said that no essential improvement has been made during the present age in the size of cannon. It is true that they have been increased in caliber from seven, up to eight and ten inches, and a few bomb-cannon have been made of twelve inches. But in the use of these the charges are so diminished, to be brought within the limits of safety, that the initial velocities, as inferred from their short ranges, are not so great as those of the old forty-two pounders; while with mortars, those of thirteen inches were used in the time of Vauban, and this remains, stereotyped, as the limit at the present day.

But to my examination. The properties or qualities of hardness and of tenacity or strength are the qualities indispensable to all cannon, and the superiority of one cannon over another is measured by the excess in which it possesses them. Inertia* is likewise required, in a certain amount, to prevent excessive recoil. Now these properties of strength and hardness are possessed in an eminent degree by bronze and cast-iron, and these bodies alone constitute, in practice, the materials for cannon; for although various attempts have been made to introduce steel and wrought-iron, it is enough for my present purpose to say, that there are not twenty cannon in use in the world, that are not made of bronze or cast-iron. For strength, bronze is generally taken at 30,000 pounds to the square inch; that is, that it will require a weight of 30,000 pounds to tear asunder a bar of good gun-metal bronze of one inch area. Following the mean of many experiments, cast-iron has generally been taken at 20,000 pounds. But that I may be sure not to under-estimate the strength of this material, and as it has been considerably improved by gun-makers within a few years, I shall estimate it at 30,000 pounds, or as equal to bronze, although it is not to be relied upon as so constant in its strength as the latter material. For hardness cast-iron greatly exceeds bronze. This renders it more suitable for very large guns, and it has, in truth, become so exclusively the material for everything above the size of field-pieces, that I shall deal with it alone in the examination proposed in this paper.

Before examining the force of gunpowder it may be well enough to say a word upon the time of its explosion. Is the firing of gunpowder instantaneous? This question has been discussed, and experiments made upon it, by Mr. Robins, Dr. Hutton, Count Rumford, and many others, besides a special committee of the Royal

* This word is used throughout this paper in its strictly technical sense, as the force, or power of resisting all change of state, whether it be from rest to motion or from motion to rest; and I use, without a doubt of its accuracy, the square of the velocity by the mass, as the measure of this force.

Society. If it be instantaneous, then it must be evident that no other substance can be fired with a greater rapidity. For instantaneousness, bearing the same relation to time that a point does to space, can admit of no degrees. Both are existences without extension, and we cannot say of any two events that one is more instantaneous than the other, without implying duration to one at least, which also implies that it is not instantaneous. Now many of the fulminating powders, and even gun-cotton, are, as is well known, fired much more rapidly than gunpowder. The firing of this last cannot, therefore, be instantaneous, and we might rest with this logical solution of the question; but, like many other logical solutions, it adds but little to our wisdom, and the amazing rapidity with which a large mass of powder is inflamed, when in a close cavity, awakens our attention to the course of the events causing, or at least accompanying, this inflammation, and I shall notice two experimental results which seem to me to indicate the state of things during that whole course.

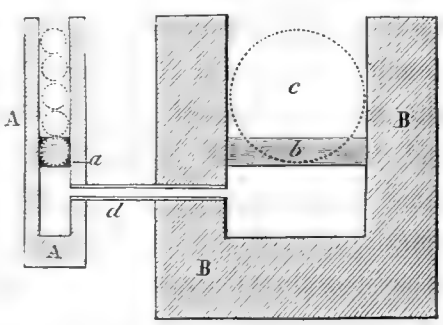
First, Count Rumford has proved that the burning of the grains is slow, or that a sensible time is required with each grain before it is wholly converted into the gaseous state; and secondly, various experiments made in England and in Prussia have shown that there is no sensible difference produced in the velocity of the shot by communicating the fire to the centre rather than to one end of the charge, which ought evidently to take place if the fire is communicated from one grain to another in succession, as this communication, being in both directions, when proceeding from the middle, would require but half the time that is required when proceeding from one end, and ought to produce a sensible increase in the velocity of the shot. I think, therefore, that these two facts warrant the following inference as to the course of the action during the production of the force. When the fire reaches the charge from the touchhole, the nearest grains become kindled; the hot fluid evolved is thrown farther into the charge, and the burning succeeds successively until the pressure becomes so great as to condense the air contained between the grains sufficiently to produce the heat required for firing those grains, which are then consumed more or less rapidly, as they are fine or coarse. We have, then, first the burning in succession of a small part of the charge; then the immensely rapid, though not instantaneous, kindling of every grain composing it; and then the consumption of those grains, which is not accomplished without time. It is a task for the conception to grasp these events, following one another in distinct succession; each having its beginning, middle, and end, and all being comprised in the period of $\frac{1}{200}$th of a second (gun 4 feet long, *formula* $t = \frac{2s}{v}$). When we have mastered the imagination of these, we may go further and combine with them the connected and

contemporaneous action of the ball, which passes from rest to motion, and through every gradation of velocity up to 1,600 feet a second, and leaves the gun as our historical period of $\frac{1}{200}$th of a second expires.

The expansive force of gunpowder, which must be resisted by the strength of the cannon, depends almost entirely upon the circumstances under which it is fired. Count Rumford has shown, by his experiments made about sixty years ago, that if the powder be placed in a closed cavity, and the cavity be two thirds filled, the force will exceed 10,000 atmospheres, or 150,000 pounds upon the square inch; and he estimates that if the cavity be entirely filled with the grained powder, and restrained to those dimensions, the force will rise to 50,000 atmospheres. My own experience, made in bursting wrought-iron cannon the strength of which was known to me, leads me to believe that he has not over-estimated its power, although I am aware that it is generally considered as excessive. If, following an opposite course to that herein described, the powder be at liberty to expand upon any side, the force thrown in the other directions is very small. Thus, if a charge be placed loose in a gun, without shot or wad, the force upon the walls of the gun is very trifling; — no more than is produced by the restraint of the inertia of the charge itself, or the fluid formed from it. If we would divest a charge of this property of inertia, and fire it in a constantly maintained vacuum, it would not rend walls made of cartridge-paper, if a single end were left open for its escape. From the preceding statement, it will be seen that gunpowder will take any force, from perhaps 50,000 atmospheres, when confined to a close cavity, down to zero, if it be deprived of inertia and fired in a vacuum constantly maintained.

In artillery practice, the restraining power which causes the powder to act against the walls of the cannon is derived principally from the inertia of the shot. This is so much greater than the inertia of the powder itself, that the latter may be neglected in the considerations that are to follow. Now, bearing in mind what has been already said, let us compare the difference of the force of powder as exerted upon a small and a large gun respectively. It is perfectly well known, that, if we have a pipe or hollow cylinder of say two inches in diameter with walls an inch thick, and if this cylinder will bear a pressure from within of 1,000 pounds per inch, another cylinder, of the same material, of ten inches in diameter, will bear the same number of pounds to the inch if we increase the walls in the same proportion, or make them five inches thick. A cross-section of these cylinders will present an area proportional to the squares of their diameters, and if the pressure be produced by the weight of plungers or pistons, as in the hydrostatic press, the weight required in the pistons will be as the squares of the diameters, or as 4 to 100.

Now carry this to two cannon of different calibers, and take an extreme case. Suppose the caliber of one to be 2 inches in diameter and the other 10 inches, and that the sides of each gun equal, in thickness, the diameter of its caliber. Then to develop the same force, per inch, from the powder of each gun, the inertia of the balls should be as the squares of the diameters of the calibers, respectively; that is, one should be 25 times as great as the other. But the balls, being one 2 and the other 10 inches in diameter, will weigh 1 pound and 125 pounds respectively; the weights being as the cubes of the calibers. Hence each inch of powder in the large gun will be opposed by 5 times as much inertia as is found in the small gun. This produces a state of things precisely similar to that of loading the small gun with 5 balls instead of 1;* and although the strain thrown upon the gun by 5 balls is by no means 5 times as great as that by 1 ball, there can be, I think, no doubt that the strain produced by different weights of ball is in a ratio as high as that of the cube roots of the respective weights.† This would give, in the example before us, an increase of from 1 to 1.71, or the stress upon the walls of the 10-inch gun would be 71 per cent greater than upon those of the 2-inch gun.



* The state of things here described will be comprehended by a glance at this figure. The two cylinders A and B, made in the proportions of 1 to 5, will resist an equal hydrostatic pressure, and the weights or plungers *a* and *b*, with which they are loaded, will remain supported upon the water in equilibrium, if an open communication be made between them by the pipe *d*. But if we load the larger one with the ball *c* instead of *b*, we shall require 5 balls, as shown in the small cylinder A, to balance the pressure of *c*.

† Hutton inferred that the velocities of balls of different weights with the same charges of powder were inversely as the square roots of the weights, and Captain Mordecai, in his excellent book of experiments, makes the same inference. This would give no increase to the force of the powder, and must be impossible; and I find from comparing their experiments, and computing the forces developed by the same charges of powder with shot of different weights, that the forces are almost exactly as the cube roots of the shot. Thus Hutton's experiments with balls of 1.2 lb. and 2.9 lb., velocities 973 and 749, give forces almost exactly proportional to the cube roots of 1.2 and 2.9. Captain Mordecai's experiments with balls of 4.42 lb., 9.28 lb., and 21 lb., velocities 2,696, 2,150, and 1,520, all furnish, by computation, forces very nearly proportional to the cube roots of the respective weights of the balls. Every one knows that a small increase in the weight of the shot in a fowling-piece increases in a sensible degree the recoil and the stress upon the gun. This is so universally received as true by ordnance officers, that it is a common practice to use two or more balls, instead of an increased charge, in proving guns.

The foregoing statement and comparison, however, do not present the whole case; for they are made upon the supposition that the charge of powder, in each instance, is as the square of the diameter of the shot, or that the cartridges of the 2 and the 10 inch guns are of the same length. This, if we take the charge of the small gun at $\frac{1}{3}$ of a pound, would give but $8\frac{1}{3}$ pounds for the large, or $\frac{1}{15}$ of the weight of the shot. The velocity obtained from this charge would produce neither range nor practical effect, and to obtain these results, that is, 1,600 feet a second, we must either increase the force through the whole length of the gun to 5 times that required for the small gun, or, the force remaining the same, we must provide for its acting through 5 times the space. Neither of these conditions can be practically accomplished. However, by an increase of both the charge and the length of the bore, the result may, in the limits under consideration, be attained. Thus, taking the large bore, if we double its length and make the cartridge 5 times as long, increasing the weight from $8\frac{1}{3}$ to $41\frac{2}{3}$ pounds, — or perhaps, having an advantage from the comparative diminution of windage and the better preservation of the heat, with a charge of from 30 to 35 pounds, — we may obtain the full velocity of 1,600 feet a second. But this again increases enormously the strain upon the gun.

It does not appear obvious, at a first view, how an increase in the charge should increase the tension of the fluid produced from it, if the cavity enclosing it be proportionably enlarged. If a steam-pipe a foot long will sustain the pressure of a given quantity of steam, of a given temperature, a pipe two feet long, of the same thickness and diameter, will sustain the pressure produced by a double weight of steam from the same boiler. Why then should the pressure upon a cannon be increased by a double length of cartridge? The difference seems to be this; with the steam, the pressure is as in a closed cavity; with the powder, the tension depends upon the movement of the shot while the fluid is forming. Now, whether the charge be large or small, the motion of the shot commences while the pressure is the same in both cases, and before the charge is fully burned, and with the same velocity in both cases; but with the large charge the fluid is formed faster than with the small, while the enlargement of the cavity by the movement of the shot is nearly the same in both cases. This destroys the proportion between the sizes of the two cavities, and the tension must increase faster, and become greater, from the larger charge. The law of this increase cannot, from the complicate nature of the problem, be stated with any reliable exactness, but we may, I think, conclude, from the increased velocity of the shot, and many other effects, that the stress thrown upon the gun by different charges of powder, within ordinary limits, will not vary essentially from the square roots of

those charges.* If then we increase, in the example under consideration, from a charge of $8\frac{1}{3}$ pounds to one of 32 pounds, the stress upon the gun, being as the square roots of these numbers, is raised from 2.88 to 5.65, or from 1 to 1.96. Having already increased the stress upon the gun, by the shot, from 1 to 1.71, if we multiply these together, we have a total increase of from 1 to 3.35. That is to say, if, under the conditions here stated, we load a gun of 2 inches' caliber with 1 shot and $\frac{1}{3}$ of a pound of powder, and a gun of 10 inches' caliber with 1 shot and 32 pounds of powder, the stress upon each square inch of the bores will be 3.35 times greater with the large than with the small gun; when at the same time, if the walls of both have a thickness proportional to the diameters of the calibers in each, the large gun will be incapable of sustaining a greater pressure per inch than the small one. Even with a charge of 12 pounds of powder, the stress upon the large gun must be more than double that upon the small gun when charged with one third the weight of its ball.

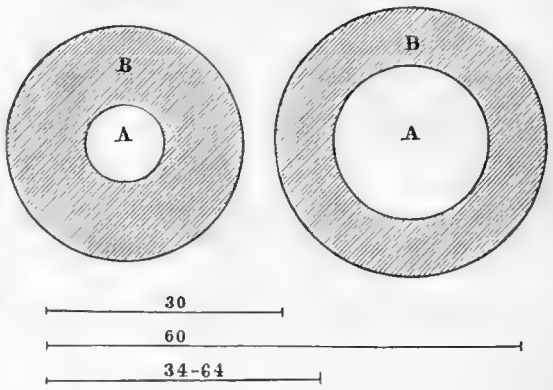
The preceding examination does not, I think, present the difficulties to be overcome in increasing the size of cannon as greater than they really are, and although the results that I have arrived at are from extreme cases, and may be said to be mere deductions, yet they are deductions legitimately drawn from the most reliable experiments that have been made. How then can the necessary strength be obtained? Will it be answered, by an increased thickness? It is not necessary to examine the obvious objections of the great increase of size and weight that this implies, because no increase that can be given to the thickness will increase the strength to a sufficient degree to resist the force required. To prove this, I must ask attention to a further and somewhat elaborate examination.

About thirty years ago, Mr. Peter Barlow, of Woolwich, published a paper in the Transactions of the Society of Civil Engineers, on the hydrostatic press, in which he showed that hollow cylinders of the same materials do not increase in strength in

* Hutton gives the velocities of the balls as the square roots of the charges, and the experiments of Captain Mordecai, although giving the velocities of the larger charges somewhat below this ratio, do not wholly contradict it. This assigns to the charges an effect, or power, that is, pressure multiplied by the space, which is directly as the charge. Now this result cannot be produced, with the larger charges, wholly by the continuance of the pressure during the last part of the passage of the ball through the bore, although a large portion of it may be derived from that source; but there must be a great increase of the tension in the fluid during the first part of the ball's motion, and an equal increase of the strain upon the gun. It appears to me that the hypothesis stated above, and the ratio of force there assigned to different charges, are in perfect accordance with these and other experiments.

the ratio of increase in thickness, but that the ratio of increase of strength is such, that, where they become of considerable thickness, the strength falls enormously below that given by the ratio of thickness. Mr. Barlow has carried out his reasoning in an analytical form, which I shall omit, while I endeavor to give the physical principles of the problem, as he has laid them down, in a form more clearly within the conception of all.* For this purpose let us suppose Fig. 1 to represent the cross-section of a hollow cylinder, like a cannon; A, the bore, 10 inches in diameter, B, the walls or body, 10 inches thick. Let this cylinder be distended by internal fluid pressure until the bore is 20 inches in diameter, as in Fig. 2. The external diameter will be increased only to 34.641 inches. For in Fig. 1 the whole diameter is 30 inches, and contains an area of $30^2 = 900$ circular inches. From this take the area of the bore $10^2 = 100$ inches, and we have 800 inches in the area of the solid walls. Now after it is distended, the area of the bore becomes $20^2 = 400$ circular inches, and as the walls contain the same area as before the distention, viz. 800, we have $800 + 400 = 1200$ circular inches for the area of the whole section, and $\sqrt{1200} = 34.641$ for the external diameter. Before the distention the circumference of the bore was $10 \times 3.141 = 31.41$, and the external circumference of the body was $30 \times 3.141 = 94.23$. After the distention the circumference of the bore is $20 \times 3.141 = 62.82$, and the circumference of the outside solid is $34.641 \times 3.141 = 108.81$. Every inch of the inner portion of the wall, then, by the distention has been doubled in length, while the external circumference of the wall has been distended only in the ratio of 94.23 to 108.81, or from 1 to 1.155, less than one seventh part.

Fig. 1. Fig. 2.



I have taken a case of extreme distention, for the purpose of showing more clearly the physical condition of the problem. But this makes the ratio of the differences less than they are when the distention is kept within the bounds of practice with iron cylinders. If, in the preceding case, the distention of the bore be made, what it may be in practice just before fracture, namely, $\frac{1}{1000}$th part of the diameter, we shall find

* Mr. Barlow's paper may be found in the first volume of the Transactions of the Society of Civil Engineers, and likewise in the Encyclopædia Metropolitana, and in the Treatise on the Manufactures of Great Britain, p. 326.

that the external portion will be distended, practically, but one ninth part as much as the internal portion of the solid, and, if we take an infinitely small part for the distention, exactly one ninth. Now it is well known that with most bodies, including iron, within the strain of its elasticity the elongation is in exact proportion to the straining force. Hence with a cylinder such as I have described, if of cast-iron, the inner portion will be rent, or strained beyond its elastic power, at the instant that the outside portion is strained with only one ninth part of the load that it is capable of bearing. If the cylinder be made thicker than in my example, the load borne by the outside will be still less. If it be twice as thick as the diameter of the bore, the outside portion will be strained with only one twenty-fifth part of the load it is capable of bearing, when the inner portion is rent, and all the other parts must be rent in succession, without any increase of the load. The law of the diminution in the power of resistance may be stated as follows. Suppose such a cylinder to be made up of a great number of thin rings or hoops, placed one within another. Then the resistance of these rings, compared one with another, to any distending force, will be inversely as the squares of their diameters.* With these incontrovertible laws of resistance before

* If we make a cylinder of 41 concentric hoops of equal thickness, disposed one within another, and exactly fitting, so that the particles of each hoop shall be in equilibrium with each other, the diameter of the largest being 5 times that of the smallest, then the force of each, beginning with the innermost, to resist distention, will be represented by the following numbers : —

1000	391	207	128	87	62	47
826	346	189	119	82	59	45
694	309	174	111	77	56	43
591	277	160	104	73	54	41
510	250	148	98	69	51	40
444	225	137	92	65	49	

An inspection of these numbers must, I think, impress any one with the fact, that it is impossible to increase essentially the strength of cannon, by a simple increase of thickness.

Mr. Barlow does not limit the application of his investigation to any kind of metal, but it is evident that his conclusions are not applicable to any *malleable* metal like bronze ; for in a cylinder constructed of hoops of this material the inner hoops may be elongated by the pressure acting as a *crushing* force, and by this means be enlarged without any diminution of tenacity. Perhaps some kinds of soft cast-iron may accommodate themselves to an enlargement in the same way. But with hard crystalline cast-iron, no actual displacement of the constituent particles can take place without fracture ; and although the effect of the fluid as a crushing force may act as an auxiliary to the strain, as any estimate of its amount would be a mere guess, I shall not attempt any modification of Mr. Barlow's conclusion, when applied, as in this case, to hard cast-iron gun-metal.

us, we cannot fail to perceive how impossible it must be to increase the strength of cast-iron cannon, in any useful degree, by an increase of their thickness beyond that now given to them.*

Now, to obviate the great cause of weakness arising from the conditions before recited, and to obtain, as far as may be, the strength of wrought-iron instead of that of cast-iron, for cannon, I propose the following mode of construction. I propose to form a body for the gun, containing the caliber and breech as now formed of cast-iron, but with walls of only about half the thickness of the diameter of the bore. Upon this body I place rings or hoops of wrought-iron, in one, two, or more layers. Every hoop is formed with a screw or thread upon its inside, to fit to a corresponding screw or thread formed upon the body of the gun first, and afterwards upon each layer that is embraced by another layer. These hoops are made a little, say $\frac{1}{1000}$th part of their diameters, less upon their insides, than the parts that they enclose. They are then expanded by heat, and being turned on to their places, suffered to cool, when they shrink and compress, first the body of the gun, and, afterwards, each successive layer all that it encloses. This compression must be made such, that, when the gun is subjected to the greatest force, the body of the gun and the several layers of rings will be distended to the fracturing point at the same time, and thus all take a portion of the strain up to its bearing capacity.

There may, at the first view, seem to be a great practical difficulty in making the hoops of the exact size required to produce the necessary compression. This would be true if the hoops were made of cast-iron, or any body which fractures when extended in the least degree beyond the limit of its elasticity. But wrought-iron and all malleable bodies are capable of being extended without fracture much beyond their power of elasticity. They may, therefore, be greatly elongated without being weakened. Hence we have only to form the hoops *small in excess*, and they will accommodate themselves under the strain without the least injury. It will be found best in practice, therefore, to make the difference between the diameters of the hoops

* I leave out of consideration another source of weakness, which comes from the unequal shrinking of the iron-casting. The heat from every casting is conducted away from the outside. Hence the outside *sets*, while the inside remains fluid. When the inside sets, the cooler solid shell that surrounds it contains more space than is required for the solid shrinking from the liquid state. This destroys the equilibrium amongst the particles, leaving them upon the *stretch*, or in a state exactly opposite to that in which, to give the greatest strength, they ought to be in, as we shall see hereafter. But the case, as I have shown it from other considerations, is so strong, or rather the gun is so weak, that I do not estimate this in this place, and only mention it in this note to show that I am aware of it, as all practical men must be.

and the parts which they surround, considerably more than $\frac{1}{1000}$th part of a diameter. The fixing the hoops in their places by the screw, or some equivalent, is absolutely necessary, not merely to reinforce the body against cross fracture, but to prevent them from starting with every shock of the recoil. I know, by experiment, that the screw-thread will fix them effectually. The trunnions must, of course, be welded upon one of the hoops, and this hoop must be *splined*, to prevent its turning by the recoil. Small *splines* should likewise be inserted under every hoop. It will, moreover, be advantageous to make the threads of the female screws sensibly finer than those of the male, to draw, by the shrink, the inner rings together endwise.

It will be seen that, with a gun made in this way, we must depend upon the cast-iron body to resist the strain tending to produce cross fracture, though this resistance will be in some degree supported by the outer rings breaking joint over the inner rings. But if the body be made to constitute half the thickness of the walls, it will be found sufficient for the purpose without any reinforcement from the rings. This results from a principle or law, which, so far as I know, was first published by me in the year 1845, in a pamphlet on wrought-iron and steel cannon. As I cannot now put this matter in a better form than that in which I have there given it, I will here quote the statement as then made.

"Let us suppose that we have a hollow cylinder, say twelve inches long, the caliber being one inch in diameter, and the walls one inch thick, giving an external diameter of three inches. Suppose this cylinder to be perfectly and firmly closed, at its ends, by screw plugs, or any other sufficient means. Let this be filled with gunpowder and fired. The fluid will exert an equal pressure, in every direction, upon equal surfaces of the sides and ends of the hollow cylinder. Let us next examine the resisting power of a portion of this cylinder, say one inch long, situated in the middle, or equally distant from the ends, so that it shall not be strengthened by the iron which is beyond the action of the powder. The fluid enclosed by this ring of one inch long contains an area of one square inch, if a section be made through it in the direction of its axis; and the section of the ring itself, made in the same direction, will measure two square inches. We have then the tenacity or cohesive force of two square inches of iron in opposition to an area of the fluid measuring one square inch; and if we take the tenacity of the iron at 65,000 pounds, the cylinder will not be burst, in the direction of its length, unless the expansive force of the fluid exceed 130,000 pounds to each inch. Next, let us suppose a section made through the cylinder and fluid, transversely. The area of the fluid, equal to the square of the diameter of the hollow cylinder, is one circular inch, and the area of the whole section, the

diameter being three inches, is nine inches. Deduct from this the area of the caliber, and we have eight circular inches. That is, the section of the iron is eight times greater than that of the fluid; whereas in the former case, of longitudinal section, the iron gave but twice as much surface as the fluid; and if we take, as before, the iron at 65,000 pounds per inch cohesive force, it will not be broken unless the force of the fluid exceed 520,000 pounds. It will be found, upon a further examination, that the relations of these sections to each other may be varied, as we take the diameter of the caliber to be greater or less, as compared with the thickness of the sides, but their difference can never be made less than as two to one. Here then is a principle, or rather a fact, of the utmost importance in forming cannon of any material, the strength of which is different in different directions; for as a cannon made in the proportions above specified, if the materials be in all directions of equal strength, will possess four times as much power to resist a cross fracture as it does to resist a longitudinal fracture, it follows, that a fibrous material which possesses four times the strength in one direction that it does in another, will form a cannon of equal strength, if the fibres be directed round the axis of the caliber. It is this fact which gives the great superiority to the various kinds of twist gun-barrels. For in these, although the fibres do not enclose the caliber in circles, yet they pass around it in spirals, thus giving their resisting force a diagonal direction, which is vastly superior to the longitudinal direction in which the fibres are arranged in a common musket-barrel."

The foregoing example supposes the cavity immovably closed at its ends, and gives to the powder more force than it actually exerts, in gun-practice, to produce cross fracture, compared with its force to produce lengthwise fracture, even at the part nearest to the breech of the gun; and as the recoil is resisted by the whole gun, the stress upon any part will diminish as the inertia, or weight, diminishes from the breech to the muzzle.

With these facts, principles, and laws, thus stated, I proceed to give some calculations to show the strength of a cannon constructed in the way that I have pointed out, as compared with one made in the usual manner. Take a cannon of 14 inches' caliber, which will carry a spherical solid ball of 374 pounds, with sides 14 inches thick, made up of 7 inches of cast-iron, and two hoops or rings, $3\frac{1}{2}$ inches each, of wrought-iron. The external layer of cast-iron will, from its position, as before explained, possess but one fourth of the strength of the inner layer, or whole strength of the iron, and the mean strength of the whole will be reduced one half. Take cast-iron at 30,000 pounds to the inch area, and we have $30{,}000 \times \frac{1}{2} = 15{,}000$ pounds to the inch. The thickness, of both sides, is 14 inches, and $15{,}000 \times 14 = 210{,}000$

pounds for the strength of the casting, to each inch of its length. The first hoop has its strength reduced from 1 to a mean of .8. Take the strength of wrought-iron at 60,000 pounds to the inch, and we have $60{,}000 \times .8 = 48{,}000$ pounds to the inch. The thickness, of both sides, is 7 inches, and $48{,}000 \times 7 = 336{,}000$ pounds. The outside ring must be reduced in strength by the same rule, for its mean, from 1 to .832, which gives it 49,920 pounds per inch, and for the 7 inches 349,440 pounds. We have then, for each inch in length,

Cast-iron body of the gun	210,000 pounds.
Inner wrought-iron hoop	336,000 "
Outer wrought-iron hoop	349,440 "
	895,440 pounds.

The diameter of the bore being 14 inches, we have $\frac{895440}{14} = 63{,}960$ pounds, as the resistance to oppose to each square inch of the fluid from the powder. The gun will bear, then, a pressure of 4,264 atmospheres.

The resistance to cross fracture at the part nearest to the breech will be, from the cast-iron, $28^2 - 14^2 = 784 - 196$ circular inches, equal to 460 square inches. Cohesive force, unreduced, 30,000 pounds, and $30{,}000 \times 460 = 13{,}800{,}000$ pounds, the whole strength. The bore contains 153 square inches, and $\frac{13800000}{153} = 90{,}196$ pounds to resist each square inch of the fluid, or 26,236 pounds to each square inch more than is provided to resist the longitudinal fracture; and this excess will be further reinforced by the wrought-iron rings, which, being screwed upon the casting, and the outer layer breaking joint over the inner, will add to the resistance to a great amount, which however need not be computed.

Let us now examine a gun made of a single casting of the dimensions that are given above; that is, of 14 inches' bore, and sides 14 inches thick. Taking the normal strength of cast-iron as before at 30,000 pounds per inch, we must reduce it, according to the laws before explained, to one third, or a mean of 10,000 pounds per inch; and the thickness of both sides being 28 inches, we have $10{,}000 \times 28 = 280{,}000$ pounds for the whole strength, and $\frac{280000}{14} = 20{,}000$ pounds to each inch of the fluid pressure, or 1,333 atmospheres, or $\frac{20000}{63960}$, or less than one third of the first example. Against a cross fracture the cast gun will possess a great excess of strength, which I do not like to call useless, although I do not perceive how it can be of any essential, practical advantage.

Let us next inquire, What force is required to give a ball of 14 inches' diameter a velocity of 1,600 feet a second? We shall obtain a better conception of this force by

estimating it in the height required by a fluid column to produce it. Suppose the ball impelled by the pressure of a column of the same substance, which would be in this case a column of fluid iron. Then (from the formula $v = \sqrt{2gh}$) we obtain $\frac{1600^2}{64} = \frac{2560000}{64} = 40{,}000$ feet, for the height of the column. But this would produce a jet forming a continuous stream. Suppose this stream to be 14 inches in diameter, and divided into a series of short cylinders, each of which, to equal a ball of 14 inches' diameter, must be $9\frac{1}{3}$ inches long. Now in giving 1,600 feet velocity to this series of cylinders by a superincumbent column, the force will act upon each cylinder only through a space equal to its length. But in a cannon the powder acts, though with a variable force, through the whole bore of the gun. The variation of this force must depend, in every case, upon the quickness of the powder, arising from its composition, fineness of grain, dryness, and the heat received from the gun from previous firings; and most essentially from the amount of the charge; and we do not know the exact law of the variation for any one case or condition. Our best judgment, therefore, must be but an approximation to the truth, entirely empirical. But if we cannot determine the truth with exactness, we can at least assign limits within which it must be contained, and upon a comparison of the velocities produced by different lengths of bore, the effect upon the gun itself at different parts of its length, and various other grounds of comparison, I think that we may take the effect of the charge through the whole bore, supposing it to be 112 inches from the ball to the muzzle, and the charge 80 pounds, as equal to the action of the maximum force through a space of not less than one half, nor more than two thirds, of its length. But that I may be sure to assign the maximum so great as to cover all anomalous or accidental conditions, I will take it as sufficient to produce a velocity of 1,600 feet a second, if acting constantly through one third the length of the bore. This will give $37\frac{1}{3}$ inches, or exactly 4 times the length of the cylinder which forms the equivalent of the shot. Then (from the formula $v = \sqrt{fs}$) the 40,000 feet above given for the height of the column, becomes $\frac{40000}{4} = 10{,}000$ feet;* and if we take the whole force of the powder as equal to its maximum force, acting through two thirds the length of the bore, or $74\frac{2}{3}$ inches, our column will become 5,000 feet high. In all cases of providing strength, we must take the force to be resisted at its maximum.

* This whole matter may be taken from the formula $\frac{v^2}{2gs} = f$, which gives the force 12,860 times gravitation. But I have preferred to give the more circuitous course, from the pressure of a column, as fixing a better conception of its enormous amount upon the mind.

Now a bar of cast-iron 1 inch square weighs 3.2 pounds to the foot in length; we have then $10{,}000 \times 3.2 = 32{,}000$ pounds' pressure to each square inch of surface, or $\frac{32000}{15} = 2{,}133$ atmospheres, on the supposition that the whole action of the powder is equal to its maximum force through one third the bore of the gun. If we take the whole action as equal to it maximum through two thirds of the bore, the column, 5,000 feet high, gives 16,000 pounds, or 1,066 atmospheres. It cannot be less than this, and although it may never come up to the greater number, or 2,133 atmospheres, it would not be safe to estimate it at less when providing the means to resist it. We require, then, a pressure of 32,000 pounds to the inch, to obtain for a 14-inch shot an initial velocity of 1,600 feet a second. We have seen that a gun formed as I have proposed will be capable of resisting a pressure of 63,960 pounds to the inch, or very nearly twice the pressure required to produce the velocity sought, while with a gun made in the usual way, of one piece of cast-iron, the power of resistance is limited to 20,000 pounds to the inch, or less than two thirds that which may be required to obtain the velocity.

We have seen that a cannon constructed in the manner recommended, of whatever size, having its walls equal in thickness to the diameter of its bore, will sustain a pressure of 63,960 pounds, equal to a column of fluid iron 20,000 feet high, very nearly. This is half the strength required to support a column capable of keeping up a continued stream with a velocity of 1,600 feet a second. Suppose that we construct such a cannon with a bore of 30 inches, and of such length that the ball shall receive the force of the powder while it moves through a space of 10 feet, and that this force be equal to a constant action of 4,266 atmospheres through 40 inches. It will be at once perceived that it will impress the above velocity upon a cylinder $\frac{40}{2} = 20$ inches long, or upon its equivalent, a sphere 30 inches in diameter. Such a sphere of solid iron will weigh 3,670 pounds, and at this point the *calculated* power of the gun meets the force required to give a velocity of 1,600 feet a second.

Although this size may be beyond practical reach, the contemplation of it as a theoretical perfection may stimulate us to attempt an approximation to it. A ball of a ton weight, with a range of, say 6 miles, would, as a mere display of mechanical force, be worthy of a great effort.

The following columns show the stress that the several kinds of guns, as mentioned, will bear, by calculation, and the pressure required to give the velocity of 1,600 feet a second. The third column shows the proportion between the required and the actual strength.

	Atmospheres.		Atmospheres.	
Hooped cannon for 14-inch shot will bear . . .	4,266 ;	required	2,133	100 : 200
Cast-iron gun, 14-inch shot, will bear . . .	1,333 ;	"	2,133	100 : 62
Cast-iron 32-pounder cannon, $6\frac{1}{4}$ inches thick, will bear .	1,333 ;	"	920	100 : 142
Hooped cannon 30 in. diam., 3,670 lb. shot, will bear .	4,266 ;	"	4,266	100 : 100

By this it appears that a common cast-iron 32-pounder, having but 42 per cent more strength than is required, is less reliable than a hooped gun of 14 inches. It will be recollected that the numbers given above in the second column, as showing the required strength, represent the utmost force ever exerted by a charge intended to produce a velocity of 1,600 feet a second.

In this paper, my principal object has been to show a mode of construction by which, with our present materials and knowledge, it will be perfectly practicable to make guns of great size capable of standing the requirements of the service. It follows almost of course, that the same form of construction must be the best possible for guns of smaller caliber, and that by adopting it, not only will the use of guns of enormous size be rendered practicable, but, if applied to cannon of smaller size, their bursting will be rendered almost impossible. If it be necessary to use the word *cost* in connection with the object to be attained, I *know* that when the manufacture is mastered, with a good machine-shop, the difference between the last of these and common cast-iron guns will be altogether insignificant to the nation.

I abstain from opening the subject of different forms of bore and of shot, although I believe that in the end some cylindrico-conical form, lightened with cavities in the rear portion, and perhaps with some form of spiral grooves to produce rotation from the air, will be substituted for the solid spheres now used.

I shall likewise forbear all description of apparatus for restraining recoil, by friction, although it will be necessary to resort to such means for the full development of the advantages of the form of cannon herein pointed out.

I should, however, leave the subject of this paper but very imperfectly treated, if I neglected to mention one most important effect of the force of the explosion, which is not indicated *a priori* by any theory, and which is so inconstant and uncertain in amount, that it can be appreciated only by a careful observation of its practical effects upon the gun, but which, unless guarded against, must essentially disturb the conclusions which I have herein deduced. I allude to what is known to artillerists as the lodgment or indentation of the ball. This first shows itself at the point immediately under the ball, where it rests at the moment of the discharge. It is best observed in a soft bronze or wrought-iron gun, and from the first instant of its appearance, as a slight impression of the under surface of the ball, it goes on increasing at

every discharge, until it becomes so deep as to deflect the ball upwards at the instant of its flight, to strike the upper surface of the bore, where a second indentation is made, considerably in advance of the first, and from this a third, still more advanced, upon the under side. These indentations go on increasing in number and size, and at length bulges appear upon the outside of the gun, which becomes oval near the muzzle, and is at last destroyed.

The lodgment here described has been attributed wholly to the downward pressure of the fluid when escaping through the opening of the windage, which is all upon the upper side of the ball, the under side resting by its weight in contact with the bore. There must undoubtedly be a great escape, not only of the fluid, but of burning powder in grains, through this passage, and the downward pressure from these causes may present an excess over the opposite pressure of the powder upon the under side of the ball, capable of producing some impression upon the under surface of the bore. I am inclined, however, to attribute the indentation mostly, if not entirely, to the compression of the back hemisphere of the ball under the enormous blow of the explosion, producing a corresponding enlargement of the ball in its diameter transverse to the axis of the bore. The smith produces such a change of form in his bar of iron, at pleasure, by the blows of a sledge applied to its end. The operation is called *upsetting*. This enlargement must impress itself upon the part of the bore upon the under side upon which the shot rests, and is alone sufficient, in my mind, to account for the whole mischief.

This view of the subject is confirmed by the form of the lodgment, which consists, at first, of a single narrow impression, exactly corresponding to a very small segment of the ball, and not in the least in advance of the spot on which the ball rests before the discharge. Now this would be the exact form and place of an impression produced by a sudden enlargement of the ball, and an equally rapid recovery of its true figure, which it would derive from its elasticity. But if the lodgment were produced by the pressure of the fluid upon its upper surface, it ought to form a long groove or channel, ceasing only with the diminished pressure of the fluid near the muzzle. Furthermore, the lodgment is greatest when a hard oakum wad is used behind the ball. Now such a wad must prevent, in some degree at least, the escape of the fluid, and therefore diminish the downward pressure. But such a wad, driven hardest against the middle of the ball, in its rear, would act most advantageously to produce the lateral enlargement by *upsetting* it as before described.

Hard cast-iron guns do not exhibit this indentation in so great a degree, because, being unmalleable, they are incapable of a permanent change of form without fracture.

With them, therefore, this pounding of the ball, being repeated a few hundred times, shatters the walls of the gun, which at length gives way at once and goes to pieces.

It must be obvious, that, if the lodgment be attributed to either or both of the causes which I have recited, it may be prevented by a most simple and easy means. This is nothing more than providing that the ball shall, at the moment of the explosion of the powder, have no part in contact with the bore of the gun, but that the windage space shall be equally distributed about the whole circumference. This may be entirely secured by enveloping the ball in a bag made of felt, or of hard woollen cloth, having an additional patch upon its under side to compensate for the weight of the ball. It would seem impossible that in this condition the ball, receiving the pressure of the powder equally distributed in the direction of the axis of the caliber, should touch the gun more than by a slight graze during its flight.*

* My observations upon the lodgment have been made upon wrought-iron cannon. Between the years 1841 and 1845, I made upwards of twenty cannon of this material. They were all made up of rings, or short hollow cylinders, welded together endwise. Each ring was made of bars wound upon an arbor spirally, like winding a ribbon upon a block, and, being welded and shaped in dies, were joined endwise, when in the furnace and at a welding heat, and afterwards pressed together in a mould by a hydrostatic press of 1,000 tons' force. Finding in the early stage of the manufacture that the softness of the wrought iron was a serious defect, I formed those made afterwards with a lining of steel, the wrought-iron bars being wound upon a previously formed steel ring. Eight of these guns were 6-pounders of the common United States bronze pattern, and eleven were 32-pounders of about 80 inches' length of bore, and 1,800 pounds' weight. Six of the 6-pounders, and four of the 32-pounders, were made for the United States. They have all been subjected to the most severe tests. One of the 6-pounders has borne 1,560 discharges, beginning with service charges and ending with 10 charges of 6 pounds of powder and 7 shot, without essential injury. It required to destroy one of the 32-pounders a succession of charges ending with 14 pounds of powder and 5 shot, although the weight of the gun was but 60 times the weight of the proper shot. If any of these guns are ever destroyed by firing them, the destruction will commence in the lodgment.

It was during a course of experimental firing with the soft wrought-iron gun, that I had an opportunity of observing the formation and increase of the lodgment; and here I was led to the experiment of placing the shot in a bag, as recommended in the text. My experiments were not sufficiently extended and varied to lead me to an assured conviction that the evil may be entirely prevented by this practice; but they were enough to lead me to a confident expectation of that result, as I could never detect the formation of any lodgment or any increase in one previously formed when the bag was used.

I cannot leave this subject without observing that I regard the late, and still continued, attempts to make wrought-iron cannon in Europe by the process of *fagoting* or *piling*, as a strange engineering delusion. It may not surprise us that *amateur* engineers, whose whole knowledge of the character of iron is derived from a printed page, should expect useful results from this attempt. But that men practically acquainted with working iron should expect to forge a serviceable gun of wrought-iron by the same process that is used to produce a shaft of that material, seems to me not very creditable to the *iron* knowledge of the age.

Unless this or some equally efficient remedy is adopted, any considerable increase in the size of cannon must be hopeless; for a surface as hard as a smith's anvil would give way under the long-continued pounding of naked twelve-inch shot; and whenever hooped cannon may be made and used, it will be essential that the means of preventing the lodgment herein given be always and at all times carefully applied.

II.

The Age of Petronius Arbiter.

By CHARLES BECK.

(*Communicated May* 13, 1856.)

Introduction.

Contents and Value of the Satyricon of Petronius.

Among the small number of Latin writers of prose fiction, Petronius, the author of the Satyricon, occupies a prominent place. While the indecent and obscene character of many portions renders the work unfit as a means of instruction of youth, and offensive to the good taste even of persons of mature age and fixed principles, the quality of its language and style and the nature of its contents constitute it one of the most interesting and important relics of Roman literature, antiquities, and history.

The work, at least the portion which has come down to us, contains the adventures of a dissipated, unprincipled, but clever, cultivated, and well-informed young man, Encolpius, the hero himself being the narrator. The book opens with a discussion on the defects of the existing system of education, in which the short-comings of both the teachers and parents are pointed out. Next follows a scene in the Forum, in which the hero and his companion, Ascyltus, are concerned, and which exhibits some of the abuses connected with judicial proceedings. After a brief and passing mention of the vices and hypocrisy of the priests, the highly interesting portion, containing an account of the banquet of Trimalchio, follows. This is succeeded by the account of the acquaintance which the hero, disappointed and dispirited by the faithless conduct of his companion, forms with a philosopher, Eumolpus, who, besides discussing some subjects relating to art, especially painting, and to literature, gives an account of his infamous

proceeding in corrupting the son of a family in whose house he had been hospitably received. The hero accepts the invitation of the philosopher to accompany him on an excursion to Tarentum. The account of the voyage, of the discovery made by Encolpius that he is on board a vessel owned by a person whose vengeance he had just ground to apprehend, of his fruitless attempt to escape detection, of the reconciliation of the hostile parties, and of the destruction of the vessel and the greater portion of the passengers by shipwreck, is full of interest. The hero and his immediate companions, being the only persons that escaped death, make their way to Croton, where Eumolpus, by representing himself as the owner of valuable and extensive possessions in Africa, works so upon the avarice and credulity of the inhabitants, who are described as a set of legacy-hunters by profession, that he meets with the most hospitable reception. An intrigue of the hero with a beautiful lady of the city occupies a large share of this part of the story. The book closes with an account of the measures which Eumolpus takes for the purpose of avoiding the detection of his fraud, by working anew upon the avarice of his hosts. The close is abrupt as the beginning had been; the book is incomplete in both parts; the end, as well as the beginning, is wanting.

That the author of this work was a man of genius is unquestionable. The narrative of the events of the story is simple, clear, — exciting, without exhausting, the interest of the reader; the description of customs, chiefly those of the middle classes of society, is invaluable to the antiquarian, and the importance of the work in this respect can scarcely be overrated; the personages introduced into the story are drawn with such a clearness of perception of their characteristics, and such an accuracy of portraiture, extending to the very peculiarities of the language used by each, that they appear to live and breathe and move before our eyes.

Opinions of several Scholars concerning the Value of the Satyricon.

It will not appear inappropriate to quote the opinions of some of the ablest scholars as to the literary and historical value of the Satyricon of Petronius.

Joannes Sambucus, in the preface to his edition of Petronius, dated Vienna, 1564, calls the work: "Sylvulam hanc satyricam eruditam et variam, adeoque ob fictas narratiunculas nec vulgaria imitationis poeticae quaedam exempla insignem."

Lilius Gregorius Gyraldus, of Ferrara, says: "Hic [Petronius] satyricum opus varium et, ut sic dicam, miscellum composuit. Cujus licet fragmenta ad nos tantum pervenerint* eademque parum castigata, multae tamen eruditionis hominem fuisse facile

* Gyraldus lived long before the discovery of the Tragurian fragment.

cognoscimus: nam in taxandis moribus cum acrem tum festivum maxime et jocis seria miscentem videmus. Quo tempore vixerit, quodve institutum vitae sectatus fuerit, haud sane compertum; in declamationibus tamen versatum ex iis, quae exstant, elicimus."

P. Guirand, in a letter written in 1590, speaks thus of Petronius: "Tu quaeris, quid de Arbitro arbitrer. Placet et taedet dicere. Placet, quia multa placent; nam sive defaecati sermonis puritiam spectes, merus lepos; sive priscas negotiorum formulas, multae et elegantes. Taedet, quia pleraque, quorum me taedet, seu quae abominor potius. Vis enim illas venerandae antiquitatis gemmas legere? Has necesse est quaeras in putore seu stercore rabidi et nefandi illius Cupidinis, cujus foedissimae faces, imo faeces, in ejusmodi quaestu tibi elucebunt."

Robertus Titius, in a lecture on Catullus, while speaking of the questionable moral tendency of that poet, as well as Tibullus, Propertius, and others, refers to Petronius, and uses this language: "Denique si quid bonis moribus non consentaneum scripsit Petronius, illud certe mihi non scripsit, qui ab eo, tamquam a scopulo, diligenter cavebo. Neque tamen par est, ut paucorum gratia tam bellae scriptiones penitus abjiciantur, quomodo nec messores quidem manipulos omnes protinus abjiciunt propterea, quod avena lolium atque alia hujuscemodi frugum vitia spicis admista sint; alioqui nec Lucretius legeretur nec Horatius nec Ovidius nec Martialis nec ullus denique poëta, qui hactenus summo in honore habitus sit."

Joannes Baptista Pius says: "Petronius festivus poëta elegantissimusque satyras Varronis more scripsit, quarum fragmentum versa et prosa oratione scriptum nostro in armario continetur." In another place he says: "Petronii Arbitri opusculum aureum manus eruditiorum versant."

Conrad Gesner of Zurich repeats almost verbatim the opinion of Lilius Gyraldus: "Petronius Arbiter, Massiliensis a plerisque existimatur, satyricum opus varium composuit, cujus licet fragmenta ad nos tantum pervenerint, eademque parum castigata, multae tamen eruditionis hominem fuisse facile cognoscimus."

Adrianus Turnebus says: "Petronius Arbiter venustatem orationis suae inquinavit spurcissimis amoribus."

Jacobus Durantius Casellius expresses a similar opinion: "Apud Petronium Arbitrum multa sunt impudica, fateor, et quae ipse iniquis oculis animoque legeres iniquo. Illum, Venus, ab oblivionis periculo sartum tectumque facias, qui in te ornanda nullas dicendi veneres, nullas praetermiserit elegantias."

Janus Gulielmus Plautin addresses P. Pithoeus thus: "Non de nihilo Petronium amas, P. Pithoee, vernulae et Latinae urbanitatis purissimum fontem. Nam Floralia sacra quod celebrat sine fuco atque fallaciis more Romano, non tam severi esse debemus,

ut, quod in aliis ferimus, quia necesse est, in hoc uno damnemus, qui illis apertior fortassis est, at non inhonestior. Recte tu, qui huic Arbitro aequissimus arbiter fuisti, et sententia tua vitam illi salutemque reddidisti." In addressing another person, he says: "Te consulo, A. Oisele, quem Arbitri studiosum opinor, vel quia mundissimi in sermone nitoris est, vel quia ab amicissimo tibi homine [P. Pithoeo] in lucem et cognitionem eruditorum retractus."

Justus Lipsius, in Antiq. Lect., Lib. I. cap. 8, says: "Petronii Arbitri fragmenta pauca habemus, scriptoris tersi et venusti, et nisi quod in re illa voluptatum nimis Latine interdum loquatur, cetera laudati." He expresses himself still more strongly in another place, Epistol. Quaestion., Lib. III. Epist. 2: "Ut in vita, sic in studiis juvat severitati adspersa comitas. Ea causa frequenter soleo a gravioribus libris animum quasi in ludum mittere ad scriptores amoeniores. Quo in numero Petronium repono; quidquid dicant isti frontis severae. Et tua fide, P. Pithoee, vidistin' quidnam venustius, argutius post natas Musas? Non ego; abesset tantum nuda illa nequitia; qua tamen nihil offendor; joci me delectant, urbanitas capit; cetera nec in animo nec in moribus meis magis labem relinquunt quam olim in flumine vestigium cymba. Ut vina apposita vinosum movent, invinium, ut antiqui loquebantur, non movent, sic ista animum jam ante improbum fortasse incitent; casto et castigato non adhaerent. Et sunt tamen inter Musaeos homines, qui hunc scriptorem fugisse velint; a quibus nos certe, mi Pithoee, dissentimus."

Conradus Ritterhusius says: "Eadem causa Petronii Arbitri elegantissimum Satyricon ita nobis laceravit ac detruncavit, ut vix Orpheum mulieres Thraciae vel Pentheum Bacchae discerpserint miserabilius."

Franciscus Raphelengius, Jr., in the preface to his edition, says: "Nos commoditati tuae consulendum rati persuaderi nos passi sumus, ac proinde tantum non justum commentarium in amoenissimae eruditionis et eruditissimae festivitatis auctorem tibi damus."

Michaël Piccartus says: "Vere arbiter elegantiarum est Petronius, quidquid Catones contradicant, et bonorum manibus terendus."

Erycius Puteanus says: "In Petronio quoque cum fructu publico eris; emacula, et florem illum Latini oris purum putumque repraesenta."

It will be seen that all these scholars, while they express themselves with more or less severity concerning the licentious character of the work, are unanimous in their praise of its literary excellency. They do not, however, enter more fully into the discussion of the subject. They are satisfied with a passing, as it were incidental, remark. But there are others who take a more comprehensive view of the work and its author.

Among these, the distinguished Niebuhr occupies a conspicuous place. It was in the year 1821 that he published his paper on the age of Curtius and Petronius, in the Transactions of the Berlin Academy. I shall have to advert again to this paper, when I speak of the different opinions entertained concerning the age of Petronius. At present I shall confine myself to Niebuhr's opinion of the moral and intellectual character of our author.

"The disgusting indecencies of which the remains of Petronius are full (although the inoffensive, nay, the pure, predominates even in amount) give him so bad a name, that he who confesses an intimate acquaintance with the poem, and expresses gratification with it, exposes himself to a severe judgment, and affords a good opportunity for the display of sanctimonious hypocrisy. This will be the more the case, if I reject the notion that the objectionable portions in particular, being extracted by filthy hands (the poor monks), were preserved, and remark that the immoral is inseparable from the scope and plan of the work.

"It is very probable that the great majority of those who have, since the days of the past, regaled themselves with this work, have done so from a corrupt heart, as so many used to read with pleasure the abominations of the French novels which were written before the Revolution; and many well-meaning persons may scarcely know that in these last three centuries many honorable men, who were disgusted with the filth of the Anthology, admired Petronius as one of the greatest minds in the literary world. He who is afraid of calumny does in such cases conceal his opinion; but it is better to profess one's opinion, without fear, so plainly that perversion alone can impart to it a false appearance. An open declaration in favor of truth is always a good action, as timid concealment is a bad one.

"All great dramatic poets are endowed with the power of creating beings who seem to act and speak with perfect independence, so that the poet is nothing more than the relator of what takes place. When Goethe had conceived Faust and Margarete, Mephistopheles and Wagner, they moved and had their being without any exercise of his will. But in the peculiar power which Petronius exercises, in its application to every scene, to every individual character, in everything, noble or mean, which he undertakes, I know but one who is fully equal to the Roman, and that is Diderot. Trimalchio and Agamemnon might have spoken for Petronius, and the nephew Rameau and the parson Papin for Diderot, in every condition and on every occasion inexhaustibly, out of their own nature; just so the purest and noblest souls, whose kind was, after all, not entirely extinct in their day.

"Diderot and a contemporary, related to him in spirit, Count Gaspar Gozzi, are

marked with the same cynicism which disfigures the Roman; their age, like his, had become shameless. But as the two former were in their heart noble, upright, and benevolent men, and as in the writings of Diderot genuine virtue and a tenderness unknown to his contemporaries breathe, so the peculiarity of such a genius can, as it seems, be given to a noble and elevated being only. That deep contempt for the prevailing immorality which naturally leads to cynicism, and a heart which beats for everything great and glorious, — virtues which then had no existence, — speak from the pages of the Roman in a language intelligible to every susceptible heart.

"The age of Louis the Fifteenth, among the South-European nations, and the third century in Rome, have the most remarkable resemblance as to their moral enormities and the disgrace of their degeneracy. In both ages, things, having reached a state of foul corruption and dissolution, were approaching their end. If Diderot lived now, and if Petronius had lived in the fourth century, they would have disdained to describe what is obscene, and also the occasion for doing it would have been far less."

While these views of Niebuhr are deserving of attention, not only because they proceed from so pure-minded and learned a man, but on account of their depth and truth, those of Teufel are not less important, on account of their comprehensiveness, and the clearness with which they are stated. They are contained in his true and admirable description of the work, its scope and character, given in Pauly's Encyclopædia, Vol. V. p. 1404: —

"The whole plan of the work is that of a novel; two freedmen, Encolpius and Ascyltus, are enamored of a boy, Giton; and the adventures which have their origin in this circumstance, or which they encounter severally, the acquaintances which they make (for instance, of Trimalchio and Eumolpus), form the contents at least of that portion of the book which has come down to us. But the book contains in this dress of a narrative descriptions of manners, partly of single places (for example, Croton), partly of certain classes (for example, of Trimalchio, a rich upstart, who apes the manners of a refined man of the world, but exposes himself most ridiculously; of Encolpius, a good-natured, cowardly, and licentious Greek;* of Eumolpus, a vain and tasteless poet, and at the same time a thoroughly demoralized preacher of virtue), all drawn with masterly truthfulness even to the minutest detail. The tone is throughout humorous; the *dramatis personæ* act and speak, even in the most offensive circumstances,

* The name Encolpius being, of course, a fictitious one, I am at a loss to perceive on what Teufel founds his assertion that the hero is a Greek. His character, his manners, and especially his language, which Teufel himself mentions, are against this hypothesis.

with an openness, unconcern, and self-satisfaction, as if they had the most undoubted right to be and think as they do; at the same time, a vein of gentle irony pervades the whole, which indicates the author's moral independence and higher stand-point, as well as his sincere gratification at the amusing and filthy scenes which he describes; he accompanies his heroes at every step with a smile on his lips and a low laugh. The work belongs, therefore, by its contents as well as its tone, to the department of satire, resembling in tone Horace, in form the Menippean satire. For, not only does the language occasionally pass over from prose to verse (limping iambs and trochees), but entire poems of greater extent are interwoven (*Trojae Halosis* and *Bellum Civile*), which are usually put in the mouth of Eumolpus, and which always have a satirical object, sometimes a double one, as is the case with the *Bellum Civile*, which ridicules Lucan, as well as his opponents personated by Eumolpus, the writer, with genuine humor, placing himself above both, and dealing against both his blows with impartial justice. The language is always suited to the character of the persons speaking, elegant in Encolpius, bombastic in Eumolpus, vulgar in Trimalchio. The language put in the mouth of the latter is for us an invaluable specimen of the *lingua Romana rustica*, as it obtained in that part of Italy where the scene is laid, — in Campania, and especially Naples. In conformity with the originally Greek character of this region, the language of Trimalchio and his companions is full of Greek words and Grecisms of the boldest kind (such as coupling the neuter plural with the verb in the singular, cap. 71). Characteristic of the local dialect are the many archaisms, compounds not known in the written language, the frequent solecisms, the many proverbial and extravagant expressions, the numerous oaths and curses. Encolpius, on the other hand, speaks in the language of the educated of his age, which in a remarkable degree resembles the language of Seneca.* This indicates contemporaneousness of the authors."

External History of the Satyricon.

Besides the character, contents, and value of the work itself, there are other circumstances which impart to it an additional interest. I mean, the fate which the book itself has at different times experienced. I have already mentioned that we do not possess it completely. It is highly probable that the part left is one tenth only of the whole. When and how the loss of the remainder took place is unknown, and will

* In speaking approvingly of the view which Teufel takes of the work of Petronius, I do not, of course, adopt it in all particulars. So far from discovering the resemblance of the language of Encolpius and Seneca, I think the former is remarkably simple, and free from the mannerism which characterizes the style of Seneca.

probably remain unknown, unless the discovery of the whole or a portion of the lost parts should, at the same time, reveal the cause which withdrew it from the sight and knowledge of the public. It is probable, however, that a part, if not the whole, of the loss happened between the twelfth and fifteenth centuries. John of Salisbury, who lived in the twelfth century, quotes passages from Petronius which are not found in the first printed editions from 1476, which contain all we now have, with the exception of the contents of the Tragurian fragment, of which I shall have, hereafter, occasion to speak more fully. Between these two points of time, then, namely, the twelfth and fifteenth centuries, if not previously, the work must have experienced considerable losses.

This great loss has been very partially only repaired by the discovery of the Tragurian fragment. In the year 1663,* Marinus Statilius,† of Tragurium (the German name of the town is Trau) in Dalmatia, discovered in the library of Nicolaus Cippi, belonging to a family favorably known, for several generations, in various departments

* Peter Burmann, in the preface to his edition of Petronius, says that the discovery of the fragment was made about 1662, and the Paduan edition published in 1662. Whatever be the true time of the discovery, Burmann is mistaken as to the year in which the Paduan edition was published. This occurred in 1664.

† Baehr, in his History of Roman Literature, adopts the statement of Claudius Nicusius, that it was Petitus, who assumed the name of Marinus Statilejus. W. S. Teufel, in his article on Petronius in Pauly's Encyclopædia, gives the same version, that Peter Petitus discovered, and defended the genuineness of, the fragment. Pierre Petit was born at Paris in 1629 (or, according to others, in 1617), and died in 1687; he was known as a physician and Latin poet. Burmann mentions another report, which he seems to be inclined to credit, that the defence of Statilius, both the *Responsio* and *Apologia*, was the work of Stephanus Gradius, the librarian of the Vatican Library. This report is supported by the statement of Justus Ryckius, a personal friend of Gradius (in a note to Tacit. Ann. 16. 19), and of Samuel Tennulius (in a note to Front. 4. 7). Whatever may be thought of these two reports, mentioned by Burmann and Baehr, we should not overlook the circumstance, that the fact of the existence of two reports, one of which alone can be true, tends to throw doubt upon both; and that Statilius — as he himself, in his *Apologia*, corrects the mistake of the publisher of the Paduan edition, who calls him Statileus — speaks throughout of himself, of his age, of his native place, Tragurium, with apparent good faith. Take, for example, the manner in which he speaks of works of art still extant in Rome: "Huic ego querelae in seculo Neronis nullum omnino locum reperio, cum ad usque Commodi principatum statuas egregio artificio perfectas adhuc exstare in Urbe audiam," etc.; and, "Testimonia certe non dubia florentis tum etiam pictorum industriae habemus ex parietibus nuper, ut accepi, repertis in ruderibus thermarum Titi, eorum autem parietum crustas diligenter exceptas ajunt et in pinacotheca viri primarii collocatas," etc. This seems to be the honest language of a man who has not seen those specimens of ancient art. Whether Petit could honestly use such language, I cannot say, because I do not know whether he ever visited Rome; that Stephanus Gradius, the second supposed author of the *Responsio* and *Apologia*, could not, is apparent from the fact that he was librarian of the Vatican Library, and must have been as familiar with these monuments of ancient art as any man living.

of literature, a manuscript containing the poets Catullus, Tibullus, and Propertius, and a portion of Petronius, namely, the banquet of Trimalchio, which existed previously in a fragmentary condition, complete or nearly complete. The news of the discovery spread quickly through all parts of Europe, and created, even before the publication of the fragment, a lively interest among scholars. The rumors circulating concerning the manuscript were, naturally, in some instances extravagant. It was supposed that the manuscript contained the entire work of Petronius. The following year, 1664, the printer Frombottus, of Padua, published the fragment; not, however, from the original manuscript, but from a copy, and, as Statilius says, a carelessly made copy,* — those portions which were contained in previous editions, and which had, by the labors of successive editors, been corrected and improved, in their improved form, but the newly discovered portions in a very rude and imperfect state. The new publication called forth very opposite opinions, some declaring the fragment a literary fraud, others expressing their belief in its genuineness. A young German scholar, Joh. Christoph. Wagenseil, who had heard from Abraham Ecchellensis, either in a conversation at Rome, 1663, or by letter at Turin, 1664, of the discovery of the fragment,† and saw a few months later, at Paris, in February, 1665, the Paduan edition of the fragment, expressed at once and without much consideration, in a letter to a learned countryman, Christoph. Arnold, his conviction that the pretended fragment was a forgery, and the pretended discoverer of the fragment, Marinus Statilius, the perpetrator of the fraud.‡

* Statil. Apol.: "Nam quid ego de ipso fragmenti contextu dicam imperite atque oscitanter exscripto et a fide sui exemplaris multis in partibus abhorrente."

† Wagenseil appears to give two different accounts of the way in which he heard of the discovery of the Tragurian fragment. In his Dissertation he says: "Ante hoc biennium [1663, the Dissertation being written in 1665] cum Romae commorarer, convenit me aliquando eruditus vir, qui nunc fato functus est, Abrahamus Ecchellensis: cumque vario sermone inter cetera de Italorum recens editis ac postmodum edendis ingenii fetibus colloqueremur, mentionem injecit Petroniani nequaquam mutili codicis, quem in Dalmatia repertum Venetus ad Pontificem legatus possideret et post suum in patriam, quem maturabat, reditum esset facturus publici juris." In a letter written at Turin, in December, 1664, to C. Arnold, he uses this language: "Ceterum commodum heri Cl. Ecchellensis quid ad me perscripsit, quod scire tua omnino interest: Legatus Venetus, qui Romae commoratur, Petronii codicem nactus est nulla sui parte mutilum; ejusque editionem maturabit, quam primum lares repetere continget; addit repertum esse in obscuro Sclavoniae angulo et accurate descriptum." It will be seen that in the one account he says that he obtained the information in a conversation with Ecchellensis at Rome; in the other, through a letter from that person at Turin. Whether the discrepancy originates in a lapse of memory or in a want of accuracy and fidelity, does not appear.

‡ "Joh. Christophori Wagenseilii de Cena Trimalcionis Nuper sub Petronii nomine vulgata ad Christoph. Arnoldum V. C. Dissertatio," in Pet. Burmann's second edition of Petronius, Amsterd. 1743, Vol. II. p. 342.

After referring to a variety of circumstances calculated to excite suspicion against the genuineness of the fragment, such as the fact, that, while Statilius sent a copy only of the fragment to the Venetian ambassador at Rome, the scholars of that city pretended to form an opinion of the age of the manuscript, — that those portions which were already extant in printed editions exhibited the corrected text, while the new additions abounded in errors and defects of all kinds, — he proceeds to say that neither the language nor the matter is worthy of Petronius. It is apparent that Wagenseil, in forming his opinion of the language of the fragment, did not make sufficient allowance for the imperfections of the manuscript itself, nor for the ignorance and unskilfulness of the publisher of the first Paduan edition. The instances which he adduces as unworthy of the elegance and purity of language for which Petronius is distinguished are, without exception, taken from the remarks and conversations of the guests and attendants of Trimalchio, who were for the most part persons of little or no education, slaves, freedmen, and mechanics.

Wagenseil's charge that the fragment is a modern fabrication is chiefly based on the ground that the writer of it understood Italian, and was acquainted with the Scriptures, because some of the expressions occurring in the fragment resemble the Italian, and one or two are not unlike some which are met in the Bible.

With regard to the subject-matter of the fragment, Wagenseil adopts the theory, of which I shall have to speak more fully hereafter, that Petronius Arbiter is the same person with the Petronius mentioned Tacit. Ann. 16. 19, and that the book is a satire on the Emperor Nero. Finding in the fragment no confirmation of his hypothesis, but, on the contrary, many things which are at variance with it, he rejects, on that ground, the fragment as a fabrication. Trimalchio gives some most ludicrous instances of his gross ignorance and entire want of education, while Nero, with all his cruelty and tyrannical disposition, had received a most careful and thorough education. Wagenseil, taking it for granted that Trimalchio is a satire on Nero, concludes that the fragment, representing Trimalchio so different from Nero, is not genuine. A somewhat bold *petitio principii*, and a very convenient mode of reasoning.

The arguments on which Wagenseil depends to prove the spuriousness of the Tragurian fragment are of a wider application than he gives to them; they have reference quite as much to the question in which age Petronius lived, as to that of the genuineness or spuriousness of the fragment. As I shall have to discuss the points made by Wagenseil, together with others, when I come to the main subject of this paper, I shall leave them for the present, and rest satisfied with having briefly stated them.

In order to judge fairly of Wagenseil's attack on the fragment, we should not overlook

the fact, that he formed his opinion after a perusal of the first edition, that of Frombottus of Padua, which was carelessly and injudiciously prepared, and, without the consent and aid of Statilius, published, long before the manuscript itself, being sent to Rome, enabled scholars to form an opinion based upon a better knowledge of the facts in the case. But while I think it just to say this much in defence of Wagenseil, I am far from extending the same indulgence to the rest of his attack, which betrays a very superficial knowledge of the language, literature, antiquities, and history of the Romans.

The next champion who entered the lists to prove the spuriousness of the fragment, a month only after the appearance of Wagenseil's dissertation, and indeed in compliance with his request, was Hadrian Valesius (Adrien de Valois). Hadrian Valesius was historiographer to the king of France, and, as far as social position and literary fame were concerned, the superior of Wagenseil.* He bases his opinion that the fragment is a fraud, both on the use of certain words which he considers barbarous and inelegant, and on grammatical irregularities. So far he agrees with Wagenseil; but on one point he differs widely from him, and censures him with considerable severity and superciliousness. This point is his adopting the hypothesis that Petronius Arbiter and the Petronius of Tacitus are one and the same person, and the character of Trimalchio a satire on Nero. He exposes very ably the improbability of the latter supposition, by pointing out the marked and important differences between Nero and Trimalchio; the noble birth of Nero, and the servile origin of Trimalchio; the noble descent of the wives of Nero, and the humble condition of Fortunata, the wife of Trimalchio; the advanced age of Trimalchio, and the youth of Nero, who died before he completed his thirty-second year. After enumerating the principal topics of the work to show more clearly that there was in them not the most distant reference to Nero, he concludes with these words: "Qui non videt ista singula ac universa nihil ad Caji Petronii [of Tacitus] libellum nihil ad Neronis flagitia noctesque pertinere sed meram esse nudamque ac simplicem vitiorum et desidiae humanae reprehensionem sale et mordaci aceto conditam: is plane nec in literis nec in ulla alia re quidquam videt aut judicat." Hadrian Valesius agrees so far with his brother, Henry Valesius, as to place Petronius long after Nero, but differs from him in this: that, while Henry puts Petronius as late as the Emperor Gallienus, Hadrian considers him a contemporary of the Antonines, on the ground that there were no indications in Petronius of the corruption

* "Hadriani Valesii, Histor. Regii, De cena Trimalcionis, nuper sub Petronii nomine vulgata, Dissertatio, et de aetate patriaque Petronii ac ejus operis inscriptione," in Pet. Burmann's second edition of Petronius, Amsterd. 1743, Vol. II. p. 350.

of the language prevailing in the time of Gallienus. He considers Petronius a native of Gaul, and supports this opinion by the resemblance of some, chiefly colloquial, phrases used by Petronius to French phrases.

While he shares the conviction of Wagenseil, that the fragment was a fraud and forgery, he does not go quite so far as to charge either Marinus Statilius or any other person with its perpetration, which Wagenseil had done.

The defence of Marinus Statilius against the charges of Hadrian Valesius and Wagenseil is contained in two papers,* the first entitled "Responsio," and addressed to M. Mocaenicus soon after the publication of the papers of Wagenseil and Valesius, and the second entitled "Apologia," which was apparently issued several years later. After premising that the first edition of the fragment at Padua was an undertaking in which he had no hand, and for whose defects he could not be held responsible, he shows that the charge of fraud, grounded on the fact that the portions of the fragment which were extant in previous editions did not show the same defects and imperfections which mark the new portions, is not true, because the former could be, and he knew them to have been, corrected by means of the existing improved editions, while the latter were given as they were in the manuscript; thus explaining very naturally a suspicious circumstance of which Wagenseil had made a great deal. He then goes on to state, that he had for a long time resisted the importunities of friends, especially of Antonius Grimanus, the Venetian ambassador at Rome, to publish the manuscript, and had at last consented to have the new, hitherto unpublished portions copied for him. These portions were, in spite of his remonstrances, published by the printer Frombottus at Padua, and he complained to Octavius Ferrarius of this publication. He mentions that the preface to that first edition contains several erroneous statements in reference to the fragment,—for instance, that the manuscript contained, besides the fragment of Petronius, the works of Horace, instead of Catullus, Tibullus, and Propertius,—as well as to himself, which he would have liked to correct, if he had not, by so doing, appeared to authorize the publication, which he did not. He not only disapproved of the Paduan publication, but declares that it must have proceeded from one to whom he was unknown, since he is called in the preface Statileus, instead of Statilius. The remark of Wagenseil, that the scholars at Rome could not possibly judge of the antiquity of the manuscript, since they had only a copy before them, seems to refer to an earlier period of the controversy, when the codex had not yet been sent to

* Marini Statilii Traguriensis J. C. Responsio ad Joh. Christophori Wagenseilii et Hadriani Valesii Dissertationes de Traguriensi Petronii Fragmento. Ad M. Mocaenicum V. P. — Apologia ad Patres Conscriptos Rei Publicae Literariae Marini Statilii Traguriensis.

Rome. It is certainly inconsistent with the statement of Statilius himself (page 380): "Sed maculam tam deformem satis superque opinor a vita et factis meis detergunt, quae a me, ut dixi, privatim ad optimum Mocaenicum hac de re scripta sunt; multo vero prolixius hoc ipsum praestitit, et omnem penitus adversariorum calumniam nudavit et refutavit res ipsa post codicem hunc Romam transmissum et doctorum hominum oculis subjectum." He was prevailed upon to send the codex to Rome, not so much by the importunity of Antonius Priulus, the governor of Dalmatia, as by the insinuations and charges of his adversaries, calling in question the genuineness of the fragment.

Statilius evidently possessed a better knowledge of the Latin language in general, and of that of Petronius in particular, than either of his assailants, and meets with marked success most of their objections and charges; and I am inclined to think that the ability of his defence did much to induce the learned to recognize the intrinsic claims of the fragment to be considered genuine, and produce eventually a verdict in favor of its genuineness. Many of his remarks show that he was not only well acquainted with the Latin language, but also with the philosophy and history of language. An evidence of this may be found in what he says of the gradual changes of language, and their different effect upon different classes of the people, the less educated retaining longer the earlier forms and expressions. In his sensible defence of Petronius for making his vulgar characters use the language of the vulgar, he adverts to and explains the fact, that this vulgar language exhibits a greater resemblance to the Italian, French, and Spanish languages, than the pure Latin, because it was chiefly this vulgar language, the "lingua rustica" of Latium, which was by Roman armies transplanted into other parts of Italy, into Gaul, and Spain. Adverting to the notion taken up by Wagenseil, that Trimalchio is a satire upon Nero, he points out the absurdity of ascribing to Nero what was common to many or all: "Quae ergo socordia est, quod multorum, immo omnium fuit commune, uni Neroni tamquam proprium assignare"; and then he adds, with great good sense: "Quid enim necesse est Trimalchionem esse Neronem? Mihi Petronium nihil aliud voluisse quam sub persona Trimalchionis stultorum divitum, quorum magna tunc Romae manus, ineptam eruditionis ostentationem urbanius traducere propemodum constat." While cruelty was one of the most striking characteristics of Nero, not the least trace of it appears in the character of Trimalchio, and Statilius justly observes: "Certe sine his notis et quasi proprio, ut ita dicam, charactere non magis ad verum pingi potuit Nero quam sine barba Jupiter, sine crinibus Apollo, sine hasta Pallas, sine tridente Neptunus." In another place he says: "Alia omnia in animo habuit Petronius noster, cum Trimalchionem in scenam induxit, quam

principem ullum Romanum aut omnino quemquam notae paullo honestioris mortalem." To prove this still further, he gives a very truthful description of Trimalchio and the class to which he belonged: "Ecquid intelligis rem illi tunc fuisse cum genere hominum humili, abjecto, impuro, quibus nulla a natalibus, nulla ab educatione, nulla a studiis honestis commendatio est? qui cum divites se factos vident, et literas admirari sero incipiunt, inter suas opes inopes, inter studia doctrinarum indoctissimos se produnt."

Statilius gives the full title of the manuscript thus: "Petronii Arbitri Satyri fragmenta ex libro decimo quinto et decimo sexto," which is repeated, in the manner usual to manuscripts, at the close: "Petronii Arbitri Satyri fragmenta expliciunt* ex libro XV. et XVI." The expression "ex libro decimo quinto et decimo sexto," which occurs both in the title and close of the fragment, not only confirms the fact, already known from ancient glossaries, that the work was divided into books, (the ancient glossary of St. Benedict Floriacensis quotes the passage, "Sed video te totum in illa haerere tabula, quae Trojae halosin ostendit," as taken from the fifteenth† book,) but throws some light on the probable extent of the work. If the banquet of Trimalchio filled a portion of the fifteenth and sixteenth books, and if we bear in mind that that part of the work is followed by the account of the hero's quarrel with Ascyltus, his meeting with Eumolpus, and his voyage and residence in Croton, which was evidently not the end of the book, it will be very moderate to suppose the whole work to have consisted of twenty books. It will further be seen, that this fragment is a part only of the fifteenth and sixteenth books, say two thirds, so that the banquet of Trimalchio constitutes two thirds of one tenth of the whole. The banquet of Trimalchio forming one third of the work as we have it at present, the other two thirds would constitute four thirds of one

* "Explicit" is the common form used at the close of manuscripts, which is probably an abbreviation for "explicitus est"; a person ignorant of the origin of the expression, and mistaking it for a verb in the active, formed a plural "expliciunt" to correspond to the plural "fragmenta."

† If the number fifteen, in the above quotation of the glossary, be correct, a difficulty arises in reconciling this quotation with the statement of the Tragurian fragment, that it contains portions of the fifteenth and sixteenth books. That fragment contains the "coena Trimalchionis," after which the acquaintance of the hero, Encolpius, with the philosopher Eumolpus commenced. How then can the passage, "Sed video," &c., which occurs in the account of the meeting between Encolpius and Eumolpus, be taken from the fifteenth book? In the present condition of the text, ten chapters intervene between the close of the "coena Trimalchionis" and the above passage. This passage might, therefore, belong to the sixteenth, or, more probably, seventeenth book, but cannot possibly belong to the fifteenth. Under these circumstances, and there being no ground to doubt the correctness of the succession of the several portions of the story, as given in our text, we must consider the number fifteen of the glossary incorrect.

tenth. If this supposition be correct, the book in its present shape is not more than one fifth of the entire work, and may be no more than one tenth. The work as we now have it makes a volume of about 150 pages; the whole would make a volume, or volumes, of not less than 750 pages, and possibly as many as 1500.*

With regard to the age of the codex, Statilius mentions that the scholars in Rome who inspected it considered it three hundred years old, exceeding by one hundred years the age which the editor of the Paduan edition had assigned to it. From the fact that John of Salisbury, of the thirteenth century, mentions the "porcus Trojanus" and the vessel of malleable glass, Statilius infers that the portion containing the banquet of Trimalchio, at least, was completely extant a short time before the copying of this fragment, about one hundred years after John of Salisbury.

It is somewhat singular that Statilius should, after so careful and thorough an examination of the subject, come to the conclusion to change his mind with regard to the age of Petronius. The manner in which he announces this change of view favors somewhat the hypothesis that he was, to some extent, influenced by the spirit of contradiction, by the desire to differ from Wagenseil in every respect. He says: "Vide autem, quantum in hoc a te dissentiam; quae tibi [Wagenseil] validissima argumenta videntur, abjudicandi a Petronio hujus fragmenti, in iis ego argumentis vel maxima hujus causae praesidia posita esse censeo. Qua de re antequam dicere incipio, aliam quandam, quae mihi tecum est, controversiam paucis aperiam; nec sane erit, quod moleste id feras, quandoquidem hac eadem in re a me ipso dissentio, adductus scilicet vi veritatis, cujus mihi studium omnibus meis studiis et rationibus antiquius est. Nam cum hactenus vulgatam de Petronii aetate opinionem, quae illum Neroni aequalem statuit, probare solitus essem, nuper accurata eruditi hominis disputatione coactus sum, ut multo recentiorem hunc scriptorem existimem, et paullo ante Constantini Augusti tempora, certe longe infra Severum collocem." The conclusion at which he arrived was, as we see, that Petronius did not belong to the age of Nero, as he had hitherto thought, but a little before the Emperor Constantine; at any rate, long after Severus. Considering that Nero reigned from 55 to 68, and Constantine from 306 to 337, it is a change of nearly three hundred years; and this change is still greater, if we take into the account the condition and fate of Roman civilization, and of the Latin language in particular, during that extended period. Of the reasons assigned by Statilius for this change of opinion, the first is, that while later writers — Priscianus, Diomedes, Victorinus, and

* Jan Dousa (Praecidanea, Lib. I. cap. 2) considers the remains of Petronius scarcely the tenth part of the whole. It should be borne in mind, that Dousa wrote before the discovery of the Tragurian fragment.

Hieronymus — mention Petronius, the earlier — Quintilian, Suetonius, and Pliny — do not. His second reason is, that Lutatius Placidus places Petronius after Statius Papirius, and says that the former borrowed from the latter the verse:

"Primus in orbe deos fecit timor."

The last argument which he adduces is the strong language in which Petronius complains of the decline of art, especially of painting, of which he says that not even the least vestige is left: "Ipse Petronius de hac controversia diserte pronuntiat in illa elegantissima de sui temporis vitiis querela ac de ruina bonarum artium, inter quas picturae ne minimum quidem vestigium reliquum esse dolet."

The controversy concerning the genuineness of the Tragurian fragment was by no means confined to Wagenseil, Valesius, and Statilius. Other scholars took a part in it, some on the one, others on the other side. Johannes Scheffer, born at Strasburg in 1621, and Professor at the University of Upsala, where he died, 1679, had received from Nic. Heinsius a copy of the Paduan edition of the fragment.* After stating very fairly the arguments which had been advanced against the genuineness of the fragment, he proceeds to refute them with considerable ability. Much stress having been laid by the opponents of the genuineness of the fragment on the circumstance that it contained expressions which occurred neither in other writers nor in the other portions of Petronius himself, Scheffer observes that there are many single expressions in Cicero used in a meaning which, in other parts of Cicero, is expressed by different words, and words, too, in common use, not only in other writers, but in Cicero himself. He very properly thinks but little of the circumstance that so valuable a manuscript remained so long concealed, a circumstance which the opponents had used to throw suspicion upon the fragment, and goes on to say, that it has frequently happened that highly valuable manuscripts were in the possession of, and withheld from publication by, persons who did not understand their value, or scholars who reserved them for future examination and publication.† With regard to the old-fashioned expressions which occur in the fragment, he remarks: "Sed et antiqua pluscula eo respectu possunt hic esse occupata, quando plebs retinentior est fere sermonis antiqui, nec nisi sero, quem ceteri arbitrantur, cultum adhibere addiscit." On one point Scheffer differs from Statilius and agrees

* "Joannis Schefferi Argentoratensis de Fragmenti hujus Traguriani vero auctore Dissertatio," in Pet. Burmann's second edition, Amsterdam, 1643, Vol. II. p. 394.

† How true this view of Scheffer's is even in our own time is sufficiently illustrated by the discovery of a large portion of "De Re Publica" of Cicero by A. Mai in 1822, and of the "Institutiones" of Gajus by Niebuhr in 1816.

with Wagenseil, in considering a large portion of the work of Petronius a satire on Nero. Although this point is not necessarily connected with the question of the genuineness of the fragment, Scheffer finds a connection between them. "Si praesertim," says he, "quod persuasum pridem viris doctis est, pars multo maxima Satyrici in Neronem est directa, cum non pauca ejus vitia docte ac subtiliter notata deprehendit hic, quisquis inspicere intimius examinareque volet."

Some idea of the interest which was excited by the discovery of the Tragurian fragment may be formed from the fact that a scholar so far advanced in life as Thomas Reinesius was drawn into the discussion. Being born in 1587, he was, at the time of writing his dissertation on the subject, nearly eighty years old. The dissertation itself is dated the 31st of January, 1666; the dedication to the renowned French minister, Joh. Bapt. Colbert, prefixed to it, the 25th of April (old style) of the same year. It would seem, from an expression of Reinesius,* that he supposed the Paduan edition, published by the printer Paulus Frombottus, to have appeared in 1665, instead of 1664, unless it be that his own dissertation, although printed in 1666, was written the preceding year. He expressed his opinion at the request of Scheffer, and, in doing so, occupied a middle ground. While he does not hesitate to consider the main part of the fragment to be genuine, he is firmly convinced that some one, in order to fit and adjust the newly discovered portions in their proper places and to smooth and polish the connecting passages, allowed himself to make alterations and additions, as the case might be. He says: "Multo maxima pars ejus fragmenti Petronio recte tribuitur, quod nemo eorum, qui vel levem deliciarum ejus gustum habent, negaverit; per omnes etiam [enim?] paene paginas doceri id posset; idemque curatissime praestitum in editione Upsaliensi [Schefferi]. Ceterum mangonium aliquod, perinde ac in aliis primae notae scriptoribus multis, quos glossemata inficeta subinde deformarunt, hic intervenisse et ejus aliquam partem Petroniastri alicujus esse, Arbitrum imitari et exhibere, velut in scena Mercurius Sosiam, ausi et apti satis, manifesta fides est. Is cum in fragmento Arbitri praeter ea, quae dudum collecta dederunt commentatores, incidisset, hiatus in editionibus conspicuos impleri sic posse ratus, ea utcunque connexuit; quod ut fieret sine offensa lectoris, fingere aliqua et infulcire de suo formandis sententiis integrandisque membris, comminisci etiam, quae nunquam facta meminerat, necesse habuit." He does not attach any importance to the fact, that the story of the malleable glass (cap. 51), contained in the fragment, is corroborated by John of Salis-

* "Hic [Frombottus] enim repertum Tragurii apud Dalmatas in bibliotheca Cippicorum insigne fragmentum, Petronianis editis connectendum, anno superiore ex apographo concesso operis suis et sumtu communicavit."

bury (Polycrat. 4. 5), on account of the difference of the language, and he has no doubt that John of Salisbury had a French or English manuscript before him, and not the Tragurian. The assertion of the editor of the Paduan edition, and of others, that two hundred years before the discovery of this fragment, this being the age which is assigned to the manuscript in the preface to that edition, there existed no scholars who were capable, as far as scholarship goes, of perpetrating such a forgery, and the argument based upon it in support of the genuineness of the fragment, Reinesius rejects, and asserts that there were enough men capable, if they were inclined, to produce such an imitation, such as Poggio, Aretini, Guarini, Valla, and others.

Another scholar of that period, Joh. Ludov. Praschius, in a letter to Arnold, dated the 5th of July, 1665, rejects most contemptuously the idea of the fragment being genuine, without entering, however, into any arguments. The same view, although in language less decided, is expressed by J. H. Ursinus, in a letter to J. L. Praschius, dated the 5th of July, 1665. An incidental remark of Ursinus, that Trimalchio was not introduced by Petronius merely for the purpose of ridiculing Nero, but from a wish of exhibiting the manners and character of the age of the Emperor Claudius, and more especially of the freedmen of that period, shows that he possessed independence of judgment.

The defence of the genuineness of the Tragurian fragment by Marinus Statilius was so able and complete, that the controversy on this subject subsided, and I know of no subsequent attempt to give a different turn to the opinion of the learned on the subject.

The remaining history of the Tragurian manuscript is brief. It is true that Statilius sent, at first, a copy only to Rome, — a circumstance of which Wagenseil made, and justly enough, a great deal, — but later the codex itself.* It remained there for some time, and was examined by many scholars, but finally returned to its owner, Statilius, in whose house Carolus Sponius, who in 1675 made a journey to Greece, saw

* Statilius, in his Apologia, says: "Sed maculam tam deformem satis superque opinor a vita et factis meis detergunt, quae a me, ut dixi, privatim ad optimum Mocaenicum hac de re scripta sunt: multo vero prolixius hoc ipsum praestitit et omnem penitus adversariorum calumniam nudavit et refutavit res ipsa post codicem hunc Romam transmissum et doctorum hominum oculis subjectum, ejusque scripturae non ambiguam antiquitatem ad CCC annos omnium judicio porrectam: spatio, ut videtis, integri seculi, quam quod Patavinus typographus profiteri ausus est, ampliorem. Expugnari namque tandem aliquando passus sum constantiam meam non tam auctoritate summi viri Antonii Priuli, Dalmatiae praefecti, cui librum in Urbem mittendum tradidi, quam adversarii conviciis et maledictis, quorum vanitatem revinci ac patefieri non mea solum sed rei literariae universae intererat, ne monumentum elegantissimi scriptoris, cui tot seculorum, ut ita dicam, ingluvies in veteres libros foede bacchata pepercisset, levissimi hominis livore ac malevolentia oppressum atque enecatum interiret."

and carefully examined it, remarking on its size and shape, and correcting the mistake of the Paduan edition, which stated that the manuscript contained, besides a portion of Petronius, the poems of Horace, instead of those of Catullus, Tibullus, and Propertius, a mistake already corrected by Statilius himself in his Apologia. He also mentions, that on page 179 of the manuscript the date 20th November, 1423, the time when it was finished, is given. The manuscript was afterwards brought back to Italy by Laurentius Statilius, perhaps a son of Marinus. Mabillon, in his account of a journey in Italy, states that, after leaving Modena, he received a letter from Statilius informing him that the manuscript was in his possession. It became, afterwards, the property of the Royal Library at Paris; but I am not able to say whether it is still extant. My inquiries on this point have been unavailing.

While the danger of losing the lately acquired genuine addition was thus averted by the able defence of Statilius, a danger of an opposite nature several times threatened the integrity of the book. I refer to the various honest or dishonest attempts of supplying the deficiencies of the work, as it has existed since the discovery of the Tragurian fragment, by foisting into it, in some instances, the baldest fabrications. The most notorious of these attempts, and one that was for a time at least successful, was that of Francis Nodot, a French soldier, who stated that, at the taking of Belgrade (Alba Graeca) in 1688, an entire copy of Petronius was found by one Du Pin, which bore all the marks of antiquity, but was written in characters difficult of deciphering; it was copied by some one, brought to Frankfort on the Main, to some merchant who is not named, and by him sent to Nodot in France. Notwithstanding the unsatisfactory and suspicious nature of these circumstances, Nodot succeeded in persuading the members of two provincial academies, those of Nismes and Arles, of the genuineness of the work. It was announced by Charpentier in 1690, and published in 1693 (the second edition in 1731). To the honor of French scholarship it must be said that P. D. Huet and other leading scholars did not allow themselves to be imposed upon by this bold fraud. Nodot endeavored, in 1700, to defend the genuineness of the work, but without success. The language, as well as the matter, betrayed the imposition. It is evident that Nodot possessed too imperfect a knowledge of the language and of the customs of the Romans to carry through such a deception with any hope of success. I shall mention a few instances to illustrate these two points. Nodot uses the expressions, "ad scientias explicandas"; "tam vehementer exclamavi, ut . . . a molesti impetu evasi"; "imprudenter est, eo nos recipere"; "persuasus insuper, nos esse securos"; "petentem, quod hominum genus stabulum jam nunc intraverat"; "furoris libidinosae"; "castella," in the sense of *villae, chateaux*. One of the most amusing mistakes is that of

transferring a modern French police-regulation, requiring that travellers newly arrived in a place should register their names in the book of a police-officer, to an Italian town in the early period of the empire. A few years sufficed to put an end to this literary deception. I have dwelt somewhat longer on this subject, because the fraud, although clumsy, and not extending beyond the present beginning and close of the book, is, within these limits, extensive, inasmuch as Nodot endeavored to supply and complete, with one important exception, all the passages in which the existing text is evidently imperfect; and created, for a little time at least, considerable interest. The exception referred to is full of significance; it extends through the entire episode of the supper of Trimalchio, namely, from the close of the twenty-sixth to the middle of the seventy-ninth chapter, over a space of about fifty-three chapters, or more than one third of the present work. Great as the impudence of Nodot was, he probably shrank from making interpolations in a part of the book requiring an intimate acquaintance with points of Roman antiquities which, were it not for the preservation of this part of the book, would still be unknown, and the consciousness of his ignorance induced him to abstain from meddling with this portion of the book. This appears to be the most natural explanation of the fact, on the supposition that Nodot was acquainted with the Tragurian fragment, the publication of which preceded his own work nearly thirty years. If he was unacquainted with it, his confining himself in his interpolations strictly to the portions of the work previously in existence, and known to him, establishes his fraud even more clearly.

All subsequent discoveries, whether the result of fraud or ignorance, were equally unsuccessful. Among them was a fragment which Marchena pretended to have found in the library of St. Gallen, and which Lallemand published in 1800. No addition has, therefore, been made to the text since the discovery of the Tragurian fragment, and we now have the work in the same condition in which it was after the insertion of that fragment. When I say this, I do not, of course, include the changes of the text caused by various critical revisions. There is no reason for despairing of recovering parts or the whole of the lost portion of the work; but since discoveries of this kind are quite as much the result of chance as of skill and penetration, it is impossible to form any conjecture when and under what circumstances they will be made.

When did Petronius live and write?

Having thus given a brief sketch of the work and its fate since the revival of letters, I now approach the question which it is my intention to examine, namely, In which age did Petronius Arbiter, the author of the work, live and write? Not the least striking feature in the history of this question is the great diversity of opinion among scholars, some placing the author as early as the times of Augustus and Tiberius, others as late as Constantine, thus ranging over a period of full three hundred years. This wide difference must strike every reflecting mind with surprise. It is certainly very remarkable that there should be so wide a difference of opinion on a work which, even in its incomplete condition, fills a volume of respectable size, and which, one would suppose, must contain sufficient internal evidence indicating pretty plainly the time in which it was written, even if there should be no external evidence. This circumstance seems either to indicate peculiar, inherent difficulties in the subject itself, or imply a charge of inattention, ignorance, haste, inconsiderateness, on the part of some, if not all, of those who have made known their opinion. Upon a closer examination of the most important of these opinions, it will be found that both causes, the difficulty of the subject as well as some fault of the inquirer, have been at work in producing so great a divergence of opinion.

In order to render intelligible the account which I deem it expedient and necessary to give of some of these opinions, I must anticipate one point to which the logical order of the argument would assign a later place. I refer to the only external evidence which is, by some, adduced, and supposed to fix the time of the composition of the work. The evidence, as it is supposed to be, is contained in the following passage in the sixteenth book of the Annals of Tacitus, c. 17–20: "Paucos intra dies, eodem agmine, Annaeus Mela, Cerialis Anicius, Rufinus Crispinus ac Gaius Petronius cecidere. . . . . De Gaio Petronio pauca supra repetenda sunt: nam illi dies per somnum, nox officiis et oblectamentis vitae transigebatur; utque alios industria, ita hunc ignavia ad famam protulerat, habebaturque non ganeo et profligator, ut plerique sua haurientium, sed erudito luxu; ac dicta factaque ejus quanto solutiora et quandam sui negligentiam praeferentia, tanto gratius in speciem simplicitatis accipiebantur; proconsul tamen Bithyniae et mox consul vigentem se ac parem negotiis ostendit; dein revolutus ad vitia, seu vitiorum imitatione inter paucos familiarium Neroni assumptus est, elegantiae arbiter, dum nihil amoenum et molle affluentia putat, nisi quod ei Petronius approbavisset; unde invidia Tigellini quasi adversum aemulum et scientia voluptatum potiorem. Ergo crudelitatem principis, cui ceterae libidines cedebant, adgreditur, amicitiam

Scaevini Petronio objectans, corrupto ad indicium servo ademptaque defensione et majore parte familiae in vincla rapta. Forte illis diebus Campaniam petiverat Caesar, et Cumas usque progressus Petronius illic attinebatur. Nec tulit ultra timoris aut spei moras; neque tamen praeceps vitam expulit, sed incisas venas, ut libitum, obligatas aperire rursum et alloqui amicos, non per seria aut quibus gloriam constantiae peteret; audiebatque referentes, nihil de immortalitate animae et sapientium placitis sed levia carmina et faciles versus; servorum alios largitione, quosdam verberibus affecit; iniit epulas, somno indulsit, ut quamquam coacta mors fortuitae similis esset. Ne codicillis quidem, quod plerique pereuntium, Neronem aut Tigellinum aut quem alium potentium adulatus est; sed flagitia principis sub nominibus exoletorum feminarumque et novitate cujusque stupri perscripsit atque obsignata misit Neroni; fregitque annulum, ne mox usui esset ad facienda pericula. Ambigenti Neroni, quonam modo noctium suarum ingenia notescerent, offertur Silia, matrimonio senatoris haud ignota, et ipsi ad omnem libidinem ascita ac Petronio perquam familiaris; agitur in exilium, tamquam non siluisset, quae viderat pertuleratque, proprio odio."

We see, then, that this Petronius, of whom Tacitus gives us an account, turned night into day, devoting the day to sleep, the night to labor and pleasure; as others have become famous by their activity, he has become so by his indolence. Yet he was not a vulgar debauchee, but a man of refined luxury; the very absence of restraint in his language and actions added to his popularity, by giving him the appearance of openness. Nevertheless, when proconsul of Bithynia, and afterwards as consul, he proved himself an able business-man. When released from these duties, he returned to his life of dissipation, was received among the more intimate friends of Nero, and became his *maître de plaisir* ("elegantiae arbiter"), the emperor's pleasures being exclusively regulated by Petronius. This excited the jealousy of Tigellinus, who, having recourse to the cruelty of the emperor, — which was even greater than his love of pleasure, — charged Petronius with being a friend of Scaevinus, suborned a slave as a witness, and deprived him of an opportunity of defending himself against the charge. It so happened that Nero had set out on a journey to Campania, and Petronius, in his retinue, had proceeded as far as Cumæ, when he was arrested. He did not bear the delay of fear and hope; nevertheless, he did not terminate his existence at once, but caused his opened veins to be bound up and reopened, according to his pleasure, while conversing jocularly with his friends, without attempting to gain the reputation of firmness. He listened to the recitations, not of discourses concerning the immortality of the soul and the tenets of philosophers, but of frivolous songs and jocose verses; some of his servants he rewarded, others he chastised; he participated in banquets,

indulged in sleep, in order that his death, though compulsory, might seem accidental. Not even in his will ("codicillis"), as was the custom of most who perished by the order of the emperor ("quod plerique pereuntium"), did he flatter Nero, or Tigellinus, or any other of the powerful; but he described the disgraceful vices of the emperor under the names of lewd men and women, indicating the strangeness and novelty of each excess ("et novitate cujusque stupri"), and sent this statement sealed to Nero. He then broke his seal-ring, that it might not serve to bring others into danger. Nero, reflecting how the manner of spending his nights could have become known, remembers Silia, a woman of some position in society in consequence of her marriage with a senator, employed by the emperor for every act of lust, and an intimate friend of Petronius. She is sent into exile for having revealed what she had seen and endured.

This is the passage from which many scholars have concluded that the Petronius of whose life, character, and death Tacitus gives this account, and the author of the Satyricon, are one and the same person; that the Satyricon as we now possess it is a portion of the statement of the amours of Nero sent by Petronius before his death to the emperor; and that, consequently, the author of this work is a contemporary of Nero. I have been thus particular in giving the original and substance of the passage of Tacitus, that the reader may judge for himself how slight and insufficient is the ground on which this opinion is based. It is apparent that two or three circumstances, either of no great weight or misunderstood, have given rise to this opinion. The first is the name Petronius, common to our author and the favorite of Nero. We shall by and by see that this name occurs in Roman history, from the earliest to the latest period, with more or less frequency; so that, unaccompanied by other circumstances, it can throw no light on the question as to the time in which our author lived. The second circumstance is the appellation "Arbiter," belonging to our author, and, in the modified form "elegantiae arbiter," given by Tacitus to the consular to designate his skill in preparing choice pleasures, and indicate the office and position which, in consequence of it, he occupied at the court of Nero. The third circumstance is the nature and character of the communication sent by Petronius to Nero, and which resembled somewhat some of the scenes described by our author.

I have already, in another place,* shown that the complete work of Petronius would be a book of not less than 700 octavo pages, and might extend to 1500 pages. Even if we allow that Petronius lived several days after his arrest,† the greater portion

* Pages 34 and 35.

† The expression "neque tamen praeceps vitam expulit" indicates that Petronius proceeded in a very

of which time, if not the whole, was, according to Tacitus's clear and explicit statement, occupied with domestic arrangements, banquets, conversations, and amusements, it is a matter of sheer impossibility for the most expert writer to perform the mechanical task of writing so much in so short a time, not to speak of the utter impracticability for any human being of composing in two or three days a work of distinguished literary excellence, and which bears on every page the marks of careful, patient labor.

The contents of Petronius's communication to Nero, as described by Tacitus, do not correspond to those of the Satyricon. While the former contained an account of the amours of Nero ("flagitia principis et noctium ingenia"), the Satyricon, even in its present incomplete condition, embraces much more. Not to mention the several, and sometimes protracted, conversations on art, poetry, and eloquence, and the episodes, — such as the charming story of the widow of Ephesus, — the account of the banquet of Trimalchio, which is more than one third of the work in its present condition, has nothing whatever, by any rational interpretation, to do with the amours of Nero.

Another circumstance deserves some notice. Considering the contents and tone of the communication sent by Petronius to Nero, is it probable that the latter would have preserved it, so that, soon after, it could become a well-known and popular part of the body of Roman literature? It is true, that some of those who favor the hypothesis that the communication sent to Nero is our Satyricon, have not overlooked this circumstance; but they do not explain it. Theodore de Juges, in the preface to his edition of Petronius, adverts to it thus: "His, inquam, verbis [cf. Tac. Ann. 16. 19] indubie Tacitus Satyricon hoc Petronii indicare voluit. Quod quidem ad se missum per codicillos promptum fuerat Neroni flammis abolere; nihilominus tamen ad nos illi codicilli pervenere, vel potius eorum fragmenta, quibus vitia aulae Neronianae perstringit Petronius."

Neither is the expression "codicilli" to be overlooked, which signifies, without an exception, "a short writing." It is true that the term "codicilli" is not directly applied to the communication of Petronius; Tacitus says, he did not in "codicilli" fawn upon Nero, or anybody else, but described the debaucheries of Nero; yet it is apparent that this description took the place of the "codicilli" (the last communication in writing of a dying person), and in size and form resembled it. Petronius, instead of filling his "codicilli" with flattery of Nero and his favorites, gave a description of

leisurely manner to prepare for and accomplish his suicide. But from other similar instances — for instance, of Torquatus Silanus (Tac. Ann. 15. 35) and of Seneca (Tac. Ann. 15. 62, 63) — it is evident that a few hours only elapsed between the decision of the emperor and the end of the accused; and no reason is assigned why Petronius should form an exception.

Nero's debaucheries. What Petronius sent to Nero was, or took the place of, "codicilli."

Whatever we may think of this hypothesis, that the consular Petronius mentioned by Tacitus is our author, a very serious injury, one in its origin but manifold in its effects, has resulted from it, and this is the desire of discovering the allusions to Nero and his debaucheries, which our work must contain if that hypothesis be true. A degree of ingenuity has been employed in discovering these allusions, which, from its very refinement, was changed into absurdity. The most unnatural, violent, and absurd interpretations have been put upon passages in themselves perfectly plain and simple; hidden allusions were discovered, where the language was as open and transparent as the light of day. Circumstances which might apply to any one, customs common to entire classes of persons, instances of extravagance which in an age running riot in all kinds of luxury were ordinary every-day occurrences, were referred to Nero. In this manner, not only single passages were misinterpreted, but the scope of the whole work was misapprehended.

Opinions of various Scholars concerning the Age of Petronius.

It is not my intention to enumerate all the opinions that have been expressed concerning the age of Petronius, but I shall confine myself to those which, from the character and standing of the scholars entertaining them, or from the reasons adduced in their support, deserve notice.

Janus Dousa (Jan van der Does was born in Noordwyck, near Leyden, 1545, and died 1604), in his "Pro Satyrico Petronii Arbitri viri consularis Praecidanea," considers, as the very title indicates, the consular Petronius of Tacitus the author of our work. He finds a striking resemblance, in opinion as well as language, between the Emperor Augustus and Petronius. In support of this view he quotes a passage from a letter of Octavianus to M. Antonius: "Tuque dubitas, Cimberne Annius an Verrius Flaccus imitandi sint tibi, ita ut verbis, quae C. Sallustius excerpsit ex Originibus Catonis, utaris; an potius Asiaticorum oratorum inanibus sententiis verborum volubilitas in nostrum sermonen transferenda?" and compares it with one of Petronius (c. 2. 7): "Nuper ventosa isthaec et enormis loquacitas Athenas ex Asia commigravit, animosque juvenum ad magna surgentes veluti pestilenti quodam sidere afflavit." It is apparent that Dousa, although he was chiefly influenced by the passage of Tacitus in forming his opinion as to the age of Petronius, recognized other indications of language and style as bearing upon the subject. He finds a confirmation of his view in a passage of Hieronymus, who, in Epist. ad Demedriad. de Virginitate servanda, says:

"Concinnatulos pueros et calamistratos et peregrini muris olentes pelliculas, de quibus illud Arbitri est: non bene olet, qui bene semper olet, quasi quasdam pestes ac venena pudicitiae virgo devitet." The expression, "non bene olet, qui bene semper olet," occurring in Martial (Epigr. 2. 12) as well as in Petronius, Dousa argues that Hieronymus would have quoted Martial instead of Petronius, unless the latter lived before Martial. Another confirmation of his opinion that Petronius was a contemporary of Nero, he finds in the fact that Fulgentius (Mythol., Lib. I.) quotes Petronius as the author of the line, "Primus in orbe deos fecit timor" (Petron. Fragm. 22. 1), which occurs also in Statius (Theb. 3. 661), which he would not have done, if he had not considered him as earlier than Statius.*

Pithoeus (P. Pithou), who was born at Troyes, 1539, and died at Nogent-sur-Seine, 1596, one of the earlier editors of Petronius, is of the same opinion, — that Petronius belongs to the age of Nero.

Jos. Anton. Gonzales de Salas, a Spanish scholar, who lived in the middle of the seventeenth century, wrote, when quite a youth, a commentary on Petronius. He takes it for granted that the consular Petronius of Tacitus is the same person with our author, and, consequently, considers Statius to have borrowed the expression, "Primus in orbe deos fecit timor," from Petronius.† Taking the ground that Terentianus Maurus, who mentions Petronius several times, was a contemporary of Martial (who was born 40 A. D., and lived as late as 100),‡ he finds in him a witness in favor of his opinion that Petronius preceded Statius. He not only endeavors to show the complete agreement of the description of the character of the consular Petronius given by Tacitus, with the character of our author as far as it appears in his work; but he goes so far as to justify the term "codicilli" as used by Tacitus, although, according to his opinion, it must in this instance mean a voluminous work.

Although a man of sense and learning, De Salas, blinded by his hypothesis as re-

* The commentator of Statius, Coelius Firmianus Lactantius (or Lutatius) Placidus, remarks on this line: "Negat Deos ulla alia re celebrari nisi timore mortalium, ut Lucanus: Quae finxere timent; et Petronius Arbiter istum secutus: Primus in orbe deos fecit timor." From this language some infer that Placidus intended to assert that Petronius lived after Statius; while others, for instance, Barth, understand him to say that Petronius lived after Lucan, "istum" referring to Lucan, not to Statius. Servius (ad Virg. Aen. 2. 715) quotes that verse as of Statius.

† De Salas interprets the expression of the scholiast Lactantius, "et Petronius Arbiter istum secutus," as Barth does, referring "istum" to Lucan, and not to Statius.

‡ Baehr, in his History of Roman Literature, favors the opinion which assigns Terentius Maurus to the end of the first or beginning of the second century, and considers him the same person with the governor of Syene mentioned by Martial, Epigr. I. 87. 6 and 7.

gards the author of the work, finds in the character of Trimalchio as described by Petronius a representation of that of Nero, and supports his opinion by such arguments as the following. Trimalchio, an ostentatious upstart, disdains to use again balls which had once touched the earth (c. 27. 2); he is, therefore, the representative of Nero, because of the latter Suetonius (Nero, 30) says: "Nullam vestem bis induit"; and because Lampridius tells of Heliogabalus, who affected to imitate Nero: "Calceamentum nunquam iteravit, annulos etiam negatur iterasse — linteamen lotum nunquam attigit, mendicos dicens, qui linteis lotis uterentur. — Idem mulieres nunquam iteravit praeter uxorem." Are circumstances like these to prove the identity of Nero and Trimalchio?

The door-keeper of Trimalchio being dressed in a green dress (c. 28. 8), De Salas says: "Notum et hinc jam in Neronem satyricum scomma. Ego autem magis adhuc confirmo. Nam Cajum principem, quem penitus aemulari gloriosum duxit inprimis ipsus Nero (ut alibi dicimus), Suetonius testatur nimis factioni Prasinae fuisse addictum; inquit ergo in Caligula 55: Prasinae factioni ita addictus et deditus, ut coenaret in stabulo assidue et maneret." Because Caligula favored the "factio Prasina," and Nero imitated Caligula, therefore Trimalchio, having a door-keeper dressed in green, is a satire on Nero. There is another instance of this kind of argument concerning the expression (c. 29. 3), "Et ipse Trimalchio capillatus caducum tenebat," when De Salas says: "Nosce jam simiam Caligulae, quem typum sibi proposuit Nero penitus imitandum, ut alibi dicimus; inquit ergo de eodem Cajo Philo Judaeus legatione ad ipsum: *Τοσαύτη δέ τις περὶ αὐτὸν ἦν λύττα καὶ παράφορος καὶ παράκοπος μανία ὥστε καὶ τοὺς ἡμιθέους ὑπερβὰς ἐπανῄει, καὶ ἐπαπεδύετο τοῖς τῶν μειζόνων καὶ ἀμφιθαλῶν εἶναι σεβασμοῖς, Ἑρμοῦ καὶ Ἀπόλλωνος καὶ Ἄρεος. Ἑρμοῦ τὸ πρῶτον κηρυκείοις καὶ πεδίλοις καὶ χλαμύσιν ἐνσκευαζόμενος.*" Because Caligula, whom Nero imitated, affected the attributes and distinctions of gods, therefore Trimalchio, doing something similar, is a satire on Nero.

The statement (c. 29. 7), "Notavi etiam in porticu gregem cursorum cum magistro se exercentem," is, by De Salas, considered another allusion to Nero, whose fondness for charioteering is well known. But what circumstance is mentioned which forces upon the reader the conviction that Nero is meant? None whatever. It is well known that Nero was not the only person who indulged in this amusement, but that it was a fashion prevailing to such an extent among the wealthy and fashionable that many squandered large estates in gratifying their passion. But what condemns this hunting after allusions to Nero still more, is that the above passage does not at all speak of charioteers, but of runners. De Salas, however, has an excuse for this; he finds in the substitution of "cursores" for "aurigae" an attempt to screen, in some measure, the attack upon Nero.

An expression in the following paragraph (c. 29. 8), "et pyxis aurea non pusilla, in qua barbam ipsius conditam esse dicebant," furnishes De Salas with another opportunity of displaying his ingenuity. To prove that here is again an allusion to Nero, he quotes Dio (Lib. LXI. p. 698): *Μετὰ δὲ ταῦτα ἕτερον αὖ εἶδος ἑορτῆς ἤγαγεν (ἐπεκλήθη δὲ Ἰουβενάλια ὥσπερ τινὰ νεανισκεύματα) καὶ ἐτελέσθη ἐπὶ τῷ γενείῳ αὐτοῦ· καὶ γὰρ τοῦτο τότε πρῶτον ἐξύρατο· καὶ τὰς γε τρίχας ἐς σφαίριόν τι χρυσοῦν ἐμβαλὼν ἀνέθηκε τῷ Διὶ τῷ Καπιτωλίνῳ.* The preserving of the beard of a youth was a Roman custom, and the taking off of the first beard was the occasion of a domestic festival. There is, therefore, nothing in the simple circumstance of the preserving of the beard which points exclusively or even pre-eminently to Nero. If he did it with more splendor and extravagance, in this he imitated, as in his turn he was imitated by, others who had the means and inclination to do so. Augustus gave on such an occasion a great public banquet (Dio Cassius, 48. 34). The act of Nero was, therefore, merely a modification — and perhaps one not originating with Nero — of the general custom. It was usual to consecrate the first beard to some deity, with more or less ceremony and state, according to the taste, means, or station of the family. It is absurd, then, to find in matters of common usage allusions to an individual case, unless there are clear, unmistakable indications distinguishing that particular case. It seems to me evident that Petronius, in his description of Trimalchio, intended to describe the extravagance and folly of the upstarts of his time; and to find, or imagine that there are to be found, in this general description, allusions to individuals, is changing the point of view from which these inimitable descriptions should be seen, and mistaking or misrepresenting the aim of the author.

This morbid eagerness for finding everywhere allusions to Nero seems to have led De Salas into misapprehensions, not only of the evident meaning of our author, but even of his language. Petronius relates (c. 30. 3) that a tablet was suspended at the entrance of the supper-room, with this inscription:

III . Et . Pridie . Kal . Jan .
G . Noster . Foras . Coenat .

which De Salas seems to understand as meaning that Trimalchio on those days sups in public, because it is related of Nero (Suet. Nero, 27, and Tac. Ann. 15. 37) that he was fond of public banquets. The phrase "coenare foras" means, of course, "to sup abroad," — that is, not at home, but at another person's house.

C. 37. 1, Fortunata, the wife of Trimalchio, is introduced, and during the whole entertainment plays no insignificant part. De Salas, swayed by his hypothesis that Trimalchio represents Nero, is of course obliged to find the original of Fortunata. He

is, however, not very successful. He can find none except the freedwoman Acte, who was for some time the favorite of the emperor. He overlooks the circumstance, that Fortunata was actually the wife, not the concubine, of Trimalchio, while Acte was nothing but the mistress of Nero, who had at the time a lawful wife, Octavia; he overlooks the fact, that Trimalchio and Fortunata are described as of the same origin and social condition, while Nero was a member of the imperial family, and Acte a freedwoman; he overlooks that Trimalchio ascribes his success in life to the management and devotion of his wife, while, of course, nothing of the kind is, or could be, related of Acte.

When Eumolpus, at his first meeting with Encolpius (c. 83. 8), says, "Ego poëta sum," De Salas at once discovers an allusion to Nero, saying: "Eum ad insaniam usque proclivem prodiderunt ad carmina historici antiqui." Every reader of Horace, Persius, and Juvenal knows how general, even from the times of the republic, was the *cacoëthes* of writing and reciting verses (cf. Hor. Sat. I. 4), and Eumolpus is the personification of this vice. To find in this character a personal satire on Nero, betrays an entire misapprehension of the object of the writer.

C. 89, the words, "quae Trojae halosin ostendit," remind De Salas immediately of Nero singing, during the conflagration of Rome, the taking of Troy. Petronius relates in the following chapter that the spectators stoned Eumolpus. What occurrence in the life of Nero can De Salas quote, to which this treatment of Eumolpus furnishes the parallel?

Joannes Sambucus, a native of Hungary, who was born 1531, and died 1584, in Vienna, in his edition of Petronius, published in 1564, declares his opinion that Petronius lived about the time of the Emperor Gallienus, who reigned from 254 to 268 A. D. It would appear, from a remark of his, that, were it not for one circumstance, he would have no objection to placing him even later. He says: "Eodem aut paullo ante tempore floruisse nostrum non dubito. Nam ex hoc fragmento satis apparet rei publicae Romanae a Christianis principibus nullam dum factam fuisse mutationem."

Patisson, in his preface to Petronius, 1575, is inclined to believe that the Petronius of Tacitus is our author; from the mention of him by Terentianus Maurus, whom he supposes to be the governor of Syene mentioned by Martial, he infers with confidence that Petronius lived before the reign of Domitian.

Melchior Goldast von Heimensfelt, one of the best among the earlier editors and commentators of Petronius, 1610 and 1621, considers our author to be the Petronius of Tacitus.

Some mediæval writers should not be passed by without a notice, who entertained

the opinion that the author of the Satyricon was the Bishop Petronius of Bologna, who lived in the reign of Valentinianus (364 – 375) and Theodosius (379 – 395), towards the close of the fourth century, a learned and eloquent divine, and no less respected for the sanctity and purity of his life than his scholarship.

It is to be regretted that the great scholar Justus Lipsius (born 1547, died 1606) had no occasion or time to examine the question of the age of Petronius. A man of his penetration, knowledge of the language, and antiquarian learning, could not have directed his great powers and resources to the subject without throwing light upon it. As it is, he expresses himself very cautiously in his commentary to Tac. Ann. 16. 18: "Quem [Petronium] viri docti eum censent, cujus fragmenta hodie purissimae impuritatis. De quo etiam delibero, sicut et de praenomine."

The author of the preface to the Paris edition of 1667, which, if not from the pen of Hadrianus Valesius, but, as Burmann states, of Joan. Bourdelot, gives the substance of the arguments of Hadr. Valesius, and sometimes in the same words, rejects the opinion that the consular Petronius of Tacitus is the author of the Satyricon. He adverts to the fact that the designation "elegantiae arbiter," indicative of the relation of the consular to Nero, was not a proper name, while Arbiter was really a part of the author's name, as is evident from the quotations of Terentianus Maurus, Diomedes, Servius Honoratus, Macrobius Theodosius, Marius Victorinus, Hieronymus, Sidonius, and others. The consular was, according to the plain statement of Tacitus, a man of rank and wealth, while nothing of the kind is mentioned concerning the author. He points to the difference between the communication of the consular to Nero, and the Satyricon of our author, with regard to their subject-matter, size, and extent. He does not admit the arguments of Janus Dousa, by which the latter endeavors to prove that the two passages, "Non bene olet, qui bene semper olet," and "Primus in orbe deos fecit timor," belonged to Petronius, and were borrowed from him by Martial and Statius, and thus to establish the priority in time of Petronius. He adopts the view of Henricus Valesius (Henri de Valois, born 1603, died 1676), who places the author Petronius much later than the times of Nero, and, influenced by a passage in Apollinaris Sidonius, 23, —

> "Et te Massiliensium per hortos
> Graji cespitis (Sacri stipitis) Arbiter colonum,
> Hellespontiaco parem Priapo," —

considers him a Gaul by birth, born in the neighborhood of Massilia; but he differs from him, inasmuch as he places him a little before the times of the Emperor Constantinus. He is induced to think so by the fact that Petronius is not mentioned by

Quintilian, Suetonius, and Pliny, but is named by Priscianus, Diomedes, Victorinus, and Hieronymus.

Joh. Christoph. Wagenseil, in his attack upon the genuineness of the Tragurian fragment, takes it for granted that the author of the Satyricon was the consular Petronius of Tacitus. He says: "Atque hic ante omnia illud mihi concedi postulo, de quo inter eruditos propemodum convenit, esse hoc in Neronem scriptum Satyricon, eoque illius mores et vitam turpissimam traduci, hoc est, non de alio quam de nostro loqui Tacitum," etc. He is equally confident that Trimalchio is a satire on Nero: "Lipsius quidem in notis videtur fuisse ambiguus. Quid autem causae habuerit, non liquet. Mihi enim Arbitrum cum Suetonio comparanti nulla dubitandi relinquitur occasio, et verisimile fit insignem hunc scriptorem multis in Petronio et praecipue his, quae de Trimalchione, hoc est de Nerone recensentur, plus lucis conferre, quam quidquid in eum congestum est commentariorum," etc.

Hadrianus Valesius, in his dissertation on the genuineness of the Tragurian fragment, agrees with Wagenseil in rejecting the latter, but differs from him with regard to the age and person of Petronius, and the opinion that Trimalchio is a satire on Nero. He points out the inconsistencies involved in this opinion. While Trimalchio was an imported slave, Nero was the descendant of one of the noblest Roman families, and, by his mother, connected with the family of the Cæsars. Trimalchio's wife, Fortunata, was of an origin similar to that of her husband; Nero's wives, Octavia and Poppæa, were of noble descent; — Acte was, indeed, a freedwoman, but she was the emperor's concubine, not his wife. Trimalchio was an old man; Nero did not exceed the age of thirty-two. Trimalchio is ignorant and foolish; Nero was educated, and a man of ability. Trimalchio delighted in an ugly, disgusting favorite; Nero's favorites were distinguished for their beauty. Valesius approves of the caution of Lipsius in not adopting the opinion that the author of the Satyricon is the consular Petronius of Tacitus. He refers to the circumstance, that, while the consular received the designation "elegantiae arbiter," to indicate his skill in arranging the amusements of Nero, Arbiter was actually the name of the author, as is evident from the manner in which Fulgentius, Terentianus Maurus, Diomedes, Servius Honoratus, and others, quote him. The consular Petronius is a man of rank and wealth; nothing of the kind is stated of the author. The last written communication of the consular to Nero was very brief; the work of the author is voluminous. Valesius finds a confirmation of this in the title of the book itself, Satyricon, — which he considers, not the nominative singular, but the contracted genitive plural, — and in the manner in which several ancient authors quote him, — for instance, Terentius Maurus:

"At Arbiter disertus
Libris suis frequentat."

The contents of the communication of the consular were true, both as to facts and names; the Satyricon, an imitation of the Menippean satire of M. Varro, in which prose alternates with poetic passages, contains, under fictitious characters, a description of the manners of the age. Valesius rejects the opinion of Janus Dousa, that Martial borrowed "Non bene olet, qui bene semper olet," and "ingeniosa gula est," and Statius, "Primus in orbe deos fecit timor," from Petronius. He agrees with his brother, Henricus Valesius, in placing Petronius much later than the times of Nero; but while Henri Valois places him in the time of Gallienus (240 A. D.) and Bourdelot a little before the times of the Emperor Constantinus, he puts him in the time of the Antonini (138–180 A. D.). He finds a confirmation of this view in Macrobius (in Scip. Somn. 1. 2): "Auditum mulcent argumenta fictis casibus amatorum referta; quibus vel multum se Arbiter exercuit vel Apuleium nonnunquam lusisse miramur"; from which he infers that Macrobius either considers Petronius a contemporary of Apuleius (who likewise belongs in the times of the Antonini), or places him a little earlier, because he mentions him first.

Marinus Statilius, as I have already mentioned, changed, in the course of his defence of the genuineness of the Tragurian fragment, his view with regard to the age of Petronius. In his first paper, the "Responsio" to Wagenseil and Valesius, he acquiesced in the belief that Petronius belonged in the times of Nero: "Nam nos Petronium ipsum tunc (Neronis principatu) extitisse contendimus." During the few years intervening between the "Responsio" and "Apologia," his opinion on this subject underwent an entire change, which he himself announces with praiseworthy frankness: "Qua de re antequam dicere incipio, aliam quandam, quae mihi tecum [he addresses Wagenseil] est, controversiam paucis aperiam; nec sane erit, quod moleste id feras, quandoquidem hac eadem in re a me ipso dissentio; adductus scilicet vi veritatis, cujus mihi studium omnibus meis studiis et rationibus antiquius est. Nam cum hactenus vulgatam de Petronii aetate opinionem, quae illum Neroni aequalem statuit, probare solitus essem, nuper accurata eruditi hominis* disputatione coactus sum, ut multo recentiorem hunc scriptorem existimem, et paullo ante Constantini Augusti tempora, certe longe infra Severum collocem." His first argument is the silence of Quintilian, Suetonius, and Pliny concerning Petronius, while he was known and appreciated by the scholars of a later period, such as Priscianus, Diomedes, Victorinus, and

* Statilius does not mention the name. P. Burmann says that it was the opinion of the Valesii which influenced him: "Valesiorum auctoritate motus quoque Statilius fuit."

Hieronymus. He next refers to Lutatius Placidus, the scholiast of Statius, whom he understands to say that Petronius lived after Statius, and borrowed from him the line "Primus in orbe deos fecit timor." He proceeds to call Petronius himself as a witness, referring to what Petronius says of the decline of art, particularly of painting. Statilius knows of no complaints of this kind in the age of Nero; on the contrary, he has been told that, as late as the reign of Commodus, statues of great artistic value were produced; and, considering the intimate connection of these two sister arts, he cannot believe that the condition of painting was less favorable; nay, he finds a positive testimony in the frescos of the baths of Titus, of whose discovery and beauty he has been told. He thinks that the censure uttered by Petronius can only apply to the times of Constantinus, and he finds a confirmation of its justice in the defects of the sculptures on the arch of Constantine.

Thomas Reinesius, in his dissertation on the genuineness of the Tragurian fragment, published in January, 1666, without entering upon the question of the age of Petronius, takes it for granted that he belonged to the time of Nero, for he calls him "T. Petronius Arbiter, scriptor aevo Neronis doctissimus, nitidissimus, lepidissimusque."

As we advance in the review of the opinions of leading scholars on the question of the age of Petronius, we come to Peter Burmann, whose opinion deserves special notice, not only on account of his reputation for thorough scholarship, but also on account of the intrinsic value of his arguments. Peter Burmann, who was born at Utrecht in 1668, and who was Professor, first in his native town, afterwards in Leyden, where he died in 1741, produced one of the best editions of Petronius in 1709, which appeared in a second edition in 1743. In the preface to the first edition, after stating that the majority of scholars believed our author to be the Petronius of Tacitus, he expresses his dissent, and declares his conviction that nothing can be found in the whole work which is, exclusively or principally, aimed against Nero. Trimalchio is a freedman, old, foolishly boasting of his elegance and learning; Nero is young, of noble descent, of great ability, although of bad moral character. What he considers the principal evidence is, that Tacitus, in distinct terms, states that the consular Petronius did not write a book, but a note, "codicilli," in which he commemorated the lust and debaucheries of dissolute men and women. He defines what the Romans meant by the term "codicilli," to show that they were small tablets used for memoranda, letters, and other brief communications. It was impossible for the consular Petronius to write, in "codicilli," which were not large enough for a long letter, our work, of which we have a part only. The elaborate style of the work is inconsistent with the idea that it should have been written during the few hours preceding Petronius's death. Tacitus

states that he gave an account of debaucheries, naming the persons concerned, while in the Satyricon the names are fictitious. These tablets having been sent to Nero sealed, it is not probable that he preserved them.

Burmann controverts the view of the Valesii, who place Petronius in the time of the Antonini,* and believe him to have been a Gaul by birth. He considers the elegance of style and the state of morals described by Petronius as opposed to that view. Expressions which seem to indicate a later age, occurring in the part describing the banquet of Trimalchio, and some other portions of the book, are purposely chosen by Petronius to be in keeping with the characters he introduces, — inhabitants of a Campanian colony, low, vulgar, half-Greek freedmen. While he concedes that, in other parts of the work, there are some few peculiarities of language which cannot be justified by the authority of the best contemporary writers, he observes that this is a charge brought against many other writers; for example, against Livy by Pollio, who accuses him of patavinity, and against Cicero himself by Statilius Maximus. That some of the peculiar expressions of Petronius occur in later writers, may be owing to the preference given by these writers to Petronius. He applies this remark more particularly to the monks, who, with a hypocritical exterior, read with relish the most indecent passages. Nay, he goes so far as to account, by this depraved taste of the monks, for the fact that so large a portion of the indecent parts of the work have been preserved, and rejects the view of Peter Daniel and Ritterhusius, who ascribe the loss of so large a portion of the work to a natural desire of pure-minded men not to perpetuate such indecencies; so that, according to his opinion, what we have left is the most indecent, according to Daniel and Ritterhusius the most decent part. He quotes Salmasius, who, in his preface to L. Ampelius, expresses a similar opinion.†

The subjects of complaint and censure, such as the corruption of eloquence, the decline of the art of painting, the degeneracy of poetry, refer, according to Burmann's opinion, to the time immediately after Augustus or Tiberius. The vices described by

* Burmann is not quite accurate in this statement. Hadrianus Valesius places Petronius in the times of the Antonini (138–180 A. D.), but his brother, Henry Valesius, in the time of Gallienus (253–268 A. D.).

† "Ita conservatus est elegantium nequitiarum curiosis Petronius Arbiter. Quod enim ex ejus satyrico habemus, mera excerpta sunt alicujus studiosi, qui, quae ad gustum suum in illo auctore invenerat, eodem, quo opus legebat, ordine adversariis suis commendavit ac commisit. Qui putant a monachis sic eviratum esse, vehementer errant. Qualis haec esset castratio, quae resectis a reliquo corpore membris vel potius ipso corpore abjecto, solas pudendas partes reliquisse videatur? Certe quae desiderantur, vix videri possunt salaciora ac nequiora fuisse his, quae relicta sunt. Immo ista nullam procacitatis et protervitatis ὑπερβολήν vel ipsis lenonibus usurpandam reliquam faciunt."

Petronius — for example, the immorality of pedagogues, the wantonness of married and unmarried women, the impudence of legacy-hunters — belong to the same time. Burmann concedes that all these vices prevailed in a higher degree in the times of Nero; but he is of opinion that satirical writings, like those of Petronius, are the offspring of a time when the sway of vice is not yet all-powerful, when there exist yet some remains of former strictness and virtue, engendering a desire to check the increasing demoralization. He considers Petronius a man of moral purity, and one who had himself reached the height of eloquence by the path which he points out in the commencement of the work, and who, for this very reason, could not bear the literary and moral degeneracy of his age.* From these considerations, Burmann comes to the conclusion, that Petronius lived in the reign of Tiberius, Caligula, and Claudius, and had yet seen the happy times of Augustus.† He is fully convinced that he selected especially Claudius and the crimes of the freedmen, so powerful under that emperor, as the subject-matter of his work. He appeals to Suetonius, Tacitus, Dion, and especially to the satire of Seneca on the death of Claudius, in confirmation of his opinion that many of the traits attributed to Trimalchio are borrowed from Claudius. This is, unquestionably, the weakest part of Burmann's otherwise so sensible opinion, in which he has suffered himself to be carried away by a fancy.

It was in the year 1821 that Niebuhr, the well-known historian, published his dissertation on the age of Curtius and Petronius, from which I have already quoted, — a dissertation which influenced the opinion of many quite as much by the reputation of its author as by the weight and force of its arguments. Two years before, in 1819, it had been discovered that beneath certain heaps of rubbish, in the Villa Pansili, a great number of Roman graves were hidden. This villa is bordered by the highway, the ancient "Via Aurelia." Upon a closer examination, it was found that the graves had previously been searched; but apparently nothing of value was found, with the exception of many gravestones with inscriptions, which indicate that the graves were chiefly those of freedmen, and belonged to the second and third centuries of our era.

A proof that these graves were not unknown to the scholars of earlier times is furnished by the fact, that the first inscription fallen in with at the last examination is

* I think Burmann errs in ascribing to Petronius a moral object, — to correct the men of his time. Petronius had no other object than to furnish a lively, entertaining, but true, description of certain phases of social life in his own time.

† "His omnibus ego rite pensitatis Tiberii, Caligulae, et Claudii imperia attigisse Petronium puto, immo Augusti adhuc felicia tempora vidisse." Afterwards: "Sedet mihi non infra Claudii tempora hoc opus esse demittendum."

found in Muratori's collection (page 1321), from the papers of a Roman scholar, but incompletely and incorrectly copied. This inscription (see Niebuhr, page 338) is on a slab of bluish and poor marble.

Niebuhr lays much stress on the fact that the inscription contains three names which occur in the banquet of Trimalchio, namely, Fortunata, Encolpus, and Apelles. The circumstance that Encolpus is mentioned as the husband of Fortunata does not disconcert Niebuhr, who says: "Who would expect to find the persons of that drama precisely in their historical relations?" If the husband's name, Encolpus, has in the story been changed into Trimalchio, what guaranty have we that Fortunata is not changed also? And if changed, like the name of the husband, the Fortunata of the story is, of course, not the Fortunata of the inscription. It will at once be apparent how slight is the basis on which Niebuhr builds his hypothesis.

The object of Niebuhr is to prove that this inscription belongs to the age of Severus, not later than 250 A. D., and he declares the opinion that Petronius belongs to the age of Nero to be "one of the prejudices of the puerile [unmündige] age of philology which are now exploded." He considers the arguments of the Valesii irrefragable and exhausting, and that to them is due the honor of having settled the point which they were first to bring into notice, and to Monsignor Gradi, that of having acknowledged as correct an opinion which he had at first violently opposed.* He refers to Lydus de Mag. 1. 14, as a confirmation of this view, who, enumerating the Roman satirists chronologically, as Niebuhr thinks, names them in this order: Horace, Persius, Turnus, Juvenal, Petronius.

From a remark of Trimalchio's (c. 69. 3), "ipsam Mammeam," Niebuhr conjectures that Trimalchio had illicit intercourse with Mammæa, the mother of Alexander Severus; and as this could not, without danger or impropriety, be alluded to in the lifetime of Alexander Severus, he places the poet later, — in the middle of the third century, — and in this respect goes even further than Hadrian Valesius.† It will again be readily perceived how slender is the foundation for this hypothesis.

Niebuhr goes on to say: "And thus we see, it may be with astonishment, that one

* From this it is apparent that Niebuhr adopts the opinion that Stephanus Gradius, the librarian of the Vatican library, was the author of the "Responsio" and "Apologia," published under the name of Marinus Statilius.

† Niebuhr commits the same error as Burmann in representing the Valesii as assigning Petronius to the same age. It has been stated above, that Hadrian Valesius places Petronius in the times of the Antonini (138–180 A. D.), while his brother Henry places him in the time of Gallienus (253–268 A. D.), so that Niebuhr agrees with Henry, but not with Hadrianus.

of the cleverest and richest poets wrote about the middle of the third century; which time, following an obscure feeling, we are accustomed to despise, as an epoch of confirmed barbarism. In respect to the arts (bildende Künste), this opinion is correct; is it not generally known that Petronius says that painting had in his time perished? How they then painted, we see with horror in the paintings found in the splendid villa Tor Marancia, which undoubtedly belong to this age. For Egyptian art, in which he sees the cause of the ruin of painting, I am inclined to believe to be the glass-mosaic. I mention in passing, that he who suffers himself to be instructed by the Valesii can, influenced by the most conclusive reasons, no longer place Terentius Maurus under Domitian, since he mentions Petronius."

It will be seen, in this instance, how one rashness leads to another. In order not to conflict with Niebuhr's hypothesis, Terentianus Maurus, who is generally placed at the end of the first or the commencement of the second century, must, without any external or internal evidence, give up his place, and descend more than a hundred years.

I have quoted before (page 25) the true and excellent remarks of Niebuhr on the moral and literary character of Petronius, and I cannot divest myself of the belief that, if Niebuhr had dwelt and reflected longer on the excellences of Petronius as a writer, which he seems to appreciate so fully, he could not have entertained for one moment the opinion that he belonged to the third century. Orelli, in a note appended to this inscription in his Collection of Latin Inscriptions, rejects the interpretation of Niebuhr in very plain terms: "Quae omnia tametsi satis ingeniose sunt excogitata, tamen haud multos fore puto, quibus suam divinationem probaturus sit vir doctissimus."*

Niebuhr has found a zealous supporter in K. Eckermann, who, in his article on Petronius, in Ersch and Gruber's *Allgemeine Encyclopädie der Wissenschaften und Künste* (Vol. XIX. pp. 323–339), vigorously assails the arguments, both historical and linguistic, of Studer, and adopts and defends, to its full extent, the hypothesis of Niebuhr. Eckermann is quite certain that the name Arbiter did not originally belong to Petronius, but was given to him through misapprehension of the passage in Tacitus's Annals.

Teufel, after the excellent criticism of the literary character of Petronius which I have quoted above (page 26), goes on to express the opinion that the work belongs to the first century of our era, and assigns as his reasons the complaint of the decline of painting (Staffelmalerei), in consequence of the prevailing taste for fresco-painting

* Inscriptionum Latinarum Selectarum Amplissima Collectio. Jos. Casp. Orellius. 1828. Vol. I. p. 257.

(Wandmalerei), the passage relating to the disappearance of genuine eloquence, and the descriptions of the overbearing conduct and the incredible riches of freedmen. He doubts the name Petronius, and thinks that this work, unknown to all classical writers, had its origin out of Rome.

One scholar only, so far as I know, has in our own days made the question of the age of Petronius the subject of a comprehensive investigation. This circumstance, as well as the intrinsic value of the investigation, entitle the author and his work to a somewhat more extended account. This scholar is G. Studer, of Bern, who wrote his paper, *Ueber das Zeitalter des Petronius Arbiter*, in 1841, for the *Rheinische Museum für Philologie*, in which periodical it appeared in 1843.

After a brief, but clear and fair account, of the labors of his predecessors on this topic, Studer begins his own work with the examination of the passage of Tacitus in Ann. 16, c. 17–20, and comes to the conclusion that not only our author, Petronius Arbiter, is the consular Petronius, the friend and companion of Nero, whose life and character are in that passage described by Tacitus, but that the Satyricon is the communication which the consular, before his death, transmitted to Nero. In maintaining this opinion, he attaches great weight to two circumstances; first, that Tacitus, when attributing to Petronius the designation "elegantiae arbiter," uses the very word which appears in the manuscripts as the surname of our author; and second, that Tacitus, in the words, "flagitia principis sub nominibus exoletorum feminarumque et novitate cujusque stupri perscripsit," hints at the contents of the Satyricon.

After having thus stated his own conviction, Studer enters upon a refutation of those who do not recognize the identity of the author of the Satyricon and the Petronius of Tacitus. Briefly alluding to Sambucus and Lipsius, he assails, with more or less success, the arguments of Hadrian Valesius. He takes particular pains to meet Valesius's position, that, while the communication sent by Petronius to Nero was of small extent, containing, not fictitious occurrences, but historical facts relating to Nero, the Satyricon was a voluminous work, filled with fictitious occurrences, embracing, after the fashion of the Varronian Satura, the manners and doings of society at large, lamenting the decline of art and letters, satirizing the absurdities of poets and rhetoricians, of freedmen and legacy-hunters, introducing longer and shorter poems,—all of which is at variance with the statement of Tacitus concerning the writing addressed by Petronius to Nero. Studer adverts to the circumstance that Tacitus, in stating that Petronius sent to Nero a description of his debaucheries, instead of the customary "codicilli," says nothing of the size or extent of the writing. He further insists that Tacitus, by using the words, "flagitia principis . . . perscripsit," did not intend to describe the

entire contents of the communication; his object was to point out the independent spirit of the former favorite of the emperor, as contrasted with the servility of others in similar circumstances, and not to analyze the communication in a literary point of view. Studer does not ignore the difficulty that all attempts of discovering or identifying in the narrative of the Satyricon the doings of Nero and his court have hitherto failed. He concedes that the attempts of Gonsalas de Salas in this direction are particularly absurd; but he meets this difficulty by the very convenient supposition, that Nero caused the passages relating to himself, and which must have been peculiarly offensive to him, to be destroyed.

Studer meets by a similar argument the objection raised by Statilius, that, if the Satyricon was the satire on Nero spoken of by Tacitus, the predominant trait of his character, his cruelty, would be mentioned, saying that Tacitus does not comprehend all the shameful deeds of Nero in the term "flagitia principis," and even if the word "flagitia" were to be taken in a more comprehensive sense, the fragmentary condition of the Satyricon would sufficiently account for the absence of any mention of this part of Nero's character.

The weighty objection of Burmann, that Petronius had no leisure, in the short time elapsing between his disgrace and suicide, to compose so voluminous a work as the Satyricon, is met by the remark that Tacitus does not say that it was written within that short period; that Tacitus does not speak of its composition, but of its transmission to Nero. Studer either allows himself here a latitude of interpretation that cannot be conceded to him, or overlooks the fact that the language of Tacitus is plain, and capable of one interpretation only; he says, "flagitia principis . . . perscripsit atque obsignata misit Neroni." If the book had been written previously to the disgrace of Petronius, Tacitus would have said, "antea perscripta misit," or used an equivalent expression; as the language stands, "perscripsit" cannot mean anything else than an act contemporaneous with "misit." If Petronius sent the book at that time, he also wrote it at that, and no other, time.

The manner in which Studer meets another objection of Burmann, which he acknowledges to be the most plausible, is equally feeble and unsatisfactory. Burmann remarks that Petronius's communication was destined for the emperor; he sent it to him sealed; the emperor could not but be deeply offended by it, and did certainly nothing to allow or aid its publication. Studer suggests the possibility that a copy of the work might have been previously deposited in safe hands. Nay, he goes so far as to think it possible that Nero, with the exception of those portions exposing his debaucheries, might have been pleased with the production, and, after those objectionable

portions were once destroyed, had no reason for preventing the publication of the rest.

After this, as it seems to me, unsuccessful, although ingenious, attempt to find in the passage of Tacitus a reference to our author and our work, Studer proceeds to examine the other passages in ancient writers which mention Petronius, and he judges in their case with much more independence and fairness than in that of Tacitus. He states with great impartiality the arguments for and against the early period of the life and writings of Terentianus Maurus, and concludes that, until the question of the age of Terentianus Maurus is settled, his testimony as regards the age of Petronius is of little weight. He further acknowledges, that the other witnesses, none of whom is older than the fourth century of the Christian era, are of even less weight; but he strenuously and ably meets the argument that Petronius could not have lived under Nero, because neither Quintilian nor Pliny nor Suetonius mentions him. He mentions other writers, such as Manilius, Paterculus, Phaedrus, Curtius, Florus, who are equally unsupported by witnesses of their own times.

Studer shows, in the next place, the insufficiency of the argument that Petronius must have lived after Martial and Statius, because several detached verses and sentences are found in them as well as in Petronius, by remarking that it is equally possible that Martial and Statius borrowed from him, or both parties from a third source, so that the coincidence is accidental; or that Hieronymus, who quotes one of the passages in question ("non bene olet, qui bene semper olet") as from Petronius, was mistaken in ascribing it to Petronius instead of Martial.

Of the hypothesis of Niebuhr he says very justly: "The untenable character of this hypothesis, for which the renowned name of its author procured an undeserved credit, is briefly pointed out by Orelli in his Inscript. Lat. Vol. I. p. 257."

Having thus declared his conviction that the Petronius of Tacitus is the author of the Satyricon, and the communication sent to Nero our work, and having met the arguments of those who, directly or indirectly, oppose this view, Studer proceeds to an examination of the internal evidence, which he naturally divides into evidence furnished by the diction and style of the book, and into that which is to be found in the contents. He enters upon the consideration of the linguistic evidence with some very judicious and sensible remarks concerning the qualified reliability of this kind of evidence. He refers to the fact, that, while the language of a certain period, as exhibited by the great body of writers, has unquestionably something in common which may be called the style or diction or language of that period, there are exceptions, such as Vitruvius and Lactantius, the former of whom in his style fell short of the purity and elegance char-

acterizing his age, while the latter rose high above the degeneracy of his. He next adverts to the circumstance, not sufficiently considered by Barth, Wagenseil, and Valesius, that Petronius purposely introduced specimens of the "lingua rustica," and to the equally important circumstance, that in all periods there is, besides the more elevated style and careful language of the historian or philosopher, a "humile dicendi genus" nearly related to the language in common use among cultivated people. Studer finds in the style of Petronius, not only many points of comparison with the language of Seneca, but striking illustrations of those qualities and characteristics ascribed by Tacitus to the consular Petronius. I find so much truth in the last observation, that, did not some weighty considerations which will appear in the course of this paper lead me to place Petronius somewhat earlier than the age of Nero, I should be ready to believe that the consular Petronius was the author of the Satyricon, — although I must wholly reject the hypothesis that our Satyricon is the communication which the consular Petronius sent to Nero. I am fully convinced that, besides being a man of genius, the author of the Satyricon was a man of refinement and varied culture, and moreover a man of the world, endowed with that clear perception of, and penetration into, human nature, which are so much more frequently found in men of the world than in retired scholars, and the talent of communicating the creations of his fancy, humor, and wit in language as simple and direct as it is elegant and polished.

Studer examines first the specimens of the "lingua rustica" contained in the Satyricon, under certain heads, enumerating, 1. the Greek words, 2. the Greek words with Latin terminations, 3. the Grecisms in syntax, 4. archaisms both in a grammatical and lexicographical point of view, 5. compound nouns, 6. diminutives, 7. expressions of peculiar strength and coarseness, 8. apothegms and proverbs, 9. comparisons, 10. hyperbolical expressions, 11. figurative expressions, 12. oaths. Then follows an examination of the language of Petronius himself, and of other persons of education introduced into the work. Studer points out the naturalness and simplicity of this language, the rarity of poetic or Greek turns of expression. He finds in words and phrases the characteristics of the silver age; the resemblance to the language of Seneca being, however, more striking and frequent than to that of Martial, Pliny, Justin, or others; and he supports this opinion by a large number of instances.

It seems to me that Studer lays too much stress upon words and phrases to prove the supposed resemblance of Petronius and Seneca. While I do not deny the existence of such a resemblance, it may, I think, be explained in quite as satisfactory a manner as by assuming that the two writers were contemporaries. Petronius used in his narrative, and in the conversations of the educated and refined portion of his *dramatis*

personæ, the easy, familiar, but still polished and refined language of his own time, which at a later period made its way into literary productions of a more dignified description. The language of conversation of one period is the parent of the style of composition of a succeeding; and the history of the linguistic development of almost every nation furnishes illustrations and examples of this fact.

The result at which Studer, after this examination of the linguistic evidence, arrives, is that the style of Petronius not only does not furnish any satisfactory ground for distrusting the external evidence pointing to the age of Nero, but that the resemblance as to words and phrases between Petronius and Seneca favors the opinion that both belong to the same age.

The examination of the evidence furnished by the style and language of the book is succeeded by that of the historical evidence. Here, as in the commencement of his dissertation, Studer acts at first polemically, by impugning the arguments of Ignarra and the author of the "Isagoge ad Volumina Herculanensia," who found in the contents of the Satyricon indications of the times of the Antonines. Ignarra, taking it for granted that the colony in which Petronius lays the scene of the earlier portion of his story can be no other place than Naples, and endeavoring to show that Naples did not become a Roman colony until after Commodus, concludes, strangely enough, that the author, who according to his own premises should be at least as late as Commodus, belongs to the times of the Antonines. Studer concedes that there is the greatest probability that the colony is Naples, but he denies that there is any evidence whatever as to the time when Naples became a colony; that this change may have taken place under Augustus as well as under Commodus, and consequently no inference can be drawn from this circumstance as to the age of Petronius; while, on the other hand, if the age of Petronius is determined from other sources, it follows as a matter of course that the colonization of Naples is anterior to that point of time.

The author of the Isagoge ad Vol. Hercul. infers, from the circumstance that the burying of the dead is (c. 111. 2) called a Greek custom, that the book must have been written after the time of the Antonines, because Lucian (De Luctu, c. 21) says that the Greeks burned their dead. Studer observes, very correctly, that it is well established latterly, by the thorough investigation of W. A. Becker (Charicles, Vol. II. p. 181), that the Greeks used both modes, but the burying more frequently, while the Romans buried their dead in the earliest times only, and then again after the third century of the Christian era (Gallus, Vol. II. p. 294). Calling burying a Greek custom, it follows that Petronius lived when burning was among the Romans the universal custom, that is, before Apuleius, who speaks of coffins, or Macrobius.

The argument advanced by Statilius in his "Apologia," that Petronius's account of the decline of art, and particularly of the total degeneracy of the art of painting, could not apply to the time of Nero, is well met by Studer by a reference to Pliny, whose account of the condition of art fully agrees with that of Petronius.

Having thus met the arguments of those who, denying the Neronian age of Petronius, seek to assign to him a later period, Studer leaves the polemical course hitherto pursued, and goes on to adduce arguments in support of his view, that Petronius belongs to the age of Nero. He points out that the complaints of Encolpius concerning the decline of genuine eloquence are confirmed by Quintilian, and still more by the author of the "Dialogus de Oratoribus." He next adverts to the insolent and overbearing conduct of the freedmen, which reached in the times of Tiberius, Claudius, and Nero its highest point, and of which Trimalchio and his companions furnish so many amusing specimens, — to the practice of leading a single life, a practice so prevalent even in the times of Augustus as to call for legislative interference, — and to that of legacy-hunting, so intimately connected with the preceding, — as unmistakable indications of the age of Nero.

With regard to the names of historical personages, which Studer very properly considers to be of great importance, he speaks of the names Mammæa, Mæcenatianus, C. Pompeius, Scaurus, Apelles, Menecrates, and naturally adopts those explanations which best suit his theory that Petronius was a contemporary of Nero. Studer expresses himself cautiously on the point whether Petronius, in what he says of poetry and how such a subject as the Civil Wars should be treated, had Lucan in his mind, simply stating that most interpreters follow the lead of Douza, and answer the question affirmatively, leaving it to be inferred that he himself is of the same opinion. He thinks it not impossible that Hermeros, mentioned in connection with Trimalchio (c. 52. 1), was the same person with the freedman of Claudius mentioned in an inscription (Gruter, 25. 12); but in the expression "Vinum Opimianum" he finds only a negative argument against a later age of Petronius.

Studer refers finally to institutions, customs, and usages, as important in settling the question. In the mention of the bird magpie ("pica," c. 28. 9), of fresco-paintings (c. 29), of the custom of anointing the feet of the guests, of appointing the emperor as one of the heirs, of the "causidici" (c. 46), he finds confirmation of his theory, although some, and probably all of them, can be traced to an earlier period.

Studer's dissertation containing, unquestionably, not only the latest, but the ablest and most complete examination of the question to what age Petronius belongs, it appeared to me just to give this full, and I trust fair, account of his opinion, and of the arguments by which he supports it.

Strange as the great diversity of opinion with regard to the age of Petronius may appear, a stranger fact is yet to be stated. It is, not only that different scholars, as has been seen, widely differ on this point; there are instances of scholars, and able ones too, who, having discarded their former and adopted a new opinion, differ with themselves. I have already mentioned the case of Marinus Statilius, who in the beginning adopted the popular opinion that Petronius was the Petronius of Tacitus, but was afterward induced to place him as late as the times of Constantine. Another similar change of opinion has occurred in our own times. G. Bernhardy, Professor of Classical Literature at Halle, and one of the ablest classical scholars of Germany, expressed, in the first edition (1830) of his *Grundriss der Römischen Litteratur* (p. 331), the following opinion: "The mysterious Petronius (Satyricon) was formerly believed to be the luxurious T. Petronius Arbiter under Nero, and was, even down to our own times, on account of his supposed eloquence and humor, praised by many, and diligently explained. A healthier criticism has proved the incorrectness of this view, and at the same time assigned to this production a more appropriate and more significant place. As far as the hitherto incomplete investigation of the text enables us to judge, the whole appears to be an aggregate of dissimilar fragments, collected without any principle, — not the product of an individual who submits to the laws and plan of the artist and the rules of the written language, but the unrestrained play of local rhetoric and low popular humor, the offspring of Naples and Lower Italy, and set off by the flexibility, voluptuousness, and fantastic absence of character of the plebeian classes of that region, whose wantonness, appearance, and depraved morals are mirrored forth in a loose series of extravagant episodes and descriptions of manners, revelling in sensuality, with alternations of poetic and prosaic, vulgar and refined language. In this, then, and not in the gratification afforded by the description of a bountiful life, consists the value of the work of Petronius, inasmuch as it affords a clearer insight into the double-tongued idiom and the rhetorical manner of the Italiots, and is the only attempt of antiquity to furnish a people's book, the result of popular art irrespective of literary objects and tendencies. Sure indications of a particular period in the time of the emperors are wanting."

The substance of this criticism is, that while many have formed an extravagant opinion of the elegance and cleverness of this work, its principal merit consists in furnishing us with a representation of the peculiar character, feelings, morals, manners, and especially the language, of the inhabitants of Middle and Lower Italy.

In a foot-note, after giving some specimens of those extravagant opinions, as they appear to him, Bernhardy expresses the sensible wish, that a consistent criticism may,

from the few manuscripts, ascertain the genuine fragments, even if it be impossible to discover the original division into books, or the historical causes of the present dissolution. To this critical examination should be added a sober interpretation of antiquarian matters and local idioms. These will be the means of discovering the authors and their times.* He thinks that most of the hypotheses on the age of Petronius rest too much on single points; as, for example, that of N. Ignarra, set forth in his work, "De Palaestra Neapolitana," and concurred in by Ruhnken, who places Petronius in the times of Commodus (180–193 A. D.); and the more probable one of Niebuhr, according to which Petronius lived in the middle of the third century. He then adds, "that the unreasonable respect for the ready language which characterizes the pertness of these would-be witty describers of manners has been so long maintained because a separation of all the fragments, especially the poetic, according to their linguistic and æsthetic value, was not made." We see here again the hypothesis of several authors, the correctness of which, Bernhardy thinks, would be proved by a more careful examination of the language of the book.

The opinion on the same subject given by Bernhardy in the second edition of his *Grundriss der Römischen Litteratur*, which appeared twenty years after the first, in 1850, is a striking proof how much more trustworthy results careful examination, aided by the labors of others, furnishes, than a hasty, partial, however ingenious, apprehension and treatment of a subject. I shall give the substance of the later view of Bernhardy, and it will be seen that scarcely a vestige of the former remains.

"Petronii Satyricon, an unfinished book in 141 chapters, is probably the most paradoxical phenomenon of Roman literature. We have a novel different in matter and tone from the known works of fiction. The description of manners, in a dramatic form, with nudities, as well as the alternation of prose and longer or shorter pieces of improvised poetry, some being composed with cleverness and elegance, remind us of satire; but it is impossible to form an accurate conception of the plan and original connection of the whole, the work being composed of different fragments discovered by degrees, and having, as far as tradition reaches, never existed as a whole. The last-discovered fragment, the "Coena Trimalchionis," forms a nucleus of the heterogeneous mass; the narrative in its various parts is chiefly occupied with these important characters, Encolpius, Eumolpus, Trimalchio, who speak according to their

* From this expression and the above, "aggregate of dissimilar fragments," it appears that Bernhardy considers these fragments the work of several writers. An attentive reader of the work will scarcely be able to reconcile this theory with the circumstance, that every part of the work is marked by the same characteristics of tone, spirit, and language.

peculiar character, the first elegantly, the second bombastically, the third vulgarly.* No small part of the value of the book consists in the mixture, not only of different styles, but of provincial and dialectic specimens of language, which, as no other literary monument, make us acquainted with one form of the 'sermo plebeius.' On the one hand, the prose in which the author narrates is related to the language and phraseology of the silver age, especially of Seneca, with this exception, that this correct language with studied *abandon* runs into the easy flow of the language of conversation, and, tinged with Grecisms, nay, even provincialisms, in the manner of a man of the world, aims at the highest degree of sensual, nay, offensive truth; hence the abundance of proverbs† and popular forms of expression, the sparkling flow of wit, and the reckless plainness of speech and humor. On the other hand, there is the vulgar language of Campania and Naples, a double-tongued idiom, in which uneducated people are truthfully represented to use grammatical terminations and forms of sentences derived from the Greek, and many strange, droll, and plebeian words drawn from nature, and not from the school, which contributes materially to produce a pleasing effect. Looking upon the greater part of the subject-matter, the nude description of debaucheries, of filthy adventures and immoral desires, however instructive it is as regards the character of the lower classes of voluptuous Lower Italy, and their manners and mode of thinking, would repel and weary rather than attract; but the talent and humor which impart interest to this disgusting subject, and revel, with fantastic gayety, in pictures of the lowest form of life, the humorous hilarity and epicurean feeling which carelessly pass from the serious to the jocose, and yet, in the midst of their sensual tendencies, are not alien to higher aims, surprise, and formerly secured to Petronius the favor of people of refinement and taste. We are astonished at the pertness and independent irony of the Neapolitan Eulenspiegel, who, full of jests, despises morality, and can even endure the air of brothels. It is evident that such a production, even if it was enlarged in the hands of the public, must have pro-

* Bernhardy seems to me to attach an undue importance to Trimalchio, by representing him as one of the three principal characters of the story, influenced, perhaps, by the relation which the "Coena Trimalchionis" bears to the whole as it now exists. Considering that possibly we have not more than one tenth of the original work left, it is quite reasonable to suppose that the relative importance of this episode, invaluable as it is in many respects, was a very different one in the original complete work. The same circumstance gives now a prominence to Trimalchio himself, which probably he had not in the complete work. Several characters are alluded to which were undoubtedly as prominent figures as Trimalchio now appears; for instance, Tryphæna and Lycas, both, like Trimalchio, representatives of entire classes of society.

† I doubt whether more than two instances of proverbs (c. 47. 8 and c. 83. 7) can be adduced as occurring in the narrative or the conversation of Encolpius.

ceeded from a member of the higher classes. Formerly, Petronius Arbiter, notorious under Nero as an accomplished courtier and master in refined enjoyment, was considered the author; an opinion which upon closer examination proves impossible. Nevertheless, the language of the author himself points unmistakably to the first century of the empire."

Who, comparing this opinion with that expressed in the first edition, could believe that both proceeded from one and the same person? Although reference is again made, in a note, to unreasonable and extravagant praises of the elegance and cleverness of the book, nothing is said concerning the hypothesis of the work being the production of several authors; and the statement that sure indications of a particular period in the time of the emperors are wanting, is changed into another, that the language of the author himself points unmistakably to the first century of the empire.

In a note appended to the above criticism, Bernhardy observes, very justly, that the literature relating to Petronius, although large in bulk, is small and poor in real merit, because, for the most part, scholars of limited acquirements have occupied themselves with the author. Speaking of the opposite attempts of assigning to Petronius an early period, and connecting him with the Petronius of Tacitus, or of pushing him as far down as possible, he says of the opinion of Niebuhr, which places Petronius in the middle of the third century, and which Bernhardy had previously pronounced the more probable, that it is "the result of the intoxication of a poetic conception" (im Rausche einer poetischen Anschauung). He speaks with approbation of the investigation of Studer.

Examination of the Evidence.

Having thus given an account of the Satyricon of Petronius, of its contents, its literary character, of the losses which in the course of time it has sustained, and of the opinions entertained by different scholars regarding the age of Petronius, I shall now proceed to a somewhat careful examination of the latter question.

It has already been stated that there is but one instance of external evidence, or what has by some been considered such; I refer to the passage in Tacit. Annal. 16. 17–20; and I have at the same time endeavored to prove that the Petronius spoken of there is probably not the author of the Satyricon, and that the communication sent by him to Nero is certainly not our work. This only external evidence that has ever been adduced being thus disposed of, we are limited to the second class of evidence

which can in such cases be used, namely, internal evidence. This naturally divides itself, in this instance, into two classes, which for the sake of convenience and brevity I shall call *historical* and *linguistic* evidence. By the former I mean any mention of, or allusion to, persons, events, literary and artistic productions, customs and manners, and laws and institutions, which may throw light upon the question concerning the period in which the book was written. By the second I mean phenomena of language, whether they consist in the choice and use of certain words, or the use of certain grammatical forms and inflections, or the form of the structure of sentences, which, when compared with the usage of standard writers whose age is known, may aid us in giving a satisfactory answer to the question. A careful examination of all the evidence of both classes, if it does not enable us to fix precisely the time of the composition of the work, may circumscribe within somewhat narrower limits the period in which we have to look for the author and his work. The preceding brief sketch of the more important opinions on this subject shows a difference extending over three centuries. Much would be gained if a careful and unbiased sifting of every circumstance that can influence our opinion should contract that space to one century, or even a part of one.

Historical Evidence.

1. In c. 1. 2, the expression "cum in forum venerint" is used. The author of De Oratoribus Dialogus (c. 39) speaks of the injurious influence which the transfer of the judicial proceedings from the forum to halls had upon eloquence: "Parvum et ridiculum fortasse videbitur, quod dicturus sum; dicam tamen vel ideo, ut rideatur. Quantum humilitatis putamus eloquentiae adtulisse paenulas istas, quibus astricti et velut inclusi cum judicibus fabulamur; quantum virium detraxisse orationi auditoria et tabularia credimus, in quibus jam fere plurimae causae explicantur? Nam quomodo nobiles equos cursus et spatia probant, sic est aliquis oratorum campus, per quem nisi liberi et soluti ferantur, debilitatur ac frangitur eloquentia."* Perizonius, in his work De Praetorio (p. 203), treats of this passage, and argues that it does not conflict with his opinion that in the first century of the empire lawsuits were managed in the forum, and not in halls. This appears to be more than can be granted to Perizonius;

* The same change is mentioned in the preceding chapter (38), in which Maternus points out the difference of the judicial proceedings in the times of the republic and of the empire, and observes, that although Pompeius in his third consulship introduced some restraints, all judicial affairs were transacted in the forum: "Primus haec tertio consulatu Gnaeus Pompeius astrinxit, imposuitque veluti frenos eloquentiae, ita tamen ut omnia in foro, omnia legibus, omnia apud praetores gererentur."

for while it must be conceded that the author of the Dialogus says only that *most cases* ("plurimae causae"), not all, were conducted in halls, he clearly states that the innovation, the injurious effects of which upon eloquence he mentions, had gained so much ground that *most cases* were managed in halls. And it must be borne in mind, that the author of the Dialogus, whether Tacitus or somebody else, is, by almost common consent, placed in the reign of Domitian (81–96 A. D.). In the above passage of Petronius (c. 1), and in another, c. 4. 2, "Primum enim, sicut omnia, spes quoque suas ambitioni donant; deinde cum ad vota properant, cruda adhuc studia in forum impellunt," — there is not even a mention of such halls, but the author speaks of the imperfect training of young orators, the fault either of their teachers or parents, which does not fit them to act with efficiency when they appear in public, that is, in the Forum. It is true, Encolpius speaks of the unfitness of the teachers of eloquence for preparing their pupils for the practice of their profession, and his opponent, Agamemnon, of the impatience of the parents, which impels their children, half educated, to appear in public; yet they would not have passed over in silence this other cause of the decline of eloquence, the use of halls instead of the Forum, to which the author of the Dialogus ascribes so injurious an influence, if it had existed at the time either at all or to a considerable extent. It would be an interesting inquiry when the use of halls superseded that of the Forum in judicial proceedings. It was probably one of those changes which originate in an accident, such as a sudden storm, or the indisposition or weakness of an advocate; and which, being readily imitated without such an occasion, become the rule. One of the earliest instances that I can find is related by M. Seneca — the father of the philosopher, L. Annæus Seneca — (Controv. 4, praef.): ". . . declamatoriae virtutis Latronem Porcium unicum exemplum, cum pro reo in Hispania Rustico Porcio propinquo suo diceret, usque eo esse confusum, ut a soloecismo inciperet, nec ante potuisse confirmari, tectum ac parietes desiderantem, quam impetravit, ut judicium ex foro in basilicam transferretur. Usque eo ingenia in scholasticis exercitationibus delicate nutriuntur, ut clamorem silentium risum coelum denique pati nesciant." Quintilian alludes to the same incident (10. 5, 18): "Quod (vera discrimina, velut quendam solem, reformidare) accidisse etiam Porcio Latroni, qui primus clari nominis professor fuit, traditur, ut, cum ei summam in scholis opinionem obtinenti causa in foro esset oranda, impense petierit, ut subsellia in basilicam transferrentur." Porcius Latro was a friend of the elder Seneca (M. Annæus), and died 750 U. C. (4 B. C.).

It may indeed be said, that Petronius speaks of the difference between speaking before the court (whether in the Forum or in a hall) and in the school. But, on the other hand, it may reasonably be doubted whether he would not have used an expres-

sion applicable to both kinds of public speaking, in the Forum and in halls, if the latter was then already an established custom, instead of "venire in forum," which can only apply to the former. Whatever weight there is in this consideration, it goes to prove that Petronius wrote before Domitian, — before the use of halls for judicial proceedings had almost become the general usage.

It is not inappropriate to refer, in connection with this particular point, to the general resemblance of opinions and views between Petronius and the author of the Dialogus. Compare, for instance, the opinion of Encolpius, who ascribes the decline of eloquence to the erroneous system of instruction, and that of Agamemnon, who assigns the same result to the impatience of the parents, with the following passage in the Dialogus (c. 28): "Quis enim ignorat et eloquentiam et ceteras artes descivisse ab illa vetere gloria non inopia hominum, sed desidia juventutis et negligentia parentum et inscientia praecipientium et oblivione moris antiqui?" It is true that the interlocutors, Messala and Maternus, — men of experience and reflection, as well as education, — the former from his leaning to republicanism, the latter from his predilection for monarchism, assign yet another and very important cause of the decline of eloquence, the political condition of Rome, — a cause which would scarcely attract the attention of our volatile, pleasure-loving, though cultivated rake, Encolpius, and which, if the book was written at an earlier time than the Dialogus, had not yet revealed itself so plainly as at a later period. The very omission of mentioning the political condition of the Roman empire and its influence upon the development of eloquence, if not a conclusive argument in favor of assigning a very early origin to the Satyricon, is yet a circumstance which should not be overlooked.

2. C. 2. 7: "Nuper ventosa isthaec et enormis loquacitas Athenas ex Asia commigravit, animosque juvenum ad magna surgentes veluti pestilenti quodam sidere adflavit, simulque corrupta eloquentiae regula stetit et obmutuit." The influence of Asiatic eloquence, of which this passage speaks, began to be felt in Rome about the beginning of the first century before Christ, when Hortensius and Cicero were young men. The former adopted it as his standard, and thus, in the opinion of Cicero, prejudiced the permanence of his oratorical reputation. Cicero, in Brut. 95. 325, says: Sed si quaerimus, cur adolescens magis floruerit dicendo quam senior Hortensius, causas reperiemus duas. Primum, quod genus erat orationis Asiaticum adolescentiae magis concessum quam senectuti. Genera autem Asiaticae dictionis duo sunt..... [326] Haec autem, ut dixi, genera dicendi aptiora sunt adolescentibus; in senibus gravitatem non habent. Itaque Hortensius utroque genere florens clamores faciebat adolescens." It cannot be doubted that Petronius in the above passage refers to the

same Asiatic style of eloquence which, in the opinion of Cicero, was one of the causes that prevented Hortensius from being as much esteemed as an orator when old, as he had been when young. This being the case, much depends upon the meaning of the adverb "nuper." This word has undoubtedly, in conformity with its etymology, the signification "lately," a time not far removed from the present. But length of time being a relative notion, we find the word applied to periods varying from a few days to several centuries. I will illustrate this by a few examples. Cic. pro Ligario, 12. 37: "Fac igitur, quod de homine nobilissimo et clarissimo M. Marcello fecisti nuper in curia, nunc idem in foro de optimis et huic omni frequentiae probatissumis fratribus." The three letters of Cicero to M. Marcellus (ad Famil. 4. 7, 8, 9), in which, as is with good reason supposed, at the instance and with the encouragement of Cæsar, he endeavors to persuade Marcellus, who was then a voluntary exile in Mytilenæ, to return to Rome, and which were written in the course of September, 46 B. C. (708 U. C.), preceded the meeting of the senate in which the senators requested and obtained from Cæsar the recall of Marcellus. This meeting may have occurred as late as October or November. The speech of Cicero in defence of Ligarius, after he had first privately tried to intercede in his behalf, was probably delivered in November, so that not more than four weeks, perhaps less than two, elapsed between the pardon of Marcellus and the defence of Ligarius. "Nuper" is therefore, in this instance, used as referring to a period of from two to four weeks.

Cic. pro P. Sestio, 5. 13: "Hunc igitur animum ad tribunatum adtulit P. Sestius; ut quaesturam Macedoniae relinquam et aliquando ad haec propiora veniam. Quamquam non est omittenda singularis illa integritas provincialis, cujus ego nuper in Macedonia vidi vestigia non pressa leviter ad exigui praedicationem temporis, sed fixa ad memoriam illius provinciae sempiternam." Cicero defended P. Sestius the 10th of February, 56 B. C. (698 U. C.). He had been exiled in the beginning of April, 58 B. C. (696 U. C.), and while absent from Rome remained from the end of May to the end of November of the same year in Macedonia (Thessalonica), as the guest of the quæstor Cn. Plancius, where he had an opportunity of hearing of Sestius's official conduct in that province. "Nuper," in this instance, therefore, refers to a period of from fourteen to twenty months.

Caes. Bell. Gall. 1. 6: "Alterum per provinciam nostram, multo facilius atque expeditius, propterea quod Helvetiorum inter fines et Allobrogum, qui nuper pacati erant. Rhodanus fluit," etc. The defeat of the Helvetii by Cæsar near Bibracte, of which this passage speaks, occurred 58 B. C. (696 U. C.), and that of the Allobroges was effected by C. Pomtinius, who was proprætor of Gaul 63 and 62 B. C. (691 and 692 U. C.): "nuper," therefore, implies here a period of from four to five years.

Cic. de Nat. Deor. 2. 50: "Atque illa mirabilia; quid ea, quae nuper, id est, paucis ante seculis medicorum ingeniis reperta sunt?" Here we see "nuper" applied to a period of several centuries.

This passage, then, does not afford much aid in determining the time of the composition of the Satyricon. While it unquestionably refers to a change in the style of eloquence which began in the youth of Cicero and Hortensius, the peculiar signification of "nuper," which, as I have shown, is applied to periods of very unequal extent, does not enable us to ascertain how long a time had expired between the first appearance of this Asiatic eloquence and the time when Petronius wrote.

3. C. 2. 9: "Pictura quoque non alium exitum fecit, postquam Aegyptiorum audacia tam magnae artis compendiariam invenit." Besides this rather obscure passage, there are two others, namely, c. 83 and c. 88, the one describing some of the finest pictures, the other relating to the decline of the art, which are in their import too brief and general to throw much light on the question of the age of Petronius. There is, however, no doubt that, in his opinion of the condition of painting in his time, Petronius agrees fully with Pliny. Both represent the art as on the decline, and very much in the same language. While Petronius says (c. 88. 1): "Erectus his sermonibus, consulere prudentiorem coepi aetates tabularum et quaedam argumenta mihi obscura simulque *causam desidiae praesentis* excutere, cum pulcherrimae artes periissent, inter quas *pictura ne minimum quidem sui vestigium reliquisset*"; — Pliny uses the following language: (35. 1) "Primumque dicemus, quae restant *de pictura, arte quondam nobili*"; (35. 2) "*artis desidia perdidit*"; (35. 11) "Hactenus dictum sit de dignitate *artis morientis*"; (35. 37) "Casa Protogenes contentus erat in hortulo suo; nulla in Apellis tectoriis pictura erat; nondum libebat parietes totos tinguere; omnium eorum ars urbibus excubabat, pictorque res communis terrarum fuit." — "Carcer ejus artis domus aurea fuit, et ideo non exstant exempla alia magnopere."

That Petronius speaks from personal knowledge when he mentions the works of Zeuxis, Protogenes, and Apelles, seems to me scarcely to admit of a doubt, if his language and the character of his remarks be carefully weighed. If he lived at, or before, the time of Pliny, he might have seen several pictures of these masters, which Pliny mentions as still extant in his time. The most distinguished picture of Apelles, who lived between 357 and 309 B. C., the Venus Anadyomene, originally in the Asclepieion in Kos, was by Augustus brought to Rome, and deposited in the temple of D. Julius. In the time of Nero it perished by rot, and the emperor caused it to be replaced by a picture of Dorotheus; whether on the same subject, does not appear. There were at Rome by his hand two other pictures, one a Castor and Pollux with a Victoria and

Alexander, the other a representation of War with hands tied, and a triumphant Alexander. Both these pictures, which Augustus had placed in the most frequented places of his forum, existed yet in the times of Claudius, who, with a barbarism worthy of such a pedantic fool, substituted in both the form of Augustus for that of Alexander. In the temple of Antonia (Sillig reads "Anna"; Plin. Nat. Hist. 35. 10. 36. 94) was an Averted Hercules. The Three Lines, drawn on a tablet by Apelles and Protogenes, were preserved in the house of Cæsar, that is, Cæsar Octavianus (Plin. Nat. Hist. 35. 10. 36. 81–83), on the Palatine, and were, together with the house, destroyed by fire. King Archelaus on horseback and Diana surrounded by sacrificing virgins were by connoisseurs preferred to all other works of Apelles (Plin. Nat. Hist. 35. 10. 36. 96). Alexander holding a thunderbolt, in the temple of Diana at Ephesus, is mentioned by Pliny as still extant. So also the portrait of Habro at Samos; of Menander, king of Caria, at Rhodes; and of Ancæus, a tragic actor, at Alexandria.

Of the works of Zeuxis, who lived, according to Pliny, Ol. 95. 4 (396 B. C.), according to others Ol. 89 (426 B. C.), — (K. O. Müller places him between Ol. 90 and 100,) — Pliny mentions as extant at Rome his Helen in the Portico of Philippus, and his Bound Marsyas in the temple of Concordia (Plin. Nat. Hist. 35. 10. 36. 66).

The Ialysus of Protogenes, who was born Ol. 104 (362 B. C.) and was yet alive Ol. 119 (300 B. C.), — (K. O. Müller places him between Ol. 112 and 120,) — considered the finest work of that artist, was, in the times of Pliny, at Rome in the temple of Pax (Nat. Hist. 35. 10. 36. 102, 104).

It might, indeed, be objected, that these pictures, though still extant, were not in Naples, the scene of this part of the story, but in Rome. This is certainly true; but it should be borne in mind, that, while Petronius selects a particular place as the scene of his story, he takes his materials, as regards persons, things, customs, from other places, especially Rome, as I shall have occasion to observe in several instances.

It will be seen, then, that by comparing the language of Petronius and Pliny on the decline of the art of painting, and considering the mention by Petronius of artists some of whose works are stated by Pliny as still extant in his time, we arrive at a high degree of probability that Petronius lived and wrote at or before the time of Pliny. C. Plinius Secundus Major was born at Como or Verona 23 A. D., and perished, while commander of the Roman fleet at Misenum, by the eruption of Vesuvius, in 79 A. D. His great work, Naturalis Historia, was completed about two years before his death, in 77 A. D. According to this view, then, Petronius cannot be placed later than the middle of the second half of the first century of the Christian era. This view is strengthened by the entire silence of succeeding writers concerning the works of the

artists mentioned by Petronius, from which circumstance it is probable, if not certain, that these pictures, which themselves were the remnants only of the originally numerous productions of these great, world-renowned artists, perished soon after the time of Pliny, by age, accident, or neglect, so that Petronius cannot, on this account, be assigned to a later period.

I have above shown that the complaint of Petronius concerning the decline of the art of painting is fully confirmed by the testimony of Pliny. But it is not so easy to explain what Petronius means by the expression (c. 2. 9), "postquam Aegyptiorum audacia tam magnae artis compendiariam invenit," which K. O. Müller himself, in his Manual of Archæology, calls obscure (räthselhaft). If we look a little more closely into the subject, we find that the principal, if not sole cause, assigned by ancient writers, of the decline of the art of painting, as of other arts, was the circumstance that it was degraded into a mere instrument of luxury, and employed in flattering a low sensuality, and ornamenting the splendid and extravagant habitations of rulers and private persons. This perversion of the art commenced soon after the division of the empire of Alexander, and the establishment of the several capitals of his successors, vying with each other in splendor and luxury. The increased demand for ornamental painting naturally produced a school of expeditious painting, the products of which were called πίνακες ἡμερήσιοι, and the most distinguished leaders of which were Pausias, Nicomachus, and Philoxenus, of whom Pliny says (35. 10. 36): "Hic celeritatem praeceptoris [Nicomachi] secutus breviores etiamnum quasdam picturae compendiarias invenit." We see, then, that Philoxenus not only rivalled the rapidity of execution of his teacher, Nicomachus, but aided and increased it by some ingenious contrivances. Considering the similarity of expression in Pliny, "breviores quasdam picturae compendiarias," and of Petronius, "artis compendiariam," it appears to me not improbable, although I must confess that I cannot support my opinion by the testimony of an ancient writer, that this school found special favor in Alexandria and in Egypt generally, and was there carried still further, as indicated by the expression "Aegyptiorum audacia," undoubtedly, however, at the expense of true artistic merit.

4. C. 16. 2: "Sera sua sponte delapsa cecidit." "Sera" — "lock," or "padlock" (because it could be removed), or "bolt" — was an ancient means of securing doors. That it could be removed appears from Festus (p. 25): "Asserere manum est *admovere;* quo ea quoque, quae in terram demittuntur, seri dicuntur; unde etiam *serae* appellantur, quia *foribus admotae* opponuntur defixae postibus, quemadmodum ea, quae terrae inseruntur"; and Varro de L. L. 6. 6: "Serae, quibus remotis fores panduntur."

That it was in use at an early period is proved by a passage from Pacuvius (born 220 B. C., 534 U. C., died 130 B. C., 624 U. C.), quoted by Festus (p. 282): "Pandite valvas, removete seras." The mention of "sera," while it does not therefore throw light upon the question of the age of Petronius, contains nothing to forbid our assigning him a very early time, if other reasons should justify such a conclusion.

5. C. 19. 3: "Frigidior hieme Gallica factus." Unless this is considered a proverbial expression, like our "Siberian winter," and hence in common use, it might be adduced as an argument in favor of an early origin of the Satyricon, because later expeditions had made the Romans acquainted with severer climates than that of Gaul.

6. C. 22. 6: "Cum intrans cymbalistria." The use of cymbals, and the employment of male and female players on cymbals at entertainments, although originally a Greek custom, was, even in the times of Cicero, a pretty common practice among the Romans. Cf. Cic. in Pison. 9. 20: "Neque hercule ego supercilium tuum neque collegae tui cymbala ac crotala fugi"; and 10. 22: "cum collegae tui domus cantu et cymbalis personaret, cumque ipse nudus in convivio saltaret." The mention of a female player on the cymbal in this passage is, therefore, no indication of a later period.

7. C. 29. 1: "Quadrata litera." However readily the interpretation "capital letter" may suggest itself, and however probable it may be, inasmuch as "quadrata" undoubtedly signifies a difference of form and not a difference of size, it must be confessed that it is a conjecture only. Many passages occur in writers speaking of "large letters," as Cic. in Verr. 4. 34. 74: "Haec erat posita Segestae sane excelsa in basi, in qua *grandibus literis* P. Africani nomen erat incisum"; but in every instance it is doubtful whether merely a difference of size or a difference of form is meant. The passage of Quintilian, 1. 7. 11, "Nam illa vetustissima transeo tempora, quibus et pauciores literae *nec similes his nostris* earum formae fuerunt," which is quoted by Erhard as throwing light on the expression "quadratus," is to be understood of the gradual changes which the Roman alphabet, like others, underwent in the course of time, but does not refer to the existence of two alphabets at the same time. Yet it is in the nature of things that the Romans, as early as the later times of the republic, when writing was a daily occupation of every educated man, could not be contented with using the letters which we find on ancient monuments, and which are our capital letters, but used an alphabet better suited to rapid writing. This supposition is strengthened by the analogous case of the Greeks. It was formerly a mooted question whether the Greeks had, besides their capital letters, an alphabet for common use (Kursivschrift). The discovery of a papyrus belonging to the year 104 B. C., and

interpreted by Boeckh,* written in a running hand, may be supposed to have settled the question, and proved that the Greeks possessed, at least a hundred years before the Christian era, a smaller and more convenient alphabet. There seems to be no reason for doubting the existence of a convenience among the Romans which was enjoyed by the Greeks, the existence of which among the Greeks was known to the Romans, and which is in itself so natural.

While I assume, then, without hesitation, that the Romans used, as early as the times of Sulla and Marius, if not earlier, two alphabets, one for inscriptions ("literae quadratae") and one for common use, I find in the expression no indication of a particular period to which the work of Petronius belongs. On the other hand, if weighty considerations should lead to the adoption of a specific time posterior to the above limit, this expression, "quadrata litera," would present no obstacle.

8. C. 30. 2: "VI viro Augustali." It is scarcely necessary to observe that the Augustales mentioned in this and several other passages (c. 57. 6 and c. 65. 5) are not the Sodales Augustales, a college of priests established by Tiberius, 14 A. D. (767 U. C.), in honor of the Julian family (Tacit. Hist. 2. 95), consisting of twenty-one members chosen from among the most distinguished men of the state (Tacit. Ann. 1. 54). The Augustales of Petronius may be traced to an institution of Servius Tullius, who established the worship of the Lares, "praestiles" as well as "compitales," and ordered, as Dionysius of Halicarnassus (4. 14) relates, that slaves should perform the service on festal days. Augustus re-established this worship when he undertook the reorganization of the state in all its departments, 28 B. C. (722 U. C.). He assigned the service to freedmen,† appointed two principal festivals,‡ and added to the worship of the Lares that of Genius Augusti, which latter naturally became the more important and prominent, and accounts for the name Augustales.

There are different opinions, however, as to the origin as well as the organization and duties of the Augustales, and the relation of the Seviri to the Augustales. Some have considered the Augustales a municipal imitation of the Sodales Augustales. A.

* A. Boeckh, Erklärung einer ägyptischen Urkunde auf Papyrus. Berlin. 1821.

† Schol. Porphyr. ad Hor. Sat. 2. 3. 281: "Ab Augusto enim Lares, i. e. dii domestici, in compitis positi sunt; ex libertinis sacerdotes dati, qui Augustales sunt appellati." Schol. Acr. to the same place: "Jusserat enim Augustus in compitis deos Penates constitui, ut studiosius colerentur. Erant autem libertini sacerdotes, qui Augustales dicuntur."

‡ Suetonius (Oct. 31), after mentioning that Augustus restored some ceremonies which had fallen into disuse, among them "ludos Seculares et Compitalicios," goes on: "Compitales Lares ornari bis anno instituit vernis floribus et aestivis."

W. Zumpt* is an able representative of this view, which appears, however, untenable. because, as we have seen, the Augustales were established by Augustus, and the Sodales Augustales by his successor, Tiberius, and surely a later institution could not have been the example for an earlier one. On the other hand, it was very natural, considering particularly the spirit of sycophancy towards the ruler which disgraced all parts of Italy during the reign of Augustus, that the worship of the "Genius Augusti," which was a part of the duty of the Augustales, produced at a later period, after the establishment of the Sodales Augustales, a resemblance of the two institutions, so that the Augustales might be considered a humble imitation, in municipal towns, of the high and distinguished association of the Sodales Augustales in Rome. It is, moreover, possible, and even probable, that the institution of the Augustales, in its further development, after the establishment of the Sodales Augustales, borrowed from them some customs which tended to increase the resemblance of the two institutions, although they were different in their origin, scope, and organization.

But not only the origin of the Augustales is a disputed point, but also their organization and duties. The Augustales were chosen by the Decuriones, the municipal magistrates, and required to pay a sum of money, from which payment some were released. It is most probable that the Seviri were the officers or presidents of the Augustales, although Marquardt advances the bold opinion, that the names Seviri and Augustales were identical in their signification. Zumpt is of opinion that the Seviri were chosen by the Augustales; W. Henzen, that they were chosen by the Decuriones. The Seviri, too, had to pay a sum of money, from which some were excused; cf. Petron. 57. 6: "Sevir gratis factus sum." The Seviri had, as a mark of distinction, six fasces or lictors, one of whom announces the arrival of his master (c. 65. 3): "Inter haec triclinii valvas lictor percussit." It was the duty of the Augustales to take care of the worship of Augustus, by preparing, on certain days, sacrifices, banquets, and games.

Although the scholiasts of Horace, Pomponius Porphyrio and Acro, connect the important historical notice relative to the re-establishment of the worship of the Lares by Augustus with the above-mentioned passage in the Satires of Horace (Sat. 2. 3. 281), it must not from this be inferred that the time of that measure is thereby indicated. The third satire of the second book is placed by Karl Franke (Fasti Horatiani), Heindorf (in his edition of the Satires), and by Dr. W. E. Weber (in his *Quintus Horatius Flaccus als Mensch und Dichter*) in the year 33 B. C. (721 U. C.). Orelli, in his second edition of the works of Horace, assigns it to the year 31 B. C. (723 U. C.).

* De Augustalibus et Seviris Augustalibus. Berolin. 1846.

This difference of opinion is, for our purpose, of small importance. It is certain, from the mention of the edileship of Agrippa, which belongs to the year 33 B. C. (721 U. C.), that this satire could not have been written earlier. Horace, therefore, spoke in this satire of the older form of the worship of the Lares, as handed down from the times of Servius Tullius, and as it was still popularly observed previously to its reorganization by Augustus.

It will be seen, then, that, so far as the mention of the Augustales affects the question of the age of Petronius, there is no objection to his being placed in the reign of Augustus.

9. C. 31. 3: "Aquam nivatam." The custom of using snow for the purpose of cooling wine and water is of early date. In Xenophon, Memor. 2. 1. 30, in his account of the well-known fiction of Prodicus, representing Hercules as choosing between the path of virtue and pleasure, this passage occurs: *ἵνα δὲ ἡδέως πίνῃς, οἴνους τε πολυτελεῖς παρασκευάζῃ, καὶ τοῦ θέρους χιόνα περιθέουσα ζητεῖς.* The custom obtained in all parts of the Mediterranean, and naturally led to various contrivances for preserving snow during the hot season; cf. Seneca, Nat. Quaest. 4. 13. 8: "Quid illi [Lacedaemonii] fecissent, si vidissent reponendae nivis officinas et tot jumenta portandae aquae deservientia, cujus colorem saporemque paleis, quibus custodiunt, inquinant?" While the use of snow as a means of cooling beverages can thus be traced to a very early time, it is otherwise with regard to a further refinement in the same direction, the practice of boiling water and then cooling it in snow, a practice ascribed to the inventive genius of Nero. Cf. Plin. Nat. Hist. 31. 3. 23. 40: "Neronis principis inventum est decoquere aquam vitroque demissam in nivis refrigerare; ita voluptas frigoris contingit sine vitiis nivis. Omnem utique decoctam utiliorem esse convenit, item calefactam magis refrigerari, subtilissimo invento."* We must therefore distinguish between "aqua nivata" and "aqua decocta," a distinction which has not been respected by some of the commentators of Petronius, who, in their eagerness of discovering allusions to Nero, took it for granted that the "aqua nivata" of Petronius was the "aqua decocta" of Nero. Erhard, for instance, in his commentary on this passage, falls into this error, speaking of "aqua nivata" and "aqua decocta" as the same thing, and, after quoting a part of the above passage from Pliny, adds: "quem [Neronem] sub persona Trimalchionis satyrice irridet Petronius." Whether it was, or could be, the intention of Petronius to satirize Nero, is a question which certainly cannot be decided by this passage.

* Cf. Juvenal 5. 49:—

"Si stomachus domini fervet vinoque ciboque,
Frigidior Geticis petitur decocta pruinis."

The mention of "aqua nivata" does not, as we have seen, prove that the book was written in, or after, the time of Nero. It is no positive evidence of any particular time, inasmuch as the use of water cooled by snow had been known and practised, to judge by the passage in the Memorabilia of Xenophon, at least three centuries before the Christian era. But while it is no positive evidence, I am inclined to find in it some of a negative kind. The writer seems to exert his ingenuity to the highest degree to mention and describe all kinds of luxury and extravagance known in his time. Would he have omitted to mention the "aqua decocta," the invention of Nero, if he had lived and written after Nero? I think not. Without laying too much weight on this argument, it should not, I think, be overlooked. While the mention of "aqua nivata" throws little or no light on the question when Petronius wrote, the omission of mentioning "aqua decocta" goes far to prove that the book was written before the reign of Nero.

10. C. 34. 6: "Statim allatae sunt amphorae vitreae diligenter gypsatae, quarum in cervicibus pittacia erant adfixa cum hoc titulo: Falernum Opimianum annorum centum." However promising at first sight this passage looks, as furnishing the most distinct and conclusive evidence with regard to the time when Petronius wrote, this evidence is to be received with great caution, partly because so much depends upon the figure of the numeral "centum," it being well known that in nothing are manuscripts to be regarded with more distrust than in numerical signs, and partly because the passage is susceptible of an interpretation which wholly destroys the value of its chronological evidence. If the reading "annorum centum" be genuine, (and, notwithstanding the many imperfections of the text of Petronius, there seems to be no reason for doubting the correctness of these words, since neither manuscripts nor editions exhibit any trace of a difference of reading,) we meet with no serious chronological difficulty.* The "vinum Opimianum" was the product of the year 121 B. C. (633 U. C.), when L. Opimius was consul with Q. Fabius Maximus Allobrogicus. It has above been seen that, so far as the mention of the Seviri Augustales affects the decision of the question, the book could not have been written before the year 28 B. C. (726 U. C.), in which year, probably, Augustus reorganized the worship of the Lares. This would be seven years before the Opimian vintage completed its one hundredth year; a period of time sufficiently long for the spread throughout Italy of the reorganized institution, considering the popular attachment to the ancient forms of worship in general and this of the Lares in particular, and the servile propensity of all classes to adopt and

* Harduin, to Plin. 14. 4. 6. 55, infers from this passage that Petronius lived in the age of Augustus.

respect any institution established and favored by Augustus, and in this case more particularly, on account of the addition of the worship of the Genius of Augustus, a rite so intimately connected with the person and family of the ruler.

There can be no doubt that wine of that vintage was still extant, not only at that time, but at a much later period. The vintage of the year 121 B. C. (633 U. C.) had been remarkable both as regards quantity and quality. Cf. Plin. Nat. Hist. 14. 4. 6. 55: "In reliquis claritas generi non fuit alicui; anno fuit omnium generum bonitas L. Opimio consule, cum C. Gracchus tribunus plebem seditionibus agitans interemptus; ea coeli temperies fulsit, cocturam vocant, solis opere natali urbis DCXXXIII. Durantque adhuc vina ducentis fere annis, jam in speciem redacta mellis asperi; etenim haec natura vinis in vetustate est, nec potari per se queant, si non pervincat aqua, usque in amaritudinem carie indomita." This statement of Pliny cannot but satisfy an unbiassed mind that wine of the Opimian vintage continued for nearly two hundred years. In receiving the testimony of Pliny, I do not intend, nor is it necessary for my present purpose, to deny the truth of the many charges of fraud and adulteration which are met with in ancient writers, for example, Martial.* The point of importance is this, — that, if we adopt a strictly literal construction of the passage, it goes to prove that the work of Petronius was written about 21 B. C. (733 U. C.), or, if we admit a freer interpretation, it may have been written any time previously to 77 A. D., when Pliny finished his work. For it is to be observed, that the interpreters of this passage differ as to the meaning which is to be given to it. Many, rejecting the literal interpretation, consider it as an instance of the boastful ignorance of Trimalchio, displayed in so many ways. W. A. Becker belongs to these, and says: "Die Amphorae an der Tafel Trimalchios tragen die Etikette, 'Falernum Opimianum annorum centum,' worin die doppelte Lächerlichkeit liegt, dem Weine, der jährlich älter wird, ein bestimmtes Alter anzuschreiben, und das Opimianum hundertjährig zu nennen, da dieser Jahrgang, der ausgezeichnetste, welchen Italien kannte, dem Jahre der Stadt 633 angehörte, und damals wenigstens 160–170 Jahre alt sein musste."† It is apparent,

* 3. 62. 2: "Quod sub rege Numa condita vina bibis."
13. 111: "De Sinuessanis venerunt Massica praelis;
Condita quo quaeris consule? Nullus erat."

† Gallus, Vol. II. p. 172. "The amphoræ on the table of Trimalchio bear the inscription, 'Falernum Opimianum annorum centum,' in which there is a twofold absurdity, to ascribe a definite age to wine which annually increases in age, and to call the Opimian a hundred years old, when this vintage, the most remarkable that Italy knew, belongs to the year 633 of the city, and could not but be, at that time, at least from 160 to 170 years old."

from this passage as well as others, that Becker, for reasons which he does not explain, places Petronius in the reign of Claudius (from 41 to 54 A. D.). Starting from this presumption, he must of course find in the passage the double absurdity which he mentions. But if we suppose that Petronius wrote about the time when the Opimian vintage was one hundred years old, was there any absurdity in Trimalchio's placing the above inscription on the vessels? Certainly not. The principal and perhaps the only charge which can be made against the passage is the addition of "annorum centum." It cannot be denied that the inscription was an unusual one, in so far as it stated the age of the wine by the addition of "annorum centum," instead of mentioning merely the consul in whose year the wine was made, the usual mode of marking wine, and leaving it to the reader to make his own calculation as to the age of the wine, — a calculation of which Trimalchio, knowing the intellectual condition of the majority of his guests, wished, perhaps, to save them the trouble. However plausible the view which Becker and others take of this passage is, it is not free from serious objections. The principal one is that it implies a *petitio principii*. Becker assumes the very thing which is to be proved, namely, the age of Petronius, and in consequence gives to this passage an interpretation which in itself is not free from doubts and difficulties, and rejects a simple and natural one. It is true, Trimalchio shows himself in many respects a remarkably ignorant man, but he certainly knows what is good eating and drinking; and this being the case, it is more natural to expect from his vainglorious propensity that he would exaggerate than underrate the age of his wine. Burmann, in his note to this passage (p. 191), explains the addition "annorum centum" very ingeniously.* But even if it be conceded that the mention of the age of the wine was contrary to custom, Trimalchio is convicted of a departure from established usage only; his veracity is not affected.

Were the decision of the question of the age of Petronius to depend on this passage alone, unconnected with other evidence, I should adopt its obvious interpretation, and find in it an argument in favor of the year 21 B. C. (733 U. C.), as the time in which Petronius wrote. But it is not so. The passage (60. 7), "et Augusto patri patriae feliciter diximus," as will by and by be seen, is inconsistent with this assumption, and obliges us to place the time of the composition of the work at least nineteen years later. I shall not endeavor to account for the discrepancy of these two important passages; it is sufficient for me to recognize its existence, and conduct my argument accordingly.

* "Potuit et titulus ille affixus fuisse anno centesimo post Opimii consulatum et ita mutato possessore ad Trimalchionem venisse, qui plura sibi a patrono relicta jactat c. 52."

11. C. 48. 3: "Nunc conjungere agellis Siciliam volo." This instance of the passion for extended landed possessions does not sufficiently characterize any period. The craving for extensive estates was of an early origin, and continued late. Livy (34. 4) represents M. Porcius Cato, consul with L. Valerius Flaccus, 195 B. C. (559 U. C.), as opposing the repeal of the "lex Oppia," which had been enacted eighteen years before for the purpose of restricting female extravagance in dress and ornaments. Speaking in his argument of various kinds of extravagance, he also refers to the excessive love of landed property as a vice of long standing; for he says: "Quid legem Liciniam excitavit de quingentis jugeribus nisi ingens cupido agros continuandi?" It appears, then, that this insatiable desire of landed property had, nearly two hundred years before Cato, called for the enactment of the Licinian law "de modo agrorum, ne quis plus quingenta jugera agri (publici) possideret," which was proposed 376 B. C. (378 U. C.), and passed nine years later, 367 B. C. (387 U. C.). The mention of a propensity which, nearly four hundred years before Christ, called for legal restrictions, and which, after having been one of the principal causes of the subversion of the republican constitution, extended far into the times of the imperial government, furnishes no indication of a particular period.

12. C. 51. 1: "Fuit tamen faber, qui fecit fialam vitream, quae non frangebatur."*

* The substance of the story, although with some inaccuracies, yet generally in the very words of Petronius, is given in the Origines (or Etymologiæ) of Isidorus, 16. 15. Isidorus was born in Sevilla (Hispalis), the capital of Andalusia, and succeeded, in 603, his brother Leander in the office of archbishop of Sevilla. He derived the story undoubtedly from Petronius, although he does not mention him. — John of Salisbury, in his Polycraticus, 4. 5, in relating the same story, adheres less closely to the language of Petronius, yet he himself states that he derived it from Petronius. Neither John of Salisbury nor Isidorus intended to give the language of their authority; yet both retained enough to indicate the source whence they drew. It will be best to give both passages. Isid. Orig. 16. 15: "Fertur autem sub Tiberio Caesare quendam artificem excogitasse vitri temperamentum, ut flexibile esset et ductile. Qui dum admissus fuisset ad Caesarem, porrexit phialam Caesari. Quam ille indignatus in pavimentum projecit. Artifex autem sustulit phialam de pavimento, quae complicaverat se tamquam vas aeneum: deinde malleum de sinu protulit et phialam correxit. Hoc facto Caesar dixit artifici, numquid alius scit hanc condituram vitrorum? Postquam ille jurans negavit alterum hoc scire, jussit eum Caesar decollari, ne, dum hoc cognitum fieret, aurum pro luto haberetur, et omnium metallorum pretia abstraherentur. Revera, quia si vasa vitrea non frangerentur, meliora essent quam aurum et argentum." — Jo. Saresberiensis Polycrat. 4. 5: "Apud Petronium Trimalchio refert, fabrum fuisse, qui vitrea vasa faceret tenacitatis tantae, ut non magis quam aurea vel argentea frangerentur. Cum ergo phialam hujusmodi de vitro purissimo, et solo, ut putabat, dignam Caesare, fabricasset, cum munere suo Caesarem adiens admissus est. Laudata est species muneris, commendata manus artificis, acceptata est devotio donantis. Faber vero, ut admirationem intuentium verteret in stuporem et sibi plenius gratiam conciliaret imperatoris, petitam de manu Caesaris phialam recepit, eamque validus projecit in pavimentum

The same story, with slight variations, of an artist who had discovered a method of making malleable glass is related by Pliny (Nat. Hist. 36. 26. 66. 195): "Ferunt Tiberio principe excogitato vitri temperamento, ut flexile esset, totam officinam artificis ejus abolitam, ne aeris argenti auri metallis pretia detraherentur, eaque fama crebrior diu quam certior fuit." It will at once be perceived how cautiously Pliny relates the story. He introduces the account with the word "ferunt," and closes it with the still more significant phrase, "eaque fama crebrior diu quam certior fuit," thus not only withholding his assent, but throwing doubt upon the story. This caution of Pliny is an important circumstance, as, from the time in which he lived,† and from his well-known facilities of investigating a fact of this kind, he was in possession of the means of ascertaining and confirming the truth of the story. His not doing it goes far to prove the story apocryphal. Another circumstance which a comparison of the two accounts of Pliny and Petronius brings out is, that what Pliny states to have happened, according to report, in the reign of Tiberius, is, by the version of Petronius, ascribed to Cæsar, which may apply to Julius Cæsar and Augustus, as well as Tiberius. It is well known that fictions and inventions of this kind are frequently made to shift their time and locality, as well as the persons to whom they are ascribed or who are introduced as actors. Besides, it is by no means improbable that Petronius wished to throw ridicule upon the whole story, by putting it in the mouth of the boastful and ignorant Trimalchio. While I look upon this story of malleable glass as a fiction, and am inclined to believe that Petronius himself intended to ridicule it as such, I do not deny that, at the close of the republic and under the first emperors, the art of glass-making and grinding was farther advanced than some are disposed to concede. These it will be sufficient to refer to the Excursus to the Seventh Scene in Becker's Gallus, where they will find that not only window-glass and vessels of all shapes and sizes were known and in common use, but pieces of plate-glass large enough to cover the walls of entire apartments were manufactured, and all kinds of precious stones imitated.

tanto impetu, ut nec solidissima et constantissima aeris materia maneret illaesa. Caesar autem ad haec non magis stupuit quam expavit. At ille de terra sustulit phialam, quae quidem non fracta erat sed collisa, ac si aeris substantia vitri speciem induisset. Deinde martiolum (al. marculum) de sinu proferens vitrum correxit aptissime, et tamquam collisum vas aeneum crebris ictibus reparavit. Quo facto se coelum Jovis tenere arbitratus est, eo quod familiaritatem Caesaris et admirationem omnium se promeruisse credebat. Sed secus accidit. Quaesivit enim Caesar, an alius sciret hanc condituram vitrorum. Quod cum negaret, eum decollari praecepit Imperator dicens, quia, si hoc artificium innotesceret, aurum et argentum vilescerent quasi lutum. An vera sit relatio et fidelis, incertum est; et de facto Caesaris diversi diversa sentiunt."

* Pliny was born 23 A. D., and was consequently fifteen years old at the time of Tiberius's death, 38 A. D.

13. C. 60. 7: "et Augusto patri patriae feliciter diximus." There seems to be no doubt or difference of opinion concerning the reading in this passage, so that so far we may consider the text as correct. The term "Augustus," as the title of the emperor, was first bestowed by the senate upon Octavianus, the 17th Jan. (according to the Feriale Cumanum the 30th, according to Ovid. Fast. 1. 587 the 13th) 27 B. C. (727 U. C.), and descended by inheritance to his successors. So far, then, the term Augustus throws no other light on our question — because it applies to Tiberius,* Caligula, Claudius, Nero, and others, as well as to Octavianus — than to fix a limit beyond which we cannot go back. Octavianus was the first who received the title Augustus, and we cannot, therefore, go beyond the year 27 B. C. (727 U. C.). Examining the other expression, "pater patriae," we shall find ourselves obliged to descend still farther than the year 27 B. C. The title "pater patriae" was conferred on Augustus on the 5th Febr. 2 B. C. (752 U. C.†). Inhabitants of Italy could not use, and could not be represented as using, this familiar title of Augustus before it existed, — before the senate had conferred it upon Augustus; and we cannot, therefore, carry the time when this book was written farther back than the year 2 B. C. (752 U. C.). The book must have been written, therefore, after the year 2 B. C. (752 U. C.). Whatever influence this fact may have upon the interpretation of the expression "Falernum Opimianum annorum centum" (c. 34. 6), previously considered, this expression, "pater patriae," fixes a limit beyond which we cannot by any possibility go.

As to the question whether the title "pater patriae" may not refer to some one of

* It should be borne in mind, however, that Tiberius, while rejecting the title "pater patriae" altogether, admitted the name Augustus in a very qualified manner; he opposed the action of the senate when they voted it, but allowed the title to be used when he was addressed orally or in writing, and used it himself when enumerating his titles, in letters to foreign kings. Cf. Dio Cass. 57. 8: *οὔτε γὰρ δεσπότην ἑαυτὸν τοῖς ἐλευθέροις, οὔτε αὐτοκράτορα, πλὴν τοῖς στρατιώταις, καλεῖν ἐφίει· τό τε τοῦ πατρὸς τῆς πατρίδος πρόσρημα παντελῶς διεώσατο, καὶ τὸ τοῦ Αὐγούστου οὐκ ἐπέθετο μὲν (οὐ γὰρ ψηφισθῆναί ποτε εἴασε), λεγόμενον δ' ἀκούων καὶ γραφόμενον ἀναγινώσκων ἔφερε· καὶ ὁσάκις γε βασιλεῦσί τισιν ἐπέστελλε, καὶ ἐκεῖνο προσενέγραφε.* This testimony of Dio Cassius is so plain and unqualified, that the idea that the above salutation was intended for Tiberius cannot be entertained for one moment.

† Zumpt, in his Annales, says, under the year 751: "Hoc ferme anno, quo Servius Galba, qui postea imperavit, natus est, Messala Corvinus, orator 70 annos natus, itemque M. Porcius Latro, nobilissimus eloquentiae professor, obierunt." On the other hand, Suetonius (Octav. 58) states distinctly that Valerius Messala was, upon the occasion of conferring the title "pater patriae" upon Augustus, the spokesman of the senate, and gives the very words used by Messala, and by Augustus in his reply: "cui lacrimans respondet Augustus his verbis — ipsa enim, sicut Messalae, posui." This slight discrepancy must be settled by supposing Zumpt to be in error; he himself does not seem to be confident that his statement is precise, for he says, "hoc *ferme* anno."

the successors of Augustus, it is to be observed, that, as Augustus was not the first who received this distinction, — Cicero having been honored with this appellation, — so he was not the last. Suetonius relates that the soldiers, after proclaiming Nero emperor, heaped all kinds of titles upon him, and that he declined that of "pater patriae." Cf. Suet. Ner. 8: "Discessitque jam vesperi, ex immensis, quibus cumulabatur honoribus, tantum patris patriae nomine recusato propter aetatem." This proves clearly two things, that the people did not hesitate to confer this title upon another person besides Augustus, and that Nero did not accept it.

The evidence in the case is this, then. Of the first five emperors, from Augustus to Nero, Tiberius and Nero declined the title of "pater patriae"; we have no evidence that Caligula and Claudius ever received it; but we have the most undoubted testimony that Octavianus received and accepted both titles, that of Augustus as well as "pater patriae." While the composition of the work, as has already been remarked, cannot, therefore, be placed earlier than the year 2 B. C. (752 U. C.), all the evidence we have is in favor of the supposition that Augustus is the emperor referred to, and that the work, although later than the year 2 B. C. (752 U. C.), belongs still to his reign.

14. C. 65. 10: "Et puto, cum vicesimariis magnam mantissam habet." There were two kinds of "vicesima," or tax of one twentieth, or five per cent, the "vicesima manumissionum" or "aurum vicesimarium," and the "vicesima hereditatum"; that is, that, in cases of manumission and of inheritance, one twentieth of the value of the slave or the inheritance had to be paid into the public treasury. The "vicesima manumissionum" referred to in the above passage, the subject of our inquiry, was the older of the two, and was established, in a very unusual manner and at a pretty early period, by the Lex Manlia of the consul Cn. Manlius, 357 B. C. (397 U. C.). Cf. Liv. 7. 16: "Ab altero consule nihil memorabile gestum, nisi quod legem novo exemplo ad Sutrium in castris tributim de vicesima eorum, qui manumitterentur, tulit. Patres, quia ea lege haud parvum vectigal inopi aerario additum esset, auctores fuerunt." The revenue thus raised was kept in the "aerarium sanctius," to indicate that this part of the public resources was to be used in extreme cases only. Cf. Liv. 27. 10: "Cetera expedientibus, quae ad bellum opus erant, consulibus, aurum vicesimarium, quod in sanctiore aerario ad ultimos casus servabatur, promi placuit." This tax continued ever after to be collected, and was at all times one of the most productive and most important among the internal, that is, Italian revenues. Cf. Cic. ad Attic. 2. 16 (Billerbeck 1. 42): "Praeterea si ulla res est, quae bonorum animos, quos jam video esse commotos, vehementius possit incendere, haec certe est [an agrarian law proposed by Cæsar, 59 B. C. (695

U. C.), and favored by Pompey], et eo magis, quod portoriis Italiae sublatis, agro Campano diviso, quod vectigal superest domesticum praeter vicesimam?"

The question whether this tax was paid by the master or the slave is discussed at large by P. Burmann in his dissertation De Vectigalibus Populi Romani (c. 10, p. 155 and foll.); and is for good reasons decided that it was paid by the slave. Passages like the following — Arrian. 2. 1: *Ὅταν οὖν στρέψῃ τις ἐπὶ στρατηγοῦ αὐτοῦ δοῦλον, οὐδὲν ἐποίησε· τί; ἔστρεψε τὸν αὐτοῦ δοῦλον· ἄλλο οὐδέν; ναί, καὶ εἰκοστὴν αὐτοῦ δοῦναι ὀφείλει·* 3. 26: *ὁ δοῦλος εὐθὺς εὔχεται ἀφεθῆναι ἐλεύθερος, διὰ τί δοκεῖτε; ὅτι τοῖς εἰκοστώναις ἐπιθυμεῖ δοῦναι ἀργύριον; οὐ, ἀλλ' ὅτι φαντάζεται, κ. τ. λ.*; Petron. 58. 2: "Tu autem, inquit, etiam tu rides, cepa purrhiata [al. pica cirrata, cepa cirrata]? O Saturnalia! Rogo, mensis December est? Quando vicesimam numerasti?" — render it certain that the duty of paying lay with the slave. The many instances when the master paid the tax were prompted by the liberality of the latter. The same feeling which led a generous master to manumit a favorite slave would also induce him, provided he had the means, to pay in his stead the tax required by law. Cf. Petron. 71. 1, 2: "Ad summam omnes illos in testamento meo manumitto. Philargyro etiam fundum lego et contubernalem suam. Carrioni quoque insulam et vicesimam et lectum stratum." The above passage (c. 65. 10), — "Scissa lautam novemdialem servo misello faciebat, quem mortuum manumiserat; et puto, cum vicesimariis magnam mantissam habet," — if rightly interpreted, does not conflict with this view. The owner, whatever be his name, — Scissa or Scilla or Stilla or Sylla, — had manumitted his slave after the latter's death, probably deeming this act a cheap mark of affection and regard. But the collectors of the "vicesima" took a different view, and, the manumitted being beyond their reach, they claimed the payment of the tax of the master.

The collection of this tax, "vicesima," like all other taxes, instead of being conducted directly by the state through its own officers, was, from the earliest times, committed to "publicani," farmers of the public revenue, who were, probably, called "vicesimarii." The earliest emperors, while endeavoring to check and prevent the great and shameful* abuses which had gradually crept into this mode of collecting the revenue, the natural and inevitable offspring of the system, did not alter the system

* Tacit. Annal. 13. 50, 51: "Eodem anno [59 A. D.] crebris populi flagitationibus immodestiam publicanorum arguentis, dubitavit Nero, an cuncta vectigalia omitti juberet. . . . . Ergo edixit Princeps, ut leges cujusque publici occultae ad id tempus proscriberentur; omissas petitiones non ultra annum resumerent; Romae praetor, per provincias, qui pro praetore aut consule essent, jura adversus publicanos extra ordinem redderent." The Digests (39, tit. 4, "De Publicanis et Vectigalibus et Commissis") are full of provisions against the abuses of the "publicani."

itself. Tacitus says, in his account of the administration of Tiberius (Annal. 4. 6): "At frumenta et pecuniae vectigales cetera publicorum fructuum societatibus equitum Romanorum [that is, 'publicanorum'] agitabantur." But, unquestionably, the tendency of the imperial administration was to transfer the collection of taxes from the "publicani" to imperial officers; and the change was gradually so far carried out, that at last the collection of the revenues arising from customs and a few mines and salt-works was the only remnant of the former system of letting and farming the public revenues. At which time and under which emperor this change took place in the case of the "vicesima manumissionum," I am unable to say. A few inscriptions which refer to collectors of the "vicesima," after the change had been made, are too obscure and too uncertain with regard to their age to aid us in answering this question.* So much is probable, from this passage of Petronius, and from the circumstance that "vicesimarius" is formed analogously to "scripturarius," a farmer of the revenues arising from the pastures, that the book was written before the collection of the tax "vicesima" was transferred from the "publicani" to imperial officials. Unfortunately, inscriptions mentioning "publicani" are rare. Gruter and Orelli mention one only. If we had more, we might possibly from them obtain some light. As it is, the above passage of Petronius is at least of a negative value, inasmuch as it contains nothing which would be an objection to the adoption of quite an early period as the time in which this book belongs.

15. C. 68. 4: "Interea medium Aeneas jam classe tenebat"; the commencement of Virg. Æn. 5. See also some other quotations, c. 112. 2, from Æn. 4. 38 and 39; c. 111. 11, from Æn. 4. 34. Virgil was born the 15th of October, 70 B. C. (684 U. C.), — the same year in which Cicero, as ædile elect, delivered some of his orations against Verres, — at Andes, near Mantua, and died, while engaged in the completion of his Æneid, the 22d of September, 19 B. C. (735 U. C.), in his fifty-first year. It is the generally received opinion that the Æneid was not published until after the poet's death, but was, upon its publication, immediately greeted with great applause.

* Orelli Inscript. Lat. 1470: "D. P. D. M. ‖ Urbanus ‖ $\overline{XX}$ Libert."

Ibid. 3338: "Barnaeus Soc. Salama
Socior. Sabbioni Soc.
Vicens Liber. Sibi Et Vicens
Libertis. Vicens. Libertae
Fratrib. Suis V. Fec. Ser
Vix. An. $\overline{XXV}$ Servo
D. M."

Cf. Ovid. Ars Amat. 3. 337:

"Et profugum Aenean, altae primordia Romae,
Quo nullum Latio clarius exstat opus."

Ovid. Amor. 1. 15. 25:

"Tityrus et fruges Aeneiaque arma legentur,
Roma, triumphati dum caput orbis eris."

Ovid. Trist. 2. 533:

"Et tamen ille tuae felix Aeneidos auctor
Contulit in Tyrios arma virumque toros;
Nec legitur pars ulla magis de corpore toto
Quam non legitimo foedere junctus amor."

Masson places the poem Amor. 1. 15 in the year 18 B. C. (736 U. C.), immediately following the year in which Virgil died; proving conclusively, therefore, the instantaneous appreciation of the great epic of Virgil. The book Ars Amat. was commenced in 10 B. C. (744 U. C.), and published, according to Masson, between May and September 2 B. C. (752 U. C.), or, according to Jahn, in 2 B. C. (752 U. C.) or the commencement of 1 B. C. (753 U. C.); so that the above poem, which speaks so strongly of the lasting fame of the Æneid, was written from eight to sixteen years after the death of Virgil. The last-quoted book, Tristia, was written during Ovid's exile in Pontus, between 9 A. D. (762 U. C.) and 12 A. D. (765 U. C.), or from twenty-seven to thirty years after Virgil's death, proving the continued popularity of the poet.

If there were need of other evidence of the immediate, general, and lasting popularity of the Æneid, it might be found in the fact stated by Suetonius, in his book "De illustribus Grammaticis" (c. 16): "Quintus Caecilius Epirota, Tusculi natus, libertus Attici equitis Romani, ad quem sunt Ciceronis epistolae, cum filiam patroni, nuptam Marco Agrippae, doceret, suspectus in ea et ob hoc remotus ad Cornelium Gallum se contulit; vixitque una familiarissime, quod ipsi Gallo inter gravissima crimina ab Augusto objicitur. Post deinde damnationem mortemque Galli scholam aperuit; sed ita, ut paucis et tantum adolescentibus praeciperet, praetextato nemini, nisi si cujus parenti hoc officium negare non posset. Primus dicitur Latine ex tempore disputasse primusque Virgilium et alios poëtas novos praelegere coepisse, quod etiam Domitii Marsi versiculus indicat:

Epirota, tenellorum nutricula vatum."

The success of the Æneid, so soon after its publication, was undoubtedly much aided by the poetic reputation of Virgil, already firmly established by his previous produc-

tions, the Eclogues and Georgics. The extent of his popularity on account of these poems is strikingly shown by a passage in Dial. de Causis corr. Eloq. (c. 13): "Malo securum et quietum Virgilii secessum, in quo tamen neque apud Divum Augustum gratia caruit neque apud populum Romanum notitia. Testes Augusti epistolae, testis ipse populus, qui auditis in theatro Virgilii versibus surrexit universus et forte praesentem spectantemque Virgilium veneratus est sic quasi Augustum."

From these facts it is evident that the popularity of Virgil, already great before his death, was still more increased by the publication of the Æneid immediately after it, so that his works were familiar not only to those already educated, but also to the young whose education was yet incomplete. Considering, in the next place, that between the death of Virgil (19 B. C., 735 U. C.) and that of Augustus (14 A. D., 767 U. C.) thirty-two years elapsed, we cannot escape the conclusion that, so far as the mention of Virgil's Æneid affects the settlement of the question of the age of Petronius, there is nothing to forbid the adoption of the last thirty years of the reign of Augustus as the period to which our author belongs.

16. C. 68. 8: "Illum emi trecentis denariis." The circumstance that, according to Habinna's own statement, his slave had two defects which impaired his value ("recutitus est et stertit"), to say nothing of his being squint-eyed, of which his master makes no account, renders it difficult for us, on account of our inability of estimating more accurately the depreciating circumstances, to judge whether three hundred denarii — equal to three thousand sestertii, or about one hundred and twenty dollars — was a high or low price, and to draw thence any inference as to the age of our writer. Horace, in Epist. 2. 2. 2–14, describes a slave-dealer offering a slave of fair appearance and various accomplishments, but of dubious fidelity, as cheap at eight thousand sesterces, or about three hundred and twenty dollars. At a somewhat later period, the prices paid for literary slaves reached a point of extravagance scarcely credible. Seneca relates (Epist. 27) an anecdote of a rich upstart of his own time, Calvisius Sabinus, who, afflicted with an uncommonly bad memory, had slaves each of whom knew by heart and was able to recite some one Greek poet, Homer, Hesiod, etc., and acknowledged that each of them cost him one hundred thousand sesterces, — about five thousand dollars. Were it not for the difficulty stated above, the price paid, according to this passage of Petronius, for a literary slave, would indicate a time nearer to that of Horace than that of Seneca. As it is, little weight can be attached to the passage, although I should not feel justified in passing it by in silence.

17. C. 70. 10: "Permitto, inquit, Philargyre et Carrio, etsi prasianus es famosus, dic et Minophilae, contubernali tuae, discumbat." Those who find in the character of

Trimalchio a satire on Nero, have not failed to discover in this allusion to the "factio prasina" a confirmation of their theory. Even a brief consideration of the point will suffice to show how little foundation there is, in this passage at least, for such a belief.

It is undoubtedly true that the splendor of the "ludi Circenses" reached in the imperial times a higher pitch than at any previous period, and as the interest in political affairs declined, the interest in amusements, and especially the amusements of the Circus, increased; so that Juvenal justly said (10. 78):

> "Nam qui dabat olim
> Imperium, fasces, legiones, omnia, nunc se
> Continet, atque duas tantum res anxius optat,
> Panem et Circenses."

Yet the "ludi Circenses" and their peculiar organization can be traced to the earliest period of Roman history, and, on the other hand, extended to the latest of the Roman empire. Cf. Liv. 1. 35: "Tum primum circo, qui nunc maximus dicitur, designatus locus est, loca divisa patribus equitibusque, ubi spectacula sibi quisque facerent; fori appellati. Spectavere furcis duodenos ab terra spectacula alta sustinentibus pedes. Ludicrum fuit equi pugilesque, ex Etruria maxime adciti; solemnes deinde annui mansere ludi, Romani Magnique varie appellati." Livy places this act in the very beginning of the reign of Tarquinius Priscus, who ascended the throne 616 (or 614) B. C., 138 (or 140) U. C. The same games are afterwards frequently mentioned by Livy. Nearly two hundred years after the above-mentioned act of Tarquinius Priscus, apartments for the chariots were erected in the circus. Cf. Liv. 8. 20: "Carceres eo anno (428 or 426 B. C., 326 or 328 U. C.) in circo primum statuti." The statement of Dionysius Halicarn. 3. 68, agrees in the main with that of Livy, 1. 35: *Κατεσκεύασε δὲ καὶ τὸν μέγιστον τῶν ἱπποδρόμων Ταρκύνιος τὸν μεταξὺ τοῦ τε Αὐεντίνου καὶ τοῦ Παλαντίου κείμενον, πρῶτον ὑποστέγους περὶ αὐτὸν ποιήσας καθέδρας.*

The charioteers, divided into several parties ("factiones"), were distinguished by different-colored tunics. Tertullian, in De Spectat. 9, makes a statement which seems to show that the number, originally two, was later increased to four: "Aurigas coloribus idololatriae vestierunt. Nam equi initio duo soli fuerunt, albus et russeus. Albus hiemi ob nives candidas, russeus aestati ob solis ruborem voti erant. Sed postea tam voluptate quam superstitione provecta russeum alii Marti, alii album Zephyris consecraverunt; prasinum vero Terrae matri vel verno; venetum coelo et mari vel autumno." Even if the information contained in this passage can be relied upon, I have no means of ascertaining when the change from two to four "factiones" was made. Domitian made an attempt to increase the number by the addition of two, the golden and purple

"factiones," but it does not appear that this addition was long preserved. Cf. Sueton. Domit. 7: "Duas Circensibus gregum factiones aurati purpureique panni ad quatuor pristinas addidit." During far the longest period, the number of "factiones" was four.

These "factiones" had their partisans and favorers among all classes of the spectators, whose party zeal sometimes gave rise to serious disturbances, not only in Rome, but also in other cities of the empire. The interest felt by almost the whole population is graphically described by Juvenal (11. 196):

> "Mihi pace
> Immensae nimiaeque licet si dicere plebis,
> Totam hodie Romam Circus capit et fragor aurem
> Percutit, eventum viridis quo colligo panni.
> Nam si deficeret, moestam attonitamque videres
> Hanc urbem veluti Cannarum in pulvere victis
> Consulibus."

Of these four parties the green one seems for a long time to have been the most popular among all classes, the popularity being, undoubtedly, originally owing to their distinguished success. Suetonius relates of Caligula (Cal. 55): "Prasinae factioni ita addictus et deditus, ut coenaret in stabulo assidue et maneret." The fondness of Nero for horses and races, and possibly his preference for the "factio prasina," are indicated by Suetonius (Ner. 22): "Equorum studio vel praecipue ab ineunte aetate flagravit, plurimusque illi sermo, quamquam vetaretur, de Circensibus erat; et quondam tractum prasinum agitatorem inter condiscipulos querens, objurgante magistro, de Hectore se loqui ementitus est." The same author insinuates the preference of the Emperor Vitellius for the green faction (Vit. 14): "Quosdam et de plebe ob id ipsum, quod venetae factioni maledixerant, interemit; contemtu sui et nova spe id ausos opinatus." Julius Capitolinus, one of the six "Historiae Augustae Scriptores," relates of the Emperor Verus (c. 4): "Amavit et aurigas, Prasino favens."

The above-mentioned testimony of ancient writers not only proves the early establishment of the "ludi Circenses" and their uninterrupted popularity, — a popularity which, in the imperial times, transcended all bounds of reason, so that Juvenal pointedly, but truly, says that the Roman people had but two wants, bread and games, — but also more especially the great favor enjoyed by the green faction at different times, among the rulers of the empire as well as among the people at large. Something more definite is, therefore, required by a person of common sense, than the simple mention of the term "prasinus" or "prasianus" to prove an allusion to Nero.

18. C. 71. 1: "Ad summam, omnes illos in testamento meo manumitto." It may

not be uninteresting to consider, for a moment, the laws regulating the liberation of slaves in the commencement of the imperial period. It is possible that from them, in connection with this passage, we may obtain some hints as to the age of our author. The right of the master to manumit his slaves was originally unrestricted. But towards the close of the republic and in the beginning of the empire, the abuses connected with the manumission of slaves increased greatly, both in number and kind. Dionysius of Halicarnassus gives a most interesting account of these abuses, — an account which, coming from a contemporary of Augustus, has all the weight of the testimony of an eyewitness; he says (Antiq. Rom. 4. 24): *Ἐπειδὴ δὲ κατὰ τοῦτο γέγονα τὸ μέρος τοῦ διηγήματος, ἀναγκαῖον εἶναί μοι δοκεῖ διελθεῖν ὡς εἶχε τότε Ῥωμαίοις τὰ περὶ τοὺς δούλους ἔθη, ἵνα μήτε τὸν βασιλέα τὸν πρῶτον ἐπιχειρήσαντα τῷ τοὺς δεδουλευκότας ἀστοὺς ποιεῖν, μήτε τοὺς παραδεξαμένους τὸν νόμον, ἐν αἰτίαις σχῇ τις, ὡς ῥιπτοῦντας εἰκῇ τὰ καλά· ἐτύγχανον δὴ τοῖς Ῥωμαίοις αἱ τῶν θεραπόντων κτήσεις κατὰ τοὺς δικαιοτάτους γενόμεναι τρόπους. ἢ γὰρ ὠνησάμενοι παρὰ τοῦ δημοσίου τοὺς ὑπὸ δόρυ πωλουμένους ἐκ τῶν λαφύρων, ἢ τοῦ στρατηγοῦ συγχωρήσαντος ἅμα ταῖς ἄλλαις ὠφελείαις καὶ δορυαλώτους τοῖς λαβοῦσιν ἔχειν, ἢ πριάμενοι παρ' ἑτέρων κατὰ τοὺς αὐτοὺς τρόπους κυρίων γενομένων, ἐκέκτηντο τοὺς δούλους· οὐδὲ δὴ πρᾶγμα ποιεῖν αἰσχύνης ἢ βλάβης κοινῆς ἄξιον οὔτε ὁ Τύλλιος ὁ καταστησάμενος τὸ ἔθος, οὔτε οἱ παραδεξάμενοι καὶ διαφυλάξαντες ᾠόντο, εἰ τοῖς ἀφαιρεθεῖσιν ἐν πολέμῳ τήν τε πατρίδα καὶ τὴν ἐλευθερίαν, χρηστοῖς γενομένοις περὶ τοὺς τὸ πρῶτον αὐτοὺς καταδουλωσαμένους, ἢ περὶ τοὺς ἀπ' ἐκείνων αὐτοὺς πριαμένους, ἀμφότερα ταῦτα παρ' αὐτῶν ὑπάρξει αὖθις τῶν κτησαμένων αὐτοὺς εἰς δουλείαν· ἐτύγχανον δὲ τῆς ἐλευθερίας οἱ μὲν πλεῖστοι προῖκα, διὰ καλοκἀγαθίαν· καὶ κράτιστος ἀπαλλαγῆς δεσποτῶν τρόπος οὗτος ἦν· ὀλίγοι δέ τινες λύτρα καταθέντες ἐξ ὁσίων καὶ δικαίων ἐργασιῶν συναχθέντα. ἀλλ' οὐκ ἐν τοῖς καθ' ἡμᾶς χρόνοις οὕτω ταῦτ' ἔχει, ἀλλ' εἰς τοσαύτην σύγχυσιν ἥκει τὰ πράγματα, καὶ τὰ καλὰ τῆς Ῥωμαίων πόλεως οὕτως ἄτιμα καὶ ῥυπαρὰ γέγονεν, ὥσθ' οἱ μὲν ἀπὸ λῃστείας, καὶ τοιχωρυχίας, καὶ πορνείας, καὶ παντὸς ἄλλου πονηροῦ πόρου χρηματισάμενοι, τούτων ὠνοῦνται τῶν χρημάτων τὴν ἐλευθερίαν, καὶ εὐθύς εἰσι Ῥωμαῖοι· οἱ δὲ, συνίστορες καὶ συνεργοὶ τοῖς δεσπόταις γενόμενοι φαρμακειῶν καὶ ἀνδροφονιῶν, καὶ τῶν εἰς τοὺς θεοὺς ἢ τὸ κοινὸν ἀδικημάτων ταύτας φέρονται παρ' αὐτῶν τὰς χάριτας· οἱ δὲ, ἵνα τὸν δημωσίως διδόμενον σῖτον λαμβάνοντες κατὰ μῆνα, καὶ εἴ τις ἄλλη παρὰ τῶν ἡγουμένων γίγνοιτο τοῖς ἀπόροις τῶν πολιτῶν φιλανθρωπία, φέρωσι τοῖς δεδωκόσι τὴν ἐλευθερίαν· οἱ δὲ διὰ κουφότητα τῶν δεσποτῶν καὶ κενὴν δοξοκοπίαν· ἔγωγ' οὖν ἐπίσταμαί τινας ἅπασι τοῖς δούλοις συγκεχωρηκότας εἶναι ἐλευθέρους, μετὰ τὰς ἑαυτῶν τελευτάς, ἵνα χρηστοὶ καλῶνται νεκροὶ, καὶ πολλοὶ ταῖς κλίναις αὐτῶν ἐκκομιζομέναις παρακολουθῶσι τοὺς πίλους ἐπὶ ταῖς κεφαλαῖς ἔχοντες· ἐν οἷς ἐπόμπευόν τινες, ὡς ἦν παρὰ τῶν ἐπισταμένων ἀκούειν, ἐκ τῶν δεσμωτηρίων ἐξεληλυθότες κακοῦργοι ἀρτίως, μυρίων ἄξια διαπεπραγμένοι θανάτων· εἰς τούτους μέντοι τοὺς δυσεκκαθάρτους σπίλους ἐκ τῆς πόλεως ἀποβλέποντες οἱ πολλοὶ δυσχεραίνουσι καὶ προβέβληνται τὸ ἔθος, ὡς οὐ πρέπον ἡγεμονικῇ πόλει, καὶ παντὸς ἄρχειν ἀξιούσῃ τόπου, τοιούτους πολίτας ποιεῖσθαι.* One of

the reasons for manumitting slaves given above by Dionysius, for the purpose of receiving from their freedmen the grain or other gifts which might be distributed among the people, is confirmed by Dio Cassius (39. 24): *Καὶ ὁ Πομπήϊος ἔσχε μὲν ἐν τῇ τοῦ σίτου διαδόσει τριβήν τινα· πολλῶν γὰρ πρὸς τὰς ἀπ' αὐτοῦ ἐλπίδας ἐλευθερωθέντων, ἀπογραφὴν σφῶν, ὅπως ἔν τε κόσμῳ καὶ ἐν τάξει τινὶ σιτοδοτηθῶσιν, ἐθελῆσαι ποιήσασθαι.*

It was to check these abuses of manumission that the consuls of the year 4 A. D. (757 U. C.), Sextus Aelius Cato and C. Sentius Saturninus, at the instance of Augustus, enacted the "lex Aelia Sentia." The leading provisions of the law were that the master, if under twenty years of age, could not manumit, except "vindicta" and after having shown a sufficient cause ("justa causa manumissionis") before a board ("consilium") appointed for this purpose; the slave, if under thirty years of age, could not, in consequence of his manumission, become a citizen, unless he had been manumitted "vindicta" and with the consent of the "consilium." Soon after, or at the time of, the "lex Aelia Sentia,"—for the precise time of its passage is not known,—the "lex Furia Caninia" was enacted, which was a supplement to the "lex Aelia Sentia." For as this regulated more especially, although not exclusively, the power of the master as regards manumission during his lifetime, so the former related to the exercise of the same power by testament. A master who had three slaves could free two by testament; he who had from four to ten, one half; from eleven to thirty, one third; from thirty-one to one hundred, one fourth; from one hundred to five hundred, one fifth; and under no circumstances could a master manumit more than one hundred, whatever might be the number of his slaves.* The "lex Junia Norbana," enacted 19 A. D. (772 U. C.), may be mentioned in connection with these laws, especially the "lex Aelia Sentia," because it regulated the political condition of those who had been manumitted without "vindicta" and without the consent of the "consilium," indirectly exercising, therefore, some influence upon the action of the master.

It is at once apparent that the "lex Furia Caninia" is the one which would have applied to the case of Trimalchio, because he freed the slaves, not in his lifetime, but by his testament: "omnes illos in testamento meo manumitto." It is further evident,

* Gaii Instit. (edit. Lachmanni) 1. 42, 43: "Praeterea lege Furia Caninia certus modus constitutus est in servis testamento manumittendis. Nam ei, qui plures quam duos, neque plures quam decem servos habebit, usque ad partem dimidiam ejus numeri manumittere permittitur; ei vero, qui plures quam X, neque plures quam XXX servos habebit, usque ad tertiam partem ejus numeri manumittere permittitur; at ei, qui plures quam XXX neque plures quam centum habebit, usque ad partem quartam . . . . datur; novissime ei, qui plures quam C habebit, nec plures quam D . . . . permittitur, quam ut quintam partem neque plures . . . . sed praescribit lex, ne cui plures manumittere liceat quam C."

that, taking into consideration the immense number of slaves owned by Trimalchio,* he would not have violated the provisions of the "lex Furia Caninia" by manumitting the few slaves referred to in this passage, and mentioned in the preceding chapter; and consequently neither he nor the author had occasion to mention those laws. On the other hand, it cannot be denied that, considering the gossiping style of Trimalchio's conversation, an allusion to those laws, if in existence, would not surprise, but appear natural and in keeping. But be this as it may, while I am not disposed to go so far as to find in Trimalchio's silence concerning the "lex Furia Caninia" a positive evidence that the book was written before the passage of that law, it is evident that this passage contains nothing which militates against such an opinion, if, from other considerations, it should prove probable or certain.

19. C. 71. 9: "Cum annulis aureis quinque." This, like the preceding expression, "et me in tribunali sedentem praetextatum," is merely a proof of Trimalchio's excessive vanity. For there is no doubt that the wearing of five gold rings, with which he desired to be represented on his sepulchral monument, as well as his actual appearance with two, one of which was gilt and the other apparently of gold,† were in violation of the existing laws and customs. Trimalchio, prompted by his vulgar vanity, takes great pains to inform us, in various ways and with great minuteness, of the leading circumstances of his life, especially of his wealth, offices, and distinctions. It is not probable, therefore, that he would have failed to mention the fact, if by some means he had obtained the right of wearing a gold ring, or, in other words, the rank of a knight.

The use of rings, whether derived from the Sabines or Etruscans, was an ancient Roman custom, the earliest ring being of iron. Not even the senators, in earlier times, had golden rings, except those who went abroad as ambassadors. Cf. Plin. Nat. Hist. 33. 1. 4. 11: "Longo certe tempore ne senatum quidem Romanum habuisse aureos manifestum est, siquidem iis tantum, qui legati ad exteras gentis ituri essent, annuli publice dabantur, credo, quoniam ita exterorum honoratissimi intellegebantur."‡ Even as late as the time of the Social War, not all senators wore golden rings. Cf. Plin. Nat.

* Cf. c. 37. 9: "Familia vero babae! babae! non me Hercules! puto decumam partem esse, quae dominum suum novit." — Cf. c. 53. 2: "VII Kal. Sextiles in praedio Cumano, quod est Trimalchionis, nati sunt pueri XXX, puellae XL."

† Cf. c. 32. 3: "Habebat etiam in minimo digito sinistrae manus annulum grandem subauratum; extremo vero articulo digiti sequentis minorem, ut mihi videbatur, totum aureum sed plane ferreis veluti stellis ferruminatum."

‡ Pliny adds in the following paragraph (12): "Ii quoque, qui ob legationem acceperant aureos, in publico tantum utebantur his, intra domos vero ferreis."

Hist. 33. 1. 6. 21: "Ne tum quidem omnes senatores habuere, utpote cum memoria avorum multi praetura quoque functi in ferreo consenuerint, sicut Calpurnium et Manilium, qui legatus Gai Mari fuerit Jugurthino bello, Fenestella tradit." By degrees, however, the golden ring seems to have become the distinction of senators. Cf. Liv. 9. 46, "Tantumque Flavii comitia indignitatis habuerunt, ut plerique nobilium annulos aureos et phaleras deponerent," in connection with Plin. Nat. Hist. 33. 1. 6. 18, "Additum Flavio, ut simul et tribunus plebei esset, quo facto tanta indignatio exarsit, ut *annulos abjectos* in antiquissimis reperiatur annalibus," and Liv. 26. 36, "Aurum, argentum, aes signatum omne senatores crastino die in publicum conferamus; ita ut annulos sibi quisque . . . relinquant." Soon the knights, or at least the more distinguished of the order, shared in this honor. Cf. Liv. 23. 12: "Ad fidem deinde tam laetarum rerum effundi in vestibulo curiae jussit annulos aureos, qui tantus acervus fuit, ut metientibus dimidium super tres modios explesse sint quidam auctores. . . . . Adjecit deinde verbis, quo majoris cladis indicium esset, neminem nisi equitem, atque eorum ipsorum primores, id gerere insigne." In the imperial times, the privilege of the golden ring was still further extended, even to freedmen, — not to entire classes, however, but only to individuals. Octavianus himself, as early as 38 B. C. (716 U. C.), bestowed the golden ring upon Mena, a freedman, the admiral of Sextus Pompeius, for having betrayed his master. Cf. Dio Cass. 48. 45: *Μηνᾶς . . . πρὸς τὸν Καίσαρα προκηρυκευσάμενος τήν τε νῆσον αὐτῷ καὶ τὸ ναυτικὸν, τό τε ἄλλο στράτευμα καὶ ἑαυτὸν παρέδωκε· καὶ αὐτὸν ἐκεῖνος ἀσμένως ἰδὼν, ἐπειδὴ καὶ τὸν Σέξστον τούς τε αὐτομολοῦντας παρὰ τὰ συγκείμενα ὑποδέχεσθαι, καὶ ναυπηγίαν τριηρῶν ποιεῖσθαι, ἔν τε τῇ Ἰταλίᾳ φρουρὰς ἔχειν ἔλεγεν, οὔτε ἐξέδωκεν ἐξαιτηθέντα καὶ προσέτι καὶ ἐν τιμῇ μεγάλῃ ἤγαγε· δακτυλίοις τε χρυσοῖς ἐκόσμησε, καὶ ἐς τὸ τῶν ἱππέων τέλος ἐσέγραψε· τὸ δὲ δὴ τῶν δακτυλίων τοιόνδε ἐστίν· οὐδενὶ τῶν πάλαι Ῥωμαίων, οὐχ' ὅτι τῶν δουλευσάντων ποτὲ, ἀλλ' οὐδὲ τῶν ἐν ἐλευθέρῳ γένει τραφέντων, δακτυλίοις χρυσοῖς, πλὴν τῶν τε βουλευτῶν καὶ τῶν ἱππέων χρῆσθαι, ὥσπερ εἴρηταί μοι, ἐξῆν.* The same distinction was, at a later period, — 23 B. C. (731 U. C.), — conferred upon the physician Antonius Musa, a freedman of course, who had cured Augustus in a dangerous disease. Cf. Dio Cass. 53. 30: *Καὶ αὐτὸν μεδὲν ὅτι μηδὲ τῶν πάνυ ἀναγκαίων ποιεῖν δυνάμενον, Ἀντώνιός τις Μοῦσας καὶ ψυχρολουσίαις καὶ ψυχροποσίαις ἀνέσωσε· καὶ διὰ τοῦτο καὶ χρήματα παρά τε τοῦ Αὐγούστου καὶ παρὰ τῆς βουλῆς πολλὰ, καὶ τὸ χρυσοῖς δακτυλίοις (ἀπελεύθερος γὰρ ἦν) χρῆσθαι· τήν τε ἀτέλειαν καὶ ἑαυτῷ καὶ τοῖς ὁμοτέχνοις, οὐχ' ὅτι τοῖς τότε οὖσιν ἀλλὰ καὶ τοῖς ἔπειτα ἐσομένοις ἔλαβεν.*

The temptation to appear, even in violation of law and custom, with the badge and ornament of a higher class, was too great for many a rich upstart, such as Trimalchio was. Acquaintance with human nature makes this probable, and the testimony of his-

tory confirms it. Cf. Plin. Nat. Hist. 33. 1. 6. 23: "Nec non et servitia jam ferrum auro cingunt, alia per sese mero auro decorant." Still the use of golden rings by slaves or freedmen was a violation of law and usage. For we have positive evidence that, under the first emperors, the golden ring was still the distinguishing badge of the knights. Cf. Sueton. Galba, 10: "Delegit et equestris ordinis juvenes, qui manente annulorum aureorum usu Evocati appellarentur, excubiasque circa cubiculum suum vice militum agerent." Id. 14: "Libertus Icelus paullo ante annulis aureis et Marciani cognomine ornatus ac jam summae equestris gradus candidatus." Tacit. Hist. 1. 13: "Nec minor gratia Icelo, Galbae liberto, quem annulis donatum equestri nomine Marcianum vocitabant." Id. 2. 57: "Vocata concione virtutem militum laudibus cumulat. Postulante exercitu, ut libertum suum Asiaticum equestri dignitate donaret, inhonestam adulationem compescit. Dein mobilitate ingenii, quod palam abnuerat, inter secreta convivii largitur; honoravitque Asiaticum annulis, foedum mancipium et malis artibus ambitiosum."

This passage of Petronius, mentioning an abuse which undoubtedly appeared early, probably towards the close of the republic, while it contains nothing which enables us to fix more definitely the period of the composition of the book, is not incompatible with the hypothesis that the work was written in the times of Augustus.

20. C. 71. 12: "C. Pompeius Trimalchio Maecenatianus." The circumstance that Trimalchio calls himself Maccenatianus is not without significance, although it may not be easy to determine how much weight is to be attached to it, and how it is to be explained. While Heinsius is of opinion that Trimalchio adopted the name Maecenatianus in order to indicate his ambitious imitation of the luxurious life and pleasure-loving disposition of that distinguished man, Burmann interprets the name as indicating the fact that Trimalchio had been the slave of Mæcenas, and manumitted by him. He goes further, and infers, from this circumstance and some others mentioned in the story of Trimalchio, that the book must have been written in the reign of Claudius. I cannot prevail upon myself to adopt Burmann's view. The few and brief allusions made by Trimalchio to his master do not, I think, apply to Mæcenas; and as to Burmann's inference that the book was written in the time of Claudius, it appears to me that the data from which he draws it, even if they were not in part mere hypotheses, are altogether insufficient. The opinion of Heinsius appears to me deserving of consideration; and I think that in the adoption of the name Maecenatianus an indication, although a slight one, might be found that the book was written soon after the death of Mæcenas, which occurred 8 B. C. (746 U. C.), when his character and habits were yet fresh in the recollection of many of his contemporaries. On the whole, however, I prefer the

interpretation, but not the inference, of Orelli.* After stating that Jannelli (in Codice Perottino, II. p. 123) has collected some strong arguments by which he intends to prove that Petronius wrote in the times of Claudius and Nero, he goes on to say: "Quibus duo praeterea addere libet a me reperta: 1, cap. 71, Trimalchio nominatur G. Pompeius Trimalchio Maecenatianus, id est vel Maecenatis libertus vel potius, ut opinor, Maecenatis liberti libertus (nam quae de domino heraque narrat, ad Maecenatem atque Terentiam referri nequeunt), uti Anna Liviae Maecenatiana Gori Columbar. in Poleni Thesauro 3, p. 150. 97." This interpretation, that Trimalchio was the freedman of Mæcenas's freedman, does not oblige us, as Orelli seems to think, to look for the author of the book in the age of Claudius and Nero; it is by no means incompatible with the opinion that the book was written in the latter years of Augustus, because the manumission of Mæcenas's freedman, nay, even that of Trimalchio, in consequence of which the latter adopted the name Maecenatianus, may have taken place before Mæcenas's death, which occurred more than twenty years before that of Augustus, or soon after.

21. C. 71. 12: "Cum posset in omnibus decuriis Romae esse." What does Trimalchio mean by this part of his sepulchral inscription? It is well known that certain corporations, such as the lictors, "scribae," and "viatores," were divided into "decuriae." It is not probable that any one of these is here referred to, because Trimalchio would not have failed to designate the corporation, if he belonged to any one of them, and the fact of his belonging to it would undoubtedly be mentioned in some part of the narrative. Moreover, the expression "cum posset in *omnibus* decuriis Romae esse" implies a gradation or a difference in rank between the several "decuriae," and this characteristic belongs to the "decuriae judicum" alone, at least in the later period of the republic and the commencement of the imperial times. Earlier, it is true, as long as the senators alone acted as "judices" in criminal cases, they were, without any difference of rank, and solely for the purpose of a convenient arrangement, divided into sections or "decuriae," which discharged, each in its turn, its duties as a jury. When, by the "lex Aurelia" of L. Aurelius Cotta (70 B. C., 684 U. C.), the duties of jurymen were divided between the senators, knights, and "tribuni aerarii," these three orders or classes were called "decuriae," and a certain number of "judices," or jurymen, were drawn from each "decuria" to try particular cases, so that in each trial the three "decuriae" were represented. This organization continued, not without some fluctuations, however, to the times of Augustus, who added to the three "decuriae"

* Inscript. Lat. I. p. 257.

a fourth, "ex infimo censu."* Caligula added a fifth, and the addition of a sixth was rejected by Galba. From the passage of the "lex Aurelia," the term "decuria" designates the three or more classes or orders of citizens from whom the "judices" were chosen. The important point here to be noticed is, that the whole arrangement implied a scale of rank chiefly, if not entirely, based upon the census or property-qualification. When, therefore, Trimalchio says that he might serve in any of the "decuriae," he, in the proud consciousness of his wealth, means that his property entitles him to be chosen into any of the "decuriae judicum." He neither says that he actually is a member of a "decuria judicum," nor that he could be,† except on the ground of property. It is another illustration of his unlimited vanity. Since Trimalchio does not mention the number of the "decuriae," we are unable to determine, from this passage, whether he speaks of the state of the courts before or after the addition made by Augustus. Besides, I have not been able to ascertain the time when Augustus made that addition to the number of the "decuriae judicum," although it is highly probable that it was one of the series of reformatory measures which distinguished his sixth consulship (28 B. C., 726 U. C.). So much is certain, however, that there is nothing in the passage which can prevent us from placing the book in the reign of Augustus, if other considerations should favor such a decision.

22. C. 71. 12: "Sestertium reliquit trecenties"; thirty million sesterces, or, according to American money, about seven hundred thousand dollars; not a very large estate. There is, so far as I know, no other instance of a testator causing the amount of his property to be inscribed on his sepulchral monument, except that mentioned by Horace (Sat. 2. 3. 84):‡

"Heredes Staberi summam incidere sepulcro."

If the inscription in Horace, as well as in Petronius, be nothing but a satirical exaggeration, introduced for the purpose of painting in strong colors the prevailing vice of their times, may we not infer that it was, in both instances, suggested by similar or the same circumstances, — that Horace and Petronius were either contemporaries, or that the

* Cf. Sueton. Aug. 32: "Ad tres judicum decurias quartam addidit ex inferiore censu, quae ducenariorum vocaretur, judicaretque de levioribus summis."

† Cf. Plin. Nat. Hist. 33. 1. 7. 30: "Servatumque in hodiernum est, ne quis e novis civibus in iis [sc. decuriis] judicaret."

‡ Karl Franke, in his "Fasti Horatiani," places this satire in 33 B. C. (721 U. C.); W. E. Weber, in his "Quintus Horatius Flaccus als Mensch und Dichter," places it in December of the same year, 33 B. C. Heindorf, in his edition of the Satires of Horace, agrees with the above-named scholars, while Orelli is inclined to place this Satire two years later, in 31 B. C. (723 U. C.).

latter lived a short time only after the former? This view of the subject is not a little strengthened by the consideration that the tyrannical character of the successors of Augustus, which rendered it prudent to avoid attracting the notice, jealousy, and suspicion of the ruler in any way, whether by birth, moral excellence, or wealth, would prevent men from making the amount of their property known.

23. C. 73. 3: "Et coepit Menecratis cantica lacerare." It is natural that those who discover everywhere allusions to Nero should at once think of Menecrates, the lyre-player, who was extravagantly honored and rewarded by that emperor. Cf. Sueton. Ner. 30: "Menecraten citharoedum et Spiculum mirmillonem triumphalium virorum patrimoniis aedibusque donavit." W. S. Teuffel (in Pauly's Encyclop. IV. p. 1744) seems to be of this opinion. The fact should not be overlooked that the Menecrates of Nero is mentioned as a *citharoedus* (lyre-player) only, not as a poet. The two arts may frequently, especially in the earlier times, have been united in the same person, but not necessarily; one might furnish the poem, the other the music. But not only was it not indispensable, according to custom, for the player to compose his own poem, or for the poet to accompany his poem with his own music; it is highly probable, from reason and from the course which modern music has pursued, that, in proportion as musical instruments improved and the skill of performers increased, music unaccompanied by words was more cultivated. That music without words was practised at as early a time as the age of Plato, is raised beyond a doubt by the passage (Legg. 2, p. 669): *Ῥυθμὸν μὲν καὶ σχήματα μέλους χωρὶς, λόγους ψιλοὺς εἰς μέτρα τιθέντες, μέλος δ' αὖ καὶ ῥυθμὸν ἄνευ ῥημάτων ψιλῇ καθαρίσει τε καὶ αὐλήσει προσχρώμενοι.* I allude to the gradual development of instrumental music, as distinct from vocal, which is noticed at so early a period, simply for the purpose of showing that, in the nature of things, the art of lyric poetry should be cultivated by one who was no musician, and that the songs of a lyric poet should be sung, if not set to music, by one who possessed a good voice and skill on the lyre, but was no poet. The favorite lyre-player of Nero, Menecrates, may have been a poet, and composed his own songs, so that they were afterwards sung by others, but the above passage in Suetonius, the only one, as far as I know, which mentions him, says nothing about it. Besides, the name Menecrates was not uncommon. It is not impossible, therefore, that, in the time of Nero, or before or after him, there may have been a poet Menecrates, of whom no notice has reached us, as well as a lyre-player, of whom so meagre a one has been preserved. Or some one of those whom we know from other sources may have been the one whose "cantica" are here mentioned. Menecrates of Ephesus, a grammarian, and the teacher of Aratus, was also a poet. Menecrates of Smyrna was a poet, of whom two epigrams are pre-

served in the Greek Anthology. But above all, there is Menecrates, an author of the new comedy, mentioned by Suidas: *Μενεκράτης κωμικός· δράματα αὐτοῦ Μανέκτωρ ἢ Ἑρμιονεύς.* If, in connection with this, we take into consideration the fact that the term "canticum" designates, not only a single song or ballad, but one of the three parts into which ancient critics divided the comedy, the "diverbium," "canticum," and "chorus," it will appear by no means improbable that the songs mentioned by our author are such "cantica," from a play or plays of this Menecrates. From these few remarks it will be apparent that, if other reasons should oblige or lead us to assign to Petronius a time different from that of Nero, the circumstance that the poet mentioned in this passage and the lyre-player of Nero bear the same name would present no objection.

24. C. 76. 2: "Coheredem me Caesari fecit." The custom of making distinguished men, not relatives, heirs, was already common in the times of the republic. It will be sufficient to illustrate this by the case of Cicero. It is well known that he received legacies from many persons on whom he had no claims arising from relationship. He himself states the amount of these legacies, Phil. 2. 16: "Hereditates mihi negasti venire. Utinam hoc tuum verum crimen esset! plures amici mei et necessarii viverent. Sed qui istuc tibi venit in mentem? Ego enim amplius HS ducenties acceptum hereditatibus retuli." Such cases were the legacies left to Cicero by Precianus, a lawyer (Cic. ad Div. 7. 8. 2), of which Cicero speaks in two places of his letters, Ad Attic. 6. 9. 2, "Hanc, quae mehercule mihi magno dolori est — dilexi enim hominem — procura, quantulacunque est, Precianam hereditatem, prorsus ille ne attingat," and Ad Div. 14. 5. 2, "De hereditate Preciana, quae quidem mihi magno dolori est — valde enim illum amavi — sed hoc velim cures," etc.; — by M. Curius, of whom Cicero speaks thus (Ad Div. 16. 4. 2): "Ad Curium vero, suavissimum hominem et summi officii summaeque humanitatis, multa scripsi";* — by Galeo, cf. Ad Attic. 11. 12. 4: "Galeonis hereditatem crevi. Puto enim cretionem simplicem fuisse, quoniam ad me nulla missa est"; — and by M. Cluvius, of Puteoli, a rich banker (cf. Ad Attic. 13. 46. 3, "Cluvium autem a T. Hordeonio legare et Terentiae HS IↃↃↃ [quinquaginta millia sestertium]," and ibid. 14. 9. 1, "Primum vehementer me Cluviana delectant"). If these instances from the life of Cicero were not sufficient to prove the existence of the custom of men, more especially men of distinction, receiving legacies from persons with whom they were not connected by ties of relationship, it would be proved by the abuses of the

* Cf. Ad Attic. 7. 2. 3: "Curius autem ipse sensit, quam tu velles se a me diligi, et eo sum admodum delectatus. Et mehercule est, quem facile diligas. *Αὐτόχθων* in homine urbanitas est. Ejus testamentum deporto Ciceronum signis obsignatum cohortisque praetoriae; fecit palam te ex libella, me ex teruncio."

custom with which Cicero charges Antony in his second Philippic. These very abuses presuppose the existence of the custom; for it is in the nature of things that the abuse of a thing succeeds its proper, legitimate use.

The existence and prevalence, nay, the abuse of this custom, even in the times of the republic, being sufficiently established, there is nothing in this passage, as far as this custom is concerned, to prevent us from applying the name Cæsar to Augustus, if not to his great-uncle, Julius Cæsar. It is known that Augustus was frequently remembered in the testaments of persons not his relations, and that he accepted such legacies. While he was entirely free from avarice, employing the means accruing from this source in the most generous manner, he loved such tokens of respect and affection, and narrowly scrutinized the amount of the legacy and the language of the testator. Cf. Sueton. Aug. 66: "Nam, quamvis minime appeteret hereditates, ut qui nunquam ex ignoti testamento capere quidquam sustinuerit, amicorum tamen suprema judicia morosissime pensitavit, neque dolore dissimulato, si parcius aut citra honorem verborum, neque gaudio, si grate pieque quis se prosecutus fuisset. Legata, vel partes hereditatum, a quibuscunque parentibus relicta sibi, aut statim liberis eorum concedere aut, si pupillari aetate essent, die virilis togae vel nuptiarum cum incremento restituere consuerat." Nay, those who see everywhere in the works of Petronius satirical allusions to individuals, and especially those who, with Burmann, discover in the name Maecenatianus (c. 71. 12) an evidence that Trimalchio was actually a freedman of that distinguished personage Mæcenas, may find a corroboration of their hypothesis in the fact that Mæcenas made Augustus his heir. Cf. Dio Cass. 55. 7: *Τούτων τε οὖν ἕνεκα ἰσχυρῶς αὐτὸν ὁ Αὔγουστος ἐπόθησε, καὶ ὅτι καὶ κληρηνόμον αὐτὸν, καίπερ ἐπὶ τῇ γυναικὶ δυσκολαίνων, κατέλιπε.*

25. C. 77. 5: "Ad summa, Scaurus cum huc venit, nusquam mavoluit hospitari, et habet ad mare paternum hospitium." The question naturally suggests itself, whether it is possible to identify this individual Scaurus. We can distinguish among those who bear the name Scaurus several branches, the most distinguished and numerous belonging to the "gens Aemilia"; besides these, we meet with Aurelii and Terentii. Among the last the most distinguished was Q. Terentius Scaurus, a grammarian in the times of the Emperor Hadrianus (from 117 to 138 A. D.). Among the Æmilii there is one who at once attracts our attention in connection with this passage, namely, Mamercus Æmilius Scaurus, distinguished as an orator and poet, but also conspicuous for the dissoluteness of his life and manners. He was the grandson of M. Æmilius Scaurus, who, in the times of Sulla, Pompey, and Cicero, played no inconsiderable part in public affairs. Mamercus at an early period drew upon himself the enmity of Tibe-

rius, when the latter played the farce with regard to the assumption of the reins of government. Cf. Tacit. Ann. 1. 13: "Etiam Q. Haterius et Mamercus Scaurus suspicacem animum perstrinxere; Haterius, cum dixisset, Quousque patieris, Caesar, non adesse caput rei publicae? Scaurus, quia dixerat, spem esse ex eo, non irritas fore senatus preces, quod relationi consulum jure tribuniciae potestatis non intercessisset. In Haterium statim invectus est; Scaurum, cui implacabilius irascebatur, silentio tramisit." After having already once before (32 A. D.) been accused of treason,* he was again accused of adultery and sorcery; but the true cause of his destruction was a tragedy of his, entitled *Atreus*, to which his enemy Macro had added some verses capable of being applied to Tiberius. Scaurus anticipated his impending doom, and at the advice of his wife, Sextia, and in company with her, died by his own hand. Cf. Tacit. Ann. 6. 29: "Mamercus dein Scaurus rursum postulatur, insignis nobilitate et orandis causis, vita probrosus. Nihil hunc amicitia Sejani, sed labefecit haud minus validum ad exitia Macronis odium, qui easdem artes occultius exercebat; detuleratque argumentum tragoediae a Scauro scriptae, additis versibus, qui in Tiberium flecterentur. Verum ab Servilio et Cornelio accusatoribus adulterium Liviae, magorum sacra objectabantur. Scaurus, ut dignum veteribus Aemiliis, damnationem anteit, hortante Sextia uxore, quae incitamentum mortis et particeps fuit." The account of Dio Cassius (58. 24) is substantially the same: *Μαμέρκος δὲ δὴ Αἰμίλιος Σκαῦρος, μήτ' ἄρξας τινῶν, μήτε δωροδοκήσας, ἑάλω τε διὰ τραγῳδίαν, καὶ παθήματι δεινοτέρῳ οὗ συνέγραψε περιέπεσεν. Ἀτρεὺς μὲν τὸ ποίημα ἦν· παρήνει δὲ τῶν ἀρχομένων τινὶ ὑπ' αὐτοῦ, κατὰ τὸν Εὐριπίδην, ἵνα τὴν τοῦ κρατοῦντος ἀβουλίαν φέρῃ· μαθὼν οὖν τοῦτο ὁ Τιβέριος ἐφ' ἑαυτῷ τότε τὸ ἔπος εἰρῆσθαι ἔφη, Ἀτρεὺς διὰ τὴν μιαιφονίαν εἶναι προσποιησάμενος· καὶ ὑπειπὼν ὅτι καὶ ἐγὼ οὖν Αἴαντα αὐτὸν ποιήσω, ἀνάγκην οἱ προσήγαγεν αὐτοεντεὶ ἀπολέσθαι· οὐ μὴν καὶ ἐπὶ τούτῳ κατηγορήθη, ἀλλ' ὡς τὴν Λιουίλλαν μεμοιχευκώς.*

The Scaurus of Petronius is well known to the guests of Trimalchio, for the latter deems it unnecessary to designate him more particularly. So Mamercus Æmilius Scaurus may be supposed to have been known to the class of persons to which Trimalchio and his guests belonged, if, as we see from this passage, he condescended to associate with them. The Scaurus of Petronius is represented as a person of property, for he says of him "et habet ad mare paternum hospitium." This is not inconsistent with the condition of Mamercus Æmilius Scaurus, as he is described to us by Tacitus and other historians. Mamercus Scaurus is, in the pregnant language of Tacitus, called

* Cf. Tacit. Ann. 6. 9: "Caesar Pollionis ac Viniciani Scaurique causam, ut ipse cum senatu nosceret, distulit datis quibusdam in Scaurum tristibus notis."

"vita probrosus," of an impure, dissolute life. It is precisely a person of this character who, in the pursuit of his vile, low pleasures, would so far demean himself as to associate with, and be the guest of, such a person as Trimalchio, a low, vulgar, but rich upstart. Another circumstance is to be noticed which is not without weight in interpreting this passage. M. Annæus Seneca, the father of the philosopher, (in Suas. 2,) states that with Mam. Æmilius Scaurus the family became extinct. Taking all these circumstances into consideration, the supposition that the Scaurus of Petronius is Mam. Æmilius Scaurus, who, under Tiberius, committed suicide in 34 A. D. (787 U. C.) acquires, to say the least, a high degree of probability. If the statement of Seneca is to be relied upon, we need not look, as far as the Æmilii Scauri are concerned, for a later member of that family as the person here mentioned. And if no valid argument can be adduced against the supposition that the Scaurus of Petronius and the Mamercus Æmilius Scaurus of Tiberius's times are the same person, the composition of the book cannot be placed later than the year 34 A. D., because Trimalchio speaks of him as still living, — and it may be placed as much earlier as other considerations may render advisable.

26. C. 78. 7: "Vigiles." Watchmen existed in Rome at an early period. If we may believe a scholion to Juv. 13. 157: "quae custos Gallicus"; "nomen praefecti vigilum, qui institutus est, postquam Galli Capitolium paene ceperunt"; they were instituted after the taking of Rome by the Gauls, and their attempt to possess themselves of the Capitolium. This institution, like almost every other, received under Augustus a new and more efficient organization. Until then, the means, partly public, partly private, of guarding against fires and acts of violence, were more or less imperfect. An instance of the employment of private watchmen for the extinguishing of fires is mentioned as late as 22 B. C. (732 U. C.) by Vellejus Paterculus (2. 91). After mentioning the conspiracy of Licinius Muræna and Fannius Cæpio against Augustus, — which was, as is well known, detected and punished in that year, — Vellejus goes on to say: "Neque multo post Rufus Egnatius, per omnia gladiatori quam senatori propior, collecto in aedilitate favore populi, quem exstinguendis privata familia incendiis in dies auxerat, in tantum quidem, ut ei praeturam continuaret, mox etiam consulatum petere ausus," etc. It is easy to see that private establishments, like that of Rufus Egnatius, however useful in single instances, must lack that unity and concert of action which alone can afford protection to a large city. This led naturally to the re-organization of the "Vigiles" by Augustus. Cf. Dio Cass. 55. 26: *Ἐπειδή τε ἐν τῷ χρόνῳ τούτῳ πολλὰ τῆς πόλεως πυρὶ διεφθάρη, ἄνδρας τε ἐξελευθέρους ἐπταχῆ πρὸς τὰς ἐπικουρίας αὐτῆς κατελέξατο, καὶ ἄρχοντα ἱππέα αὐτοῖς προσέταξεν, ὡς καὶ δι' ὀλίγου σφᾶς διαλύσων· οὐ μέντοι καὶ ἐποίησε τοῦτο·*

καταμαθὼν γὰρ ἐκ τῆς πείρας καὶ χρησιμωτάτην καὶ ἀναγκαιοτάτην τὴν παρ' αὐτῶν βοήθειαν οὖσαν, ἐτήρησεν αὐτούς. This important measure is placed in the year 6 A. D. (759 U. C.). A little later (cap. 31), Dio Cassius mentions whence the means for the support of the watchmen were obtained: Προσδεόμενος δὲ δὴ χρημάτων ἔς τε τοὺς πολέμους καὶ ἐς τὴν τῶν νυκτοφυλάκων τροφὴν, τό τε τέλος τὸ τῆς πεντεκοστῆς ἐπὶ τῇ τῶν ἀνδραπόδων πράσει ἐσήγαγε, κ. τ. λ. Suetonius makes mention of the establishment of the "Vigiles" (Aug. 30): "Adversus incendia excubias nocturnas vigilesque commentus est." This force consisted of seven cohorts, each numbering one thousand men, quartered in seven barracks, each on the confines of two adjoining "regiones" (the whole city being divided into fourteen "regiones"); they had, besides, fourteen "excubitoria," or places of meeting, one in each "regio." Each cohort was commanded by a tribune, and the whole force by a "praefectus vigilum."

At a somewhat later time the Emperor Claudius established an additional cohort of watchmen in Ostia, and one in Puteoli. Cf. Sueton. Claud. 25: "Puteolis et Ostiae singulas cohortes ad arcendos incendiorum casus collocavit." This piece of information is of importance, — at least if it should be proved that the book was written before the reign of Claudius, — to show that, while Petronius professedly places this part of his story in Naples, he in fact portrays the customs and institutions of Rome. For from the circumstance that the extension of the institution of watchmen to Puteoli and Ostia is specially mentioned by Suetonius, we are justified in inferring that other cities, and Naples among the rest, were yet destitute of a similar organization; and this scene, therefore, which Petronius describes as having occurred in the house of Trimalchio at Naples, could, in reality, only have happened in Rome. At a still later period, the institution of watchmen was introduced into Constantinople, not without material modifications, however.

The question now arises, Was this passage written before or after the reorganization of the "Vigiles" by Augustus, in 6 A. D. (759 U. C.)? I entertain no doubt, from the general character of the passage, and more especially from the expression "qui custodiebant vicinam regionem," that the writer was acquainted with the Augustan organization of the "Vigiles" in Rome, and that the book was consequently written after 6 A. D.

27. C. 81. 3: "Arenae imposui." It may be safely inferred, from this and some other passages, that Encolpius was a runaway gladiator; but it does not follow, as Janus Dousa and others are inclined to think, that he was a slave. The great majority of gladiators were undoubtedly slaves or criminals condemned to death; but not all. Freemen could, for a stated sum ("auctoramentum gladiatorium"), sell themselves

to a "lanista," being from this circumstance called "auctorati." Cf. Horat. Sat. 2. 7. 58:

> "Quid refert uri, virgis ferroque necari
> Auctoratus eas, an turpi clausus in arca";

and two Scholia Acr.: "Haec sunt verba eorum, qui gladiatores emunt, conditiones proponentium, quibus se vendant; cautiones enim hujusmodi faciebant, *Uri flammis, virgis secari, ferro necari*"; and, "Qui se vendunt ludo, auctorati vocantur; auctoratio enim dicitur venditio gladiatorum." This same gladiator's oath is alluded to by our own author (c. 117. 5): "Itaque, ut duraret inter omnes tutum mendacium, in verba Eumolpi sacramentum juravimus, uri, vinciri, verberari, ferroque necari, et quidquid aliud Eumolpus jussisset, tamquam legitimi gladiatores, domino corpora animasque religiosissime addicimus." That this "auctoramentum," or wages, was sometimes very considerable in amount, is proved by such a case as that of Tiberius, who, at a gladiatorial exhibition in honor of his deceased father in the Forum, induced, by a high compensation, certain gladiators already discharged to appear once more. Cf. Sueton. Tib. 7: "Munus gladiatorium in memoriam patris et alterum in avi Drusi dedit diversis temporibus ac locis, primum in foro, secundum in amphitheatro, rudiariis quoque quibusdam revocatis auctoramento centenum millium." That this letting one's self as a gladiator, however profitable in some instances, was always considered a disreputable condition, is apparent from the above passage in Horat. Sat. 2. 7. 58, and the following of Seneca (Ep. 37): "Quod maximum vinculum est ad bonam mentem, promisisti virum bonum. Sacramento rogatus es. Deridebit, si quis tibi dixerit, mollem esse militiam et facilem; nolo te decipi. Eadem honestissimi hujus, et illius turpissimi auctoramenti verba sunt: uri, vinciri, ferroque necari. Ab illis, qui manus arenae locant, et edunt et bibunt, quae per sanguinem reddant, cavetur, ut ista vel inviti patiantur; a te, ut volens libensque patiaris."

A comparison which Cicero uses in his speech Pro Roscio Amerino (c. 6), comparing T. Roscius Capito and T. Roscius Magnus, the relatives and enemies of his client, the former to an old, experienced, and distinguished gladiator, the latter to a tyro in the same occupation, proves that "auctorati," or hired gladiators, were not the offspring of the imperial times, but reach far back into the republican period: "Nam duo isti sunt T. Roscii — quorum alteri Capitoni cognomen est; iste, qui adest, Magnus vocatur — homines ejusmodi: alter plurimarum palmarum vetus ac nobilis gladiator habetur; hic autem nuper se ad eum lanistam contulit, qui cum ante hanc pugnam tiro esset scientia, facile ipsum magistrum scelere audaciaque superavit."

Encolpius, then, had been such an "auctoratus," and, taking advantage of an unex-

pected chance, escaped from his employer. What that chance was, is perhaps indicated by the preceding expression, "Ergo me non ruina terra potuit haurire?" and by the similar one (c. 9. 8), "Non taces, inquit, gladiator obscoene, quem de ruina arena dimisit?"* The giving way of a part, or the whole, of the structure erected for a gladiatorial exhibition, might have afforded an opportunity for escape to the gladiators, whether slaves or "auctorati." That such accidents were not unknown, and sometimes attended with terrible loss of life, is apparent from the case related by Tacitus in Ann. 4. 62, which happened in the reign of Tiberius (in 27 A. D., 780 U. C.), in an amphitheatre near Fidenæ, erected by a freedman, Atilius, for the sake of gain, and by which fifty thousand persons were killed or wounded.†

This view of the condition of Encolpius as a freeman, although a hired gladiator, is confirmed, not only by the circumstance that his companion, Ascyltus, is (in c. 58. 3 and 5) spoken of by the angry freedman as a freeman, but also by his own assertion (at the close of the chapter, § 6): "Nam aut vir ego liberque non sum, aut noxio sanguine parentabo injuriae meae." Another proof is to be found in c. 107. 3, where Eumolpus, in his endeavor to bring about a reconciliation between Lycas and Encolpius, uses this language: "Flectite ergo mentes satisfactione lenitas, et patimini liberos homines ire sine injuria, quo destinant. Saevi quoque implacabilesque domini crudelitatem suam impediunt, si quando poenitentia fugitivos reduxit; et deditiis hostibus parcimus." It will be observed that Eumolpus not only calls Encolpius and Gito "liberos homines," but uses this argument: If severe masters relent towards their repentant runaway slaves, if victors spare their conquered enemies, how much more is it proper for you to be reconciled to your former friends? If there were need of any

* Anthon reads, "quem de arena ruina dimisit," and Studer approves of the emendation.

† "Marco Licinio Lucio Calpurnio consulibus ingentium bellorum cladem aequavit malum improvisum; ejus initium simul et finis exstitit. Nam coepto apud Fidenam amphitheatro Atilius quidam libertini generis, quo spectaculum gladiatorium celebraret, neque fundamenta per solidum subdidit, neque firmis nexibus ligneam compagem superstruxit, ut qui non abundantia pecuniae nec municipali ambitione, sed in sordida mercede id negotium quaesivisset. Affluxere avidi talium imperitante Tiberio procul voluptatibus habiti, virile ac muliebre secus, omnis aetas, ob propinquitatem loci effusius; unde gravior pestis fuit, conferta mole, dein convulsa, dum ruit intus aut in exteriora effunditur, immensamque vim mortalium, spectaculo intentos aut qui circum adstabant, praeceps trahit atque operit; et illi quidem, quos principium stragis in mortem afflixerat, ut tali sorte, cruciatum effugere; miserandi magis, quos abrupta parte corporis nondum vita deseruerat; qui per diem visu, per noctem ululatibus et gemitu conjuges aut liberos noscebant. Jam ceteri fama exciti, hic fratrem propinquum ille, alius parentes lamentari; etiam quorum diversa de causa amici aut necessarii aberant, pavere tamen; neque dum comperto, quos illa vis perculisset, latior ex incerto metus."

further proof that Encolpius was a freeman, the language used by Eumolpus a little further on (§ 5) would furnish it: "In conspectu vestro supplices jacent juvenes, ingenui, honesti, et quod utroque potentius est, familiaritate vobis aliquando conjuncti."

The above passage, therefore, while it does not aid us in determining the age of our author, contains nothing inconsistent with the state of manners and customs prevailing towards the close of the republican and the commencement of the imperial period.

28. C. 85. 1: "In Asiam cum a quaestore essem stipendio eductus." Asia was, in the time of Cicero, one of the eight praetorian provinces of the Roman empire, and when Augustus made that master-stroke of policy by retaining those provinces in which the strongest Roman armies were stationed under his own control, and leaving the others under the management of the senate, Asia remained one of the senatorial provinces. The administration of the latter provinces remained, on the whole, the same as it had been in the time of the republic. The financial affairs, particularly, which in the imperial provinces were intrusted to special officers, appointed by the emperor, were in the senatorial provinces still administered by the quæstors, chosen in the usual manner. The manner in which the province of Asia and its quæstor are mentioned, affords no definite clew to the time of our author; it may refer to the period of Augustus, or of a much later emperor (for the division into imperial and senatorial provinces, and the mode of their administration, remained essentially the same until the time of Constantine, who remodelled this whole branch of the government); but at the same time it must be conceded that the expression contains nothing incompatible with the later times of the republic or the reign of Augustus.

One term in the phrase deserves some notice, namely, "stipendio." It does not appear that Eumolpus accompanied the quæstor in a military capacity, but formed one of his "cohors" or personal retinue; and yet "stipendium," in the sense of compensation, wages, salary, is, as far as I know, exclusively applied to soldiers. The question naturally arises, Were such personal attendants — "comites," as Horace calls them — treated and paid as a part of the military staff of the magistrate?

29. C. 88. 5: "Verum ut ad plastas convertar." The remarks previously made on Petronius's criticisms of paintings, may be equally applied to his criticisms on the works of the sculptors Lysippus and Myron. Though brief, they prove that the critic has seen of what he speaks. A short statement of the facts in the case will show that a contemporary of Augustus, living in Rome, could be acquainted with several works of those two artists.

Lysippus, one of the most distinguished sculptors, was a contemporary of Alexander,

according to the statement of Pliny (Nat. Hist. 34. 8. 19. 51): "Lysippus fuit, cum et Alexander magnus, item Lysistratus frater ejus," etc. Sillig, in his *Catalogus Artificum* (p. 256), expresses the opinion that Lysippus was, at the time of Alexander's death (Ol. 114. 1, 323 B. C.), nearly seventy years old. Lysippus was one of the most prolific artists, and although the accounts of ancient writers are extremely meagre, Sillig enumerates twenty-four of his works. I shall confine myself to those which were in Italy, or, more particularly, in Rome, in and before the time of Augustus. 1. A colossal statue of Jupiter, at Tarentum, forty cubits high. Fabius Maximus Verrucosus (Cunctator) wished, but was not able, to remove it to Rome (cf. Plin. Nat. Hist. 34. 7. 18. 40). 2. A colossal statue of Hercules, at Tarentum, which Fabius Maximus Cunctator transported to Rome and placed in the Capitol (cf. Plin. Nat. Hist. l. c.), 209 B. C., 545 U. C. After an interval of more than five hundred years, probably in the reign of Constantinus, the statue was transported to Constantinople, and first set up in a basilica, afterwards in the Hippodrome, and finally destroyed by the Latins. 3. A statue of Hercules in a sitting position, in the house of Nonius Vindex, mentioned by Martial (9. 44) and Statius (Silv. 4. 6). 4. A group representing the labors of Hercules, first erected in Alyzia in Acarnania. Strabo, who lived during the reign of Augustus and a part of that of Tiberius, speaking of the town Alyzia and of the temple of Hercules, says (10. 2. 22): *Ἐξ αὐτοῦ Ἡρακλέους ἄθλους, ἔργα Λυσίππου, μετήνεγκεν εἰς Ῥώμην τῶν ἡγεμόνων τις, παρὰ τόπον κειμένους διὰ τὴν ἐρημίαν.*

Myron, who lived about Ol. 87 (430 B. C.), nearly a century before Lysippus, although less prolific, left many works. Of these, several representations of animals were in Rome. Augustus placed his group of four oxen in the portico of the temple of the Palatine Apollo as early as 28 B. C. (726 U. C.), when he dedicated that temple. We have the following account in Strabo (14. 1. 14) of a group of Jupiter, Minerva, and Hercules, originally placed in Samos, removed by Antonius, and in part restored by Augustus: *Ὧν τρία Μύρωνος ἔργα κολοσσικὰ ἱδρυμένα ἐπὶ μιᾶς βάσεως· ἃ ᾖρε μὲν Ἀντώνιος, ἀνέθηκε δὲ πάλιν ὁ Σεβαστὸς Καῖσαρ εἰς τὴν αὐτὴν βάσιν τὰ δύο, τὴν Ἀθηνᾶν καὶ τὸν Ἡρακλέα· τὸν δὲ Δία εἰς τὸ Καπετώλιον μετήνεγκε, κατασκευάσας αὐτῷ ναΐσκον.* Besides this statue of Jupiter, and one of Hercules near the Circus Maximus in the temple of Pompeius Magnus, in the eleventh region of the city, I am not aware that any other image by the hand of Myron, of man or god, was in Rome, unless it be the statue of Hercules, the property of Heius of Messana, which Verres carried off,* or the statue of Apollo,

* Cf. Cic. in Verr. 4. 3. 5: "Verum ut ad illud sacrarium redeam, signum erat hoc, quod dico, Cupidinis e marmore; ex altera parte Hercules, egregie factus ex aere. Is dicebatur esse Myronis, ut opinor; et certe."

formerly in the temple of Æsculapius at Agrigentum, which was likewise taken away by Verres.*

30. C. 89. 2: "Jam decimo," etc. A very indifferent poetical description of the Trojan War, the fate of Laocoön and his children, and of the taking of Troy, in iambic trimeters. Poems like this, or like the longer one on the Civil War occupying chapters 119–124, were probably made in the schools by hundreds, and while most of them were imitations, generally very unsuccessful ones, of Virgil and other poets of acknowledged worth, it appears absurd to look upon them as satires of the works of known poets. A few expressions are clever, such as (in v. 10) "in voto latent"; many are remarkable for that affected pointedness characterizing many poets of the Augustan age, and the period immediately succeeding it, such as (v. 27) "Ibat juventus capta, dum Trojam capit."

31. C. 118. 6: "Ecce, belli civilis ingens opus quisquis attigerit, nisi plenus literis, sub onere labetur." It is quite natural that the reader should, at the mention of the "Bellum Civile," at once be reminded of Lucan, the only Roman poet whose work has come down to us among those — probably not a few — who selected this theme. Many scholars, both of earlier and later times, yielded to this first impression; and some, as I shall show in the case of Dousa, expressed their conviction, with more zeal than discretion, that Petronius in this passage alludes to Lucan. This impression is apparently strengthened by a comparison of the words immediately following, — "Non enim res gestae versibus comprehendendae sunt, quod longe melius historici faciunt; sed per ambages deorumque ministeria et fabulosum sententiarum tormentum praecipitandus est liber spiritus, ut potius furentis animi vaticinatio appareat quam religiosae orationis sub testibus fides," — with the opinion which Quintilian expresses of Lucan (10. 1. 90): "Lucanus ardens et concitatus et sententiis clarissimus et, ut dicam, quod sentio, magis oratoribus quam poëtis annumerandus." But this corroboration of the opinion of Eumolpus by that of Quintilian is apparent only; for it will at once be perceived, that while Eumolpus calls the poets whom he censures historians rather than poets, Quintilian is tempted to class Lucan among the orators rather than the poets.

Among the older scholars who adopted the view that Petronius referred in this passage to Lucan, one of the ablest, as well as most extravagant, is Dousa. He says, in his Praecidanea (lib. 2. c. 12): "Aut frustra sum ego, aut ad Lucanum poëtam, notissi-

* Cf. Cic. in Verr. 4. 43: "Agrigenti nonne ejusdem P. Scipionis monumentum, signum Apollinis pulcherrimum, cujus in femore literulis minutis argenteis nomen Myronis erat inscriptum, ex Aesculapii religiosissimo fano sustulisti?"

mum illum civilium bellorum compositorem, trahendum hanc digressionem, qua satyrice ejusdem Pharsaliam perstringit noster; *ἀνωμεί* quidem et quasi ex traverso, verum ita tamen, ut eum ipsum veluti digito indicare videatur." He goes then so far as to say: "Et (si mei arbitrii res fuat) unam mehercule a Petronio Eumolpicam Trojae Halosin aut hanc ipsam potius vere poëticam belli civilis vaticinationem multo mavelim mihi

'Quam vel trecenta Cordubensis illius
Pharsalicorum versuum volumina.'"

And after quoting the opinion of Quintilian that Lucan is to be numbered among the orators rather than the poets, he continues: "Utut est, *σύγχρονοι* certe Lucanus ac Petronius noster, indidemque fortasse in contentione studiorum communium aliquanta aemulationis simultas."

It is not necessary to point out the extravagance of Dousa in the above passage, by which he conclusively proves his incompetency of judging of the relative poetical merits of Lucan and Petronius. Let us for one moment look how far his opinion is, in a chronological point of view, probable. Dousa belongs to those who take it for granted that Petronius is the Petronius mentioned in Tacit. Ann. 16. 18 and foll. In consideration of the change which the opinion of Lucan with regard to the character of Nero underwent, — since in the first three books of the Pharsalia he speaks in terms of high praise of the emperor, but in the remaining seven he does not conceal his hatred and abhorrence, — it is generally acknowledged to be highly probable, if not certain, that the Pharsalia was not, and in fact could not with safety be, published in the lifetime of Lucan. This view is not a little strengthened by the fact that the poem is incomplete, probably for no other reason than because death overtook Lucan before he could finish it. The same considerations which rendered it unsafe for Lucan to publish his poem, even if it had been completed, would deter any of his friends and admirers from doing so before the death of the tyrant, which occurred three years after that of the poet. Under these circumstances, it is next to impossible that the Petronius of Tacitus, who died one year after Lucan and two before Nero, could have been acquainted with this work of Lucan, unless we suppose an intimacy to have existed between the two men, of which we have no evidence, and which would certainly be at variance with the unfriendly intention, which Dousa and those who share his opinion attribute to Petronius, of pointing out the radical defect of Lucan's poem, and of showing in his own production how that subject should be treated.

While many of the commentators of Petronius share the opinion of Dousa, that Petronius alludes in this passage to the Pharsalia of Lucan, — without expressing it, however, in so extravagant terms, — some do not. Gonsalius de Salas, for example,

although he agrees with Dousa, that Petronius is the Petronius of Tacitus, does not in this passage find an attack on Lucan. He says, in his *In T. Petronii Arbitri Satyricon Commenta*,* in language more distinguished for good sense than good Latinity: "Meram igitur historiam canere eoque ordine res, quo gestae sunt, describere, a poëtae omnino esse munere alienum, edocet in praesentia Petronius et latius in I Iliad. Eustathius, quem vide. Minime vero innuit Arbiter, quod poëma ex historia non sit conficiendum; tale namque delirium in mentem hominis eruditissimi cadere non potuit, cum nemo nesciat omnibus epicis poëtis res gestas sive historiam esse pro argumento. Quod et tragicis commune quoque est. Unde poëta ab Scaligero patre adsertus Lucanus vindicatusque ab nugatorum calumniis, grammaticorum objicientium videlicet, illum historiam conscripsisse non poëma. Ipsummet itidem volunt hic Arbitrum sugillare, conarique ideo de sacris Musarum adscensuque difficilibus sedibus illum, invito tamen Apolline, deturbare. Equidem autem prorsus ignoro, uti Pharsaliae scriptori convenire potessit rigida sane aliasque erudita isthaec Petronii declamatio. Scriptori, inquam, qui eximia cum esset eruditione insigniter instructus, spiritu insuper termaximo, sive, ut ille aliter, plusquam poëtico, bellum illud funestissimum scribere adgressus est. Itaque ego potius existimo, magno ipsum in pretio fuisse nostro Petronio, praesertim cum neque antiquius habuerit quidquam, quam eum scilicet, tum rebus tum verbis, penitus toto in proximo poëmatio imitari, uti ex sequenti haud nimis adcurata conlatione liquido patefiet."

Studer neither adopts nor rejects the view of Dousa, but expresses himself doubtingly. Adverting to the epic poems, the "Trojae Halosis" and the "Bellum Civile," he says (p. 85): "It is not quite clear whether the satirist, by putting them in the mouth of an old, half-insane poet, Eumolpus, intended to parody the faults and foibles of his poetic contemporaries, or seriously believed that he was furnishing something better than they whose defects he, theoretically indeed, pointed out with clearness, but did not escape in his own attempts."

I have above conceded that it is quite natural for the reader of the passage under consideration to think at once of Lucan as the object of Eumolpus's criticism, and spoken of those who, carried away by this first impression, have endeavored to maintain their opinion of this relation of the Pharsalia of Lucan and the "Carmen Civile" of Petronius. But if we enter upon a closer examination and comparison of the two productions which, according to Dousa and his followers' theory, must be compared, the result at which we shall arrive will be a very different one. One difference, important although merely external, at once presents itself; it is the extent of the two works.

* Burmann's edit., Vol. II. p. 231.

The poem of Eumolpus contains less than three hundred* lines; while that of Lucan, even in the incomplete condition in which it has come down to us, contains above eight thousand. This difference of size indicates such a difference of plan and scope of the two works, and necessarily implies such a difference in the treatment of the subject, that from this point of view alone a comparison of the two appears almost an absurdity. Supposing the general character of the Pharsalia of Lucan, and the mode of his treatment of the subject, to be familiar to the reader, I shall confine myself here to a brief account of the poem of Eumolpus. It opens with a rapid sketch of the moral condition of the Roman people, the restlessness of avarice, the eagerness of possessing distant lands, the importation of foreign animals for the purpose of exhibiting them at the combats of the arena, the appearance and development of unnatural lusts leading to a perversion of nature itself, the excess in eating and drinking, the venality of the people in the exercise of their political power, the increasing abuse of usury, and points out that, in this state, the people looked upon war as their only rescue. The leaders themselves, Crassus, Pompey, and Cæsar, are mentioned as the victims of the war, destined to fall in different distant parts of the empire. Pluto is introduced addressing Fate, and calling upon her to do her work, saying that Rome, no longer able to endure herself, must perish. Fate replies, saying that his desires shall be gratified, — the power which she herself has reared is to perish; and urges Pluto to prepare for the reception in his realm of the multitudes which are to fall in the coming battles which she foretells. Then follows a description of the signs and portents revealing the anger of the Gods. Cæsar is next introduced, commencing the war and his march over the Alps; when he reaches the summit, he addresses the soldiers, justifying his undertaking, and throwing the blame upon his opponents. The appearance of a bird is received as a happy omen. Then follows a description of the laborious descent from the Alps, which is unable to stay Cæsar. In the mean time, Rumor, moving with mysterious rapidity, reaches Rome, and creates a general consternation; all are ready to flee, — they only differ as to the mode. The flight from Rome is described, in which even the consuls and Pompey himself join. The Gods themselves leave their abodes. Among them Discord appears, exhorting the raging nations to war, and calling upon Cæsar to complete his work and hasten to the slaughter in the fields of Thessaly. The poem then closes with the declaration, that all which Discord commanded was done on earth:

"Factum est in terris, quidquid Discordia jussit."

This is the poem of Eumolpus, in two hundred and ninety-five lines, on the Civil

* Two hundred and ninety-five.

War. It is a brief sketch, and if its admirers insist upon it I am even willing to call it a clever sketch, of the subject; but to compare this mere sketch with the long and elaborate work of Lucan, appears to me like comparing the epitomes preceding the single books in Livy's inimitable work with that work itself, and to say that they are free from that poetic and rhetorical ornament in which the work itself abounds, — that they are more strictly historical. And what assurance have we, granting every merit to the sketch which its admirers claim, that, if Eumolpus had attempted to fill up and complete it, it would not have been a miserable failure, not worthy to be mentioned in the same breath with Lucan's Pharsalia?

But even if we overlook the inherent difficulty of comparing two works so different in extent and size, and actually make an attempt at a comparison of the production of Eumolpus with the Pharsalia of Lucan, numerous and glaring as are the defects of the latter, we look in vain for the excellences which must exist in the poem of Eumolpus in order to justify the hypothesis that he wished, by contrast, to exhibit the shortcomings of Lucan. It is impossible that the work of Lucan, so full of beauty with all its defects of plan and detail, can, in the opinion of an impartial and qualified reader, suffer by a comparison with the production of Eumolpus. And yet, if Petronius, according to this hypothesis, wished to ridicule Lucan, and expose his deficiencies by contrasting them with a better specimen, how can we reconcile his selecting so imperfect a production with his acknowledged character as a man of rare culture and refined taste?

The same propensity to which I have been obliged to advert in other instances — I mean the propensity which finds everywhere in the work of Petronius satires upon individuals, which sees in Trimalchio a satire on Nero, and similar absurdities, and which has done so much to prevent a correct understanding and full appreciation of the excellences and spirit of Petronius — has been at work here. I consider the work of Petronius a picture of the manners and life of his time, painted with unrivalled fidelity and skill. He may have, he undoubtedly has, borrowed single traits and circumstances from living individuals and current events, but the whole of his personages and their adventures is the author's creation. Whencesoever the single particles of the material may have been derived, they have been moulded, by the creative genius of the author, into new, original, and harmonious forms, and the attempt of tracing any one of these particles to an historical person or event is not only an idle and bootless undertaking, but one which is calculated to pervert the point of view from which the author's creation should be seen.

These remarks suggest, in my opinion, the key to a correct interpretation of the object of Petronius in introducing the poem of Eumolpus on the Civil War. We

know from undoubted authority, from Horace and Juvenal,* how much time and labor were bestowed, in and out of the schools of the grammarians and rhetoricians, by persons of all ages, upon poetic as well as oratorical compositions, either for the modest purpose of self-improvement, or because they supposed themselves to be capable of charming a larger circle by their talent. It is natural, and can be illustrated by the history of poetry of almost all nations, that certain classes of subjects, as well as certain modes of treating them, prevailed at certain times. We have several proofs that, soon after the commencement of the imperial period, not only the historical epos in general (which, by the way, was not an invention of the Romans, but originated with the Alexandrine school, and was thence transplanted to Rome) was cultivated with much zeal; but more especially subjects belonging to Roman history, and among them the all-important subject of the Civil Wars, were chosen with marked preference. While we have thus, among the poets of this period, C. Valerius Flaccus, the author of the Argonautica, and P. Papinius Statius, the author of the Thebais, we have also the Punica of C. Silius Italicus, and, besides the sketch of Eumolpus, the Pharsalia of Lucan. From the few works still remaining, we may infer how prolific the muse of the schools was in poems on national subjects, and more especially on the Civil War. It is this class of poets whose productions and defects Eumolpus criticises, and not those of an individual poet. I am convinced that we misapprehend the object of our author in this as in almost every other instance, if we look for individual originals of his representations. Single features may be recognized in individuals, but the whole is the production of the author, who, gathering his materials wherever he finds them, with a tact and penetration which a consummate knowledge of human nature alone can give, forms of them creations which bear the stamp of truth and reality, but are not portraits of individuals.

* Horat. Serm. 1. 10. 36:

"Turgidus Alpinus jugulat dum Memnona, dumque
Defingit Rheni luteum caput, haec ego ludo,
Quae nec in aede sonent certantia judice Tarpa,
Nec redeant iterum atque iterum spectanda theatris."

Juven. Sat. 1. 1:

"Semper ego auditor tantum? nunquamne reponam
Vexatus toties rauci Theseide Codri?
Impune ergo mihi cantaverit ille togatas,
Hic elegos? impune diem consumpserit ingens
Telephus aut summi plena jam margine libri
Scriptus et in tergo necdum finitus Orestes?"

It cannot escape the careful and competent reader of the productions of Eumolpus, when he compares this poem on the Civil War, and the shorter one on the Taking of Troy, with the story of the Widow of Ephesus, that his prose is far better than his poetry. The former, although not free from some blemishes of affectation, is, on the whole, a fine specimen of graceful, easy, sportive narrative, while the poetic effusions do not rise above mediocrity, if they reach it. Eumolpus, as a rhetorician and critic, has very sound notions on literature, and on poetry in particular, and states them in a clear and forcible manner; but when he attempts to illustrate them by poetic productions of his own, he fails lamentably. If Petronius, who proves himself throughout his work a man of uncommon culture and taste, wished to ridicule Lucan, and show his short-comings, he surely would not have selected the production of so poor a poetaster as Eumolpus. Eumolpus is the representative of a class of persons, numerous at the time, who, by dint of careful application, and, in many cases, aided by natural ability, acquired an acuteness of criticism and a facility of composition which they too readily mistook for productive power. Some of them perceived clearly enough the defects of the poets of the time, but were unable to supplant their productions by better ones.

The passage under consideration is of considerable importance. While it cannot, indeed, be quoted as establishing, in itself, the age of Petronius, I hope I have succeeded in showing that it is not only not an allusion to Lucan, but, rightly interpreted, refers to certain abuses in literature, precisely like those which we know, from various other sources, to have prevailed as early as the times of Augustus, and even earlier. So far, then, as this passage is concerned, there are strong reasons why we should place Petronius in the age of Augustus.

32. C. 126. 7: "Usque ab orchestra quatuordecim transilit, et in extrema plebe quaerit, quod diligat." The passage alludes to the regulation of the seats in the theatres, and the evident meaning is, that Circe, prompted by her lust, and disregarding all social distinctions, while taking no notice of the higher classes, — senators and knights, — seeks the companions of her pleasures among the lowest portion of the people.

A brief review of the Roman legislation on the subject of theatrical arrangements will enable us to judge whether this passage throws any, and what, light on the question under consideration as to the age of our author. It must, in the first place, be observed that the term "quatuordecim," wherever it occurs, relates to the theatres, the places for dramatic representations, and not to the circus or amphitheatre. Dramatic representations were, in Rome, of much later date than those of the circus and amphitheatre, and for some time after their introduction no provision was made for seating the spectators. But the senators, even in this early period, were furnished with a sep-

arate place in the orchestra (194 B. C., 560 U. C., — fifty years before the probable introduction of seats throughout the theatre). Cf. Liv. 34. 44: "Creati censores Sex. Aelius Paetus et C. Cornelius Cethegus principem senatus P. Scipionem consulem, quem et priores censores legerant, legerunt; — Gratiam quoque ingentem apud eum ordinem pepererunt, quod ludis Romanis aedilibus curulibus imperarunt, ut loca senatoria secernerent a populo; nam antea in promiscuo spectabant." This arrangement, like every innovation, gave rise to various remarks. Cf. Liv. 34. 54: "Horum aedilium ludos Romanos primum senatus a populo secretus spectavit, praebuitque sermones, sicut omnis novitas solet," etc. Cf. Cic. de Harusp. Resp. 12: "Nam quid ego de illis ludis loquar, quos in Palatio nostri majores ante templum in ipso matris magnae conspectu Megalensibus fieri celebrarique voluerunt? qui sunt more institutisque maxime casti solemnes religiosi; quibus ludis primum ante populi consessum senatui locum P. Africanus iterum consul ille major dedit, ut eos ludos haec lues impura polluerit."*

The next step in providing for the convenience, as well as the amusement, of all the spectators, was the erection of temporary seats ("subitarii gradus"). When this was first done I am not able to state; most probably by L. Mummius, when, at his triumph after the taking of Corinth (146 B. C., 608 U. C.), he caused Greek dramas to be performed by Greek actors. Cf. Tacit. Annal. 14. 21: "Majores quoque non abhorruisse spectaculorum oblectamentis pro fortuna, quae tum erat; eoque a Tuscis accitos histriones, a Thuriis equorum certamina; et possessa Achaia Asiaque ludos curatius editos; nec quemquam Romae honesto loco ortum ad theatrales artes degeneravisse, ducentis jam annis a L. Mummii triumpho, qui primus id genus spectaculi [that is, ludos Graecos] in urbe praebuerit." An unsuccessful attempt to erect a permanent theatre with permanent seats had a few years previously been made (155 B. C., 599 U. C.). Cf. Vell. Paterc. 1. 15. 3: "Auximum autem in Picenum abhinc annos centum octoginta septem ante triennium quam Cassius censor a Lupercali in Palatium versus theatrum facere instituit, cui in emoliendo eo† eximia civitatis severitas et consul Scipio restitere." Liv. Epit. 48: "Quum locatum a censoribus theatrum exstrueretur, P. Cornelio Nasica auctore tamquam inutile et nociturum publicis moribus ex senatus consulto destructum est, populusque aliquamdiu stans ludos spectavit." The second and intermediate condition of the theatre — the stage, as well as the seats of the spectators ("subitarii gradus"), being temporary structures erected for special occasions — continued for nearly a century, until Cneius Pompey erected a permanent theatre (55 B. C., 699 U. C.). Cf. Tacit. Annal. 14. 20: "Quippe erant, qui Cn. quoque Pompeium incusatum a seniori-

* There is an able note to this passage by Klotz, in his edition of Cicero's Orations.

† Riguez reads "in eo moliendo."

bus ferrent, quod mansuram theatri sedem posuisset; nam antea subitariis gradibus et scena in tempus structa ludos edi solitos; vel si vetustiora repetas, stantem populum spectavisse, ne, si consideret, theatro dies totos ignavia continuaret."

But before this point of permanent theatres was reached, an important measure, regulating the arrangements within the theatre, was adopted, the provisions of which remained, with slight fluctuations, in force throughout the republican period, and reached far into the times of the empire. I refer, of course, to the important "lex Roscia theatralis," which was carried, 67 B. C. (687 U. C.), by the tribune L. Roscius Otho, by which the first fourteen rows of seats, immediately behind the orchestra, — the place granted to the senators, — were assigned to the knights; not the ancient "equites" who served "equo publico," but the "ordo equester" as constituted by the "lex Sempronia judiciaria." Cf. Liv. Epit. 99: "L. Roscius tribunus plebis legem tulit, ut equitibus Romanis in theatro quatuordecim gradus proximi adsignarentur." Cic. pro Murena, 19: "L. Otho, vir fortis, meus necessarius, equestri ordini restituit non solum dignitatem sed etiam voluptatem. Itaque lex haec, quae ad ludos pertinet, est omnium gratissima, quod honestissimo ordini cum splendore fructus quoque jucunditatis est restitutus." Horat. Epod. 4. 15:

> "Sedilibus magnus in primis eques
> Othone contempto sedet."

Horat. Epist. 1. 1. 62:

> "Roscia, dic sodes, melior lex an puerorum est
> Naenia, quae regnum recte facientibus offert."

Vell. Pat. 2. 32: "Et Otho Roscius lege sua equitibus in theatro loca restituit." Plin. Nat. Hist. 7. 30. 116: "Te [Cicero] suadente Roscio theatralis auctori legis ignoverunt notatasque se [sc. tribus] discrimine sedis aequo animo tulerunt." Dio Cass. 36. 25: *Ἐσήνεγκε μὲν οὖν καὶ ὁ Ῥώσκιος νόμον, ἐσήνεγκε δὲ καὶ ὁ Γάϊος Μάλλιος [Μανίλιος], ὅτε ἐδημάρχησεν· ἀλλ' ἐκεῖνος μὲν (τὰς γὰρ τῶν ἱππέων τὰς ἐν τοῖς θεάτροις ἕδρας ἀκριβῶς ἀπὸ τῶν ἄλλων ἀφώρισε) καὶ ἔπαινον ἐπ' αὐτῷ ἔλαβεν.* Plut. Cic. 13: *Δεῖγμα δ' αὐτοῦ τῆς περὶ τὸν λόγον χάριτος καὶ τὸ περὶ τὰς θέας ἐν τῇ ὑπατείᾳ γενόμενον· τῶν γὰρ ἱππικῶν πρότερον ἐν τοῖς θεάτροις ἀναμεμιγμένων τοῖς πολλοῖς, καὶ μετὰ τοῦ δήμου θεωμένων, ὡς ἔτυχε, πρῶτος διέκρινεν ἐπὶ τιμῇ τοὺς ἱππέας ἀπὸ τῶν ἄλλων πολιτῶν Μάρκος[?] Ὄθων στρατηγῶν[?] καὶ διένειμεν ἰδίαν ἐκείνοις θέαν, ἣν ἔτι καὶ νῦν ἐξαίρετον ἔχουσι. Τοῦτο πρὸς ἀτιμίαν ὁ δῆμος ἔλαβε, καὶ φανέντος ἐν θεάτρῳ Ὄθωνος ἐφυβρίζων ἐσύριττεν, οἱ δὲ ἱππεῖς ὑπέλαβον κρότῳ τὸν ἄνδρα λαμπρῶς. Αὖθις δ' ὁ δῆμος ἐπέτεινε τὸν συριγμὸν, εἶτ' ἐκεῖνοι τὸν κρότον. Ἐκ δὲ τούτου τραπόμενοι πρὸς ἀλλήλους ἐχρῶντο λοιδορίαις, καὶ τὸ θέατρον ἀκοσμία κατεῖχεν. Ἐπεὶ δ' ὁ Κικέρων ἦκε πυθόμενος καὶ τὸν δῆμον ἐκκαλέσας πρὸς τὸ τῆς Ἐννοῦς ἱερὸν, ἐπετίμησε καὶ παρήνεσεν, ἀπελθόντες αὖθις εἰς τὸ θέατρον*

ἐκρότουν τὸν Ὄθωνα λαμπρῶς, καὶ πρὸς τοὺς ἱππέας ἄμιλλαν ἐποιοῦντο περὶ τιμῶν καὶ δόξης τοῦ ἀνδρός.

It is, for my purpose, unnecessary to enter upon a consideration of the disputed point, whether the "lex Roscia theatralis" established a new privilege, as the brothers Stockmann (in their dissertation *De Legibus Roman. Theatral.*), and W. A. Becker (in his *Handbuch der Römischen Alterthümer*), and some others, maintain; or whether it revived a previously existing right, — a view strongly favored by the language in the above-quoted passages of Cicero pro Murena ("restituit" and "restitutus") and of Vellejus Paterculus, and maintained by Ph. E. Hutschke (in his *Verfassung des Königs Servius Tullius*, p. 361) and Zumpt (in his paper on Roman Knights, p. 94). The fact that this privilege of the Knights was recognized by the "lex Roscia" is for my purpose sufficient.

The "lex Julia theatralis" — one of the large number of laws which Julius Cæsar enacted during the last two years of his life (after 46 B. C., 708 U. C.), when he had finally established his supreme power — was probably nothing else than a re-enactment of the "lex Roscia." It is incidentally mentioned by Pliny in his historical sketch of the use of rings among the Romans (Nat. Hist. 33. 2. 32): "Hac de causa constitutum, ne cui jus [sc. annuli] esset, nisi qui ingenuus ipse, patre, avo paterno HS $\overline{\text{CCCC}}$ census fuisset et lege Julia theatrali in quatuordecim ordinibus sedisset."

A change, although of no great importance, was made in the law under Augustus. The "ordo equester," to which the "lex Roscia," and of course the "lex Julia" also, had reference, being based upon a property qualification, and forming thus a moneyed aristocracy, "decoctores" — that is, persons who had squandered the whole or so much of their estate that the remainder fell short of the "census equester" — were excluded from the privilege of occupying a seat in the "quatuordecim," and had another place assigned to them. Cf. Cic. Phil. 2. 18: "Tenesque memoria prætextatum te decoxisse? Patris, inquies, ista culpa est. Concedo. Etenim est pietatis plena defensio. Illud tamen audaciae tuae, quod sedisti in quatuordecim ordinibus, cum esset lege Roscia decoctoribus certus locus constitutus, quamvis quis fortunae vitio non suo decoxisset." Juven. 3. 152:

"Nil habet infelix paupertas durius in se,
Quam quod ridiculos homines facit. Exeat, inquit,
Si pudor est, et de pulvino surgat equestri,
Cujus res legi non sufficit, et sedeant hic
Lenonum pueri quocunque in fornice nati;
Hic plaudat nitidi praeconis filius inter
Pinnirapi cultos juvenes juvenesque lanistae.
Sic libitum vano, qui nos distinxit, Othoni."

A passage in Suetonius (Octav. 40) shows that, because many knights, reduced by the civil wars in their circumstances, did not dare through fear of the law to occupy a seat in the "quatuordecim," Augustus interpreted the law in such a manner as not to apply to all of them: "Cum autem plerique equitum attrito bellis civilibus patrimonio spectare ludos e quatuordecim non auderent metu poenae theatralis, pronunciavit non teneri ea, quibus ipsis parentibusve equester census nunquam fuisset." It does not appear whether this interpretation of Augustus, which was intended to relieve those who owed their poverty to no fault of theirs or their parents from undeserved humiliation, remained long in force.

The last legislative action on the subject mentioned by historians is that of the Emperor Domitian (from 81 to 96 A. D.) mentioned by Suetonius (Domit. 8): "Suscepta morum correctione licentiam theatralem promiscue in equite spectandi inhibuit." This very passage proves the tendency to disregard the provisions of the "lex Roscia"; and considering the condition of the empire, the growing disorganization, both external and internal, it is highly probable that this act of Domitian's was the last effort on the part of the government to sustain them. The latest mention of the law, so far as I know, is in Juvenal (14. 322):

> "Acribus exemplis videor te claudere; misce
> Ergo aliquid nostris de moribus; effice summam,
> Bis septem ordinibus quam lex dignatur Othonis."

If we adopt the view of Francke,* who places Juvenal's death, in his eighty-second year, 121 A. D. (874 U. C.), we know the limit beyond which no mention is made of the "lex Roscia," even supposing that the fourteenth Satire was written towards the close of the poet's life.

This brief sketch of the "lex Roscia," from its origin to the last mention of it in the fourteenth Satire of Juvenal, is sufficient to convince the reader that the above passage of our author affords little or no aid in determining the limit of time after which the composition of Petronius's work cannot be placed. This opinion is strengthened by another consideration which should not be overlooked; namely, that the phrase "usque ab orchestra quatuordecim transilire" — although originating in the peculiar custom established by the "lex Roscia," according to which the senators occupied in the theatre the space immediately in front of the stage, the knights the space immediately in the rear of the senators, and the people the rest of the theatre to the extreme hindmost seats — naturally acquired a wider signification, and meant from the highest to the lowest of the people, and might, in this extended signification, be and remain

* J. Valent. Franckii Examen criticum D. Junii Juvenalis Vitae.

in use long after the custom to which it owed its birth had disappeared. If other irrefutable arguments should force us to place Petronius long after the death of Juvenal, and in a time when the "lex Roscia" with its amendments had fallen into disuse, the above passage would have little or no effect to impugn such a conclusion. But, on the other hand, it must also be conceded that this passage contains nothing which would prevent the adoption of the earliest possible period as that in which Petronius lived and wrote.

In collecting the passages which have been examined in the preceding pages, it has been my endeavor to omit or wink out of sight none which could possibly have any influence upon the decision of the question under consideration. Having no favorite, preconceived theory at the time when I entered upon this investigation, but honestly desiring to arrive, if possible, at a result satisfactory to my own mind and to that of any one capable of weighing and appreciating arguments on which the decision of the question must turn, I had no occasion for admitting some and excluding other evidences. If I have passed over any passage or expression which can throw additional light on the subject, it is to be ascribed to ignorance or inadvertence, not to design.

What, then, is the result of the preceding examination? What time is indicated by the customs, institutions, persons, and occurrences alluded to in the above passages, as the period in which our author, Petronius, lived and composed this work?

It will be readily perceived, that among the passages which have been examined there are many which refer to customs or institutions prevailing so great a length of time that their mention affords no positive aid in determining a particular point of time; these passages are of negative value only, inasmuch as they contain nothing inconsistent with a result based upon other and more definite evidence. Of this kind are, for example, the passage in c. 65. 10, mentioning the "Vicesimarii"; c. 70. 10, alluding to the "Factio Prasina"; c. 71. 9, concerning golden rings; c. 71. 12, concerning the "decuriae"; c. 85. 1, mentioning the province of Asia.

Of the remaining passages, some go to fix the earliest possible limit, others the latest, between which the composition of the book must have taken place. The following passages are of the former description, that is, they refer to events or institutions the mention of which proves that the composition of the book cannot be placed farther back than the time when the event alluded to happened, or the institution mentioned was established, and they determine one of the limits of the period during which the composition of the book must be placed.

The mention of the "Augustales" as reorganized by Augustus — a measure which

is probably to be assigned to the year 28 B. C. — makes it necessary to place the composition of the book after that year. The title Augustus, mentioned c. 60. 7, proves that the book must have been written after the year 27 B. C., when Octavius received that title; and the other title, "pater patriae," mentioned in connection with the preceding, obliges us to place the book after the year 2 B. C., when the honor of this title was bestowed upon Augustus. The name Maecenatianus (c. 71. 12) may be considered as a strong reason for supposing that the book was written not very long after the year 8 B. C., when Mæcenas died. And finally, the mention of "Vigiles" (c. 78. 7), and the manner in which they are mentioned, are conclusive proof that the composition of the book belongs after the year 6 A. D., when Augustus organized the institution of the Vigiles, and distributed them over the city, for the protection of the different "regiones" into which the city had been divided, for the purpose of a better and more efficient administration of the police of Rome.

It will be perceived, then, that while the mention of the "Augustales" would not oblige us to descend much lower than the year 28 B. C., the mention of the titles "Augustus" and "pater patriae," and of the name Maecenatianus, and finally of the "Vigiles," compels us to descend to a time after the year 6 A. D.

The Satyricon contains but one passage which is irreconcilable with this inevitable conclusion, and this is that remarkable one in c. 34. 6, "Falernum Opimianum annorum centum," which, if it really indicates the time of the entertainment of Trimalchio, and also of the composition of the book, would clearly give us the year 21 B. C., — a time not incompatible with the mention of the Augustales and the title Augustus, but quite incompatible with the mention of the title "pater patriae," of the name Maecenatianus, and of the Vigiles. This difficulty may be solved in various ways. One is suggested by the ingenious interpretation of Burmann, referred to before, that the wine had, for a certain occasion, been correctly marked as one hundred years old, but not having been used, and coming, by purchase or gift or inheritance, into the possession of Trimalchio, he served it up with the same label, although this was no longer a correct statement of the wine's age. Another solution of the difficulty is, that, although the above passage in c. 34. 6 may indicate the time when the banquet of Trimalchio took place or is represented as having taken place, it does not follow that thereby the time when the Satyricon was composed is likewise indicated. Whether the book contains the real adventures of Encolpius, or occurrences which had their origin in the imagination of Petronius alone, it must have been written after the adventures happened or are represented to have happened, and the interval of time between the actual or supposed occurrence of the events and their description may be longer or shorter; so

that while the banquet of Trimalchio may actually have happened in the year 21 B. C., the work of Petronius giving an account of it may have been written twenty-nine years or more afterwards; for this length of time, at least, must have intervened between a banquet given 21 B. C. and the composition of a work which mentions the Vigiles. Either of these explanations will solve the difficulty presented by the passage c. 34. 6, and it is unnecessary to have recourse to other expedients, such as questioning the correctness of the text "annorum centum." It will also be readily perceived, that, if this circumstance is an impediment to our adopting so early a period as 6 A. D. for the composition of the book, it is a still greater impediment to the hypotheses — and they are the more numerous — which adopt a later time.

Having pretty satisfactorily ascertained the year 6 A. D. as the limit beyond which we cannot ascend in determining the time of the composition of the Satyricon, it remains to inquire whether we can ascertain with equal accuracy the limit beyond which we cannot descend. It will at once be seen that the evidence on this point is not quite so conclusive as on the other; for it is to a great extent of a negative kind. While the mention of a person, event, or institution is conclusive evidence that the work in which the mention occurs is posterior to the person, event, or institution mentioned, the fact that a certain person, event, or institution is not mentioned is not conclusive evidence that the work in question is anterior to that person, event, or institution. But notwithstanding this great and inherent difficulty, the evidence which can be adduced is of such a nature that we may arrive at a considerable degree of probability.

Of the passages which have above been examined, the following more especially bear on this part of the question. In the discussion on the imperfect education of young orators with which the work in its present state commences, the term "forum," as the stage on which the orator is to act, occurs several times, c. 1. 2 and c. 4. 4, no mention being made of the halls ("basilicae"); and yet these were in pretty general use before the reign of Domitian, who was emperor from 81 to 96 A. D. Considering how natural it would have been to mention halls in that connection, if they had been in common, if not exclusive use, we may fairly infer that the Satyricon must have been written before 81 A. D.

If what Petronius says (c. 83) concerning the condition of painting be compared with the statements of the elder Pliny in his great work, the conclusion suggests itself that Petronius wrote before Pliny had completed his work; and inasmuch as Pliny finished his production in 77 A. D., we may infer that the Satyricon was written before that year.

From the circumstance that (c. 31. 3) "aqua nivata" is evidently spoken of as a

proof of uncommon luxury, and no mention is made of Nero's invention of "aqua decocta," we are justified in supposing that Petronius wrote before Nero, who reigned from 54 to 68 A. D., or at least before that invention of Nero.

It is highly probable that the Scaurus mentioned c. 77. 5 is Æmilius Scaurus, who committed suicide in 34 A. D. As he is spoken of in that passage as still living, it would follow that the Satyricon was written before the year 34 A. D.

The circumstance that Trimalchio (in c. 71. 1), while speaking of the manumission of several of his slaves by testament, does not allude to the restriction placed upon the action of the master by the "lex Furia Caninia," which was enacted in 4 A. D., might induce us to place the composition of the Satyricon before that year, were it not that this supposition clashes with the positive evidence concerning the "Vigiles," which were organized by Augustus two years later. The negative evidence that Trimalchio does not mention the "lex Furia Caninia" when we should naturally expect that he would do so, must yield to the positive evidence establishing that the book was written after the organization of the Vigiles, in 6 A. D.

The result, therefore, of our investigation into the historical evidence is, that there is the highest degree of probability that the Satyricon was written some time between 6 and 34 A. D.; that is to say, during the last eight years of the reign of Augustus, or the first twenty-one of that of Tiberius. The probability of this result is strengthened by all those passages, considered in the above pages, which, while they afford no hint for determining the precise time of the composition of the book, contain nothing inconsistent with the result at which we have arrived. For the mention (c. 2. 7) of the influence which Asiatic eloquence exercised upon that of the Romans, of "sera" (c. 16. 2), of "hiems Gallica" (c. 19. 3), of "cymbalistria" (c. 22. 6), of the "literae quadratae" (c. 29. 1), of large landed estates (c. 48. 2 and 3), of the "vicesimarii" (c. 65. 10), of Virgil's Æneid (c. 68. 4), of the price of slaves (c. 68. 8), of golden rings (c. 71. 9), of the name "Maecenatianus," of the "decuriae," and of the amount of property inscribed on the sepulchral monument (c. 71. 12), of Menecrates (c. 73. 3), of Cæsar as heir of Trimalchio's master (c. 76. 2), of the "arena" (c. 81. 3), of the province of Asia (c. 85. 1), and of "plastae" (c. 88. 5), is not only not incompatible with the result stated above, but several of the circumstances in question are positively favorable to that conclusion, especially the name "Maecenatianus" (c. 71. 12), and the mention of Cæsar as heir of Trimalchio's master (c. 76. 2). The story of malleable glass (c. 51), even if it were less apocryphal than Pliny plainly represents it, is not inconsistent with my conclusion. The same is the case with the two poems introduced c. 89 and 119, — the former on the taking of Troy, the latter on the Civil War, — if they are viewed in the light in which I have represented them.

If it were necessary or desirable to define my opinion on the subject still more precisely than I have done, I should say, that while I am not prepared to deny that the book may have been written in the reign of Tiberius previously to the year 34, I am inclined to think that the adventures related belong to the time of Augustus. Besides the circumstances already mentioned, and a general impression produced by an unbiassed perusal of the book, — an impression which is more easily felt than described, — I would more especially refer to the political spirit of the humbler *dramatis personae*, a certain sturdy independence marking their sentiments and language (see, for instance, the conversation of Ganymedes in c. 44), which lingered yet, at least in the country, during the milder autocracy of Augustus, but which was totally crushed out by the sterner despotism of Tiberius. But as the object of this branch of the investigation is to ascertain by historical evidence, and not by personal impressions, the time of the composition of the Satyricon, I am willing to abide by the above-stated result, — that it is to be placed between the years 6 and 34 A. D.

Linguistic Evidence.

Having finished the examination of the first kind of evidence — the historical — which has a bearing on the inquiry as to the age of Petronius, and having stated the result to which that examination has led, I now turn to the second, the linguistic evidence. It has above (p. 68) been stated, that by linguistic evidence I understand phenomena of language, whether consisting in the use of certain words and expressions and of certain grammatical forms and inflections, or in the structure of the sentences and what is more particularly understood by the term style, — which phenomena, when compared with the language of writers whose age is known, may aid in obtaining a satisfactory answer to the question to what age Petronius belongs.

In entering upon this inquiry, we meet at the very threshold with a great difficulty, arising from the peculiar and singular nature of the Satyricon. It is a unique book; there is not another like it in the whole body of Roman literature, so far as it has been preserved. The Metamorphoses of Apulejus, a work with which it may in one respect be classed, inasmuch as it is likewise a novel, or prose fiction, is so different in its plan and execution, and so peculiar in its language and style, that it affords no aid whatever in the solution of our problem. If we attempt to compare the Satyricon with works in other departments of literature, — the only comparison that can be made, — it is at once apparent that the result must in a great degree be unsatisfactory, for the very reason that the works compared belong to different departments of literature, each of which has its own rules and laws of composition.

But not only are we deprived of the advantage which a comparison of the Satyricon with another work of the same kind would afford, but great caution is required in comparing different parts of the book with one another, because it contains, besides the narrative of the hero, Encolpius, the sentiments, notions, and language of a variety of persons, of both sexes and of all grades of culture and refinement. Some critics, modern as well as older ones, when speaking of the language of Petronius, have not carefully enough discriminated between the different portions of the book, charging upon Petronius defects of language which evidently belong to the persons introduced by him. It would be easy, if it were necessary, to mention instances of this superficial mode of proceeding. It is one of the great excellences of the Satyricon, and an excellence which will at once be noticed by the attentive reader, that the persons introduced are drawn consistently and truthfully. The skill and tact displayed by the author in apprehending and portraying the peculiarities of birth, education, and social position, are not limited to the representation of classes, but extend to that of individuals. Each one has his own character, and speaks in language in keeping with it. The vain, good-natured, purse-proud, ignorant,* and irascible Trimalchio differs in his language quite as much as in the other characteristics of his person, mind, and situation, from the sturdy Hermeros, — who, though a native of a foreign country, had come in his early youth to Italy, and, imbibing the feelings and opinions of an Italian, adopted also the language of the native inhabitants, which retains yet much of the raciness and vigor, nay, even coarseness, which we find in the language of Plautus, — or from the vulgar, gossiping, and superstitious Niceros, as he shows himself in his story of the man-wolf (*versipellis*). But for this very reason, because individuals and their peculiarities are represented, and represented with life-like fidelity, their language affords little or no aid in the solution of the question concerning the age of the author and his work. It would be necessary to ascertain how far the personal character controlled and modified the feelings, views, and language of the class to which the individual belongs; and this again could be accomplished only by a careful comparison of the language of these persons with that of other persons of the same class and condition. But the materials for such a com-

* Some of the instances of Trimalchio's ignorance are highly amusing; for example, the account which he gives to his companions of a passage in Homer (c. 59. 3): "Scitis, inquit, quam fabulam agant? Diomedes et Ganymedes duo fratres fuerunt; horum soror erat Helena. Agamemnon illam rapuit, et Dianae cervam subjecit. Ita nunc Homerus dicit, quemadmodum inter se pugnent Trojani et Parentini. Vicit scilicet, et Iphigeniam, filiam suam, Achilli dedit uxorem; ob eam rem Ajax insanit, et statim argumentum explicabit."

parison do not exist; and in consequence of this entire absence of other specimens of the language of this class of persons, such a comparison is impossible.

From these few remarks it will be perceived, that, whatever evidence of language is to be found in the work of Petronius tending to throw light on the question of its age, it will chiefly, if not exclusively, be found in the narrative of Encolpius, and the conversations and other specimens of language of the more cultivated persons introduced into the story, such as Eumolpus, Lycas, Tryphæna, and Circe; although the value of these portions of the book, in this point of view, is again greatly diminished by the fact, that either the subjects are different from those treated by standard authors with whom we might be induced to compare them, or that the form is a different one. If we compare these portions of the Satyricon with any prose writer of the period between Cicero and Nero, who is prepared to say how far their subject affected the language of the historians Livy, Curtius, and Vellejus, who again are so widely different from one another, — of the architect Vitruvius, — of the philosopher Seneca, — and what allowance is to be made for this circumstance in judging of their language and style? Again, if we make a comparison between these portions of the Satyricon and certain passages in the poems of Catullus, Horace, Tibullus, and Ovid, however similar the subjects may be, the form of the latter, being poetic, compels us to make so many and great allowances, that the result of such a comparison cannot be satisfactory. But however unpromising the prospect may be in entering upon an examination of the language of Petronius for the purpose of ascertaining from it the age of the author, the work has to be done; and if it does not result in a positive answer to the question when the Satyricon was written, it may at least in a negative, by proving that the language is not at variance with, and furnishes no ground for opposing, the result of the above examination of the historical evidence.

While it must be conceded that the specimens of language of the humbler *dramatis personae* in the Satyricon throw but little light on the question of the age of the writer, they should not be entirely overlooked even in this point of view. I shall make the beginning with their grammatical peculiarities.

Trimalchio uses, c. 39. 5, *coelus* for *coelum*, and *cornum* for *cornu;* c. 47. 4, *Jovis* for *Jupiter;* c. 51. 3, *vasum* for *vas;* c. 59. 1, *sanguen* for *sanguis;* c. 61. 2, *suavius esse* for *suavis esse;* c. 63. 3, *margaritum* for *margarita;* c. 63. 4, *strigae* for *striges;* c. 71. 1, *lactem* for *lac*, and *malus fatus* for *malum fatum* (see c. 77. 2, *fatus meus*); c. 75. 8, *quisquilia* for *quisquiliae;* c. 76. 5, *gusti* for *gustui;* c. 75. 10, *candelabrus* for *candelabrum;* — c. 47. 4, *pudeatur* for *pudeat;* c. 48. 4, *fastiditum* for *fastidivisse;* c. 51. 3, *pote* for *potest;* c. 63. 8, *amplexaret* for *amplexaretur;* c. 64. 2, *delectaris* for *delectas;*

c. 69. 2, *defraudit* for *defraudat;* c. 71. 10, *faciatur* for *fiat;* c. 74. 14, *somniatur* for *somniat*, and *domata* for *domita;* c. 75. 3, *fruniscaris* for *fruaris;* c. 76. 9, *foenerare* for *foenerari;* c. 77. 5, *mavoluit* for *maluit;* — c. 47. 4, *ne Jovis* for *ne Jovis quidem* (see c. 9. 6, *ne spiritus* for *ne spiritus quidem*, Encolpius); c. 50. 7, *quid dixero* for *quod dixero;* c. 51. 6, *quia enim* for *quia;* c. 63. 9, *plus sciae* for *magis sciae;* c. 76. 3, *contra aurum* for *auro contra;* c. 77. 5, *et* for *atqui;* — c. 33. 5, *si sorbilia sunt* for *sint;* c. 34. 10, *postquam auferet* for *abstulerit;* c. 39. 12, *prae mala sua* for *malis suis;* c. 49. 4, *voca cocum in medio* for *medium;* c. 51. 2, *fecit reporrigere;* c. 52. 3, *meum enim intelligere* for *meam intelligentiam;* c. 63. 9, *oportet credatis*, and, c. 74. 2, *oportet fiat;* c. 70. 2, *volueris* for *si volueris;* c. 71. 9, *in publico effundere*, and *scis enim, quod epulum dedi* for *me epulum dedisse;* c. 71. 10, *faciatur triclinia* for *faciantur* or *fiant;* c. 71. 11, *ne effluant vinum;* c. 74. 17, *ne mortuus quidem lites habeam;* c. 75. 8, *nam ego quoque tam fui, quam vos estis;* c. 76. 3, *nemini nihil satis est;* c. 76. 3 and 6, *oneravi vinum;* c. 76. 5, *tamquam nihil facti*, a Grecism, ὡς μηδενὸς γεγενημένου; c. 76. 10, *nolente me . . . exoravit;* c. 77. 1, *felix in amicos* for *in amicis.*

Seleucus, one of Trimalchio's guests, uses, c. 42. 5, *malus fatus* for *malum fatum;* — c. 42. 2, *fui in funus;* c. 42. 3, *tam bonus Chrysanthus;* c. 42. 7, *nemini nihil boni facere oportet* for *nemini quidquam boni facere oportet.* Phileros, another of the guests, uses, c. 43. 6, *frunitus est* for *fruitus est*, and, c. 43. 1, *ille habet, quod sibi debebatur* for *quod ei debebatur.* Ganymedes, likewise a guest of Trimalchio, uses, c. 44. 8, *schemas* for *schemata;* c. 44. 16, *fruniscar* for *fruar;* c. 44. 18, *plovebat* for *pluebat;* and, c. 44. 1, *quid annonam mordet* for *mordeat.*

Echion, still another of Trimalchio's guests, uses, c. 45. 3, *medius coelus* for *medium coelum;* c. 45. 4, *excellente* for *excellens* (used also by Habinnas, c. 66. 3); c. 45. 9, *stigmam* for *stigma;* c. 45. 11, *nervia* for *nervos;* c. 46. 1, *pauperorum* for *pauperum;* c. 46. 7, *libra rubricata* for *libros rubricatos*, and *usionem* for *usum;* c. 46. 8, *thesaurum* for *thesaurus;* — c. 45. 7, *delectaretur* for *delectaret;* c. 45. 10, *vinciturum* for *victurum;* c. 46. 1, *argutat* for *argutatur*, *loquere* for *loqui*, and *loquis* for *loqueris;* — c. 45. 10, *subolfacio* for *suboluit mihi; quod nobis epulum daturus est Mammea* for *nobis epulum daturum esse Mammeam;* c. 46. 1, *prae literas* for *literis;* c. 46. 2, *te persuadeam* for *tibi persuadeam;* c. 46. 4, *dixi, quod mustela comedit* for *dixi mustelam comedisse.*

Hermeros, one of the same party, uses, c. 57. 8, *vasus* for *vas; lorus* for *lorum;* c. 57. 10, *malisto* for *megisto;* c. 57. 11, *athla* for *athlon;* c. 58. 2, *offla* for *offula; Jovis* for *Jupiter;* c. 58. 7, *Athana* for *Athene;* c. 58. 12, *volpis* for *vulpes;* — c. 57. 2, *convivare* for *convivari;* c. 57. 3, *rideatur* for *rideat;* c. 57. 8, *argutas* for *argutaris;*

— c. 58. 5, *nec non cresco;* — c. 58. 4, *videbo te in publicum;* c. 58. 13, *majorem maledicas* for *majori.*

Niceros, another guest at Trimalchio's banquet, uses, c. 62. 13, *bovis* for *bos;* — c. 61. 4, *ridetur* for *ridet;* c. 61. 8, *fefellitus sum* for *falsus sum;* — c. 62. 14, *hoc de* for *de hoc;* — c. 62. 1, *Capuae exierat* for *Capua exierat;* c. 62. 2, *persuadeo hospitem* for *hospiti;* c. 62. 11, *nobis adjutasses* for *nos.*

Habinnas, the friend and colleague of Trimalchio, at whose banquet he appears unexpectedly with his wife, Scintilla, uses, c. 66. 3, *excellente* for *excellens* (see c. 45. 4), and, c. 66. 4, *si aliquid muneris meo vernulae non tulero* for *nisi quid muneris meo vernulae tulero.* The wife, Scintilla, uses, c. 69. 1, *stigmam* for *stigma*, while Fortunata, the wife of Trimalchio, uses, c. 67. 5, *est* in the sense of *licet,—Est te, inquit, videre?*

One of Trimalchio's guests, who is not mentioned by name, uses, c. 38. 1, *lacte* for *lac;* c. 41. 11, *balneus* for *balneum;* c. 41. 12, *vinus* for *vinum;* — c. 37. 8, *argentum plus* for *argenti.*

Bargates, the steward of a building, says, c. 96. 7, *maledic illam* for *illi.*

Quartilla, although evidently a woman of education, uses, c. 19. 2, the expression, *Ideo vetui hodie in hoc deversorio quemquam mortalium admitti* for *in deversorium.* Two more persons of a humble rank are to be mentioned; one a farmer, who, c. 116. 4, uses the expression *O mi hospites* for *mei;* and the other an old woman, who, c. 131. 7, says, *Vides, Chrysis mea, vides, quod aliis leporem excitavi* for *vides me aliis leporem excitasse;* and, c. 134. 8, introduces a most irregular anacoluthon: *hunc adolescentem, quem vides, malo astro natus est.*

If we examine this pretty complete list of grammatical forms, which are more or less departures from the established classical usage of the language, we find that, besides those which must unhesitatingly be acknowledged as solecisms and vulgarisms, there remain a considerable number of antiquated forms, which, no longer in use among the cultivated in the age of Cicero, and even earlier, remained still in the mouth of the people.

To the former class belong the following expressions: *balneus* for *balneum*, c. 41. 11; *vinus** for *vinum*, c. 41. 12; *excellente* for *excellens*, c. 45. 4 and c. 66. 3; *stigmam* for *stigma*, c. 45. 9 and c. 69. 1; *libra rubricata* for *libros rubricatos*, c. 46. 7; *thesaurum* for *thesaurus*, c. 46. 8; *athla* for *athlon*, c. 57. 11; *offla* for *offula*, c. 58. 2; *Athana*† for

* Natural as it is to expect a more frequent occurrence of this form *vinus*, since it resembles more closely the Greek form, οἶνος, from which it is derived, I know of no other instance.

† This form is characteristic. It is well known that the Greek colonies of Middle and Lower Italy were chiefly of the Doric tribe; hence this Doric form *Athana.*

Athene, c. 58. 7; *suavius* for *suavis*, c. 61. 2; *quisquilia* for *quisquiliae*, c. 75. 8; and *gusti* for *gustui*, c. 76. 5; — *delectaretur* for *delectaret*, c. 45. 7; *vinciturum* for *victurum*, c. 45. 10; *subolfacio* for *suboluit mihi*, c. 45. 10; *loquere* for *loqui*, and *loquis* for *loqueris*, c. 46. 1; *pudeatur** for *pudeat*, c. 47. 4; *fastiditum* for *fastidivisse*, c. 48. 4; *rideatur* for *rideat*, c. 57. 3; *ridetur* for *ridet*, c. 61. 4; *fefellitus sum* for *falsus sum*, c. 61. 8; *amplexaret* for *amplexaretur*, c. 63. 8; *delectaris* for *delectas*, c. 64. 2; *defraudit* for *defraudat*, c. 69. 2; *somniatur*† for *somniat*, c. 74. 14; and *domata*‡ for *domita*, c. 74. 14; — *quid* for *quod*, c. 50. 7; *quia enim* for either *quia* or *enim*, c. 51. 6; *malisto* for *megisto*, c. 57. 10; *hoc de*§ for *de hoc*, c. 62. 14; *plus*‖ *sciae* for *magis sciae*, c. 63. 9; *ne mortuus quidem lites habeam*,¶ c. 74. 17; — *postquam nos auferet Orcus* for *abstulerit*, c. 34. 10; *argentum plus*** for *argenti plus*, c. 37. 8; *prae mala sua* for *malis suis*, c. 39. 12, and *prae literas* for *literis*, c. 46. 1; *tam bonus* for *bonus*, c. 42. 3; *nemini nihil boni facere oportet* for *quidquam boni*, c. 42. 7, and *nemini nihil satis est* for *nemini*

* This must be considered an individual solecism, unless the passage in Plaut. Cas. 5. 2. 4, *pudet, quod prius non puditum unquam est*, is to be considered as evidence of a more frequent use of the passive form.

† *Sed hic, qui in pergula natus est, aedes non somniatur.* This, being a proverb, is not to be supposed to be of Trimalchio's making, and hence it might be supposed that this grammatical irregularity is not to be ascribed to him; unless it can be proved that the proverb is originally Greek, and ungrammatically translated by Trimalchio.

‡ It is highly probable that other writers used the form *domatus* for *domitus*. We can infer this from the existence of the noun *domator* for *domitor;* cf. Tibull. 4. 1. 116, *Te duce non alias conversus terga domator Libera Romanae subjecit colla catervae.* E. C. F. Wunderlich, in his note to this passage, says: "Vocabulum *domator* suspectum erat Scaligero, sagacissimo viro: sed non ut Broukhusius putat, propter formam; nam et *domitor* et *domator* dixere veteres; sed," etc.

§ The passages which may be adduced to prove that the position of *de* after *hoc* is not an irregularity peculiar to Niceros, differ in one important respect: the word governed by *de* is in every instance a relative pronoun. Cf. Cic. de Invent. 1. 28. 41, *et quod simile erit ei negotio, quo de agitur.* Cic. in Verr. 2. 2. 12. 31, *si paret fundum Capenatem, quo de agitur, ex jure Quiritium P. Servilii esse.* Cic. pro Leg. Man. 16. 47, *de hujus autem hominis felicitate, quo de nunc agimus, hac utar moderatione dicendi.* Paullus in Dig. 21. 2. 11, *Ex his verbis stipulationis duplae vel simplae, eum hominem, quo de agitur, noxa esse solutum, venditorem conveniri non posse propter eas noxas, quae publice coërceri solent.* For this reason, I deem it proper to consider the expressien *hoc de* a solecism of Niceros's own making.

‖ Anthon explains *plus* as the accusative governed by *sciae*, "knowing more," as if *sciae* were used for a participle like εἰδώς. This appears to me untenable. *Plus* is used for *magis*. Cf. Nemesian. Eclog. 4. 72, *Plus tamen ecce meus, plus est formosus Iolas.*

¶ "Lest I have, even after my death, quarrels," *ne* being used adverbially in connection with *quidem*, and at the same time as the conjunction.

** This expression, though undoubtedly a solecism, occurs in another later writer. Cf. Lamprid. Alex. Severus, c. 41, *Et cum argentum in ministerio plus ducentis libris non haberet*, etc.

quidquam, c. 76. 3; *quod sibi debebatur* for *ei*, c. 43. 1; *quid annonam mordet* for *mordeat*, c. 44. 1; *quod nobis epulum daturus est Mammea* for *nobis daturum esse Mammeam*, c. 45. 10; *te persuadeam* for *tibi*, c. 46. 2; *dixi, quod mustela comedit*, c. 46. 4; *voca cocum in medio* for *medium*, c. 49. 4; *videbo te in publicum*, c. 58. 4; *majorem maledicas* for *majori*, c. 58. 13, and *maledic illam* for *illi*, c. 96. 7; *Capuae exierat* for *Capua*, c. 62. 1; *persuadeo hospitem* for *hospiti*, c. 62. 2; *si aliquid muneris meo vernulae non tulero* for *nisi quid muneris*, c. 66. 4; *ne effluant vinum*, c. 71. 11; *oneravi vinum*,* c. 76. 3 and 6; *tamquam nihil facti*, c. 76. 5; *nolente me . . . exoravit* for *nolentem me*,† c. 76. 10; *felix in amicos*, c. 77. 1; *vides, quod aliis leporem excitavi*, c. 131. 7; and *hunc adolescentem, quem vides, malo astro natus est*, c. 134. 8.

After having thus separated these instances of grammatical impurity and irregularity, whether solecisms or vulgarisms, which have not the authority of another good writer, and which, for this very reason, afford no indication whatever as to the time in which the book was written, we find that the following remain. In quoting the authority of other writers who have used the same grammatical forms, it is by no means my object to defend the correctness of these forms: my sole aim is to ascertain, from a careful examination of these expressions, in connection with other circumstances, whether they throw any light, and if so, how much, on the question of the age of Petronius.

C. 38. 1: "lacte gallinaceum, si quaesieris, invenies"; "lacte" for "lac," but still a neuter. Cf. Plaut. Menaech. 5. 9. 30: "Neque aqua aquae neque lacte lactis, mihi crede, usquam similiust, Quam hic tuist tuque huius autem." Non. 8. 483: "Lacte nominativo casu ab eo, quod est lac. Ennius lib. xi: et si mulier erubuit, ceu lacte et purpura mixta. Hemina Annalium lib. iv: ex Tiberi lacte haurire," etc. Charis. 1. 21 (p. 78): "Lactis nominativum, alii volunt lac, alii lact, alii lacte, *ĕ* postrema. Omnino enim nullum nomen muta litera finitur alia nisi *s*. Itaque eruditiores adjunxerunt *t;* et propter genitivum qualitatis facit. Nam tria praeterea inveniuntur, quae litera eadem finiuntur, caput, git, nepet. Sed his occurrit, quod nullum omnino nomen duabus mutis literis finiatur, ergo lacte sine vitio dicimus. Nam et Cato sic dixit: Et in Italia atras capras lacte album habere." C. 71. 1: "et aeque unum lactem biberunt"; this form, "lactem," which is a masculine, is not to be confounded with the preceding "lacte." Cf. Plaut. Bacchid. 5. 2. 18: "quae nec lactem nec lanam habent." Gell.

* The passage in Virg. Aen. 1. 195, "Vina bonus quae deinde cadis oneraret Acestis," even if it were not poetical, is not parallel.

† This must be considered a Grecism; for it is known that, in Greek, the genitive absolute is sometimes used for the case which the verb requires; especially is this the case with the phrase ἄκοντος ἐμοῦ, as Reiske has shown.

12. 1: "praesertim si ista, quam ad praebendum lactem adhibebitis, aut serva aut servilis est."

C. 39. 5: "coelus hic"; and c. 45. 3: "ubique medius coelus est." The early existence of the form "coelus" might, indeed, be inferred from the plural "coeli," which was, since Lucretius, the only received form of the plural; but we have positive evidence of the fact. Cf. Ennius, in Non. 3. 197, and in Charis. 1. 35: "fortis Romani, quamquam coelus profundus."

C. 39. 5: "cornum acutum." Besides the received form, "cornu," we find in many passages in early and good writers the form "cornus," and in a few, "cornum." Cf. Ovid. Metam. 2. 874: "et dextra cornum tenet"; and 5. 383: "Oppositoque genu curvavit flexile cornum." The language of Priscianus (Lib. VI. p. 685) confirms the correctness of this reading in both places. Varro de R. R. 3. 9. 14: "Circum caveas eorum incendendum cornum cervinum, ne quae serpens accedat; quarum bestiarum ex odore solent interire." An instance occurring in the work of Scribonius Largus Designatianus *De Compositione Medicamentorum* (141), — "Ad lumbricos satis commode facit et sandonica herba, quae nunc viget, et cornum cervinum limatum lima lignaria," — is of less weight, because doubts are entertained as to the age of that work in the form in which we now possess it. Scribonius himself was the physician of the Emperor Claudius, but the Latinity of his work is so bad, that some suppose he wrote in Greek, and that the work as it now exists was a later translation. But be this as it may, the passage in Scribonius, if it does not prove the correctness, proves the continued existence, of the form "cornum."

C. 42. 5: "At plures medici illum perdiderunt, imo magis malus fatus"; c. 71. 1: "etiamsi illos malus fatus oppresserit"; and c. 77. 2: "Hoc mihi dicit fatus meus." Cf. Grut. Inscr. 661, No. 6: "Fructum Alium Meritorum Suor. Reportare Fatus Malus Negavit"; and 663, No. 5: "Virginem Eripuit Fatus Malus Destituisti Vitilla Mea Miseram Mammam Tuam."

C. 44. 8: "nec schemas loquebatur sed directum, cum ageret." Cf. Plaut. Amphit. prol. 116: "Ne hunc ornatum vos meum admiremini, Quod ego huc processi sic cum servili schema." Id. Pers. 4. 2. 2: "Tiara ut lepidam lepide condecorat schemam." Priscian. 6. 679: "Haec tamen antiquissimi secundum primam declinationem saepe protulerunt et generis feminini."

C. 45. 9: "itaque quamdiu vixerit, habebit stigmam"; and c. 69. 1: "at curabo, stigmam habeat." As this form occurs only in these two places, it might be enumerated among the solecisms, were it not for the analogy of "schema" and other words.

C. 45. 11: "Tertiarius mortuus pro mortuo, qui habuit nervia praecisa." Cf. Varro

in Non. 3. 215: "scientia doceat, quem ad modum in psalterio extendamus nervia." It should be observed, however, that Gerlach in his edition of Nonius reads "nervias."

C. 46. 7: "ad domus usionem." Cf. Q. Scaevola in A. Gell. 4. 1: "sed ea potius, quae hujusce generis longae usionis gratia contrahuntur et reconduntur." Varro in Non. 3. 251: "Diogenem litteras scisse, dum usioni quod satis esset." Cato R. R. 38. 4: "virgas et sarmenta, quae tibi usioni supererunt, in segete comburito."

C. 47. 4: "Hoc solum vetare ne Jovis potest"; and c. 58. 2: "Curabo, jam tibi Jovis iratus sit." Cf. Varro de L. L. 7: "A dissimilibus similia, ut Juppiter Jovis [genitive] et Jovis [nominative] Jovis." Gell. 5. 12: "Jovem Latini veteres a juvando appellavere: eundemque alio vocabulo juncto patrem dixerunt. Nam quod est in elisis aut immutatis quibusdam literis Jupiter, id plenum atque integrum est Jovispater." Ennius in Apul. de Deo Socrat. 2. 121: "Quorum in numero sunt illi duodecim numeroso situ nominum in duos versus ab Ennio coartati:

'Juno, Vesta, Minerva, Ceres, Diana, Venus, Mars,
Mercurius, Jovi', Neptunus, Vulcanus, Apollo.'"

Caecilius and Attius in Priscian. 6. 695: "Nam Jovis nominativo quoque casu invenitur. Caecilius in epistola: nam novus quidem deus repertus est Jovis. Actius in *'σπινανσιμάχῃ*: Lucifera lampade exurat Jovis arietem." Mythogr. 3, Prooem.: "Vocatur Jovis sive Juppiter in aethere, Juno in aëre, Diana in terra."

C. 51. 3: "tamquam vasum aeneum." Cf. Plaut. Trucul. 1. 1. 33: "aut aliquod vasum argenteum, Aut aliquod vasum ahenum." Fab. Pictor. in Non. 15. 544: "aquam manibus pedibusque dato, polybrum sinistra manu teneto, dextera vasum cum aqua." Cato in Gell. 13. 23: "Neque mihi aedificatio neque vasum neque vestimentum ullum est manu pretiosum neque pretiosus servus neque ancilla est." But even if we had not the testimony of these writers, the circumstance that the classical language retained the plural of the second declension (cf. Plin. Nat. Hist. 33. 11. 53. 148, "siquidem Lucius Scipio in triumpho transtulit argenti caelati pondo MCCCC et vasorum aureorum pondo MD") would sufficiently prove the early existence of the form "vasum." There seems to be no authority, however, for the masculine "vasus," which occurs in c. 57. 8, "vasus fictilis."

C. 57. 8: "lorus in aqua." Cf. Apul. Metam. 3. 13. 197: "Et cum dicto lorum quempiam sinu suo depromit"; and 14. 198: "Omnium quidem nequissimus audacissimusque lorus iste." Schol. ad Juvenal. 6. 480: "Scutica, lorus latus, corium non confectum." These are the only passages, so far as I know, in which "lorus" occurs; nor should I attach any importance to the two instances in Apulejus, were it not that his well-known partiality for old-fashioned forms, especially those of Plautus, rendered

it highly probable that in these instances, too, he has followed some ancient exemplar.

C. 58. 12: "volpis uda." Cf. Phaedr. 4. 3. 1: "Fame coacta vulpis alta in vinea Uvam appetebat."

C. 59. 1: "sanguen illi fervet." Cf. Ennius in Non. 3. 224 and 10. 504: "heu me miseram, interii, pergunt labere sanguen sanguine." Cato in Gell. 3. 7: "cumque inter mortuos defatigatum vulneribus aegreque spirantem, quod sanguen defluxerat, cognovere, eum sustulere." Ennius in Cic. de Orat. 3. 58. 218: "nemo est tam firmo ingenio et tanta confidentia, Quin refugiat timido sanguen, atque exalbescat metu." Lucret. 1. 836 (with Lachmann's note): "et de pauxillis atque minutis Visceribus viscus gigni sanguenque creari."

C. 62. 13: "jacebat miles meus in lecto tamquam bovis." Cf. Varro de L. L. 7, p. 122: "nunc in consuetudine aliter dicere pro Jovis Juppiter, pro bovis et bus bos, pro struis strues."

C. 63. 3: "margaritum." Cf. Augustus in Macrob. Saturn. 2. 4: "Tiberinum margaritum." Augustus applying this term in a jocose manner to Mæcenas, it is not improbable that he preferred to use the popular, less elegant form of the word. Tacit. Agric. 12: "gignit et Oceanus margarita sed suffusca ac liventia."

C. 75. 10: "Tam magnus ex Asia veni, quam hic candelabrus est ad summa." Cf. Caecilius in Non. 3. 202: "memini ibi candelabrum ligneum Ardentem."

C. 116. 4: "O mi, inquit, hospites." Cf. Plaut. Cist. 4. 2. 8: "Mi homines, Mi spectatores."

C. 43. 6: "quod frunitus est, quamdiu vixit"; c. 44. 16: "Ita meos fruniscar, ut ego puto omnia illa aedilibus fieri"; c. 75. 3: "Rogo, inquit, Habinna, sic peculium tuum fruniscaris, si quid perperam feci, in faciem meam inspue." Besides a passage in Plaut. Rud. 4. 3. 84,—"Hinc tu, nisi malum, frunisci nil potes: ne postules,"—which is of itself enough to prove the existence and use of this word at an early period, there is a very important statement in A. Gell. 17. 2: "Domus, inquit, suas quemque ire jubet et sua omnia frunisci: frunisci rarius quidem fuit in aetate M. Tullii ac deinceps infra rarissimum: dubitatumque est ab imperitis antiquitatis, an Latinum foret: non modo autem Latinum sed jucundius amoeniusque etiam verbum est fruniscor quam fruor: et ut fatiscor a fateor ita fruniscor factum est a fruor. Q. Metellus Numidicus, qui caste pureque lingua usus Latina videtur, in epistola, quam exul ad Domitios misit, ita scripsit: Illi vero omni jure atque honestate interdicti: ego neque aqua neque igni careo, et summa gloria fruniscor. Novius in Atellana, quae Parcus inscripta est, hoc verbo ita utitur:

Quod magno opere quaesiverunt, id frunisci non queunt.
Qui non parsit, apud se frunitus est."

This passage, while it conclusively proves the existence and use of the word in the best period, shows that it was rarely used in the time of Cicero, and still more rarely in the time immediately following. The language of the vulgar often retains words which have disappeared from that of the educated, because the influence of the educated upon the great mass is slow and gradual. The question arises, then, How long was the word probably retained in the language of the vulgar? The statement of Gellius throws much light on the subject. He says that the word was rarely used in the age of Cicero, and after that so rarely that those not acquainted with the older literature even doubted whether it was a Latin word. This proves, therefore, that before the death of A. Gellius, which must be placed between 145 and 164 A. D., the word had disappeared, not only from the written, but even the spoken language. In Petronius, three different persons, all belonging to the humbler classes, — Seleucus, Ganymedes, and Trimalchio, — use the word, thus proving that, although no longer in use in the written language, the word was still in common use among the lower classes. This appears to be a very strong, and indeed irrefragable argument, for placing Petronius long before Gellius, and not very long after Cicero.

C. 46. 1: "Quid iste argutat molestus?" and c. 57. 8: "tu lacticulosus, nec mu nec ma argutas." Cf. Propert. 1. 6. 7: "Illa mihi totis argutat noctibus ignes."

C. 46. 1: "Quia tu, qui potes loquere, non loquis." Cf. Enn. Annal. 7. 101: "Quoi res audacter magnas parvasque jocumque Eloqueret."*

C. 51. 3: "Caesar non pote validius quam expaverit." Cf. Cic. Brut. 46. 172: "Hospes, non pote minoris." Cic. ad Attic. 13. 38. 1: "Hoc quidquam pote impurius?" Ter. Adel. 2. 3. 11: "Nil supra pote."

C. 52. 3: "meum enim intelligere nulla pecunia vendo." The use of the infinitive as a substantive occurs in the best writers. Cf. Cic. de Fin. 2. 13. 43: "Quae cum Aristoni et Pyrrhoni omnino visa sunt pro nihilo, ut inter optime valere et gravissime aegrotare nihil prorsus dicerent interesse, recte jam pridem contra eos desitum est disputari." Cic. Parad. 3. 1. 20: "ipsum quidem illud peccare, quoquo verteris, unum est." But the addition of any other adjective pronoun than "ipsum," as here of "meum," is very rare.

C. 71. 10: "Faciatur, si tibi videtur, et triclinia." Here are two grammatical irregularities, one of which occurs in other writers also, — "faciatur" for "fiat." Cf. Titinius in Non. 10. 507: "stultitia cupidinis petunt consilium, bona gratia ut parvi faciatur"

* Others read "Eloqueretur."

(in Priscian. 8, p. 801: "bona gratia parvi ut faciatur"). Of the second irregularity, a common Grecism, of connecting the singular of the verb with a plural neuter noun, I find but one other instance quoted, Ter. Eun. Prol. 17: "Habeo alia multa, nunc quae condonabitur." But as this passage of Terence is susceptible of another and better explanation, namely, "with regard to which he will be pardoned," "quae" being the Greek accusative, and not the nominative, I am constrained to consider the phrase "faciatur triclinia" as a bold Grecism of Trimalchio's, unless in his ignorance he took "triclinia" to be a noun of the first declension.

C. 76. 9: "et coepi libertos foenerare." Cf. Ter. Adel. 2. 2. 9: "Metuisti, si nunc de tuo jure concessisses paululum atque Adulescenti esses morigeratus, hominum homo stultissime, Ne non tibi istuc foeneraret."

C. 77. 5: "Ad summa, Scaurus, cum huc venit, nusquam mavoluit hospitari." We find several analogous forms of other tenses, so that it is not probable that this "mavoluit" is an invention of Trimalchio's. Cf. Plaut. Poen. 1. 2. 91: "Bono ingenio me esse ornatam quam auro multo mavolo"; and 93: "Bonam ego quam beatam me esse nimio dici mavolo." Plaut. Asin. 1. 1. 106: "Eidem homini, si quid recte curatum velis, Mandes, moriri sese misere mavolet." Plaut. Truc. 4. 2. 33: "Mortuum hercle me, quam id patiar, mavelim." Naevius in Fest. sub stuprum: "Seseque ii perire mavolunt ibidem quam cum stupro redire ad suos popularis."

C. 47. 4: "Hoc solum vetare ne Jovis potest." Another instance of this peculiar use of "ne," in the sense of "ne . . . quidem," occurs in the generally much more correct language of Encolpius, c. 9. 6: "Quid dicis inquam, muliebris patientiae scortum, cujus ne spiritus purus est?" Instances of this omission of "quidem," or, as some think, of the emphatic meaning of "ne," which can dispense with the addition of "quidem," occur in the best writers. Cf. Cic. in Cat. 2. 4. 8: "Nemo, non modo Romae sed ne ullo in angulo totius Italiae, oppressus aere alieno fuit, quem non ad hoc incredibile sceleris foedus adsciverit." Cn. Pompeius Magnus L. Domitio, in Cic. ad Attic. 8. 12. D. 2: "et si convenirent, quantum iis committendum sit, qui inter se ne noti sunt, contra veteranas legiones, non te praeterit." Liv. 44. 36: "neque enim ne his cunctationem aperuerat suam."* Cic. in Verr. 3. 84. 195: "sin, ut plerique faciunt, in quo etiam erat aliquis quaestus, sed is honestus atque concessus, frumentum, quoniam vilius erat, ne emisses; sumpsisses id nummorum, quod tibi senatus cellae nomine concesserat."†

* It should not be overlooked, however, that there is some diversity of reading in these three passages. Orelli reads, in the first, "sed nec ullo," and in the second, "qui inter se ne noti quidem sunt." Crevier and Drakenborch, without authority of manuscripts, adopt in the passage of Livy a conjectural emendation, "ne his quidem."

† There being no difference of reading in this, as in the preceding passages, the text may be assumed to

Horat. Serm. 2. 3. 262: "Ne nunc, cum me vocet ultro, Accedam?" and Pers. 5. 172: "Quidnam igitur faciam? ne nunc, cum accersat et ultro Supplicet, accedam?" both in imitation of Ter. Eun. 1. 1. 4: "Exclusit; revocat. Redeam? Non, si me obsecret." Flor. 3. 17: "Postremo Livius Drusus non tribunatus modo viribus sed ipsius etiam senatus auctoritate totiusque Italiae consensu easdem leges asserere conatus, dum aliud captat ex alio, tantum conflavit incendium, ut ne prima illius flamma posset sustineri, et subita morte correptus hereditarium in posteros suos bellum propagaret." Cic. de Fin. 1. 6. 19: "Quae cum res tota ficta sit pueriliter, tum ne efficit,* quod vult." Besides the uncertainty of the text in many of these passages, it should be borne in mind that, even in those in which the text is not questioned, the interpretation differs. Some explain them by the omission of "quidem." Ruhnken takes this ground in his edition of Rutilius Lupus (Lugd. Bat. 1768). Hand, in his excellent work, *Tursellinus seu de Particulis Latinis Commentarii* (Vol. IV. p. 69), seems inclined to take the other view, that in all these passages "ne" is used in an emphatic sense, and does not, therefore, require the addition of "quidem." The latter view is favored by a passage in Quintilian (1. 5. 38). Speaking of solecism, he goes on to say: "Per quot autem et quas accidat species, non satis convenit. Qui plenissime, quadripertitam volunt esse rationem, nec aliam quam barbarismi, ut fiat adjectione, ut Veni de Susis in Alexandriam: detractione, Ambulo viam, Aegypto venio, Ne hoc fecit: transmutatione, qua ordo turbatur, Quoque ego, Enim hoc voluit, Autem non habuit." From this passage it would appear that Quintilian considered the expression "ne hoc fecit" for "ne hoc quidem fecit," a solecism. But strange to say, Quintilian himself is charged with this solecism, if it be a solecism. Cf. 1. 12. 14: "Nam nec ego consumi studentem in his artibus volo," where some of the best manuscripts and editions (Cod. Goth. and Edit. Venet. 1494) read "ne"; 6. 1. 47: "Ita neque illum probaverim, qui inter clarissimos sui temporis oratores fuit," where the Edit. Venet. has "ne"; 1. 2. 7: "Verba ne Alexandrinis quidem permittenda deliciis risu et osculo excipimus," where there is another reading, "ne Alexandrinis permittenda," without "quidem"; 2. 17. 27: "Quorum neutrum est turpe, cum ex bona ratione proficiscitur: ideoque nec vitium," where some read "ne vitium." The weight of evidence is, however, against this charge.† Without attempt-

be correct. This being the case, Hand (*Tursell.* Vol. IV. p. 71) has recourse to an interpretation of the passage which I cannot admit; he says that "ne emisses" is not the apodosis of the sentence, but that the apodosis begins with "sumpsisses," and takes "ne emisses" in the sense of "in order not to purchase." If this were the idea of Cicero, he would have said "ne emeres," instead of "ne emisses."

* Orelli reads, "ne efficit quidem."

† But even if this charge of inconsistency had been made out, it would not be the only one of its kind. It is not uncommon for men, even intelligent men, to be drawn, by the course of their argument, into asser-

ing, then, to settle the vexed question whether "ne" is used in the best writers for "ne . . . quidem," or whether, when it does occur, it must be interpreted in some different way, I have adduced a sufficient number of passages from writers of the best age, in which "ne" is used in precisely the same sense as in the two above passages of Petronius. This is sufficient for my purpose, inasmuch as I do not intend to defend the purity and elegance of the language of Petronius, but merely to show that it contains nothing that is inconsistent with an early period of its composition.

C. 75. 8: "nam ego quoque tam fui, quam vos estis." This may be explained by the ellipsis of "tenuis" after "tam," an ellipsis which is not infrequent in the language of conversation. Cf. Plaut. Aul. 3. 6. 12: "Tam hic scit me habere, quam egomet." Ter. Eun. 4. 4. 50: "Parmenonis tam scio esse hanc technam quam me vivere."

C. 58. 5: "Nec sursum nec deorsum non cresco, nisi dominum tuum in rutae folium non conjecero"; and c. 76. 3: "Nemini tamen nihil satis est." It is well known that this accumulation of negatives, so common in Greek, occurs also in Latin, at least in the less careful language of conversation. Cf. Ennius Erechtheo, in Festus, p. 162: "lapideo corde sunt multi, quos non miseret neminis." Plaut. Mil. Glor. 5. 18: "Jura te non nociturum esse hominem de hac re neminem." A. Gell. 4. 1: "Quid enim refert mea ejusque quicum loquor, quo genere penum dicam, aut in quas extremas literas declinem, si nemo id non nimis barbare fecerit?" Ter. Andr. 1. 2. 34: "Ne temere facias, neque tu haut* dices tibi non praedictum: cave." Here may also be mentioned the expression (c. 42. 7), "nemini nihil boni facere oportet," unless it should be thought more proper to consider it an individual solecism of Seleucus.

C. 76. 3: "oneravi vinum, et tunc erat contra aurum." The expression "auro contra" is undoubtedly the more common. Cf. Plaut. Epid. 3. 3. 30: "Non carust auro contra." Yet "contra aurum" occurs in other writers also. Cf. Varr. de R. R. 1. 2. 10: "Hujusce inquam pomaria summa sacra via, ubi poma veneunt, contra auream imaginem." Hand, in his Tursellinus (Vol. II. p. 120), attaching no weight to the passage in Varro, on account of the unsatisfactory condition of the text, limits the expression "contra aurum" to later writers ("recentiores").

C. 33. 5: "tentemus tamen, si adhuc sorbilia sunt." Cf. Ter. Eun. 3. 4. 7: "Idque adeo visam, si domi 'st." Ter. Phorm. 3. 6. 20: "Vide opis si quid potes adferre huic."

tions unsupported by facts. A striking instance is furnished by Cicero, Tusc. 1. 36. 88, where he says, "Carere in malo non dicitur," when he himself not only says "febri carere" (Ad Fam. 16. 15. 1), an exception which he himself admits, but "carere dolore" (De Fin. 1. 11. 38), "miseria carere" (Tusc. 3. 13. 27), "malo carere" (Ibid. 3. 18. 40).

* Others read "hoc."

C. 42. 2: "Nec sane lavare potui, fui enim hodie in funus." Cf. Cic. ad. Attic. 15. 4. 2: "ut certior fieret, quo die in Tusculanum essem futurus." A. Gell. 1. 7: "Idem autem ille amicus noster in ejusdem M. Tullii Ciceronis oratione, quae est de imperio Cn. Pompeii, ita scriptum esse a Cicerone dicebat, atque ipse ita lectitabat (pro lege Manil. 12. 33): Cum vestros portus atque eos portus, quibus vitam ac spiritum ducitis, in praedonum fuisse potestatem sciatis. Neque soloecismum esse ajebat 'in potestatem fuisse,' ut vulgus semidoctum putat, sed ratione dictum certa et proba contendebat, qua et Graeci uterentur: et Plautus verborum Latinorum elegantissimus in Amphitryone (1. 1. 26) dixit: 'Numero mihi in mentem fuit'; non, ut dici solitum est, 'in mente.' Sed enim praeter Plautum, cujus ille in praesens exemplo usus est, multam nos quoque apud veteres scriptores locutionum talium copiam offendimus, atque his vulgo annotamentis inspersimus." After such testimony, it is unnecessary to adduce any other evidence that this mode of expression, not only occurred in writers of the best ages, but was considered elegant. I will, however, add one more instance. Suet. Oct. 16: "Ne rectis quidem oculis eum aspicere potuisse instructam aciem: verum supinum coelum intuentem stupidum cubuisse: nec prius surrexisse ac militibus in conspectum fuisse, quam a M. Agrippa fugatae sint hostium naves." It is probable that Suetonius, in mentioning this charge by Antony against Octavianus of a want of courage, quotes his very words.

C. 51. 2: "deinde fecit reporrigere Caesarem." This use of "facere" is not infrequent. Cf. Liv. 22. 13: "Sed Punicum abhorrens ab Latinorum nominum prolatione pro Casino Casilinum ducem accipere fecit."* Varr. de R. R. 3. 5. 3: "Fenestras raras, per quas non videantur extrinsecus arbores aut aves; quod earum aspectus ac desiderium macrescere facit volucres inclusas." Colum. 12. 38. 5; "Mel Atticum ter infervere facito." Cic. Brut. 38. 142: "Nulla res magis penetrat in animos, eosque fingit format flectit; talesque oratores videri facit, quales ipsi se videri volunt."

C. 63. 9: "Rogo vos, oportet credatis"; c. 74. 2: "nam aut incendium oportet fiat, aut aliquis in vicinia animam abjiciet"; to which may be added c. 92. 3: "oportet hodie bene sit," and c. 102. 14: "tamquam hic solus color figuram possit pervertere, et non multa una oporteat consentiant, ut omni ratione mendacium constet"; the one a remark of Eumolpus, the other of Giton. However few the instances of the subjunctive after "oportet" are in comparison with the many in which the accusative with the infinitive is used, they prove, not only that this construction was used, but that it was used by the best writers. Cf. Cic. Divin. in Caec. 11. 34: "sin autem de accusatione dicimus, concedas oportet iis, qui nullo suo peccato impediuntur, quominus alterius peccata

* Others read "ducem ut acciperet."

demonstrare possint." Cic. in Verr. 1. 10. 30: "P. Sulpicius, judex tristis et integer, magistratum ineat oportet Non. Decembribus." Cic. de Fin. 2. 26. 85: "Me ipsum igitur ames oportet, non mea, si veri amici futuri sumus." Cic. Parad. 6. 1. 43: "Animus oportet tuus te judicet divitem non hominum sermo." Cic. de R. P. 6. 23. 25 (Somn. Scip. 7): "suis te oportet illecebris ipsa virtus trahat ad verum decus."

C. 67. 5: "Est te, inquit, videre?" "Est," in the sense of "licet," is frequent in good writers. Cf. Hor. Ep. 1. 1. 32: "Est quadam prodire tenus, si non datur ultra." Ter. Adel. 5. 1. 42: "scire est liberum Ingenium atque animum." Tac. Annal. 16. 34: "ut conjectare erat intentione voltus et auditis."

C. 70. 2: "Volueris: de bulba faciet piscem." Cf. Cic. in Verr. 2. 3. 2. 4: "Furem aliquem aut rapacem accusaris? vitanda tibi semper erit omnis avaritiae suspicio." Ter. Phorm. 2. 3. 35: "Unum cognoris, omnes noris." Hor. Serm. 2. 3. 292: "Casus medicusve levarit Aegrum ex praecipiti, mater delira necabit In gelida fixum ripa, febrimque reducet."

C. 71. 9: "scis enim, quod epulum dedi, binos denarios." The use of "quod" after "scio," and other verbs of a similar meaning, is not at once to be declared a solecism, because it can be shown that the best writers made a nice distinction between the accusative with the infinitive and "quod" with the subjunctive. (See Reisig's *Lateinische Sprachwissenschaft*, § 331). Cf. Cic. de Fin. 5. 11. 30: "in nobismet autem ipsis intelligi qui potest, quod* propter quampiam rem, verbi gratia propter voluptatem, nos amemus." Plaut. Asin. 1. 1. 38: "Equidem scio jam, filius quod amet meus Istanc meretricem e proxumo Philenium." Phaedr. 5. 2. 12: "Ego, qui sum expertus, quantis fugias viribus, Scio, quod† virtuti non sit credendum tuae." Liv. 3. 52: "scituros, quod sine restituta potestate redigi in concordiam res nequeant." Even if the passages from Cicero and Phædrus, on account of the uncertainty of the text, be rejected, those from Plautus and Livy prove the existence of this peculiar mode of expression; and the impropriety of Trimalchio's language consists, therefore, not in the use of "quod" after "scio," but in connecting with it the verb in the indicative. It is otherwise with "quod" after "dico," c. 46. 4, "et dixi, quod mustela comedit," which is unhesitatingly to be considered a Grecism.

C. 71. 11: "et amphoras copiosas gypsatas, ne effluant vinum"; a Grecism. Cf. Claud. in Prob. et Olybr. cons. 51: "Quantum stagna Tagi rudibus stillantia venis Effluxere decus."

This somewhat minute examination of the grammatical forms and combinations used

* Orelli reads, "in nobismet autem ipsis ne intelligi quidem, ut propter aliam quampiam rem," etc.

† Others read "quam."

by the humbler personages of the story establishes the very important fact, that, with few exceptions, these forms belong to the earlier period of the language, from the times of Ennius, Cato, Plautus, and Terence to the age of Varro and Cicero. To these exceptions belong "cornum," which has only the authority of Ovid; "lorus," which is used by Apuleius (I have mentioned above that the well-known partiality of Apuleius for old, especially Plautinian forms, renders it highly probable that in using "lorus" he imitated the example of an older writer whose works are lost); "margaritum," used by Augustus and Tacitus; "effluere," as a transitive verb, only once used by Claudian; and perhaps "fatus," which occurs in a few inscriptions only, of doubtful age. Besides these, a few must be noticed having the authority of later writers as well as earlier: "Jovis," used by Hyginus and Apuleius, as well as Ennius and Varro; "lactem," used by both Gellius and Plautus; the repetition of negatives, of which an instance occurs in Gellius, besides the more numerous instances in Ennius, Plautus, and Terence. The remainder and larger number belong, so far as our means of ascertaining the fact extend, exclusively to the earlier age of Latin literature; viz. "coelus," used by Ennius; "vasum," by Plautus, Fabius Pictor, and Cato; "sanguen," by Ennius, Cato, and Lucretius; "lacte," by Plautus and Cato; "candelabrus," by Cæcilius; "schemas," by Plautus, to which is to be added the important remark of Priscianus, "Haec tamen antiquissimi secundum primam declinationem saepe protulerunt et generis feminini"; "nervia," by Varro; "usio," by Q. Scaevola, Cato, and Varro; "bovis," by Varro; "mi" (for "mei), by Plautus; "intelligere," as a substantive, by Cicero; "faciatur," by Titinius and Nigidius; "foenerari," by Terence; "mavoluit," by Nævius and Plautus; "ne," for "ne . . . quidem," by Cicero, Horace, and Persius; "facit" followed by the infinitive, by Varro, Columella, and Livy; "pote," by Varro and Cicero; "oportet" with the subjunctive, by Cicero; omission of "si," in Cicero and Terence; "scio, quod," in Plautus and Livy, if not in Cicero and Phædrus; "contra aurum," by Varro; "esse" with "in" and the accusative, by Plautus and Cicero, together with the important remark of Gellius; "fruniscor," by Plautus, Nonius, Q. Metellus Numidicus, with the highly important remark of Gellius; "arguto," by Ennius and Propertius. This great majority of grammatical forms belonging exclusively to the earlier language is certainly a significant fact, which would naturally lead us to assign to the Satyricon a time not very distant from the period, the language of which the humbler personages borrow so largely. It may, indeed, be objected, that the vulgar are tenacious of established usages, in language as well as in other things; and this is unquestionably true, and it becomes necessary, therefore, in order to complete the argument, to ascertain the limit of time beyond which it is not probable that the vulgar retained those older

forms. Here the above passage of Gellius becomes of great importance. It proves that a word, which, at the time when the Satyricon was written, was in so general use among the vulgar as to be employed by three different persons of that class, although no longer used by the educated and in writing, had at the time when Gellius wrote — in or before the middle of the second century — so entirely disappeared from both the written and spoken language, that persons not familiar with the earlier literature ("imperiti antiquitatis") doubted whether it was a Latin word. Hence it follows that the time which elapsed between the composition of the Satyricon and Gellius must have been considerable, because the disappearance of an old, or the introduction of a new word, is not brought about at once, but is the result of slowly and gradually operating causes; and we are not only allowed, but obliged, so far as the grammatical forms of the vulgar language in the work are concerned, to place the composition of the Satyricon as early as the age of Augustus or Tiberius.

I proceed, in the next place, to the consideration of the *words* and *phrases* employed by the same class of persons, the humbler *dramatis personae.*

Trimalchio says, c. 33. 1, "absentivus"; c. 39. 3, "Rogo"; c. 39. 5, "frontem expudoratam," "scholastici"; c. 39. 8, "et hoc et illoc," for "et huc et illuc"; c. 39. 10, "laniones"; c. 47. 4, "suae rei causa facere"; c. 47. 5, "desomnem"; c. 47. 10, "in coenam fieri"; c. 47. 12, "emtitius"; c. 50. 5, "nesapium" and "scelio"; c. 50. 6, "statuncula"; c. 51. 4, "martiolum"; c. 51. 5, "condituram"; c. 51. 6, "decollari"; c. 59. 1, "scordalias"; c. 63. 3 and c. 68. 8, "omnium numerum"; c. 63. 4, "tristimonio"; c. 63. 5, "valde audaculum"; c. 63. 8, "manuciolum," "stramentitium," and "vavatonem"; c. 64. 2, "canturire"; c. 69. 3, "debatuere"; c. 71. 3, "publico"; c. 73. 6, "barbatoriam fecit," "praefiscini," and "micarius"; c. 74. 2, "buccinus"; c. 75. 4, "artisellium"; c. 75. 6, "fulcipedia" and "amasiuncula"; c. 75. 9, "sterteia" or "stertera"; c. 75. 10, "rostrum barbatum"; c. 76. 2, "patrimonium laticlavium"; c. 76. 8, "corrotundavi";* c. 76. 9, "libertos foenerare"; c. 76. 10, "Graeculio"; c. 77. 4, "marmoratas," "cellationem," and "sessorium"; c. 77. 5, "Ad summa"; c. 77. 7, "vitalia" and "gustum"; c. 78. 2, "ut totus mihi populus bene imprecetur."

Hermeros uses, c. 57. 2, "berbex"; c. 57. 3, "larifuga"; c. 57. 10, "dignitoso"; c. 58. 3, "de praesentiarum" (and c. 74. 17, where Trimalchio uses it); c. 58. 11, "occuponem." — Niceros uses, c. 61. 3, "gaudimonio"; c. 61. 4, "scholasticos"; c. 61. 7,

* Wherever the word occurs, (Sen. Quaest. Nat. 4. 3, 7. 26, Epist. 113. 18,) it is used in its literal sense, "to make round." In the figurative sense, "to collect, to accumulate," it does not occur anywhere. Horace (Ep. 1. 6. 34) uses "rotundare" in this sense: "Mille talenta rotundentur, totidem altera, porro et Tertia succedant, et quae pars quadrat acervum."

"venerarias"; c. 61. 9, "ecraginavi"; c. 62. 1, "scruta scita"; c. 62. 3, "Apoculamus" (used also by Habinnas, c. 67. 3); c. 62. 4, "ad stelas facere" and "cantabundus"; c. 62. 10, "lauram," "animam ebullivi," and "bifurcum"; c. 62. 11, "ambularem"; c. 62. 14, "exopinassent." — Habinnas uses, c. 65. 10, "mantissam"; c. 66. 5, "intestina sua vomuit"; c. 66. 7, "improbiter"; c. 67. 10, "excatarassasti"; c. 68. 8, "recutitus" and "strabonus." — Seleucus uses, c. 42. 6, "vitali lecto." — Giton uses, c. 91. 2, "poenitentiam"; c. 94. 11, "praecipitia"; c. 101. 8, "in ultimis esse"; c. 102. 14, "increta"; c. 102. 15, "ferrumine"; c. 114. 11, "lapidabit." Giton betrays so many marks of culture and refinement, that perhaps his peculiarities of speech should not be enumerated among those of the uneducated. — One of Trimalchio's guests, not mentioned by name, uses, c. 38. 1, "lacte gallinaceum"; c. 38. 6, "succosi"; c. 38. 11, "impropero"; c. 38. 12, "Sestertium suum vidit"; "male vacillavit"; "qui omnia ad se fecerunt"; c. 38. 16, "illum conturbare"; "auctionem proscripsit." — Echion uses, c. 45. 4, "lanistitia"; c. 45. 5, "calidi cerebri"; c. 45. 6, "ferrum bonum"; c. 45. 8, "sestertiarius"; c. 45. 9, "exitum facturam." — Scintilla uses, c. 69. 1, "Agaga." — A peasant uses, c. 116. 8, "necessitudines." — Chrysis uses, c. 126. 7, "nota"; c. 131. 3, "fastose." — Circe uses, c. 128. 3, "excaeco."

Some of these expressions are unsupported by the authority of any writer, early or late, and therefore, in this respect at least, throw no light on the question of the age of Petronius. But while they consequently appear to us, with our limited remains of the popular language, as the peculiarities of the persons who use them, most of them, if not all, have the appearance of being taken from the living language of the people, and are remarkable for that vigor and expressiveness which characterize the older language of the Romans. To this class belong "absentivus"; "expudoratus"; "suae rei causa facere" for "cacare"; "desomnis," analogous to "deplumis" (cf. Plin. Nat. Hist. 10. 24. 34. 70, "inventaeque jam sunt ibi nudae atque deplumes"); "martiolus" (John of Salisbury, De Nug. Curial. 4. 5, has the same reading); "scordalia," undoubtedly from "scordalus," which occurs in other writers as well as in Petronius (cf., besides c. 95. 7, Sen. Ep. 83. 11, "Tillius Cimber et nimius erat in vino et scordalus"); "omnium numerum," the same as "omnes numeros habere" (cf. Cic. de Offic. 3. 3. 11); "tristimonium"; "manuciolum"; "vavato"; "canturire"; "debatuere" in the sense of "subagitare"; "barbatoriam facere"; "micarius"; "buccinus," undoubtedly connected with "buccina" and "buccino"; "artisellium"; "fulcipedia"; "amasiuncula"; "sterteia"; "corrotundare"; "Graeculio"; "ad summa"; "vitalia," unless, in Sen. Ep. 99. 20, "quam multis vitalia emuntur" should prove to be the correct reading; "gustus" in the sense of "specimen"; — "dignitosus"; "de praesentiarum," unless the similar expression

"in praesentiarum" (Corn. Nep. Hannib. 6) be considered an authority; "larifuga," a word worthy of the pen of Plautus; "occupo"; — "gaudimonium," formed like "tristimonium"; — "venerarius"; "ecraginare" or "ecreginare"; "apoculare" or "aboculare"; "laura"; "exopinassent" or "exopinissent"; — "excatarassare" or "excatarizare"; — "strabonus"; — "vitalis lectus"; — "poenitentia," "the act repented of"; "incretare"; "lapidare"; — "fastum facere," in the sense of "contemnere"; — "succosus," in the sense of "wealthy"; "improperare," which Burmann calls a "verbum cadentis Latinitatis"; but, besides the uncertainty of the text, it is to be observed that Du Cange, although he enumerates "improperanter" and "improperium," does not mention "impropero"; "ad se facere"; — "lanistitius"; "calidi cerebri"; "ferrum bonum," for "gladiator bonus"; "sestertiarius"; — "Agaga"; "excaecare," in the phrase of Circe, "numquid ab aliquo naturali vitio formam meam excaeco," — "do I, through some natural blemish or defect, impair the effect of my beauty?" Similar, although not the same, is the use of the word in Ovid. ex Pont. 4. 2. 17: "Scilicet ut limus venas excaecat in undis, Laesaque suppresso fonte resistit aqua; Pectora sic mea sunt limo vitiata malorum."

The remaining expressions are, indeed, of infrequent occurrence, but still supported by the authority of other writers.

C. 39. 3: "Rogo, me putatis illa coena esse contentum, quam in theca repositorii videratis?" Cf. Plaut. Bacch. 2. 2. 28: "Ecquidnam meminit Mnesilochi? *Pi.* Rogas? Imo unice unum plurimi pendit." Ter. Phorm. 4. 1. 8: "Pol me detinuit morbus. *D.* Unde? aut qui? *C.* Rogas? Senectus ipsa est morbus." Ter. Andr. 1. 2. 13: "*D.* Qua de re? *S.* Rogas? Meum gnatum rumor est amare."

C. 39. 5, "scholastici," and c. 61. 4, "scholasticos." Cf. De Orat. Dial. 35: "At nunc adolescentuli nostri deducuntur in scenas scholasticorum, qui rhetores vocantur." Jul. Capitol. Maxim. Jun. 3: "Sed timeo, ne soror mea Graecis munditiis erudita barbarum socerum ferre non possit: quamvis ipse adolescens et pulcher et scholasticus ad Graecas munditias eruditus esse videatur." Quint. 12. 11. 16: "Cognoscere et praecepta vivendi perdiscere et in foro nos experiri potuimus, dum scholastici sumus."

C. 39. 8: "et hoc et illoc," for "et huc et illuc." See K. L. Schneider's *Grammatik* (Vol. I. p. 28), on the relationship of *o* and *u*, and Priscian. I. p. 553 (Putsch): "O aliquot Italiae civitates teste Plinio non habebant, sed loco ejus ponebant *u*, et maxime Umbri et Thusci"; and p. 554: "*u* quoque multis Italiae populis in usu non erat, sed e contrario utebantur *o*; unde Romanorum quoque vetustissimi in multis dictionibus loco ejus *o* posuisse inveniuntur." Cf. Varr. de L. L. 5. 9: "Voca inlicium omneis Quiriteis hoc ad me." Plaut. Merc. 2. 2. 49: "hoc non voluntas me impulit." Plaut.

Bacch. 2. 3. 77: "Ne ille hercle mihi sit multo tanto carior, Si me illoc auro tanto circumduxerit."

C. 39. 10: "laniones." Cf. Flav. Cap. de Orthographia (Putsch), p. 2245: "Hic lanius nomen est: verbum autem lanio, lanias; at dixerunt tamen et lanio in nomine."

C. 47. 10: "in coenam fieri." Cf. Mart. 13. 54: "Cerretana mihi fiet, vel missa licebit De Menapis: lauti de petasone vorent." Val. Max. 8. 1. 8: "Non supprimenda illius quoque damnatio, qui pueruli sui nimio amore correptus, rogatus ab eo ruri, ut omasum in coenam fieri juberet, cum bubulae carnis in propinquo emendae nulla facultas esset, domito bove occiso desiderium ejus explevit."

C. 47. 12: "Emtitius." Cf. Varro de R. R. 3. 2. 12: "et hic aprum glans cum pascit emtitia, facit pinguem; illic gratuita exilem."

C. 50. 5: "nesapium." Cf. Q. Ter. Scaurus de Orthogr. p. 2251: "Ne pro non positum est apud antiquos; significat nefrendes porcos [al. sic nefrendes porci], qui sunt sine dentibus, id est, qui fabam frendere non possunt; nesapius, qui non sapit; ita et nescio, non scio." — "Scelio," or "scellio." Cf. Plin. Nat. Hist. 30. 10. 27. 89: "Operae pretium est scire, quomodo praecipiatur, cum exuitur, membrana hiberna, alias devoranti eam, quoniam nullum animal fraudulentius invidere homini tradunt, inde stellionum nomine in maledictum translato." Apul. Metam. 5. 30. 376: "Sed nunc irrisui habita quid agam? quo me conferam? quibus modis stellionem istum cohibeam?" Fest. (ed. Müller) p. 313: "Stelionem genus aiunt lacertae, quod Verrius dictum ait, quia virus instillet cibo, potius quam, ut putant abi [ali], a stellarum similitudine, quia varium est." If the passages in Pliny and Apuleius left any doubt of the antiquity of this word, that in Festus, who speaks of Verrius's attempt at explaining its etymology, settles the question.

C. 50. 6: "statuncula." Cf. Ael. Donat. Edit. Secunda (ed. Putsch, p. 1747): "Sunt diminutiva, quae non servant genera, quae ex nominibus primae positionis acceperunt, ut scutum scutella, pistrinum pistrella, canis canicula, rana ranunculus, statua statunculus." According to this statement of Donatus, we should read "statunculos," unless there was a form "statunculum," as well as "statunculus."

C. 51. 5: "condituram vitreorum." Isidorus, in his account of the occurrence (Orig. 16. 15), attributes to Tiberius the same expression: "Hoc facto Caesar dixit artifici, Numquid alius scit hanc condituram vitrorum?" The account of Isidorus differs, in other respects, somewhat from that of Petronius, so that we are not justified in supposing that Isidorus borrowed his expression from Petronius. If so, Petronius may be considered as employing a term used probably before him by others in the same signification. In the sense of "seasoning," the word is used by Sen. de Ira, 3. 15, and by Columella repeatedly.

C. 51. 6: "decollari." Cf. Fenestella in Diomed. 1 (Putsch, p. 361): "Quemadmodum Caesar a piratis captus sit, utque eos ipse postea ceperit et decollaverit."

C. 63. 5: "valde audaculum." Cf. Fest. 23 (Müller, p. 27): "Audax diminutivum facit audaculus." Gell. 5. 21: "reprehensor audaculus verborum."

C. 63. 8: "stramentitium vavatonem." Cf. Auct. B. Hisp. 16: "ad casas, quae stramentitiae ab nostris hibernorum causa aedificatae erant."

C. 71. 3: "et haec omnia publico." The earliest writers, who use this word in the sense of "to publish, to make known," are Tacit. Ann. 16. 4: "mox flagitante vulgo, ut omnia studia sua publicaret (haec enim verba dixere), ingreditur theatrum"; and Plin. Ep. 1. 1: "Frequenter hortatus es, ut epistolas, si quas paullo accuratius scripsissem, colligerem publicaremque." The very manner in which Tacitus states the matter seems to indicate that the expression "studia publicare" was a vulgarism; and Pliny seems to use the expression "publicare" because he quotes the language of his friend Septicius Clarus, rather than from his own choice. This instance illustrates an important fact in the development of language, that an expression originally without doubt a vulgarism — as "publicare," used by Trimalchio — is after a time introduced into the written language, at first hesitatingly and with an apology, as Tacitus seems to do, until without challenge it maintains its place.

C. 73. 6: "praefiscini." Cf. Fl. Sos. Charis. 2. 165: "Titinnius in Setina: Paula mea, amabo, pol tu ad laudem addito, Praefiscini, ne puella fascinetur"; 166: "Afranius in Consobrinis: Scis habitum ita ut nunc obtinet, praefiscine." Plaut. Rud. 2. 5. 4: "Praefiscine, Satis nequam sum: utpote qui hodie inceperim Amare." Both forms, "praefiscini" and "praefiscine," are indiscriminately used.

C. 75. 10: "rostrum barbatum." Cf. Plaut. Menaech. 1. 1. 13: "Aput mensam plenam tu hominis rostrum deliges." Varr. Peripl. in Nonius, 6. 455: "itaque videas barbato rostro illum conmentari et unumquodque verbum statera auraria pendere." Lucil. in Nonius, 6. 455: "ne designati rostrum praetoris pedesque Spectes."

C. 76. 2: "patrimonium laticlavium." Cf. Val. Max.* 5. 1. 7: "itaque puerum annulo fibulaque aurea et tunica laticlavia Hispanoque sagulo et ornato equo donatum datis, qui eum prosequerentur, equitibus ad Masinissam remisit."

C. 76. 9: "et coepi libertas foenerare." Of the various explanations of this obscure expression I prefer that of Burmann: "I began to deal in freedmen, but with usury, as I had hitherto dealt in money; that is, I made freedmen of slaves, but with profit to myself." Cicero uses "fenerari" in this sense with the accusative "beneficium"; Lael.

* It is now well known that Valerius Maximus, like Velleius Paterculus, belongs to the times of Augustus and Tiberius.

9. 31: "Ut enim benefici liberalesque sumus, non ut exigamus gratiam (neque enim beneficium feneramur; sed natura propensi ad liberalitatem sumus), sic amicitiam non spe mercedis adducti, sed quod omnis ejus fructus in ipso amore inest, expetendam putamus."

C. 77. 4: "porticus marmoratas." Cf. Varr. de R. R. 1. 59. 2: "Ideoque in iis camaras marmorato et parietes pavimentaque faciunt, quo frigidius sit."* Ibid. 3: "In oporothece mala manere putant satis commode alii in tabulis, ut in opere marmorato, alii substrata palea vel etiam floccis." Gruter. Inscr. 39. 4: "M. Aurelius. Pacorus M. Cocceius. Stratocles Aeditui. Veneris. Hortorum Sallustianorum. Basem. cum Pavimento. Marmorato Deanae. D. Φ D." — "Sessorium." Cf. Cael. Aurelianus † Acut. 1. 11: "At si hoc fieri non potuerit, in vicina porticu gestatio adhibenda, ita ut sella bajulatoria vel quolibet sessorio leniter atque mediocriter moveantur." The authority of this passage, the only one besides that of Petronius in which the word occurs, is, for two reasons, of little weight: firstly, because the age of Aurelianus is not certainly known; and secondly, Aurelianus uses the word in the sense of "chair," while Petronius seems to use it in that of "sitting-room."

C. 78. 2: "ut totus mihi populus bene imprecetur." "Imprecari," in a favorable sense, does not occur in writers of the best age. Cf. Apul. Metam. 9. 25. 641: "solito sermone salutem ei fuerat imprecatus."

C. 57. 2: "berbex," for "vervex." The near relationship of *b* and *v* is well known.‡ The instances on ancient monuments in which these letters are used one for the other are innumerable, proving that the pronunciation of the vulgar was inaccurate; for example, "vene," "acervus," "vasis," for "bene," "acerbus," "basis," and, *vice versa*, "bendidit," "bixit," "serbus," for "vendidit," "vixit, "servus"; nay, we find "vibus," and even "bibus," for "vivus." The last-mentioned instance is quite analogous to "berbex"; for in this case, too, we find an intermediate form, "verbex," which occurs repeatedly in an inscription of Fratres Arvales, Gruter. Inscrip. 121. 1. Cf. Vopisc. Aurel. 50: "vehementissime autem delectatus est Phagone, qui usque eo multum comedit, ut uno die ante mensam ejus aprum integrum, centum panes, berbicem§ et porcellum comederet."

* Although the text is apparently imperfect, the existence and use of the word "marmoratus" is sufficiently proved by this and the following passage.

† His age is uncertain: some place him in the time of Galenus (b. 130, d. 200), others as late as the fifth century.

‡ See K. L. Schneider's *Grammatik*, Vol. I. p. 226.

§ This is the reading of one of the best manuscripts.

C. 58. 10: "molestare." Cf. Scribon. Largus Compos. Medic. 71: "Uva raro valde molestat."

C. 62. 1: "scruta scita." Cf. Lucil. in Gell. 3. 14: "Quid ni? et scruta quidem ut vendat scrutarius, laudat Praefractam strigilem, soleam improbus dimidiatam." Hor. Ep. 1. 7. 65: "Volteium mane Philippus Vilia vendentem tunicato scruta popello." Cf. Fest. 330 (Müller): "Scitae alias, quae sunt bona facie, alias bonis artibus mulieres a poëtis usurpantur." Plaut. Merc. 4. 4. 17: "Scitam hercle sane concubinam hanc." Plaut. Amphitr. 1. 1. 135: "Haec nox scita est exercendo scorto conducto male."

C. 62. 3: "ad stelas facere." Cf. Plin. Nat. Hist. 6. 28. 32. 150: "Insulae sine nominibus multae, celebres vero Isura, Rhinnea et proxuma, in qua scriptae sunt stelae lapideae literis incognitis"; and 6. 29. 34. 174: "Insulae ante portum duae Pseudepylae vocantur, interiores totidem Pylae, in altera stelae lapideae literis ignotis." If "facere" is used for "se facere," in the sense of "se conferre," "to make for a place," it may be justified by the authority of Apuleius (Metam. 5. 2. 321): "Invitata Psyche talium locorum oblectatione propius accessit, et paullo fidentior intra limen sese facit."

C. 62. 4: "cantabundus." Cf. Q. Claudius Quadrigarius in Gell. 9. 13: "Ita, ut ante dixi, constiterunt: Gallus sua disciplina scuto projecto cantabundus." Gellius himself bears this testimony to the excellence of the style of this annalist, a contemporary of Sulla's: "Sed quid hostis et quod genus et quam formidandae vastitatis et quantum insolens provocator et cujusmodi fuerit pugna decertatum, Q. Claudius primo annalium purissime atque illustrissime simplicique et incomta orationis antiquae suavitate descripsit."

C. 62. 10: "animam ebullivi."* Cf. Sen. Apocol. 4: "Et ille quidem animam ebulliit."

C. 65. 10: "mantissam habet." Whatever be the true interpretation of this difficult expression, the word occurs in old writers. Cf. Fest. (Müller, p. 132): "Mantisa additamentum dicitur lingua Tusca, quod ponderi adicitur, sed deterius et quod sine ullo usu est. Lucilius: Mantisa obsonia vincit."

C. 68. 8: "recutitus est." Cf. Mart. 7. 30. 5: "Nec recutitorum fugis inguina Judaeorum." Pers. 5. 184: "Labra moves tacitus recutitaque sabbata palles."

C. 94. 11: "praecipitia." Cf. Plin. Nat. Hist. 22. 17. 20. 43: "sed contra volsa, rupta lapsusque et praecipitia aut vehiculorum eversiones singularis."

* The expression is used by Seleucus too, c. 42. 3: "tam bonus Chrysanthus animam ebulliit."

C. 101. 8: "in ultimis esse." Cf. Sen. Controv. 2. 12: "cum subito nunciatum est in ultimis esse filium."

C. 102. 15: "ferrumine." Cf. Plin. Nat. Hist. 36. 23. 55. 176: "Ruinarum urbis ea maxume causa, quod furto calcis sine ferrumine suo caementa componuntur."

C. 126. 7: "Ex hac nota." Cf. Hor. Carm. 2. 3. 6: "Seu te in remoto gramine per dies Festos reclinatum bearis Interiore nota Falerni." The transition from this special signification, "kind or quality of wine," to a more general, was easy and natural. Hence Colum. 9. 15. 13: "atque id secundae notae mel defluit"; 12. 59. 3: "Caseum Gallicum vel cujuscunque notae volueris, minutatim concidito et conterito." Curius ap. Cic. ad Fam. 7. 29. 1: "Quare, Cicero mi, persevera constanter nos conservare et Sulpicii successori nos de meliore nota commenda." Catull. 66. (68.) 28: "Veronae turpe Catullo Esse, quod hic quisquis de meliore nota Frigida deserto tepefecit membra cubili."

C. 38. 1: "lacte gallinaceum." Cf. Plin. Nat. Hist. Praef. 23: "ut vel lactis gallinacei sperare possis in volumine haustum."

C. 38. 12: "Sestertium suum vidit decies." Cf. Sen. de Benef. 2. 27. 1: "Hic, qui quater millies sestertium suum vidit." — "male vacillavit." Cf. Cic. in Cat. 2. 10. 21: "qui partim inertia partim male gerendo negotio partim etiam sumptibus in vetere aere alieno vacillant."

C. 38. 16: "illum conturbare," in the sense of "to be embarrassed in one's pecuniary circumstances, to be bankrupt." Cf. Cic. pro Planc. 28. 68: "Verum fac me multis debere, et in his Plancio: utrum igitur me conturbare oportet, an ceteris, cum cujusque dies venerit, hoc nomen, quod urget, nunc, cum petitur, dissolvere?" Cic. ad Quint. Fr. 2. 12. 5: "Ad quem ego rescripsi nihil esse, quod posthac arcae meae fiducia conturbaret." — "auctionem proscripsit." Cf. Cic. ad Attic. 13. 37. 4: "Velim, si tibi videtur, appelles Balbum et Offilium de auctione proscribenda."

C. 45. 9: "bonum exitum facturam." Cf. Sen. Ep. 115. 15: "donec Euripides in medium ipse prosiluit petens, ut exspectarent viderentque, quem admirator auri exitum facerent."

C. 116. 8: "necessitudines." Cf. Tac. Hist. 3. 59: "atque ipse Vitellius respectu suarum necessitudinum nihil in Domitianum atrox parabat." Curt. 4. 10: "Crederes Alexandrum inter suas necessitudines flere et solatia non adhibere sed quaerere." Fest. 138 (Müller, p. 288): "Rapi simulatur virgo ex gremio matris aut, si ea non est, ex proxima necessitudine, cum ad virum traditur, quod videlicet ea res feliciter Romulo cessit."

C. 131. 3: "fastose." Cf. Mart. 10. 13. 7: "Ad nocturnae jaces fastosae limina

moechae." Panegyr.* in C. Calp. Pisonem 107: "Rara domus tenuem non aspernatur amicum, Raraque non humilem calcat fastosa clientem."

It is apparent from this brief examination, that most of these expressions are supported by the authority of the oldest and best writers; and even those few which now have the authority of later writers only are such that they are not necessarily of later origin, but their not occurring in earlier writers is either accidental, it so happening that the earlier writers had no occasion to use them, or is to be accounted for by the fact that so large portions of the works of older writers have perished. So much is certain, — that an unprejudiced reader will find no evidence in these expressions militating against the result of the historical examination, that Petronius belongs to the period of time covered by the close of the reign of Augustus and the commencement of that of Tiberius. Nay, if we allowed ourselves to be exclusively influenced by the character of the language of the humbler persons introduced into the story, we might be tempted to place the work in a period considerably earlier, were it not for one consideration. The language of the vulgar retains grammatical forms, words, and phrases frequently for generations after they have disappeared from the language of the cultivated. Hence, though some of the humbler characters use expressions which remind us of the time immediately succeeding Plautus, it does not follow that they lived in that time. But however strong this conservative principle is, it is not lasting; the language of the humble follows at some distance that of the educated, and adopts, though much later, the innovations introduced by their superiors in learning and refinement. From the entire want of similar works of the same or other periods, we are now unable to determine, and prove by positive evidence, at what distance these imperfectly educated men followed their betters, and how long a time elapsed between their own time and the time when the language of which their conversation furnishes a specimen was the language of the cultivated; but we are justified in availing ourselves of the important information contained in Gellius (17. 2) concerning the form "fruniscor,"† and of the light thus thrown on the history of the grammatical element of this humbler language, and in inferring, since grammar and vocabulary are two coexisting parts of one whole, that what is by the statement in Gellius so clearly proved of the grammatical forms, is equally true of the words and phrases.

This appears to be the proper place to advert, in a few words, to the diminutives, to the Greek forms and expressions, and to the proverbs occurring in this work, most of which are put in the mouths of the humbler personages.

* This poem is ascribed by some to Lucan, by others to Saleius Bassus, a *protégé* of Calpurnius.

† See page 133.

The diminutives which occur in the work, and most of which are used by the humbler personages, although not many, are yet sufficiently numerous to impart a marked character to the language of those who employ them, and corroborate the view that the Satyricon was written at a time when the peculiarities of the older writers were yet in vogue among the people. No one can read Plautus and other writers of the older times without being struck by their predilection for the use of diminutives, whether nouns, adjectives, or adverbs, — a predilection which even the language of affected imitators, such as Apuleius, confirms.

Trimalchio uses, c. 39. 4, "fericulus"; c. 39. 6, "taurulus"; c. 50. 6, "catilla" (for the more common "catillos") and "statuncula" (or, as others read, "statunculas" or "statunculos"); c. 63. 4, "misella"; c. 63. 5, "audaculum"; c. 75. 6, "amasiuncula"; c. 75. 8, "corcillum" (for the more common "corculum"); c. 77. 4, "casula." Hermeros uses, c. 57. 6, "glebulas" and "lamellulas"; c. 58. 2, "offla"; c. 58. 5, "comula"; and c. 58. 8, "sponsiunculam." Habinnas uses, c. 65. 10, "misello"; c. 65. 11, "ossicula"; c. 66. 2, "lucunculum"; c. 66. 4, "vernulae"; c. 66. 6, "homuncionem"; and c. 66. 7, "catillum." Plocrinus uses, c. 64. 3, "adolescentulus"; Echion, c. 45. 7, "amasiunculos"; Ganymedes, c. 44. 15, "casulas"; and a guest of Trimalchio, whose name is not mentioned, uses, c. 38. 3, "meliusculae" and "Graeculis." Even the better educated persons frequently employ diminutives. Agamemnon uses, c. 3. 2, "adolescentuli," and c. 46. 2, "casulas"; Quartilla, c. 24. 2, "vernulae"; Oenothea, c. 134. 11, "adolescentulus"; Eumolpus, c. 85. 1, "aedicularum"; c. 111. 5, "casulam" (in the sense of "sepulcrum"); and Encolpius, or Petronius himself, by no means abstains from the use of diminutives; he uses, c. 1. 3, "adolescentulos" and "globulos"; c. 6. 4, c. 7. 4, c. 131. 2 and 6, and c. 138. 3, "anicula"; c. 11. 2, "amiculo"; c. 28. 6, "libellus"; c. 29. 8, "aedicula" and "pusilla"; c. 31. 9, "asellus"; c. 40. 3, "sportellae"; c. 40. 5, "alicula"; c. 56. 8, "offla"; c. 64. 6, "catellam"; c. 67. 9, "capsellam aureolam"; c. 70. 8, "corollis"; c. 96. 1, and c. 136. 4, "ostiolum"; c. 126. 16, "osculum"; c. 131. 5, "lapillos"; c. 135. 8. 11, "tigillo"; c. 136. 5, "mensulae"; c. 140. 11, "clostellum"; c. 140. 15, "locellos."

Of these diminutives, "adolescentulus" has the authority of Cicero (not to mention the analogous form "adolescentula," which occurs in Plautus and Terence); "aedicula," of Plautus and Cicero; "amiculum," of Festus and Cicero; "anicula," of Terence and Cicero; "asellus," of Varro and Cicero; "audaculus," of Festus (see p. 145); "catillum" ("us"), of Columella and Val. Maximus; "corolla," of Plautus, Festus, Propertius, and Catullus; "glebula," of Columella and Vitruvius; "globulus," being by Petronius used in a metaphorical sense, has in its literal signification the authority of Cato

and Varro; "homuncio," of Cicero; "libellus," of Plautus, Cicero, and Livy; "locelli," of Cæsar and Val. Maximus; "lucunculus," of Afranius; "meliusculus," of Plautus, Varro, and Columella; "mensula," of Plautus; "misellus," of Plautus, Cicero, and Catullus; "osculum" (in the sense of "little mouth"), of Ovid and Phædrus; "ostiolum," of Columella; "pediculus," of Columella; "pusillus," of Plautus, Cato, and Cicero; "tigillum," of Livy, Catullus, and Tibullus; "vasculum," of Cato.

It is seen, then, that by far the greater number of these diminutives are supported by the authority of old writers; and the fact that a few occur in later writers only, ("alicula" in Martial and Velius Longus, "capsella" in Ulpianus, "casula" in Pliny and Juvenal, "catella" in Martial and Juvenal, "ossiculum" in Pliny and Gellius, and "vernula" in Juvenal,) or in Petronius alone, ("amasiuncula" and "amasiunculus," "clostellum," "comula," "corcillum," "fericulus," "offla," "statunculum," "taurulus,") is no evidence of the late age of the Satyricon, because the non-occurrence of these words in older writers may be accidental.

It is certainly not to be wondered at that residents of Middle and Lower Italy, most of whom were not even natives of Italy, but had come from Greece or Asia, should mix Greek expressions, more or less corrupted and modified, in their discourse.

We find, thus, in the conversation of Trimalchio, the following words and forms: "tengo menas," c. 34. 7 and 73. 6; "philologiam," c. 39. 3; "praxim," c. 39. 4; "cataphagae," c. 39. 9; "anathymiasis," c. 47. 6; "peristasin," c. 48. 4; "melicam," c. 64. 2; "zelotypa," c. 69. 2; "colepio," c. 70. 2; "faciatur triclinia," c. 71. 10; and "nemini nihil satis est," c. 76. 3. — Niceros uses "basioballum," c. 61. 6; "ecraginavi," c. 61. 9; "apoculamus," c. 62. 3. — Hermeros says, "malisto" (*μάλιστος* being, perhaps, a Greek vulgarism for *μέγιστος*), c. 57. 10; "Nec sursum nec deorsum non cresco," c. 58. 5; and "Athana" and "alogias manias," c. 58. 7. — Seleucus uses "laecasin," c. 42. 2; and "nemini nihil boni facere," c. 42. 7. — Scintilla uses "Agaga," c. 69. 1. — Ganymedes says, "percolapabant," c. 44. 5; and another of the guests, "zaplutus," c. 37. 6, and "babae," c. 37. 9. Nay, even the language of Petronius himself is not entirely free from Grecisms. Thus we meet "phantasia," c. 38. 15; "sophos" (*σοφῶς*), c. 40. 1; "bucolesias," c. 41. 2; "automatum," c. 50. 1, and "automata," c. 140. 11; and "periscelides" and "phoecasia," c. 67. 4. — Eumolpus says, "in hypogeo," c. 111. 2.

It is in the nature of things that most of the proverbs, those vehicles of popular feeling, experience, and wisdom, are found in the conversation of the humbler personages of the drama. Trimalchio says, c. 39. 7: "In Geminis autem nascuntur bigae et boves et colei, et qui utrosque parietes linunt," — the Greek *δύο τοίχους ἀλείφειν*, the German "auf beiden Achseln tragen," "to please two, even opposite, characters"; it

conveys a similar, although not altogether the same, idea as the proverb, "duo parietes de eadem fidelia dealbare," used by Curius in Cic. ad Fam. 7. 29. 2. C. 39. 11: "In Sagittario strabones, qui olera spectant, lardum tollunt." C. 59. 2: "Semper in hac re qui vincitur, vincit." C. 63. 2: "Asinus in tegulis." C. 74. 13: "in sinum suum conspuit." (Cf. Plin. Nat. Hist. 28. 4. 7. 35: "Veniam quoque a deis spei alicujus audacioris petimus in sinum spuendo.") C. 74. 14: "qui in pergula natus est, aedes non somniatur." C. 74. 16: "ipse mihi asciam in crus impegi." C. 76. 11: "ab acia et acu mi omnia exposuit." C. 77. 6: "assem habeas, assem valeas"; and "habes, habeberis." — One of Trimalchio's guests, whose name is not given, says, c. 37. 2: "quae nummos modio metitur." (Cf. Horat. Sat. 1. 1. 96: "Ut metiretur nummos." The Greeks had the same proverb. Cf. Suid.: *μέδιμνον καὶ παροιμία· Μεδίμνῳ ἀπομετρῶ παρὰ τοῦ πατρὸς ἀργύριον· ἐπὶ τῶν μεγάλην καὶ ἀθρόαν προσδοκώντων ὠφέλειαν.* Lucian. Dial. Meretr. 9: *τὸ μὲν γὰρ ἀργύριον μηδὲ ἀριθμῷ ἄγειν αὐτὸν, ἀλλὰ μεδίμνῳ ἀπομεμετρημένον πολλοὺς μεδίμνους.*) C. 38. 12: "Sestertium suum vidit decies" (cf. Sen. de Benef. 2. 27. 1, "hic, qui quater millies sestertium suum vidit"), and "Non puto illum capillos liberos habere." C. 38. 13: "olla male fervet," — the Greek *ζεῖ χύτρα, ζῇ φιλία.* — Seleucus says, c. 42. 2: "Aqua dentes habet"; and c. 42. 7: "aeque est, ac si in puteum conjicias." — Phileros says, c. 43. 5: "Longe fugit, quisquis suos fugit"; and c. 43. 7: "in manu illius plumbum aurum fiebat." Varro had written a satire with the title, "Longe fugit, qui suos fugit," as is seen from a quotation in Nonius, 3. 204: "Erbum generis neutri est, ut plerumque. Feminini Varro Longe fugit, qui suos fugit: sed uti serat haec legumina arte parva pauca: cicer, ervillam, ac paregia alia spiria ceteris"; and from a second, 4. 271. — Ganymedes says, c. 44. 1: "quod nec ad coelum nec ad terram pertinet." (Cf. Lucian. Alexand. seu Pseudomant. 54: *ὀκτώ μοι χρησμοὺς ἔπεμψεν, οὔτε γῆς, φασιν, οὔτε οὐρανοῦ ἁπτομένους, ἀνοήτους δὲ καὶ δυσνοήτους ἅπαντας.*) C. 44. 3: "serva me, servabo te." C. 44. 7: "cum quo audacter posses in tenebris micare." That this was an old proverb is sufficiently proved by a passage in Cic. de Off. 3. 19. 77: "Haec non turpe est dubitare philosophos, quae ne rustici quidem dubitent? a quibus natum est id, quod jam contritum est vetustate, proverbium. Cum enim fidem alicujus bonitatemque laudant, dignum esse dicunt, quicum in tenebris mices." C. 44. 10: "annona pro luto erat." A similar expression occurs, Plaut. Trucul. 2. 7. 6: "Qui bona pro stercore habet." C. 44. 18: "Dii pedes lanatos habent." (Cf. Macrob. Sat. 1. 8: "Saturnum Apollodorus alligari ait per annum laneo vinculo et solvi ad diem sibi festum, id est, mense hoc decembri: atque inde proverbium ductum deos laneos pedes habere.") — Echion says, c. 45. 8: "qui asinum non potest, stratum caedit"; c. 45. 9: "Colubra restem non parit"; c. 45. 13: "Manus manum lavat." Cf. Plat. Axioch., where the

same proverb is ascribed to Epicharmus: *διὰ παντὸς δὲ ἔθος ἐστὶν αὐτῷ φωνεῖν τὸ Ἐπιχάρμειον ἁ δὲ χεὶρ τὰν χεῖρα νίζει.* Sen. Lud. de Morte Claud. 9. 5: "Hercules enim, qui videret ferrum suum in igne esse, modo huc modo illuc cursabat et aiebat: Noli mihi invidere, mea res agitur: deinde si quid volueris, invicem faciam: Manus manum lavat." It will at once be apparent that Seneca imitates, even to the proverb, the language of the vulgar. This satire was probably written immediately after the death of Claudius, in 54 A. D. — Hermeros says, c. 57. 3: "Larifuga nescio quis nocturnus, qui non valet lotium suum," and "in molli carne vermes nascuntur." C. 57. 7: "in alio pediculum vides, in te ricinum non vides?" (Cf. Horat. Sat. 1. 3. 73: "Qui ne tuberibus propriis offendat amicum, Postulat, ignoscet verrucis illius." Matt. vii. 3–5: *τί δὲ βλέπεις τὸ κάρφος τὸ ἐν τῷ ὀφθαλμῷ τοῦ ἀδελφοῦ σου, τὴν δὲ ἐν τῷ σῷ ὀφθαλμῷ δοκὸν οὐ κατανοεῖς; ἢ πῶς ἐρεῖς τῷ ἀδελφῷ σου Ἄφες ἐκβάλω τὸ κάρφος ἐκ τοῦ ὀφθαλμοῦ σου; καὶ ἰδοὺ ἡ δοκὸς ἐν τῷ ὀφθαλμῷ σου· ὑποκριτά, ἔκβαλε πρῶτον ἐκ τοῦ ὀφθαλμοῦ σου τὴν δοκὸν, καὶ τότε διαβλέψεις ἐκβαλεῖν τὸ κάρφος ἐκ τοῦ ὀφθαλμοῦ τοῦ ἀδελφοῦ σου.*) C. 57. 8: "lorus in aqua." C. 58. 3: "qualis dominus, talis et servus." (Cf. the Greek proverbs alluded to by Cic. ad Attic. 5. 11. 5: *οἷα γ' ἡ δέσποινα, τοία δὲ καὶ ἡ κύων,** or *ὁποία ἡ δέσποινα τοῖαι καὶ θεραπαινίδες.*) C. 58. 12: "volpis uda," where even the old form "volpis" for "vulpes" bears testimony to the antiquity of the proverb. — Plocrinus says, c. 64. 3: "quadrigae meae decucurrerunt." The Greeks express the idea conveyed in this proverb by another: *Πάλαι ποτ' ἦσαν ἄλκιμοι Μιλήσιοι.* This proverb, the origin of which is variously explained, occurs frequently in Greek writers, among others in Aristoph. Plut. 1002. — Habinnas says, c. 67. 10: "nunc hoc est caldum meiere et frigidum potare," a proverb more remarkable for its vigor than its elegance, but perfectly in keeping with the character of the person who uses it. — Circe says, c. 129. 7: "ad tubicines mittas."

Encolpius himself, or rather Petronius, does not abstain from the use of proverbs. He says, c. 47. 8: "in medio clivo laborare." A similar idea is expressed in a similar manner in Ovid. Heroid. 20. 41: "Mille doli restant; clivo sudamus in imo." V. Lörs, in his edition of Ovid's Heroides (Cologne, 1830), rightly defends the proverbial character of this expression of Ovid's by referring to the above passage of Petronius. Another expression of a similar character occurs in Sen. Ep. 31. 4: "Tanto melior, surge et inspira, et clivum istum uno, si potes, spiritu exsupera." C. 83. 7: "cum ventis litigo." The Greeks have several proverbs of the same import; as, *ἀνέμους γεωργεῖς*, which Suidas thus explains: *ἐπὶ τῶν πονούντων καὶ μηδενὸς μετεχόντων· καὶ γὰρ ὁ ἄνεμος πάντα μὲν φύει καὶ αὔξει, οὐδὲν δὲ ἕτερον ἢ μόνην ἄχνην ἀποφέρεται· ὥστε οὐδενὸς μεταλαμβάνει.* The New

* See Plato de R. P. 8. 13.

Testament expressions εἰς ἀέρα λαλεῖν (1 Cor. xiv. 9, ἔσεσθε γὰρ εἰς ἀέρα λαλοῦντες) and ἀέρα δέρειν (1 Cor. ix. 26, οὕτως πυκτεύω ὡς οὐκ ἀέρα δέρων) are of the same import.

Several facts cannot but strike the reader. In the first place, it is plain that all these proverbs share more or less in those qualities which are required to make a maxim or apothegm a proverb. Secondly, the same taste and sense of propriety which are shown by the author in attributing to each person language suited to his station, age, and education, are equally observed in the use of these proverbs. Any one who will compare the homely "serva me, servabo te," or "manus manum lavat," of Echion, the vulgar "in molli carne vermes nascuntur" of Hermeros, the coarse "caldum meiere et frigidum potare" of Habinnas, and the refined "in medio clivo laborare" of Encolpius, will perceive the correctness of this observation. Thirdly, the proverbs bear, both in their import and language, the impress of antiquity. In the case of one, at least, of the proverbs, — "cum quo audacter posses in tenebris micare," — we have the clear and irrefragable testimony of Cicero as to its age; and what is thus established in the case of this beyond the shadow of a doubt, may fairly be presumed with regard to the rest, on account of their general resemblance in feeling, conception, and language.

The result, then, of the examination of the diminutives, Grecisms, and proverbs seems to be, that they contain no indication whatever of a late composition of the work; on the contrary, whatever evidence we have as to their age, more especially of the diminutives and proverbs, is decidedly in favor of an early period.

Having thus examined the language of the humbler persons introduced into the story of the book, it remains to subject to a like examination the language of Encolpius, the hero who relates his adventures. I shall include in this examination the language of several other persons who are the equals of Encolpius in education and refinement, such as Eumolpus, Ascyltus, Quartilla, and others.

But before entering upon this examination, it is necessary to advert again to a fact already mentioned, that the work of Petronius is the only one of its kind. There is no other like it in the whole range of Roman literature, so far as it has been preserved. Each kind of composition has its own standard, and it is a delicate task to judge a production of one kind by the standard of another. The dialogues introduced into the story of Petronius, truthful, lifelike dialogues though they be, are not like the dialogues of the Latin comedy. The latter have one object: they are exclusively intended to aid in advancing and unfolding the plot of the play, while the former are of the greatest variety, just like the conversations which are wont to occur at accidental meetings of persons of different occupations, opinions, and conditions. The narrative of the work is equally different from any other. It tells, in simple, unpretending language, every

day's occurrences. Some of the familiar letters of Cicero, in which he relates the less important occurrences of his life while at home, or on a journey, or in one of his villas, come perhaps nearest, both in matter and form, to the narrative of Petronius. But although the difficulty here indicated, the want of any other work of the same kind with which the Satyricon could be compared, may render the result of an examination of the language of Petronius extremely uncertain and unsatisfactory, this is certainly no reason why the examination should not be made.

C. 10. 4: "privatis quaestibus." "Privatus" in the sense of "individual," the reverse of "communis." Cf. Cic. de Off. 1. 7. 20: "deinde, ut communibus pro communibus utatur, privatis ut suis." Cic. de Leg. 3. 19. 44: "In privatos homines leges ferri noluerunt: id est enim privilegium." It is to be noticed that Scaliger alters "privatos" into "privos," without the authority, however, of the manuscripts. Cic. pro Domo sua, 17. 43: "Vetant leges sacratae, vetant XII tabulae leges privatis hominibus irrogari: id est enim privilegium." In this instance, too, Scaliger reads "privis" for "privatis." — C. 10. 5: "et per totam urbem rumoribus different." Cf. Plaut. Aul. 3. 2. 31: "Ita me bene Laverna amet, te jam, nisi reddi Mihi vasa jubes, pipulo hic differam ante aedis." Caecilius in Gell. 2. 23: "Differor sermone miser." Propert. 1. 16. 47: "Sic ego nunc dominae vitiis et semper amantis Fletibus aeterna differor invidia." — C. 10. 6: "quia tamquam scholastici ad coenam promisimus." Cf. Plaut. Men. 5. 2. 43: "Una opera prohibere, ad coenam ne promittat, postules." Plaut. Stich. 4. 2. 16: "Ad coenam hodie hercle alio promisi foras." Plin. Ep. 1. 15. 1: "Heus tu, promittis ad coenam, nec venis." Cic. de Orat. 2. 7. 27: "Quidnam? inquit Catulus. Ut hic sitis hodie. Tum, cum ille dubitaret, quod ad fratrem promiserat, Ego, inquit Julius, pro utroque respondeo." — "et habitationem mihi prospiciam." Cf. Cic. ad Fam. 13. 2: "Peto igitur a te in majorem modum, quod sine tua molestia fiat, ut ei de habitatione commodes." Caes. Bell. Civ. 3. 21: "unam (legem), qua mercedes habitationum annuas conductoribus donavit." — C. 10. 7: "amoliri custodem molestum." Cf. Ter. Andr. 4. 2. 24: "Proinde hinc vos amolimini."

C. 15. 5: "nisi ut semel deposita vestis inter praedones strangularetur." Cf. Stat. Silv. 2. 2. 150: "Non tibi sepositas infelix strangulat arca Divitias." But although in both instances "strangulo" is used in the sense of "removing out of sight," in Petronius it is probably a vulgarism for "to steal," like the English "to hook."

C. 17. 1: "et ad neutram partem assentationem flectentibus." Cf. Vell. Pat. 2. 128. 3: "et qui M. Tullio tantum tribuere, ut paene assentatione sua, quibus vellet, principatus conciliaret." The verb "assentari" is used in the corresponding sense. Cf. Plaut. Most. 1. 3. 90: "Nunc, ne ejus causa vapulem, tibi potius adsentabor."

Vell. Pat. 2. 48. 1: "et iis, qui a Caesare dimittendos exercitus contendebant, assentabatur." — C. 17. 8: "Sed de remedio non tam valde laboro"; for "tam"; an expression used by Quartilla, a woman of refinement and education, however licentious and unprincipled. Cf. Cic. de Divin. 2. 39. 81: "Quasi vero quidquam sit tam valde, quam nihil sapere, vulgare." Caesar in Cic. ad Attic. 9. 7, C. 1: "Gaudeo mehercule vos significare literis, quam valde probetis ea, quae apud Corfinium sunt gesta." Plaut. Merc. Prol. 103: "Vosmet videte, quam mihi valde placuerit." — The same person uses, c. 17. 9, "traducere," which is used in two other places in the same sense, once by Eumolpus, c. 87. 4, and once by Echion, c. 45. 8. Cf. Liv. 2. 38: "An non sensistis triumphatum hodie de vobis esse? vos omnibus, civibus peregrinis tot finitimis populis, spectaculo abeuntes fuisse? vestras conjuges vestros liberos traductos per ora hominum?" Sen. de Benef. 4. 32. 3: "Hic corpore deformis est, adspectu foedus et ornamenta sua traducturus."

C. 18. 1: "Secundum hanc deprecationem." Cf. Cic. in Verr. 1. 11. 34: "Tua ratio est, ut secundum binos ludos mihi respondere incipias: mea, ut ante primos ludos comperendinem." Cic. de Orat. 1. 62. 264: "nobis exponcs ea, quae abs te de officiis praeceptisque oratoris quaesita sunt: sed opinor, secundum hunc diem." Cic. ad Attic. 3. 12. 1: "Spem ostendis secundum comitia." The word occurs once more in the same sense, c. 112. 8. — C. 18. 3: "adjuvaturos." Cf. Sal. Jugurth. 47. 2: "ratus, id quod res monebat, frequentiam negotiatorum et commeatum juvaturum exercitum et jam paratis rebus munimento fore." Plin. Ep. 4. 15. 13: "Etenim cum sic te, sic Bassum diligamus, ut et illum cujuscunque et tuum quemcunque quaestorem in petendis honoribus omni opera omni labore omni gratia simus juvaturi," etc. See Reisig's Lat. Gram. p. 234. — C. 18. 4: "post hanc pollicitationem." Cf. Asinius Pollio in Cic. ad Fam. 10. 32. 4: "Tres legiones firmas habeo: quarum unam, duodetrigesimam, cum ad se initio belli arcessisset Antonius hac pollicitatione," etc. Ter. Phorm. 5. 5. 17: "Quin tu hinc pollicitationes aufer."

C. 22. 5: "et stertere, tamquam olim dormientes, coeperunt"; "olim" in the sense of "long ago." Cf. Curt. 10. 3. 10: "Hoc ego nunc primum profiteor, sed olim scio." Phaedr. 3. 12. 4: "Hoc si quis pretii cupidus vidisset tui, Olim redisses ad splendorem pristinum." Virg. Georg. 4. 421: "Deprensis olim statio fidissima nautis." See Hand's Tursellinus, Vol. IV. p. 370.

C. 24. 4: "Ab hac voce equum cinaedus mutavit"; c. 41. 9: "Ab hoc ferculo Trimalchio ad lasanum surrexit"; and c. 80. 6: "ab extrema parte verbi consurrexit"; "ab" in the sense of "immediately after." Cf. Liv. 44. 34: "Ab his praeceptis concionem dimisit." Vell. Paterc. 2. 104. 3: "Quippe protinus ab adoptione missus cum eo præfectus equitum in Germaniam."

C. 26. 8: "unus servus Agamemnonis"; and c. 78. 6: "Unus praecipue servus libitinarii illius"; "unus" for "quidam" or "aliquis." Cf. Plaut. Most. 3. 1. 147: "Iterum jam ad unum saxum me fluctus ferunt." Cic. de Orat. 1. 29. 132: "qui sicut unus pater familias his de rebus loquor." Cic. pro Rosc. Com. 5. 15: "et advocatio ea est, quam propter eximium splendorem ut judicem unum vereri debeamus." — C. 26. 9: "et buccinatorem habet subornatum." This expression is put in the mouth of a slave. Cf. Cic. de Leg. 1. 22. 59: "et cum se ipse perspexerit totumque tentarit, intelliget, quemadmodum a natura subornatus in vitam venerit."

C. 27. 3: "non quidem eas, quae inter manus lusu expellente vibrabant"; "vibrare" as a neuter verb. Cf. Sen. de Provid. 3. 3: "Inter multa magnifica Demetrii nostri et haec vox est, a qua recens sum; sonat adhuc et vibrat in auribus meis." Plin. Nat. Hist. 2. 80. 82. 194: "Itaque et sine motu saepe editur sonus, nec simplici modo quatitur unquam, sed tremit vibratque."

C. 28. 4: "in quo deliciae ejus vehebantur." Cf. Plaut. Poen. 1. 2. 155: "Mea voluptas, meae deliciae, mea vita, mea amoenitas." Catull. 6. 1: "Flavi, delicias tuas Catullo, Ni sint illepidae atque inelegantes, Velles dicere, nec tacere posses." Cic. de Divin. 1. 36. 79: "Quid, amores et deliciae tuae, Roscius," etc. Cic. ad Attic. 16. 6. 4: "Piliae salutem dices et Atticae, deliciis atque amoribus meis." Cic. pro Cael. 19. 44: "Amores autem et hae deliciae, quae vocantur," etc. — C. 28. 6: "jam admiratione saturi"; in the sense of "wonder." Cf. Cic. Phil. 10. 2. 3: "Nam, ut superiora omittam, hoc certe, quod mihi maximam admirationem movet, non tacebo." Liv. 7. 34: "Inde admiratione paventibus cunctis," etc.; and in the same chapter: "deinde admiratio incessit, quod nec pugnam inirent," etc. — C. 28. 7: "sine dominico jussu"; and c. 31. 2: "Vinum dominicum." Cf. Varr. de R. R. 2. 10. 10: "Is enim sine literis idoneus non est, quod rationes dominicas pecuarias conficere nequidquam recte potest." Sen. Ep. 47. 6: "Adjice obsonatores, quibus dominici palati notitia subtilis est."

C. 33. 8: "hic nescio quid boni debet esse"; in the mouth of a guest, in the sense of "it is natural, probable." Cf. Cic. pro Quint. 28. 86: "id testibus me pollicitus sum planum facturum, qui et scire deberent, et causam, cur mentirentur, non haberent." Lucret. 6. 633: "Debet, ut in mare de terris venit umor aquai, In terras itidem manare ex aequore salso."

C. 34. 8: "sic aptum"; in the sense of "fitted, joined." Cf. Fest. 16 (Müller, p. 18): "Apex, qui est sacerdotum insigne, dictus est ab eo, quod comprehendere antiqui vinculo *apere* dicebant. Unde aptus is, qui convenienter alicui junctus est." Cic. Tusc. 5. 21. 62: "In hoc medio apparatu fulgentem gladium e lacunari seta equina aptum demitti jussit." Cic. Orat. 71. 235: "Facilius est enim apta dissolvere quam dissipata

connectere." — C. 34. 9: "catenatio." Cf. Vitruv. 2. 9. 11: "Ulmus vero et fraxinus .... in commissuris et in coagmentationibus ab lentitudine firmas recipiunt catenationes." Vitruv. 10. 1. 2: "Scansoria ratio non arte sed audacia gloriatur; ea catenationibus et [transversariis et] plexis colligationibus et erismatorum fulturis continetur."

C. 36. 4: "Damus omnes plausum." Cf. Cic. Cato, 18. 64: "Quibus cum a cuncto consessu plausus esset multiplex datus, dixisse ex iis quendam," etc.

C. 37. 1, "longe arcessere fabulas coepi," and c. 139. 3, "arcessito sermone." Cf. Cic. Top. 9. 39: "Cum autem a genere ducetur argumentum, non erit necesse id usque a capite arcessere."

C. 40. 1: "Subsessoresque." Cf. Serv. ad Virg. Aen. 11. 268: "subsessores dicuntur, qui in insidiis tauros interimunt."

C. 41. 8: "puerum sane perbasiamus"; "sane" in the sense of "valde." Cf. Plaut. Most. 3. 2. 73: "Nam sibi laudavisse hasce ait architectonem Nescio quem esse aedificatas has sane bene." Cic. de Orat. 2. 66. 264: "in quibus est narratio; res sane difficilis." Cic. in Verr. 2. 17. 42: "Interea sane perturbatus et ipse et ejus amici et consiliarii moleste ferre coeperunt."

C. 47. 7: "et subinde castigamus crebris potiunculis risum." Cf. Cic. Tusc. 2. 21. 50: "Videsne, ut obmutuerit non sedatus corporis sed castigatus animi dolor?"

C. 50. 3: "Exspectabam, ut pro reliqua insolentia diceret." Cf. Caes. B. C. 1. 6: "neque exspectant, quod superioribus annis acciderat, ut de eorum imperio ad populum feratur."

C. 52. 12: "Nihil autem tam inaequale erat." Cf. Hor. Sat. 2. 7. 10: "Vixit inaequalis, clavum ut mutaret in horas."

C. 54. 1: "Cum maxime haec dicente Gaio"; "cum maxime" in the sense of "just." Cf. Cic. de Harusp. Resp. 15. 32: "Verumtamen antiqua negligimus; etiam ea negligemus, quae fiunt cum maxime, quae videmus?" Cic. pro Cluent. 5. 12: "quae multos jam annos et nunc cum maxime filium interfectum cupit." Ter. Andr. 5. 1. 4: "Imo enim nunc cum maxime abs te postulo atque oro, Chreme." Ter. Heaut. 4. 3. 40: "atqui cum maxime Volo te dare operam, ut fiat." Plin. Ep. 10. 61. (58.) 1: "ob hoc praecipue, quod est multo depressior opere eo, quod cum maxime surgit." — C. 54. 3: "Nam puer quidem." In this elliptical sense,* "nam" occurs several times in the

* Hand, in his Tursellinus (Vol. II. p. 376 and Vol. IV. p. 12), objects, and to some extent justly, to the term elliptical. It is certainly true that the Roman, in such sentences, was not aware of an ellipsis, — the sentence was to him complete; but most, perhaps all modern languages, not having an equivalent for "nam" and "enim" in this peculiar sense, must have recourse to an ellipsis in order to explain or render the full sense of such sentences. This will be easily seen by taking in connection the two sentences which are

book, c. 56. 4, c. 78. 4, and c. 93. 3, and "enim" in the same sense, c. 56. 6. Instances of this use of "nam" and "enim" are frequent in the best writers, especially Cicero. Cf. Cic. Brut. 43. 161: "Omnibus quidem aliis, inquam, in magistratibus, sed tribunus anno post fuit, eoque in rostris sedente suasit Serviliam legem Crassus. Nam censuram sine Scaevola gessit." Cic. de Nat. Deor. 2. 27. 67: "principem in sacrificando Janum esse voluerunt, quod ab eundo nomen est ductum, ex quo transitiones perviae jani foresque in liminibus profanarum aedium januae nominantur. Nam Vestae nomen a Graecis est." Cic. Brut. 23. 91: "Quid igitur, inquit, est causae, Brutus, si tanta virtus in oratore Galba fuit, cur ea nulla in orationibus ejus appareat? quod mirari non possum in iis, qui nihil omnino scripti reliquerunt. Nec enim est eadem, inquam, Brute, causa non scribendi et non tam bene scribendi quam dixerint."—C. 54. 3: "Nec enim adhuc exciderat cocus ille." Cf. Cic. ad Fam. 5. 13. 2: "Quae cogitatio cum mihi non omnino excidisset — etenim penitus insederat — vi tamen tempestatum et concursu calamitatum erat aliquantum labefactata atque convulsa."—C. 54. 4: "Itaque totum circumspicere triclinium coepi, ne per parietem automaton aliquod exiret." It is well known that "aliquis" is used after "si," "nisi," "ne," for "quis" when it is emphatic. Cf. Cic. ad Attic. 3. 14. 2: "Hinc, si aliquid a comitiis audierimus, nos in Asiam convertemus." Cic. pro Mil. 24. 66: "Verum, ut intelligo, cavebat magis Pompeius, quam timebat, non ea solum, quae timenda erant, sed omnino omnia, ne aliquid vos timeretis." See Reisig's Lat. Gram. p. 340, and Zumpt's Lat. Gram. p. 580. —C. 54. 5: "in vicem enim poenae venit decretum Trimalchionis." Cf. Colum. 3. 14. 3: "potest tamen malleolus protinus in vicem viviradicis conseri soluta et facili terra." Liv. 6. 34: "poenaque in vicem fidei cesserat."

C. 60. 3: "cum alabastris unguenti"; like the "onyx" of Horace, Carm. 4. 12. 17: "Nardi parvus onyx eliciet cadum." Cf. Ciceronis Fragm. in Non. 15. 545: "Cicero Academicorum lib. II., Quibus etiam alabaster plenus unguenti putre esse videtur."

C. 67. 7: "Notavit haec Trimalchio," and c. 82. 2: "notavit me miles"; "notare" in the sense of "to observe." Cf. Cic. de Orat. 3. 48. 186: "quem [numerum] in cadentibus guttis, quod intervallis distinguuntur, notare possumus; in amni praecipitante

united by "nam": "Ipse Trimalchio cum graviter ingemuisset superque brachium tamquam laesum incubuisset, concurrere medici, et inter primos Fortunata crinibus passis cum scypho miseramque se atque infelicem proclamavit. Nam puer quidem, qui ceciderat, circumibat jam dudum pedes nostros, et missionem rogabat." Trimalchio indicated the great pain which he suffered, and his wife expressed in the strongest terms her sympathy. It was otherwise with the boy; for he was already appealing to us. That which we express by, "it was otherwise with the boy, for," is expressed by "nam," and the Roman found all this in "nam"; and to the Roman, therefore, as Hand very properly asserts, there was here no ellipsis.

non possumus." Cic. in Verr. 5. 10. 27: "Cum autem ver esse coeperat, cujus initium iste non a Favonio neque ab alio astro notabat, sed cum rosam videret, tunc incipere ver arbitrabatur." — C. 67. 11: "altera delicias et indiligentiam viri." Cf. Cic. ad Quint. Fr. 1. 2. 7: "Ac si omnium mearum praecepta literarum repetes, intelliges esse nihil a me nisi orationis acerbitatem et iracundiam et, si forte, raro literarum missarum indiligentiam reprehensam."

C. 69. 4: "semihora." Cf. Cic. pro Rabir. Perd. 2. 6: "Nunc, quoniam, T. Labiene, diligentiae meae temporis angustiis obstitisti, meque ex comparato et constituto spatio defensionis in semihorae curriculum coëgisti, parebitur."

C. 71. 1: "Diffusus." Cf. Ovid. Metam. 3. 318: "Forte Jovem memorant diffusum nectare curas Seposuisse graves vacuaque agitasse remissos Cum Junone jocos."

C. 74. 4: "quem Trimalchio jussit, ut aeno coctus fieret." This irregular use of "ut" after "jubeo" is not without a parallel even in Cicero. Cf. Cic. in Verr. 4. 12. 28: "Hic tibi in mentem non venit jubere, ut haec quoque referret HS VI millibus IↃ se tibi vendidisse?" and several times in the legal formula, "velitis, jubeatis," and similar ones. Cf. Cic. pro Domo, 17. 44: "velitis, jubeatis, ut M. Tullius in civitate ne sit, bonaque ejus ut mea sint." Cic. in Verr. 2. 67. 161: "Centuripinorum senatus decrevit populusque jussit, ut, quae statuae C. Verris ipsius et patris et filii essent, eas quaestores demoliendas locarent." — C. 74. 5: "in cacabum est conjectus." Cf. Varr. de L. L. 4. 27: "Vas, ubi cibum coquebant, ab eo cacabum appellarunt."

C. 78. 8: "verba dedimus"; a phrase so common in Plautus and Terence. Cf. Plaut. Truc. 1. 1. 72: "Mihi verba retur dare sese." Ter. Andr. 1. 3. 5: "Si illum relinquo, ejus vitae timeo: sin opitulor, hujus minas, cui verba dare difficile 'st." Ter. Phorm. 4. 5. 1: "Quietus esto, inquam; ego curabo, ne quid verborum duit." Cic. ad Attic. 15. 16, A: "Vel verba mihi dari facile patior in hoc, meque libenter praebeo credulum."

C. 80. 7: "Fulminatus hac pronunciatione." Cf. Cic. pro Cluent. 20. 56: "Atque hoc tum judicio facto et Opianico re et existimatione jam, lege et pronunciatione nondum, condemnato tamen Avitus Opianicum reum statim non fecit." — C. 80. 9: "Grex agit in scena mimum." Cf. Cic. pro M. Cael. 27. 65: "Mimi ergo est jam exitus, non fabulae."

C. 81. 2: "redeunte in animum solitudine"; "solitudo" in the sense of "desolate condition." Cf. Cic. ad Quint. Fr. 1. 4. 5: "Si tuam solitudinem comunemque calamitatem nemo despexerit." Corn. Nep. Thrasyb. 2. 2: "Neque vero hic non contemptus est primo a tyrannis atque ejus solitudo." — C. 81. 3: "Ergo me non ruina terra potuit haurire?" Cf. Horat. Carm. 1. 24. 5: "Ergo Quintilium perpetuus sopor Urget!"

Horat. Sat. 2. 5. 101: "Ergo nunc Dama sodalis Nusquam est!" Cic. ad Fam. 8. 17. 1: "Ergo me potius in Hispania fuisse tum quam Formiis, cum tu profectus es ad Pompeium!"—"arenae imposui"; and c. 102. 4: "Et utcunque imponi vel dormienti posset." Cf. Cic. ad Quint. Fr. 2. 6. 5: "Sic legibus perniciosissimis obsistitur, maxime Catonis, cui tamen egregie imposuit Milo noster."—C. 81. 6: "noxio sanguine parentabo injuriae meae." Cf. Liv. 24. 21: "Secundum Hieronymi caedem primum tumultuatum in Leontinis apud milites fuerat vociferatumque ferociter parentandum regi sanguine conjuratorum esse."

C. 82. 2: "grassator." Cf. Cic. de Fato, 15. 34: "Hoc enim modo viator quoque bene vestitus causa grassatori fuisse dicetur, cur ab eo spoliaretur."

C. 84. 3: "Jactantur . . . literarum amatores"; in the sense of "to harass, vex." Cf. Plaut. Cist. 2. 1. 4: "Qui omnis homines supero, antideo cruciabilitatibus animi: Jactor, crucior, agitor, stimulor," etc. Cic. Divin. in Caecil. 14. 45: "Te vero, Caecili, quemadmodum sit elusurus, quam omni ratione jactaturus, videre jam videor."—C. 84. 5: "et ipsis lenonibus doctior;" and the adverb "docte," c. 105. 10. Cf. Colum. 2. 15. 4: "quod M. Columellam patruum meum doctissimum et diligentissimum agricolam saepenumero usurpasse memoria repeto."

C. 85. 4: "ludum arctaverat"; "had closed the school." I find no parallel to this use of "arctare." It is not improbable that Petronius wished to mark, by this word, one of the characteristics of Eumolpus's style, which, with all its general elegance and purity, is occasionally marred by a dash of affectation and pedantry. Of the same class may be the following expression, "pigritiam recedendi."—C. 85. 6: "bene mane." Cf. Cic. ad Attic. 4. 9. 2: "Eo die Neapoli apud L. Paetum ante diem IV Kal. Maias iens in Pompeianum bene mane haec scripsi."

C. 86. 4, "male dormientis," and c. 87. 3, "male repugnanti." Cf. Horat. Carm. 1. 9. 24: "Pignusque dereptum lacertis Aut digito male pertinaci."

C. 87. 2: "plane iratus"; "plane" in the sense of "altogether, entirely." Cf. Cic. de Orat. 1. 23. 107: "Nam si ars ita definitur, ut paullo ante exposuit Antonius, ex rebus penitus perspectis planeque cognitis," etc. Cic. ad Fam. 3. 10. 1: "Illud plane moleste tuli, quod certissimum et justissimum triumphum hoc invidorum consilio esse tibi ereptum videbam."—"jam dicam"; "jam" in the sense of "immediately." Cf. Plaut. Aul. 1. 3. 25: "Occlude sis Foris ambobus pessulis; jam ego hic adero." Ter. Heaut. 4. 4. 18: "bono animo es: jam argentum ad eam deferes, Quod ei es pollicitus." Horat. Sat. 1. 1. 16: "jam faciam, quod voltis."—C. 87. 7: "iteratione." Cf. Cic. de Orat. 3. 53. 203: "propositioque, quid sis dicturus, et ab eo, quod est dictum, sejunctio, et reditus ad propositum et iteratio et rationis apta conclusio."

C. 88. 1: "consulere prudentiorem coepi aetates tabularum et quaedam argumenta mihi obscura"; "consulere" with two accusatives. Cf. Cic. ad Attic. 7. 20. 2: "Nec te id consulo." Plaut. Menaech. 4. 3. 26: "Ibo et consulam hanc rem amicos."

C. 90. 2: "teli conjectum." Cf. Cic. ad Attic. 4. 3. 2: "Quinti fratris domus primo fracta conjectu lapidum ex area nostra, deinde inflammata jussu Clodii." Liv. 28. 14: "et jam conflixerant cornua, cum, quod roboris in acie hostium erat, Poeni veterani Afrique nondum ad teli conjectum venissent." — C. 90. 4: "sanguinem tibi a capite mittam." Cf. Cels. 2. 10: "sanguinem incisa vena mitti novum non est." — C. 90. 6: "ne et tecum quoque habeam rixandum toto die." The ablative, frequently used by writers of the silver age to express duration of time, and repeatedly occurring in Petronius, is not entirely without the authority of writers of the best age. Cf. Cic. de Off. 3. 2. 8: "Quod eo magis miror, quia scriptum a discipulo ejus Posidonio est triginta annis vixisse Panaetium, posteaquam illos libros edidisset." This passage of Cicero proves that the departure from the grammatical rule and usage was not a later innovation, but that it may have been in common use in the language of conversation even of the educated, as Petronius, Encolpius, Eumolpus, although it was not until a later period that it gained a more extended footing in the written language.

C. 91. 1: "Scires non libenter servire"; and 3: "Supprimere ego querelam jubeo"; c. 93. 4: "et negavit recte facere"; and c. 99. 2: "daturum tamen operam." To any one familiar with the language of the dramatists, innumerable instances of the omission of the personal pronoun in the construction of the accusative with the infinitive will occur. Cf. Ter. Andr. 1. 5. 46: "Unum hoc scio esse meritam [sc. eam], ut memor esses sui." Ter. Andr. 3. 2. 37: "ubi intellexeras Id consilium capere [sc. eas], cur non dixti extemplo Pamphilo?" Ter. Andr. 3. 3. 21: "Ita magnae, ut sperem posse avelli [sc. eum]." Nay, even the higher kinds of composition furnish instances of this negligence. Cf. Cic. pro Rosc. Amer. 22. 61: "confitere huc ea spe venisse [sc. te], quod putares hic latrocinium non judicium futurum." Cic. pro Sulla, 23. 65: "agrariae legi, quae tota a me reprehensa et abjecta est, intercessorem fore professus est [sc. se]." — C. 91. 9: "reviviscentem amicitiam." Cf. Cic. ad Fam. 4. 4. 3: "Noli quaerere; ita mihi pulcher hic dies visus est, ut speciem aliquam viderer videre quasi reviviscentis rei publicae."

C. 92. 3: "se ut in grabatum rejecit." Cf. Cic. de Divin. 2. 63. 129: "Venit enim jam in contentionem, utrum sit probabilius, deosne immortales, rerum omnium praestantia excellentes, concursare omnium mortalium, qui ubique sunt, non modo lectos verum etiam grabatos," etc. — C. 92. 9: "O juvenem laboriosum!" in the sense of "capable of enduring labor." Cf. Cic. Tusc. 2. 15. 35: "Itaque industrios homines illi studiosos vel potius amantes doloris appellant: nos commodius laboriosos."

C. 93. 4: "quod seniori conviciarer." Cf. Varr. de R. R. 2. 5. 1: "Cum alius eum salutasset, alius conviciatus esset, qui tam sero venisset ad constitutum."

C. 94. 7: "hac denunciatione." Cf. Cic. pro Flacc. 6. 14: "Adjunxit illa, ut eos, qui domo exire nolebant, testimonii denunciatione terreret." — C. 94. 14: "instruxerat thecam." Cf. Cic. in Verr. 4. 23. 52: "Efferri sine thecis vasa, extorqueri alia de manibus mulierum, effringi multorum fores, revelli claustra." Varr. de R. R. 1. 48. 1: "proinde ut grani theca sit gluma et apex arista." — C. 94. 15, "mortem mimicam," and c. 106. 1, "mimicis artibus." Cf. Cic. de Orat. 2. 59. 239: "sed etiam si quid perridicule possis, vitandum est oratori utrumque, ne aut scurrilis jocus sit aut mimicus."

C. 95. 2: "furtiva molitio." Cf. Cic. de Nat. Deor. 1. 8. 19: "Quibus enim oculis intueri potuit vester Plato fabricam illam tanti operis, qua construi a deo atque aedificari mundum facit? quae molitio, quae ferramenta," etc. — C. 95. 3: "Jam enim faxo sciatis." Cf. Ter. Andr. 5. 2. 13: "Imo vero indignum, Chreme, jam facinus faxo ex me audias." — C. 95. 4: "palma excussissima." Cf. Ovid. Metam. 5. 596: "quas dum ferioque trahoque Mille modis labens, excussaque brachia jacto." Sen. de Benef. 2. 6. 1: "sed infinitum interest, utrum excusso lacerto torqueantur, an remissa manu effluant." — C. 95. 9: "se ab omni periculo vindicabat." Cf. Brut. 96. 329: "Sed illum videtur felicitas ipsius, qua semper est usus, ab iis miseriis, quae consecutae sunt, morte vindicasse."

C. 97. 1: "intrat stabulum." Cf. Cic. Phil. 2. 28. 69: "hujus in sedibus pro cubiculis stabula pro tricliniis popinae sunt."

C. 98. 1: "arundinem." Cf. Plaut. Stich. 2. 2. 23: "eeferte huc scopas simulque harundinem, Ut operam omnem aranearum perdam et texturam improbam, Deiciamque earum omnis telas."

C. 100. 1: "Luna innumerabilibus comitata sideribus"; "comitata" in a passive sense, as c. 17. 1: "intravit ipsa una comitata virgine." Cf. Cic. pro Cael. 14. 34: "ideo viam munivi, ut eam tu alienis viris comitata celebrares?"

C. 101. 5: "archipirata." Cf. Cic. de Off. 2. 11. 40: "ille autem, qui archipirata dicitur, nisi aequabiliter praedam dispertiat, aut interficiatur a sociis aut relinquatur." — C. 101. 7: "nisi naufragium ponimus." Cf. Ter. Phorm. 4. 3. 25: "Verum pono esse victum eum: at tandem tamen Non capitis ei res agitur sed pecuniae." Cic. in Verr. 2. 38. 93: "Itaque tantum verbo posuit Sacerdote praetore Sthenium literas publicas corrupisse." — C. 101. 10: "Accedit his, quod." Cf. Liv. 2. 18: "Supra belli Latini metum id quoque accesserat, quod triginta jam conjurasse populos concitante Octavio Mamilio satis constabat." — C. 101. 11: "quam se ipsos proscribere," "to ruin one's self," "to rush into one's own destruction." Besides this, I do not remember another place in which "proscribo" is not used in its technical meaning.

C. 102. 2: "Quid enim attinet." Cf. Cic. de Fin. 4. 22. 60: "quid attinuit cum iis, quibuscum re concinebat, verbis discrepare?"—C. 102. 5: "Praeterea illud miror, Encolpi, tibi non succurrisse." Cf. Cic. ad Fam. 16. 21. 6:* "Deinde illud etiam mihi succurrebat grave esse me de judicio patris judicare."—C. 102. 13: "Hoc ergo remedio mutemus colores." It is not necessary to consider the plural "colores" as a poetic construction for the singular "colorem"; to exchange one color with another implies a plural. Cf. Vopisc. Prob. 24: "cum imago Probi in Veronensi ita fulmine icta esset, ut ejus praetexta colores mutaret."—C. 102. 15: "asperginem." Cf. Cato de R. R. 128: "Ita neque aspergo nocebit, neque mures cava facient, neque herba nascetur, neque lutamenta scindent se."

C. 103. 5: "Unus forte ex vectoribus"; c. 107. 2: "cum omnis vector nihil prius quaerat"; and c. 108. 4: "alterque infirmissimus vector." Cf. Cic. Phil. 7. 8. 27: "tamen etiam summi gubernatores in magnis tempestatibus a vectoribus admoneri solent."

C. 104. 1: "secundum quietem." Cf. Cic. de Divin. 2. 66. 135: "Tum secundum quietem visus ei dicitur draco is, quem mater Olympias alebat."

C. 105. 1: "Excanduit." Cf. Cic. ad Fam. 8. 12. 2: "Id postquam resciit, excanduit et me causam inimicitiarum quaerere clamitavit."—"nocte intempesta." Cf. Cic. in Pison. 38. 92: "inde nocte intempesta crepidatus vesti servili navem conscendit, Brundisiumque vitavit et ultimas Hadriani maris oras petivit." Fest. 82 (Müller, p. 110): "Intempestam noctem dicimus pro incertiore tempore, quia non tam facile noctis horae quam diei possint intelligi. Tempestatem enim antiqui pro tempore posuere."—C. 105. 2: "non adumbratae comarum praesidio." Cf. Colum. 5. 5. 15: "M. quidem Columella patruus meus, vir illustribus disciplinis eruditus ac diligentissimus agricola Baeticae provinciae, sub ortu caniculae palmeis tegetibus vineas adumbrabat."—C. 105. 4: "placuit quadragenas utrisque plagas imponi"; and c. 113. 7: "Utraque inimicissima oculis meis." This irregular use of the plural "utrisque" and "utraque" for the singular "utrique" and "utrumque," is not without example in good writers. Cf. Cic. in Verr. 3. 60. 140: "Indignum, uni potius ex iniquis sumendi quam utrisque ex aequis rejiciendi fieri potestatem." Id. 4. 14. 32: "Permotus sum, inquit: binos habebam: jubeo promi utrosque, ne quid plus mali nasceretur." Caes. B. G. 1. 53: "Duae fuerunt Ariovisti uxores . . . utraeque in ea fuga perierunt." Sall. Cat. 30: "Igitur Senati decreto Q. Marcius Rex Faesulas, Q. Metellus Creticus in Apuliam circumque ea loca missi; hi utrique ad urbem imperatores erant."—C. 105. 5: "Et ego quidem tres plagas Spartana nobilitate concoxi." Cf. Cic. ad Quint. Fr. 3. 9. 5: "Sed me ab

* This is a letter of the younger Cicero to his father's freedman, Tiro.

eo ita observari scio, ut ejus ista odia non sorbeam solum sed etiam concoquam." — C. 105. 7: "cum ancillae pariter proclamant." There are several other instances in Petronius of this use of "cum" in a lively narration,* so frequent in Curtius, that master of vivid description, and not infrequent in Cicero. C. 111. 5: "cum interim imperator provinciae latrones jussit crucibus affigi"; c. 115. 11: "cum inviolatum os fluctus convertit in terram." Cf. Curt. 3. 10: "Jam in conspectu sed extra teli jactum utraque acies erat, cum priores Persae inconditum et trucem sustulere clamorem." Cic. in Verr. 2. 29. 72: "Non dubitabat Minucius, qui Sopatrum defendebat, quin iste, quoniam consilium dimisisset, illo die rem illam quaesiturus non esset, cum repente jubetur dicere." — C. 105. 9: "luminibus deflexis." "Lumen" for "oculus," though rare in prose-writers, is used even by Cicero, Tusc. 5. 39. 114: "Democritus luminibus amissis alba scilicet et atra discernere non poterat." — C. 105. 11: "in hoc supplicium"; "in" expressing the object or result of an action. Cf. Cic. pro Flacc. 14. 33: "At enim negas fratrem meum, qui L. Flacco successerit, pecuniam ullam in remiges imperasse." Cic. pro Cluent. 66. 188: "Nihil de alteris Oppianici nuptiis queror; quarum illa cum obsides filios ab eo mortuos accepisset, tum denique in familiae luctum et in privignorum funus nupsit."

C. 106. 3: "Ita vide, ut prosit illis ignosci." Cf. Ter. Andr. 4. 4. 14: "tu ut subservias Orationi, utcunque opus sit, verbis vide." Ter. Hec. 5. 4. 1: "Vide, mi Parmeno, etiam sodes, ut mi haec certa et clara attuleris." Plaut. Truc. 4. 2. 1: "vide intus modo, ut tu tuum item efficias."

C. 107. 1: "utpote hominem non ignotum." Cf. Nep. Hannib. 2: "Pater, inquit, meus Hamilcar puerulo me utpote non amplius novem annos nato in Hispaniam imperator proficiscens Carthagine Jovi Optimo Maximo hostias immolavit." Horat. Sat. 1. 5. 94: "Inde Rubos fessi pervenimus utpote longum Carpentes iter et factum corruptius imbri." — C. 107. 3: "satisfactione lenitas." Cf. Cic. ad Fam. 7. 13. 1: "Hic tu me etiam insimulas nec satisfactionem meam accipis." — C. 107. 6: "Si, me Hercules, intervortissent pecuniam vestram." Cf. Cic. Phil. 2. 32. 79: "Ille induxit, ut peteret; promissum et receptum intervertit ad seque transtulit." — "Servitia," for "servi." Cf. Cic. pro Cael. 32. 78: "qui in Palatio atque in urbis oculis servitia ad caedem et inflammandam urbem incitavit." — C. 107. 11: "At enim amici fuerunt nostri"; and c. 115. 17: "At enim fluctibus obruto non contingit sepultura"; "at," so frequently used in the best writers, especially Cicero, to introduce an actual or supposed objection. Cf. Cic. Cat. 19. 68: "At sperat adolescens diu se victurum, quod sperare idem senex non potest. Insipienter sperat." Cic. de Nat. Deor. 3. 11. 26: "At enim quaerit apud

* See Zumpt's Lat. Gram. § 580.

Xenophontem Socrates, unde animum arripuerimus, si nullus fuerit in mundo. Et ego quaero, unde orationem unde numeros unde cantus." — C. 107. 13: "curationis." Cf. Cic. de Nat. Deor. 1. 34. 94: "Omnis cultus et curatio corporis erit eadem adhibenda deo, quae adhibetur homini." — "propositum." Cf. Cic. de Fin. 3. 6. 22: "et tamen, ut omnia faciat, quo propositum assequatur, sit hoc quasi ultimum."

C. 108. 3: "Negat Eumolpus passurum se, ut quisquam ingenuos contra fas legemque contaminet." Although the accusative with the infinitive is commonly used after "pati," there are instances in good writers of "ut." Cf. Cic. pro Font. 12. 27: "Quod si in turpi reo patiendum non esset, ut quidquam isti se minis profecisse arbitrarentur: quid faciendum vobis in M. Fonteio arbitramini?" — C. 108. 12: "caduceatoris more." Cf. Festus 36 (Müller, p. 47): "Caduceatores legati pacem petentes. Cato, Caduceatori, inquit, nemo homo nocet." Liv. 32. 32: "Mora, cur non extemplo oppugnarentur, ea fuit, quod caduceator ab rege venerat locum ac tempus petens colloquio."

C. 109. 7: "pelagiae volucres," and c. 55. 6. 10: "ornata phaleris pelagiis." Cf. Varr. de R. R. 3. 3. 10: "Sic nostra aetas, inquam, luxuria propagavit leporaria, ac piscinas protulit ad mare, et in eas pelagios greges piscium revocavit." Phaedr. 4. 21. 7: "Redire in patriam voluit cursu pelagio."

C. 110. 4: "repositum in pristinum decorem puerum gaudebam." This very rare use of "reponere" in the sense of "restituere" occurs once in Virgil, Aen. 1. 253: "sic nos in sceptra reponis?" — C. 110. 7: "Quam facile adamarent." Cf. Cic. in Verr. 2. 34. 85: "Interea cupiditate iste illa sua nota atque apud omnes pervagata, cum signa quaedam pulcherrima atque antiquissima Thermis in publico posita vidisset, adamavit." Cic. Acad. 2. 3. 9: "Sed nescio quo modo plerique errare malunt eamque sententiam, quam adamaverunt, pugnacissime defendere quam sine pertinacia, quid constantissime dicatur, exquirere."

C. 111. 2: "in hypogeo" (see p. 151). Cf. Vitruv. 6. 8. (11.) 1: "Sin autem hypogea concamerationesque instituentur, fundationes eorum fieri debent crassiores quam quae in superioribus aedificiis structurae sunt futurae." Gruter. Inscr. 1114. 3: "Cum Ypogaeo Suo Hred." — C. 111. 3: "sine alimento." Cf. Cic. Timaeus seu de Univ. 6: "nec vero desiderabat aut alimenta corporis aut detractionem confecti et consumpti cibi." The use of the word "alimentum" in this connection may be an indication of that affectation which characterizes the language of Eumolpus. Of the same description is the expression, § 5: "solum illud affulsisse verum pudicitiae amorisque exemplum." Cf. Liv. 27. 28: "Magoni jam haud ferme fidenti retenturum defensurumque se urbem prima spes morte nunciata Marcelli affulsit." Val. Max. 7. 6, Ext. 1: "Cretensibus nihil tale praesidii affulsit." — C. 111. 5: "fabula erat." Cf. Horat.

Ep. 1. 13. 9: "Asinaeque paternum Cognomen vertas in risum et fabula fias." — C. 111. 8: "exulceratae mentes." Cf. Cic. pro Deiot. 3. 8: "cumque apud ipsum te de tuo periculo dicerent, fore putabant, ut in exulcerato animo facile fictum crimen insideret."

C. 112. 5: "cruciarii." I find one authority, but a sufficient one, for the use of this word; namely, M. Seneca, Controv. 3. 21: "fecit se similem tyranno, filiam raptis, libertum cruciariis." — C. 112. 6: "residet." Cf. Plaut. Capt. 3. 1. 8: "Ita venter gutturque resident esuriales ferias." Cic. pro Rosc. Amer. 21. 59: "ita negligens esse coepit, ut, cum in mentem veniret ei, resideret."

C. 113. 1: "et erubescente non mediocriter Tryphaena vultum suum super cervicem Gitonis amabiliter posuit." This irregular use of the ablative absolute, both the participle and finite verb having the same subject, cannot be fully justified by the passage in Cic. de Nat. Deor. 2. 15. 39, "Atque hac mundi divinitate perspecta tribuenda est sideribus eadem divinitas," because, in the latter, the form of the clause is essentially altered by the repetition of "divinitas" in the nominative in connection with the finite verb "tribuenda est," after having been used in the ablative in connection with the participle "perspecta." The instance, c. 76. 10, spoken of above (p. 130), "nolente me . . . exoravit," is of no weight, partly because it is put in the mouth of the ignorant Trimalchio, partly because it is probably to be explained as a Grecism. An instance in Flor. 4. 1, "Tum consul habito senatu in praesentem reum Cicero peroravit: sed non amplius profectum, quam ut hostis evaderet seque palam professo incendium suum restincturum ruina minaretur," bears a closer resemblance to our passage, and, although it cannot establish the correctness of the expression of our author, it proves that this irregularity is not without example in the best ages of Latin literature. — C. 113. 4: "praeoccupaverat." The simple verb "occupo" expresses what is intended to be expressed by "praeoccupo." Although Cicero cannot be adduced as an authority for this word, — since in the only passage in which the word is said to occur (Phil. 10. 1. 2, "Quas enim ipse mihi partes sumpseram, eas praeoccupavit oratio tua") the better reading is "praecepit," — other writers of the best age may be quoted. Cf. Caes. B. G. 6. 41: "Sic omnium animos timor praeoccupaverat, ut paene alienata mente deletis omnibus copiis equitatum tantum se ex fuga recepisse dicerent." Liv. 4. 48: "ubi videant collegas principes agendae rei gratiam omnem ad plebem praeoccupasse," etc. — C. 113. 7: "Omnia me oscula vulnerabant"; "vulnerare" in a metaphorical sense. Cf. Cic. in Cat. 1. 4. 9: "et quos ferro trucidari oportebat, eos nondum voce vulnero." — C. 113. 8: "tralatitia propinatione." Cf. Phaedr. 5. 7. 24: "Di sunt locuti more translatitio."

C. 114. 1: "inhorruit mare." Cf. Pacuv. in Cic. de Divin. 1. 14. 24: "Interea prope jam occidente sole inhorrescit mare." — C. 114. 2: "certos fluctus," "running steadily in the same direction." Cf. Cic. de Nat. Deor. 2. 38. 97: "Quis enim hunc hominem dixerit, qui, cum tam certos coeli motus tam ratos astrorum ordines tamque inter se omnia connexa et apta viderit, neget in his ullam inesse rationem," etc. — C. 114. 13: "infecta materies." Cf. Liv. 34. 10: "Argenti infecti tulit in aerarium quatuordecim millia pondo septingenta triginta duo."

C. 115. 4: "laborat carmen in fine." Cf. Quint. 9. 4. 33: "Tum vocalium concursus; qui cum accidit, hiat et intersistit et quasi laborat oratio." — C. 115. 5: "phrenetico." Cf. Cic. de Divin. 1. 38. 81: "Ego autem haud scio an nec cardiacis hoc tribuendum sit nec phreneticis." — C. 115. 6: "Hoc opere tandem elaborato." Cf. Cic. pro Leg. Man. 1. 1: "nihil huc nisi perfectum ingenio elaboratum industria afferri oportere." — C. 115. 7: "cum poneremus consilium." Cf. Cic. de Orat. 1. 22. 102: "Quid? mihi nunc vos, inquit Crassus, tamquam alicui Graeculo otioso et loquaci et fortasse docto atque erudito quaestiunculam, de qua meo arbitratu loquar, ponitis?" Cic. Tusc. 1. 4. 7: "Ponere jubebam, de quo quis audire vellet. — C. 115. 16: "Si bene calculum ponas." Cf. Plin. Ep. 1. 14. 9: "Et sane de posteris et his pluribus cogitanti hic quoque in conditionibus deligendis ponendus est calculus."

C. 116. 1: "carpimus iter." Cf. Horat. Sat. 2. 6. 93: "Carpe viam, mihi crede, comes."

C. 117. 2: "largior schema"; "schema" in the sense of "dress." Cf. Plaut. Amphitr. Prol. 116: "Nunc, ne hunc ornatum vos meum admiremini, Quod ego huc processi sic cum servili schema." — "peram." Cf. Phaedr. 4. 10. 1: "Peras imposuit Jupiter nobis duas." — "differrem." Cf. Caes. B. C. 2. 14: "Hunc [ignem] sic distulit ventus, uti uno tempore agger plutei testudo turris tormenta flammam conciperent," etc. — C. 117. 3: "Atqui promitto, quidquid exigeret," etc. It is well known that, while in the more animated narrative the present is frequently used for the perfect, the dependent tenses, in such sentences, are sometimes the imperfect and pluperfect, thus showing that the leading verb, although a present in form, is a perfect in meaning. Instances of this kind are not infrequent in the best writers. Zumpt, in his Latin Grammar (p. 432), quotes a long passage from Cic. in Verr. 4. 18. 38, which variously illustrates this peculiar usage, and of which it will be sufficient to give the concluding clause: "Diodorus, homo frugi ac diligens, qui sua servare vellet, propinquo suo scribit, ut iis, qui a Verre venissent, responderet, illud argentum se paucis illis diebus mississe Lilybaeum." — C. 117. 6: "elatumque." Cf. Cic. de Nat. Deor. 3. 32. 80: "Cur Maximus extulit filium consularem?" — C. 117. 7: "non agnoscere dignitatem

suam." Cf. Cic. Lael. 2. 9: "Tu autem, Fanni, qui mihi tantum tribui dicis, quantum ego nec agnosco nec postulo, facis amice." — C. 117. 9: "loquatur aurum et argentum." Cf. Cic. ad Attic. 9. 2. A. 3: "Vixdum epistolam tuam legeram, cum ad me currens ad illum Postumus Curtius venit nihil nisi classes loquens et exercitus." Horat. Sat. 1. 3. 12: "modo reges atque tetrarchas Omnia magna loquens." — C. 117. 10: "et ne quid scenae deesset." Cf. Cic. ad Fam. 8. 11. 3: "Scena rei totius haec: Pompeius, tamquam Caesarem non impugnet, sed, quod illi aequum putet, constituat, ait Curionem quaerere discordias."

C. 118. 2: "controversiam vibrantibus sententiolis pictam." Cf. Cic. Phil. 3. 9. 21: "Sententiolas edicti cujusdam memoriae mandavi, quas videtur ille peracutas putare."

C. 125. 1: "gratiae suae." Cf. Cic. ad Fam. 13. 29. 5: "Omnia, quae potui in hac summa tua gratia ac potentia a te impetrare, si petiissem, ultro te ad me detulisse putabo, si hanc rem impetravero."

C. 126. 5: "aut statores altius cinctos." Cf. Cic. ad Fam. 2. 17. 1: "Binas literas a te mihi stator tuus reddidit Tarsi a. d. XVI Kalend. Sextiles." Cic. ad Fam. 2. 19. 2: "Quae cum essent incerta, existimavi tamen faciundum esse, ut ad te statores meos et lictores cum literis mitterem." — C. 126. 12: "qui ambulationi haerebat." Cf. Cic. ad Quint. Fr. 3. 1. 1: "Sed tamen nihil ei restabat praeter balnearia et ambulationem et aviarium." — "platanona." Cf. Vitruv. 5. 11. 4: "Faciunda autem xysta sic videntur, ut sint inter duas porticus silvae aut platanones." Mart. 3. 19. 1: "Proxima centenis ostenditur ursa columnis, Exornant fictae qua platanona ferae." — "daphnona." Cf. Mart. 10. 79. 5: "Disposuit daphnona suo Torquatus in agro." Although there is no equally old authority for the use of "daphnon," as there is for that of "platanon," yet from the analogous character of the two words, and from the fact that both are originally Greek, there seems to be reason for supposing that they were used in Latin at the same time. — C. 126. 15: "Crines ingenio suo flexi." Cf. Naev. ap. Non. 322: "vos, qui regali corporis custodias Agitis, ite actutum in frundiferos lucos, Ingenio arbusto vineta sunt, non obstutas." Sallust. Hist. 3, ap. Non. 323: "castrisque collatis pugna tamen ingenio loci prohibebatur." — C. 126. 16: "osculum," in the sense of "mouth." Cf. Virg. Aen. 12. 434: "Summaque per galeam delibans oscula fatur." Phaedr. 4. 23. 7: "Et matronarum casta delibo oscula."

C. 128. 3: "numquid ab aliquo naturali vitio formam meam excaeco?" "Ab" in the sense of "with regard to," or "on account of," is common in the best writers. Cf. Ter. Heaut. Prol. 13: "Sed hic actor tantum poterit a facundia, Quantum ille potuit cogitare commode." Cic. ad Fam. 1. 4. 3: "Ego tibi a vi hac praesertim imbecilitate magistratuum praestare nihil possum." Cic. Brut. 16. 63: "Sed ille Graecus ab omni

laude felicior." — C. 128. 5: "quodam visu." Cf. Liv. 8. 6: "Hos ubi nocturnos visus inter se consules contulerunt, placuit averruncandae Deum irae victimas caedi." — C. 128. 7: "hoc nomine," "on this account." Cf. Cic. pro Muren. 38. 82: "Neque isti me meo nomine interfici sed vigilantem consulem de rei publicae praesidio demovere volunt."

C. 129. 1: "Funerata est pars illa corporis." Cf. Horat. Carm. 3. 8. 7: "prope funeratus Arboris ictu." — C. 129. 3: "codicillosque." Cf. Cic. ad Fam. 6. 18. 1: "Simul accepi a Seleuco tuo literas, statim quaesivi e Balbo per codicillos, quid esset in lege." — C. 129. 6: "Narrabo tibi." Cf. Cic. ad Attic. 2. 11. 1: "Narro tibi; plane relegatus mihi videor, postcaquam in Formiano sum."

C. 130. 5: "tempore," "early." Cf. Horat. Sat. 1. 5. 47: "Hinc muli Capuae clitellas tempore ponunt."

C. 131. 2: "spatiatus." Cf. Cic. pro Rosc. Amer. 21. 59: "Posteaquam invenit neminem eorum, qui possunt et solent, ita negligens esse coepit, ut, cum in mentem veniret ei, resideret, deinde spatiaretur," etc.

C. 132. 4: "sputisque." Cf. Sen. de Constant. 1. 3: "quodque a rostris usque ad arcum Fabianum per seditiosae factionis manus tractus voces improbas et sputa et omnes alias insanae multitudinis contumelias pertulisset."

C. 134. 11: "perplexe agere." Cf. Ter. Eun. 5. 1. 1: "Pergin', scelesta, mecum perplexe loqui?"

C. 135. 3: "quam vivis implevit carbonibus." Cf. Horat. Carm. 3. 21. 23: "Vivaeque producent lucernae." — C. 135. 4: "in quo faba erat ad usum reposita"; c. 136. 7: Jam reliqui revolutam passimque per totum effusam pavimentum collegerant fabam"; and c. 135. 5: "Ut solvit ergo licio pannum, partem leguminis super mensam effudit." Both "faba" and "legumen" are frequently, although not always, used as collective nouns. Cf. Cic. de Divin. 1. 30. 62: "Ex quo etiam Pythagoricis interdictum putatur, ne faba vescerentur, quod habet inflationem magnam is cibus tranquillitati mentis quaerentis vera contrariam." Fab. Pict. in Gell. 10. 15: "capram et carnem incoctam et hederam et fabam neque tangere Diali mos est neque nominare." Gell. 4. 11: "Sed Aristoxenus musicus vir literarum veterum diligentissimus, Aristotelis philosophi auditor, in libro, quem de Pythagora reliquit, nullo saepius legumento Pythagoram dicit usum quam fabis." Cic. de Nat. Deor. 2. 62. 156: "Terra vero feta fragibus et vario leguminum genere, quae cum maxima largitate fundit, ea ferarumne an hominum causa gignere videtur?" Varr. de R. R. 1. 23. 2: "praeter cicer: hoc enim quoque legumen ut cetera, quae velluntur e terra."

C. 136. 1: "delibat." Cf. Phaedr. 4. 23. 7: "Et matronarum casta delibo oscula."

Varr. de R. R. 2. 2. 16: "ne toto die cursantes inter se teneri delibent aliquid membrorum." — "et dum coaequale natalium suorum sinciput in carnarium furca reponit." However questionable the word "coaequale" may appear, it has the authority of Columella, 8. 14. 8: "atque ubi [anser] se paullum confirmavit, in gregem coaequalium compellitur." — C. 136. 3: "statimque, ne res aliqua sacrificium moraretur, ad reficiendum ignem in vicinia cucurrit." If "in vicinia" be connected with "ad reficiendum ignem," there is no grammatical irregularity, although it must be confessed that the use of "cucurrit" without a designation of the place whither the woman ran is abrupt and harsh; if, on the other hand, "in vicinia" is to be connected with "cucurrit," the construction is undoubtedly ungrammatical, but not without example in good writers. Cf. Cato de R. R. 157. 15: "Et si polypus in naso introierit, brassicam erraticam aridam tritam in malum conjicito." Plaut. Amph. 4. 3. 14: "Certum est, introrumpam in aedibus."* Plaut. Aul. 3. 6. 17: "Qui intromisisti in aedibus* quingentos cocos." Cic. Tusc. 3. 11. 25: "His autem perturbationibus, quas in vita† hominum stultitia quasi quasdam furias immittit atque incitat." — C. 136. 4: "Itaque ad casae ostiolum processi." Cf. Colum. 8. 14. 1: "et aditus singulos firmis ostiolis munitos." — C. 136. 5: "pedem mensulae extorsi." The form "mensula," although it does not occur frequently, is used by Plautus, Most. 1. 3. 150: "Age accumbe igitur; cedo aquam manibus, puere; oppone hic mensulam."

C. 137. 10: "Interea haec satagens"; and c. 58. 9: "satagis." The contracted form "satago," as well as the original form "satis ago," occurs in old and good writers. Cf. Plaut. Asin. 2. 4. 34: "Prius quae credidi, vix anno post exegi; Nunc satagit: abducit domum etiam ultro et scribit numos." Plaut. Merc. 2. 1. 4: "Velut ego nocte hac, quae praeteriit, proxuma In somnis egi satis et fui homo exercitus."

C. 139. 5: "Unus ex novitiis servulis." Cf. Varr. de L. L. 7. 2: "etiam novitii servi empti in magna familia cito omnium conservorum omnis recto casu accepto in reliquos obliquos declinant." Cic. in Pison. 1. 1: "Nemo queritur Syrum nescio quem de grege novitiorum factum esse consulem."

In making this selection of words and phrases, I have endeavored, without extending the list unnecessarily, to choose such as are fair representatives of the phraseology of Encolpius and the other more cultivated personages of the story. It will be seen, that the use of these phrases and words is justified by the authority of the best writers of the best age; and that the language of Petronius himself and of the better-edu-

* It should be noticed that some editions read, in both these places, "aedis," for "aedibus."

† Orelli adopts the reading "vitam," but states in the note: "Sic [in vitam] L. D. 1. W. 2. — 'in vita' Cdd. noti, etiam b. Ceterae Edd. (etiam W. in Ed. pr.)."

cated persons contains, so far, nothing inconsistent with the period indicated by the historical evidence, as well as by that portion of the linguistic evidence which has hitherto been examined. But the examination would be incomplete, were I to pass by some grammatical forms and expressions, both in the language of Petronius and that of the better-educated persons, which have not the support and authority of writers of the best age, without considering how far they affect the answer to the question in what age Petronius wrote.

C. 15. 3: "Neque enim res tantum, quae viderentur in controversiam esse," etc., for "in controversia." — C. 15. 4: "et nescio quis ex concionibus"; a singular use of the plural, as if "concio" meant "a hearer," instead of "a collection of hearers," a use of the word for which I find no authority. The passage quoted by De Salas and others, from Cic. de Orat., "conciones saepe exclamare vidi, cum apta verba cecidissent," is not apposite, because Cicero speaks of several different assemblies, not of the individuals present at one. There are two other instances of the same use of "conciones" in our writer, c. 14. 7, "et conciones, quae ad clamorem confluxerant," and c. 15. 8, "ridere acumen non minus concionum quam calumniantium." — C. 15. 7: "Indignatus enim rusticus, quod nos centonem exhibendum postularemus," for "ut centonem exhiberet."

C. 16. 1: "ostium satis audaci strepitu impulsum exsonuit"; c. 19. 1: "Omnia mimico risu exsonuerant"; c. 73. 4: "gingilipho et ingenti clamore exsonabant"; and c. 109. 6: "Exsonat ergo cantibus totum navigium." The verb "exsonare," as far as I know, occurs in Petronius — and with him in these few passages — alone.

C. 19. 2: "Ideo vetui hodie in hoc deversorio quemquam mortalium admitti," for "deversorium"; c. 26. 10: "et Gitona, libentissime servile officium tuentem usque hoc, jubemus in balneo sequi," for "in balneum"; c. 73. 5: "Nos, dum alii sibi ludos faciunt, in solio, quod Trimalchioni parabatur, descendimus," for "in solium"; and c. 136. 3: "ad reficiendum ignem in vicinia cucurrit," for "in viciniam"; the first used by Quartilla, the last three by Encolpius.

C. 26. 8: "Itaque cum moesti diliberaremus, quonam genere praesentem evitaremus procellam, unus servus Agamemnonis interpellavit trepidantes"; for "quo modo," or "qua ratione."

C. 27. 5: "cum Trimalchio digitos concrepuit," for "digitis," as Cic. de Offic. 3. 19. 1: "si digitis concrepuerit"; and c. 22. 6: "et concrepans aera," for "aeribus" or "aere."

C. 29. 1: "dum omnia stupeo"; c. 60. 8: "candidas succincti tunicas"; and c. 82. 1: "gladio latus cingor"; a poetical construction. — C. 29. 2: "Et collegae quidem mei riserunt"; "collega" in the sense of "fellow-guest." I know of no other instance of the word being used in this sense.

C. 34. 2: "colaphisque objurgari puerum . . . jussit." I know of no writer of the best age who uses "objurgare" in the sense of "punish, chastise."

C. 36. 5: "Non minus et Trimalchio ejusmodi methodo laetus." "Methodus," if the reading be correct, is used in the sense of "contrivance, invention," a meaning of which I know no other instance.

C. 54. 3: "Pessime mihi erat, ne," etc., in the sense of "I feared," probably a colloquial expression, although I do not know of another instance. Similar phrases are Plaut. Amphit. 5. 1. 6: "Animo male est"; Truc. 2. 4. 14: "Non edepol bibere possum jam; ita animo male est"; and Curc. 1. 3. 8: "nam si absim, haud recusem, quin mihi male sit."—"ne his precibus periculo aliquid catastrophae quaereretur"; "catastropha," in this sense, seems to be a *ἅπαξ λεγόμενον*.

C. 69. 6: "nisi epidipnis esset allata." The plural, "epidipnides," occurs in a few instances; the singular, in this place alone.—C. 69. 8: "et omnium genera avium"; for "omnium generum aves."

C. 72. 4: "nudisque consurrexit pedibus et Trimalchionem gaudentem subsequi," for "subsecutus est"; a singular use of the historical infinitive immediately after the indicative consurrexit."

C. 74. 9: "maledicere Trimalchionem coepit." This is the only instance in which Encolpius uses this irregular construction, which, as has been stated above, was frequent among the uneducated (see c. 58. 13 and c. 96. 7). In all other instances, Encolpius, or Petronius, as well as the steward of Trimalchio, uses the regular construction; see c. 53. 3; c. 117. 11; c. 132. 13 and 14.

C. 97. 10: "Amolitur Ascyltus invidiam." "Amoliri" is used in similar phrases in Quint. 5. 13. 11: "Videndum etiam, simul nobis plura aggredienda sint, an amolienda singula." Tac. Hist. 3. 75: "invidiam crimenque agnovisse et a partibus Vitellii amolitus videbatur." In the literal sense the verb occurs in the *Historiae* of L. Cornelius Sisenna, who was probably a few years older than Cicero. Cf. Non. 2. 73: "Sisenna Historiae IIII: inpedimentum omne de cunctis itineribus amoliuntur."—"quem post fatalem rixam habuit carissimum." Reiske explains "post" as being used in the manner of the Greek *μετά*, in the sense of "except." I know of no other instance of "post" being used in this sense.

C. 102. 4: "per ipsa gubernacula." While this word, in a metaphorical sense, is almost without exception used in the plural, I do not know of another instance of the plural when the word is employed in its literal meaning, as here.

C. 102. 7: "nec vos quidem existimo velle"; c. 110. 4: "quem alloquio dignum nec*

* The Codex Memmianus has "ne."

Lycas quidem crederet"; c. 132. 9: "nam nec nominare quidem te inter res serias fas est"; c. 13. 1: "Nam adhuc nec suturae quidem attulerat rusticus curiosas manus." I do not intend to enter into a discussion whether "nec... quidem" is good Latin or not, nor whether it is good Latin but not Ciceronian, which question is ably discussed by Hand in his Tursellinus (Vol. IV. p. 142); nor is it incumbent upon me to explain how far, in those passages in which the reading "nec... quidem" cannot be doubted, it differs in meaning from "ne... quidem." It is sufficient for me to ascertain in what writers this expression, in the sense in which Petronius uses it, occurs. Cicero cannot be quoted in support of it, as will be seen upon an examination of the following passages. Cic. de Nat. Deor. 3. 9. 23: "Nihil igitur affert pater iste Stoicorum, quare mundum ratione uti putemus, nec* cur animantem quidem esse." Of the same kind is the passage in Cic. in Verr. 2. 20. 48: "De isto, id quod omnes videbant, neque ille quidem obscure locutus est." In both these passages, the only ones in Cicero in which the reading "nec" is sufficiently authenticated, "nec... quidem," signifying "and not even," is not equivalent to "ne... quidem," and differs, therefore, from the "nec... quidem" as used in the above-mentioned passages by Petronius. And the few passages in which "nec... quidem" is used as in the above passages of Petronius, belong to writers of the silver age. Cf. Flor. 2. 17. 3: "Alioquin ita undique mari Pyrenaeoque vallata est, ut ingenio situs nec adiri quidem potuerit." Sen. de Ira 1. 6. 2: "Non est ergo natura hominis poenae appetens: et ideo nec ira quidem secundum naturam hominis, quia poenae appetens est." Plin. Nat. Hist. 8. 36. 54. 129: "Procedunt vere, sed mares praepingues; cujus rei causa non prompta est, quia nec† somno quidem saginatis praeter quatuordecim dies, ut diximus."

C. 105. 11: "aut cujus tam crudeles manus in hoc supplicium durassent?" "who could carry his cruelty so far as to inflict such a punishment?" Tacitus (Ann. 1. 6) uses the verb "durare" in a similar manner: "ceterum [Augustus] in nullius unquam suorum necem duravit."

C. 106. 3: "Deos immortales rerum humanarum agere curam, puto, intellexisti, o Tryphaena!" Lycas uses the perfect, "intellexisti," for the present, "intelligis."

C. 107. 9: "si gratiam a legato moliebantur"; for "per legatum." — C. 107. 15: "Pharmace." I am not aware that any Latin writer, with the exception of Servius, the scholiast of Virgil, and Lactantius Placidus, the scholiast of Statius, mentions this word. In Greek it was used in the same sense in which it appears to be used by Lycas, namely, as an opprobrious epithet. Cf. Arist. Equit. 1405:

* Orelli, while stating that a few manuscripts read "ne," adopts the reading "nec," and expresses in a decided manner his opinion that "nec ... quidem" means "and not even."

† Sillig reads "ne," in opposition to all the manuscripts; he says, "ita nos scripsimus; nec, R, d, β, γ."

Καὶ σ' ἀντὶ τούτων ἐς τὸ Πρυτανεῖον καλῶ,
Ἐς τὴν ἕδραν θ', ἵν' ἐκεῖνος ἦν ὁ φαρμακός.

C. 108. 12: "stlatarium bellum." Provided this be the correct reading, it is not easy to give a satisfactory explanation of the expression. The adjective occurs, so far as I know, in one passage only, Juv. 7. 134: "Spondet enim Tyrio stlataria purpura filo"; unless we admit the authority of the scholiast to this passage, who quotes from Ennius this line:

"Et melior navis, quam quae stlataria portat."

The noun, certainly, was of early origin. Cf. Fest. p. 313: "Stlata genus erat navigii latum magis quam altum, sic appellatum a latitudine, sed ea consuetudine, qua stlocum pro locum et stlitem antiqui pro litem dicebant." Gellius enumerates the word in a list of names of weapons and vessels which occur in ancient writers: "quae in historiis veteribus scripta sunt." There is no evidence that the adjective, as well as the noun, was not early in use; on the contrary, the reverse is highly probable; for even if the scholiast to Juvenal was mistaken in ascribing the line quoted to Ennius, it was undoubtedly borrowed from a writer of equal age and authority.

C. 109. 5: "odia detumescunt." I know of no earlier writer who uses this verb than Statius. Cf. Theb. 5. 468:

"Detumuere animi maris, et clementior Auster
Vela vocat."

—C. 109. 8: "elegidarion," in the sense of "elegidion." I am not aware that the word occurs in any other writer.

C. 110. 1: "corymbio." "Corymbion" is undoubtedly the diminutive of "corymbos," but it occurs in no other writer.—C. 110. 5: "capillamento." Although I know of no earlier writer who uses this word than Pliny and Seneca, they both use it in a manner incompatible with the idea that it had lately come into use, or that it was of their making. On the contrary, the figurative sense in which Pliny several times uses it, as well as Seneca, necessarily implies the previous existence of the word in its literal sense.*

C. 111. 2: "conditorium," in the sense of "sepulchre." Cf. Plin. Ep. 6. 10. 5: "Tam rara in amicitiis fides, tam parata oblivio mortuorum, ut ipsi nobis debeamus etiam conditoria exstruere omniaque heredum officia praesumere." Although Pliny the younger is the earliest writer in whose writings this word, used in the sense of "sepulchre," occurs, there is no evidence that it did not exist long before.

* Cf. Plin. Nat. Hist. 16. 10. 16. 38: "ex his pinus atque pinaster folium habent capillamenti modo praetenue longumque et mucrone aculeatum." Sen. Ep. 86. 18: "hujus [vitis] capillamenta quoque, si fieri potest, colligenda sunt."

C. 116. 1: "ex quo haud procul impositum arce sublimi oppidum cernimus," for "in arce sublimi."

C. 117. 1: "genusque divitationis." If this be the correct reading, the word "divitatio" is a ἅπαξ λεγόμενον. The verb from which it is derived occurs in ancient writers. Cf. Non. 2. 95: "Divitant pro divites faciunt. Accius Astyanacte: nihil credo auguribus, qui auris verbis divitant Alienas, suas ut auro locupletent domos. Turpilius Transilione: di me divitant." Gellius (14. 1) also quotes the former passage from Accius. The presumption, therefore, is in favor of "divitatio" being an old word.

C. 127. 1: "risit tam blandum." The ecstatic frame of mind of Encolpius is indicated by the poetic coloring of this passage, and this accounts satisfactorily for the use of the adjective "blandum" for the adverb "blande."

C. 131. 5: "praecantatos." This word is a ἅπαξ λεγόμενον; but from the fact that another word of the same root, "praecantrix" and "praecantatrix," "a sorceress," occurs in some of the oldest writers,* the inference is natural that the non-occurrence of "praecantatus" in other writers is accidental.

C. 132. 3: "convocat omnes quasillarias." Cf. Gruter. Inscr. 648. 5: "Musa. Quasill Vix. An. XXX Cratinus. Lanipend De. Suo." — C. 132. 12: "poenitentiam agere sermonis mei coepi." Cf. De Orat. Dial. 15: "Neque illius, inquit, sermonis mei poenitentiam ago."

C. 136. 13: "tam magnum aeque clamorem sustulit, ut putares," etc. A singular and unnecessary use of "aeque," the sense being fully expressed by "tam." A second construction seems to have been in the mind of Encolpius, namely, "aeque magnum clamorem sustulit, ac si iterum anseres limen intrassent," which he changed into its present form, unnecessarily retaining "aeque."

C. 141. 9: "Quod si exemplis vis quoque probari consilium"; for "Quod si exemplis quoque vis probari consilium."

It will be readily perceived that the above list of words or phrases and grammatical forms consists of two kinds, — of those which occur in Petronius alone, unsupported by the authority of any other writer, early or late, and of those which occur also in other later writers. To the former class belong: "in controversiam esse," c. 15. 3; "conciones," c. 14. 7, c. 15. 4, and c. 15. 8; "centonem exhibendum postulare," c. 15. 7; "exsonare," c. 16. 1, c. 73. 4, and c. 109. 6; "in hoc deversorio admitti," c. 19. 2; "in balneo sequi," c. 26. 10; "in solio descendere," c. 73. 5; "in vicinia currere," c. 136. 3;

* Cf. Non. 8. 494: "Praecantrix. Varro Cato, vel de liberis educandis: ut faciunt pleraeque, ut adhibeant praecantrices, nec medico ostendunt." Plaut. Mil. 3. 1. 98: "da, quod dem quinquatribus Praecantrici [al. Praecantatrici], conjectrici, ariolae atque aruspicae."

"quonam genere," c. 26. 8; "digitos concrepare," c. 27. 5, and "concrepare aera," c. 22. 6; "collegae," c. 29. 2; "colaphis objurgare," c. 34. 2; "methodus," c. 36. 5; "pessime mihi erat, ne," etc., and "catastropha," c. 54. 3; "epidipnis," c. 69. 6; "omnium genera avium," c. 69. 8; "consurrexit et subsequi," c. 72. 4; "maledicere" with the accusative, c. 74. 9; "post," c. 97. 10; "gubernacula," c. 102. 4; "intellexisti," c. 106. 3; "a legato," c. 107. 9; "elegidarion," c. 109. 8; "corrymbion," c. 110. 1; "arce," for "in arce," c. 116. 1; "divitatio," c. 117. 1; "praecantatus," c. 131. 5; "tam magnum aeque," etc., c. 136. 13; "quoque," c. 141. 9.

A consideration suggests itself which will lead a cautious inquirer into the subject of the age of Petronius to attach little or no weight to these exceptional expressions and forms. Even if it were an ascertained fact, that the non-occurrence of these forms and words in other writers is not accidental, but that they were used by Petronius alone, we should be no nearer to a solution of the problem. If these expressions occurred in writers whose age is known, we might with some reason infer that Petronius belonged to the same age. But as the case is, these irregularities, whether barbarisms or solecisms, may, for aught we know, have been the offspring of any time, an earlier as well as a later. It is a well-known fact, that we not only find in different writers of the same age expressions not in keeping with the character of the language of that age, but we meet in the works of one and the same writer such inconsistencies. While it may, indeed, be conceded that some, if not all, of these expressions impair the reputation of Petronius as a writer who is in every part of his work correct and elegant, they afford no evidence as to his age, and neither strengthen nor weaken other evidence on that point. They must be laid out of the case, however interesting they may otherwise be as one of the characteristics of the language of Petronius.

A more serious obstacle is presented by the second class of expressions, — those which have the authority of later writers only. Their number is not so large as that of the preceding class; they are: the poetic use of the accusative, c. 29. 1, c. 60. 8, and c. 82. 1; "amoliri invidiam," c. 97. 10; "nec ... quidem," c. 13. 1, c. 102. 7, and c. 132. 9; "durare in supplicium," c. 105. 11; "pharmacus," c. 107. 15; "stlatarium bellum," c. 108. 12; "detumescere," c. 109. 5; "capillamentum," c. 110. 5; "conditorium," c. 111. 2; "blandum," c. 127. 1; "quasillariae," c. 132. 3; and "poenitentiam agere," c. 132. 12.

It is necessary to observe, in the first place, that the fact of the occurrence of these expressions, so far as now known, in later writers only, is no conclusive evidence that they did not previously form a part of the Latin language. On the contrary, I have shown in the instance of several, as "stlatarium" and "capillamentum," that it is highly probable, if not certain, that they existed at a much earlier period than the writers in which alone

they are now found. Another weighty consideration is suggested by a fact of which the history and development of every language furnish examples. I refer to the reciprocal influence of the written and spoken language. While it is unquestionably true that the writers of a nation by their genius invent and introduce new words and forms, which by degrees pass over into the spoken language of their countrymen, it is equally true that the creative mind of the people itself forms new words, which, if they really satisfy the constantly increasing wants of the language, and intelligibly and in accordance with the genius of the language express new objects and new ideas and relations of ideas, soon make their way from the spoken into the written language. This fact suggests the reason why it should not at once be concluded that a word used for the first time, so far as our literary monuments reach, by Tacitus or Quintilian or Seneca, did not previously exist in the spoken language of the educated and refined, as well as of the large mass of the people, even if we had irrefutable evidence, which we have not, that those authors were the first to use it in writing. Petronius, or his hero, Encolpius, in using throughout the whole of his narrative, with few exceptions, the easy, simple language of conversation, employed some terms which occur for the first time in the works of somewhat later writers, although they may have been for a generation in the mouth of everybody. Not much more than that length of time, in almost every instance, need have elapsed between the time which the preceding examination has led me to adopt as the age of Petronius, and the period of those writers who, so far as our present literary means enable us to judge, were the first to use the expressions in writing.

While these expressions, considered by themselves, would undoubtedly lead us to the conclusion that Petronius belonged to a period posterior to the time of those writers in whose works we meet them for the first time, the great body of evidence, both historical and linguistic, is opposed to that conclusion. Under these circumstances, it becomes necessary to allow due weight to the above-stated considerations, that either the non-occurrence of those few words in earlier writers may be accidental, or that, although in general use in conversation, it was not until a later period that they were introduced into the written language.

The investigation into the age of Petronius is thus completed. The historical evidence points distinctly to the period between 6 and 34 A. D. as the time in which Petronius lived and wrote; the great body of the linguistic evidence does not only not militate against, but strongly corroborates, this result; and the small number of expressions which at first view are inconsistent with it are capable of an explanation, at once natural and in conformity with the history of language, which removes this only and slight objection.

III.

On the Use of Equivalent Factors in the Method of Least Squares.

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One of the most important applications which has been made of mathematics to investigations in physical science has for its object to ascertain the best manner of combining data affected by unknown errors of observation, so that the probable effect of these errors shall be the least possible. The method of least squares proposes to accomplish this, by reducing to a minimum value the sum of the squares of the outstanding errors, and, by conforming to this single criterion, to fulfil the condition, so desirable in the prosecution of thorough and exact research, of reducing to its least possible amount the influence of errors in the data employed.

The investigations here presented have been entered upon with the design of determining the degree of numerical exactness proper to be observed in making use of the method of least squares, in order to secure its peculiar advantages with the least outlay of labor.

Some detail in the discussion seems to be called for from the prevalence of a practice, almost universal among computers, of adhering to the letter of the method of least squares with a strictness which implies a misapprehension of its true spirit. It is impossible to adduce any valid reasons to justify such a course when it must be followed at a serious expense of time and labor in the computations.

It has not escaped the observation of Gauss, in his original exposition of the method, that some freedom of interpretation may be allowed when its theoretical results are applied in practice, as the following passage, referring to the solution of equations by least squares, will show: —

"When the number of functions or equations proposed for solution is considerable, the computations become laborious, the more so from the circumstance that the coefficients by which the primitive equations are to be multiplied are almost always complicated decimal fractions. If it is not thought worth the trouble in such a case to calculate the products with exactness by means of logarithms, it will generally be sufficient to substitute for them (i. e. for the multiplying factors) more simple numbers differing but slightly from them." *

In his subsequent researches, it does not appear that Gauss has given any further development to the suggestion here put forth. Indeed, the introduction of modifications of a like nature, however desirable in a practical point of view, would have deprived a purely theoretical discussion of much of its elegance and symmetry. Yet the passage above quoted lends the support of the highest authority to the leading proposition which we shall have occasion most frequently to insist upon; namely, the propriety of allowing some relaxation of theory in applying the calculus of probabilities to the discussion of data affected by ordinary errors of observation, whenever the modification conduces to convenience and the saving of labor at the sacrifice of no appreciable advantages.

Even an unqualified admission of the superior probability of results which exactly fulfil the criterion proposed in the method of least squares, does not relieve us from the necessity of restricting it to examples which never actually occur, that is, if the question be made a rigorous one; † — to such, for instance, as involve the discussion of observations which are entirely free from unknown constant errors, or errors following any law of facility which does not imply the assumption that the mean error is proportional to the square root of the mean of the squares of the individual errors. But we know that this proposition, which lies at the foundation of the whole subject, is not susceptible of absolute demonstration by any process of mathematical reasoning. Further than this, we know from constant experience that the law of distribution of errors recognized in the method of least squares practically fails, in extreme cases, both for very large and for very small errors. If any illustration of the failure of the assumed law be needed, it will be found in the familiar instance of computing by it the probable error of the arithmetical mean of a very large number of observations, where common sense assures us that the theoretical probable errors of the result are invariably smaller than they should be.

Why, then, should an implicit adherence to its minutest details be required as essen-

* Theoria Motûs, § 185.

† Theor. Comb., § 17.

tial to its successful application, or to the attainment of all the advantages which its employment may confer upon the discussion of any practical problem?

It is true that no other system can be proposed which is free from similar objections, or which can be mathematically demonstrated to be exclusively the best, without qualification, and therefore the arguments above stated are of no force whatever, if employed as reasons for the rejection of the method of least squares. They nevertheless greatly weaken the position of those who would insist upon a strict compliance with its precepts, and effectually preclude all arguments of a purely theoretical character in support of such a course. Still it is desirable that the force of any objections which may be made to an attempt to modify the theoretical conditions for effecting the most favorable combination of equations should be appreciated at their true value. We therefore propose to show that the spirit of the method of least squares, rightly apprehended, in reality rather invites than discountenances a liberal construction of its rules.

Admitting that the best possible solution is attained when the sum of the squares of the outstanding errors, represented by Ω, is a minimum, it is evident that Ω is a minimum relatively to the manner in which the original equations have been treated. And since the peculiarity of the solution consists in the employment of a system of factors, α, α', &c., by which the original equations are multiplied before combination, the first differential coefficient of Ω relatively to either of these factors, in the case of the least-square solution, must have the value for each factor,

$$\frac{d\,\Omega}{d\,\alpha} = 0.$$

When, therefore, the factors are varied by small amounts, $\delta\,\alpha$, $\delta\,\alpha'$, &c., the consequent variations of Ω developed in a series, will contain only terms multiplied by the second and higher powers of $\delta\,\alpha$; or, in general terms, *if we deviate from the exact*
(1.) *precepts of the method of least squares by small variations of the first order, we shall fail to satisfy its fundamental criterion by small terms of the second order only.*

Looking thus at the most elementary principle of the method, we find a warrant for some degree of liberty in applying it, — a liberty which we can scarcely hesitate to avail ourselves of, if we further consider the peculiar circumstances attending its actual employment in the discussion of data furnished directly by observation.

Among its first requirements is the assignment of weights to the original observations; but it is one which it is not possible to fulfil correctly, for we are provided neither with a theory nor with data for the purpose. All that can be done is to accept, as indices of the relative value of the different observations, certain numbers depending either proximately or remotely upon no other authority than the mere exercise of the judgment

alone. No one can pretend that this is a process susceptible of strict accuracy; yet an error here is as fatal as if we had disregarded any other of the precepts of the method.

This step being an arbitrary one, although one of fundamental importance, we may properly appeal to it as a precedent for the modification of others suggested by considerations of convenience, though they may not, like this, be justified on the plea of actual necessity. In this view of the subject, we find support for the modification suggested by Gauss, in the passage we have quoted above. Each of the complicated factors which it is there proposed to simplify is itself a product of two other factors, one of which is the weight of the equation under treatment; if one of these, that is, the number representing the weight, is erroneous, the product is of course erroneous, with whatever accuracy the other is expressed.

Again, as a matter of convenience, it is usual to express the conditional equations proposed for solution in a linear form, by reducing the indeterminates to small quantities and neglecting the terms multiplied by their second and higher powers, and to construct from them normal equations, as they are called, previously to applying the method of least squares. Both of these may be practices perfectly allowable under the circumstances, but since they are almost always theoretically incorrect, their admission is a virtual relinquishment of all pretensions to a rigorous course of computation, and cannot be compensated for by any subsequent refinements.

We will now proceed to examine the limits of accuracy appropriate to the arithmetical operations required in the combination of conditional equations by the method of least squares, and afterwards to develop in detail some proposed modifications of that method, having for their object the reduction to its minimum value of the amount of labor requisite for its successful application.

It is scarcely necessary to remark, that the subject is plainly one which is in its nature somewhat vague and insusceptible of rigorous treatment, though it is at the same time interesting from its practical bearings. If no very precise or definite rules for regulating the degree of numerical exactness suited to the discussion of any given problem can be arrived at, it may still be of service to point out the principles which ought to guide the computer in the choice of such limits as shall perfectly meet all reasonable requirements of accuracy, without imposing upon him the unprofitable labor of multiplying the extent and difficulties of calculation, to no useful purpose, and without the remotest prospect of sensibly improving the real value of the results.

Let us suppose a series of equations,

$$a\,\mathrm{x} + b\,\mathrm{y} + \ldots\ldots\ldots + m = \mathrm{e},$$
$$a'\,\mathrm{x} + b'\,\mathrm{y} + \ldots\ldots\ldots + m' = \mathrm{e}',$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

in which m is the element derived from observation, and e the unknown error of the equation, to be solved by the method of least squares, giving for x the value x, with its probable error, ε, obtained from a comparison between the observed and the computed values of m, after substituting x, y, &c. in the primitive equations.

If x_0 be the true value of x, we may represent by $\varkappa$ a quantity such that it is an even chance whether $x_0 - x$ is comprised between the limits $\varepsilon + \varkappa$ and $\varepsilon - \varkappa$. The magnitude of the limit defined by $\varkappa$ has an evident relation to the question how far the simplification of the arithmetical processes may be carried without detriment to the results.

For instance, the solution of the above equations may be repeated with small variations from the process at first applied, giving for x a new value x_1 with a probable error ε_1, differing but little from ε. If we were in entire ignorance of the relative amount of the probable errors ε_1 and ε, there would be no reason at all for giving the preference to x rather than to x_1. If only the single circumstance were known that ε_1 exceeded ε by a given small amount, we should be equally at a loss, while the value of ε remained unknown, to state the relative weight of x_1 compared with x, and should, in fact, be again obliged to resort to the hypothesis that ε and ε_1 were sensibly equal. And in general, the greater the uncertainty of ε, or, in other words, the larger the value of $\varkappa$, the less reason would there be for excluding from competition with x any other determination of x, such as x_1, of which the probable error ε_1 differed but little from ε.

In order to employ the limit $\varkappa$ as here proposed, its value must be known before the computations have reached an advanced stage. That this is not ordinarily practicable will readily appear. On the other hand, it must be left entirely to the judgment of the computer to decide as to the precise manner in which $\varkappa$ is to be applied in limiting the allowable amount of difference $\varepsilon_1 - \varepsilon$.

Objections of a similar character apply equally to other standards which might be proposed for the same object. As has before been remarked, the question must be treated, if at all, upon a somewhat arbitrary basis, and we must be content with suggestions addressed to the judgment or common sense of the computer, in cases where no fixed rule is admissible.

Viewed in this light, there will ordinarily be no difficulty in recognizing the point at which there will be danger of compromising accuracy in the attempt to simplify the computations, nearly enough at least for practical purposes, if we are prepared to admit, at least in its general spirit and tendency, the truth of the following proposition: —

(2.) *The application of the method of least squares to the discussion of observations of physical phenomena, with the exception of a few special cases of rare occurrence, requires the use of such numbers only, in the arithmetical processes peculiar to it and characteristic of the method, as may be designated by one of the numerals* 0, 1, 2 . . . . . 9, *or of the fractions* $\frac{1}{2}, \frac{1}{3} \ldots\ldots \frac{1}{9}$, *or by a product of one of these numbers by an integral power of* 10.

An idea may be formed of the amount of the intentional errors occasioned by these substitutions, by noticing that if by N is represented any number whatsoever, and by N' a number chosen from the proposed series which most nearly coincides with N, we shall have

(3.)
$$\text{The maximum value of } \frac{N - N'}{N} = \frac{1}{9} \text{ nearly.}$$
$$\text{The probable value of } \frac{N - N'}{N} < \frac{1}{25}.$$

Before proceeding to a detailed investigation of the consequences of the changes proposed, it will be useful to point out the degree of insecurity attaching to the values which must ordinarily be adopted to represent the probable error of x; the different sources which may be supposed to contribute to the increase of ε; and their relative importance in connection with the question of the comparative accuracy of the two results x and x_1.

ε may be referred to the combined influence of two mutually independent errors η and η', η being the probable value of $x_0 - x$ which would result from the errors of observation alone, supposing the theory of the method of least squares and its application to the data to be rigorously exact, and η' the probable amount of error in x having its origin in errors necessarily committed in the discussion of the observed data, supposing the mode of discussion, although the best practicable, to fall short of strict conformity with the theory. η_1' represents the value of η' when the same data have been reduced, by a process made intentionally still less exact, to a small extent, both in its theory and in its arithmetic, than that which gives the error η'. η_1' will bear to x_1 a relation similar to that which η' bears to x. η cannot be completely eliminated, so long as the errors of observation remain unknown, by any treatment, and the same may be said of η'; but η_1' can always be reduced to its least limit, η', by suitable refinements of theory and of computation. In view of the fact that η and η' must have always sensible, but very uncertain values, it will be of but little consequence that η_1' should be reduced to its utmost limit without regard to the labor and inconvenience which it may cost. At all events, the attempt will be ineffectual as a means of improving the substantial accuracy of the results, as we shall presently see.

Since η is independent of η' and η_1', we have, assuming η' to be the least attainable value of η_1',

$$\varepsilon^2 = \eta^2 + \eta'^2, \qquad \varepsilon_1^2 = \eta^2 + \eta_1'^2.$$

If η'' be used to designate the probable value of $x - x_1$ which would result from small intentional deviations from that treatment of the data which is recognized to be the best, we have

$$\eta_1'^2 = \eta'^2 + \eta''^2, \qquad \varepsilon^2 = \eta^2 + \eta'^2, \qquad \varepsilon_1^2 = \eta^2 + \eta'^2 + \eta''^2. \tag{4.}$$

As regards the uncertainty of ε, some estimate of its extent may be obtained in the following manner.

If it is an even chance that the error of which the probable value is η is comprised somewhere between the limits $\eta + \lambda$ and $\eta - \lambda$, η having been derived from comparisons of a given system of equations with observation, the number of individual equations thus compared being represented by n, and the number of unknown quantities entering into them by n', λ may be found from the expression*

$$\lambda = 0.477 \frac{\eta}{\sqrt{n - n'}}. \tag{5.}$$

Any value of $n - n'$ less than 100 gives

$$\lambda > \frac{1}{21}\eta.$$

The scale of substituted numbers (2) admits, as we have before stated, of representing η within the probable amount of $\frac{1}{25}\eta$; hence, for any value of $n - n'$ less than 100, the series will afford numbers representing η with a probable error less than λ. A slight examination will show that a similar remark applies still more decisively to ε.

The considerations which oblige us to attribute a sensible value to η' are too many and too obvious to require to be specified in detail. It will be sufficient to cite one or two which have already been alluded to. The existence of unknown constant errors in the data will render the application of the method of least squares, strictly speaking, inexact. From this source η' will inevitably acquire some influence. Again, the uncertainty incident to any attempt to assign to the original data their proper relative weights, will have a similar effect. No process more loose and arbitrary can well be conceived, than that by which the relative precision of the elements afforded directly by observation is graduated. Yet, imperfect as it is, improvement in this particular is scarcely to be hoped for. Exact conformity with a theory which requires a previous knowledge of the relative weight of observations is quite impossible.

* Gauss, Zeitschrift für Astr., B. I. Theor. Comb.,§ 40.

At the same time, then, that the existence and influence of η' are admitted, its amount is altogether uncertain, to an extent sufficient at least to make the uncertainty of ε which is dependent on that of η and η' not less in proportional amount than that of η; consequently we shall obtain from (5) the expression

(5 *a*.) $$\varkappa > 0.477 \frac{\varepsilon}{\sqrt{n-n'}}$$

by which to measure the uncertainty of ε. If $n - n' < 100$,

(5 *b*.) $$\varkappa > \frac{1}{21}\varepsilon.$$

When ε is represented by a number chosen from the series (2), the probable error of the representation is, by (3), less than $\frac{1}{25}\varepsilon$; in other words, it is more than an even chance that this number will fall within the limits $\varepsilon + \frac{1}{25}\varepsilon$ and $\varepsilon - \frac{1}{25}\varepsilon$; and since the inherent uncertainty of ε makes it more than an even chance that its actual value is outside of the limits $\varepsilon + \frac{1}{21}\varepsilon$ and $\varepsilon - \frac{1}{21}\varepsilon$, in accordance with the above determination of $\varkappa$, we conclude that ε can be represented by one of the series of numbers 0, 1, 2 ..... 9, or of the fractions $\frac{1}{2}, \frac{1}{3}$ ..... $\frac{1}{9}$, or by a product of one of these numbers by an integral power of 10, with more accuracy than we can determine its amount by one hundred comparisons between the observed and the computed values of m. It would be easy to show, from the probable existence of constant errors alone, that an indefinite increase of the number of comparisons with observation would not sensibly diminish the uncertainty of ε below the amount stated. The proposition (2) would thus be sustained, as far as relates to all expressions for probable errors and weights, since they must depend upon conditions similar to those limiting the accuracy of ε.

An immediate consequence of this admission will be the extension of the proposition in question, in the qualified sense, at least, in which alone it is to be understood, to all other arithmetical expressions required in the application of the method of least squares, since the peculiar province of the latter is restricted entirely to the solution of equations of the form

(5 *c*.) $$a(x - x_1) + b(y - y_1) + \ldots\ldots\ldots + (m - m_1) = e,$$

in which each separate term and factor may be defined as proposed in (2).

To illustrate this, let us suppose for the moment that x_1 has been derived from the same primitive equations, but by an essentially different process from that by which x has been obtained; x_1 would still be precisely equal to x, if it were not for the errors e, e′, &c. Any such process, not intentionally bad, must evidently lead to a determination of x_1 differing from x by an amount of an order not higher than that of ε, while

one adopted expressly on account of its good qualities, though without bearing any intended resemblance to the method of least squares in its characteristic features, will diminish the difference $x - x_1$ to a value either less in absolute amount than ε, or very nearly equal to it; so that $(x - x_1)$, $(y - y_1)$, &c. may be sufficiently well expressed by the series (2) in the same sense that ε may be. The equations

$$\begin{aligned} a\,x + b\,y + \ldots\ldots\ldots + m &= e, \\ \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot & \\ a\,x_1 + b\,y_1 + \ldots\ldots\ldots + m_1 &= 0, \\ \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot & \end{aligned}$$

in which e is the value of e obtained by substituting x, y, &c. in the primitive equations, give at once

(5 *c*.) $$\begin{aligned} a\,(x - x_1) + b\,(y - y_1) + \ldots\ldots + (m - m_1) &= e, \\ \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot & \end{aligned}$$

The solution of which by the method of least squares gives $(x - x_1)$, $(y - y_1) \ldots\ldots$, and thence

$$\begin{aligned} x &= x_1 + (x - x_1), \\ y &= y_1 + (y - y_1), \\ \cdot \quad \cdot \quad \cdot \quad \cdot & \end{aligned}$$

Therefore the application of that method may be confined to the equations (5 *c*) alone.

But by what has already been said, $(x - x_1)$, $(y - y_1) \ldots\ldots$, and e, are quantities sufficiently well expressed by the series (2), from which we readily infer that there can be no appreciable advantage in giving to $(m - m_1)$ or to the products $a\,(x - x_1)$, $b\,(y - y_1)$, &c., or to the factors a, b, &c., any higher exactness of expression. Hence the proposition (2) may be extended to every term and factor of the equations (5 *c*), and therefore to all the numerical processes peculiar to, and characteristic of, the method of least squares.

This extreme application cannot, however, be recommended even on the ground of convenience or simplicity; on the contrary, the indiscriminate use of the fractional terms of the series would often be highly inconvenient; and a form of solution like that just indicated would not always be desirable.

In considering the different sources of error from which ε and ε_1 acquire their value, it will be convenient to compare the increase given to ε by the introduction of small intentional inaccuracies, in consequence of which ε becomes ε_1, either with ε itself or with $\varepsilon - \eta$, by means of the following relations derived from (4):—

(6.) $$\frac{\varepsilon_1 - \varepsilon}{\varepsilon} < \frac{1}{2}\left(\frac{\eta''}{\varepsilon}\right)^2, \qquad \frac{\varepsilon_1 - \varepsilon}{\varepsilon - \eta} < \left(\frac{\eta''}{\eta'}\right)^2.$$

Used in connection with (3) and the limit defining the uncertainty of ε,

$$\varkappa > 0.477 \frac{\varepsilon}{\sqrt{n-n'}}, \text{ or usually } \varkappa > \frac{1}{21}\varepsilon.$$

ε_1 will thus be comprised between the limits $\varepsilon + k\varkappa$ and $\varepsilon - k\varkappa$, when η'' has such a value that

$$\left(\frac{\eta''}{\varepsilon}\right)^4 < \frac{9}{10}\frac{k^2}{n-n'}.$$

The relative accuracy of x and x_1 will now be investigated for some special examples of deviation from a strict compliance with the method of least squares.

Let the equations proposed for solution be the following: —

$$\begin{aligned} &a\,\mathrm{x} + b\,\mathrm{y} + \ldots\ldots\ldots + m = \mathrm{c}, \quad \text{weight} = w, \\ &a'\,\mathrm{x}' + b'\,\mathrm{y} + \ldots\ldots\ldots + m' = \mathrm{c}', \quad \text{“} \quad = w', \\ &\quad\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \end{aligned} \tag{7.}$$

where c is the difference between the observed and computed value of m; m being the element derived from observation.

In solving these by least squares, the final equation for x is formed by taking the sum of all the equations after multiplying the first by $a\,w$, the second by $a'\,w'$, and so on, and then making

$$a\,w\,e + a'\,w'\,e' + \ldots\ldots\ldots = 0,$$

and for y

$$b\,w\,e + b'\,w'\,e' + \ldots\ldots\ldots = 0,$$

continuing in succession to form new equations until a final equation is obtained for each unknown quantity.

We shall compare the results of two solutions of the above equations (7), *in one of which* (I.) *the factors* $a\,w$, $a'\,w'$ ..... *conform strictly to the method of least squares. In the other* (II.), *these factors are replaced respectively by* α, α' .....; α *being that one of the numbers* 0, 1, 2.....9, *or of the fractions* $\frac{1}{2}$, $\frac{1}{3}$ ..... $\frac{1}{9}$, *or of their products by an integral power of* 10, *which approaches most nearly to a given ratio with* $a\,w$, *and* α' *that which approaches most nearly to the same ratio with* $a'\,w'$, *&c. In a similar manner,* β, γ ..... *are used in the place of* $b\,w$, $c\,w$ .....

The true values of x and y..... we will indicate by x_0, y_0..... Those deduced by (I.) will be denoted by x, y ....., and those deduced by (II.) will be denoted by x_1, y_1..... For the final equation for x, we make

$$a\,w\,e + a'\,w'\,e' + \ldots\ldots\ldots = 0.$$

For the final equation for x_1

$$\alpha e_1 + \alpha' e_1' + \ldots\ldots\ldots = 0.$$

For the corresponding final equations for x_0, which must be rigorous, we make either

$$a w e_0 + a' w' e'_0 + \ldots\ldots\ldots = a w e_0 + a' w' e'_0 + \ldots\ldots\ldots$$

or

$$\alpha e_0 \quad + \alpha' e'_0 \quad + \ldots\ldots\ldots = \alpha e_0 \quad + \alpha' e'_0 \quad + \ldots\ldots\ldots$$

according as the first (I.) or the second (II.) form of combination is adopted.

e_0, e, and e_1 are the values of e when the indeterminates x_0, $y_0 \ldots\ldots$, x, $y \ldots\ldots$, x_1, $y_1 \ldots\ldots$, &c., replace x, y ..... in (7).

The final equations for the combination (I.) are: —

$$\begin{aligned} P\,x + P'\,y + P''\,z + \ldots\ldots\ldots + L &= 0, \\ P'\,x + Q\,y + Q'\,z + \ldots\ldots\ldots + M &= 0, \\ P''\,x + Q'\,y + Q''\,z + \ldots\ldots\ldots + N &= 0, \\ \ldots\ldots\ldots\ldots & \end{aligned} \tag{8.}$$

$$\begin{aligned} &P = w\,a\,a + w'\,a'\,a' + \ldots\ldots, \quad &&Q = w\,b\,b + w'\,b'\,b' + \ldots\ldots, \quad &&R = w\,c\,c + w'\,c'\,c' + \ldots\ldots \\ &P' = w\,a\,b + w'\,a'\,b' + \ldots\ldots, \quad &&Q' = w\,b\,c + w'\,b'\,c' + \ldots\ldots, \quad &&R' = w\,c\,d + w'\,c'\,d' + \ldots\ldots \\ &\ldots\ldots\ldots && \ldots\ldots\ldots && \ldots\ldots\ldots \end{aligned} \tag{9.}$$

From the conditions I. and II. applied to the original equations (7), if we make

$$\begin{aligned} &A\,\alpha = a\,w + \delta\,\alpha, \quad &&B\,\beta = b\,w + \delta\,\beta\,, \quad &&C\,\gamma = c\,w + \delta\,\gamma\,, \ldots\ldots\ldots \\ &A\,\alpha' = a'\,w' + \delta\,\alpha'\,, \quad &&B\,\beta' = b'\,w' + \delta\,\beta'\,, \quad &&C\,\gamma' = c'\,w' + \delta\,\gamma'\,, \ldots\ldots\ldots \\ &\ldots\ldots && \ldots\ldots && \ldots\ldots \end{aligned}$$

may be obtained

$$P\,(x - x_1) + P'\,(y - y_1) + \ldots\ldots\ldots + L + P\,x_1 + P'\,y_1 + \ldots\ldots\ldots = 0$$

$$L + P\,x_1 + P'\,y'_1 + \ldots\ldots\ldots = - e_1\,\delta\,\alpha - e'_1\,\delta\,\alpha' - \ldots\ldots\ldots$$

Hence,

$$\begin{aligned} P\;(x - x_1) + P'\;(y - y_1) + \ldots\ldots\ldots &= \delta\,\alpha\,e_1 + \delta\,\alpha'\,e'_1 + \ldots\ldots\ldots \\ P'\,(x - x_1) + Q\;(y - y_1) + \ldots\ldots\ldots &= \delta\,\beta\,e_1 + \delta\,\beta'\,e'_1 + \ldots\ldots\ldots \\ \ldots\ldots\ldots\ldots & \end{aligned} \tag{10.}$$

And in a similar manner,

$$\begin{aligned} P\;(x_0 - x) + P'\,(y_0 - y) + \ldots\ldots\ldots &= a\,w\,e_0 + a'\,w'\,e'_0 + \ldots\ldots\ldots \\ P'\,(x_0 - x) + Q\;(y_0 - y) + \ldots\ldots\ldots &= b\,w\,e_0 + b'\,w'\,e'_0 + \ldots\ldots\ldots \\ \ldots\ldots\ldots\ldots & \end{aligned} \tag{11.}$$

Since ε is the probable value of $x_0 - x$, and η'' the probable value of $(x - x_1)$, to ob-

tain the ratio $\frac{\eta''}{\varepsilon}$, we will compare the probable values of $x_0 - x$ and $x - x_1$, having, as above,

(12.) $$\frac{\eta''}{\varepsilon} = \frac{\text{Probable value of } (x - x_1)}{\text{Probable value of } (x_0 - x)}.$$

$x_0 - x$ and $x - x_1$ must be derived from a solution of equations (10) and (11), but since (II.) differs from (I.) by small variations only, we have, very nearly,

(13.) $$w e_1^2 + w' e_1'^2 + \ldots\ldots\ldots = w e^2 + w' e'^2 + \ldots\ldots\ldots$$

For the second member of (13) is a minimum relatively to the mode of solution, and, as has already been shown, (1), it differs from the first member by small terms of the second order only, those of the first order vanishing with the first differential coefficient of $\Omega = w e^2 + w' e'^2 + \ldots\ldots$

If, then, μ_0, μ, and μ_1 represent the probable values of e_0, e, and e_1 corresponding to the unit of weight of the equations (7), we may assume, for the purpose of determining $x - x_1$, that $\mu - \mu_1$ is a small quantity compared with μ, since we have

$$\frac{\mu^2}{\mu_1^2} = \frac{w e^2 + w' e'^2 + \ldots\ldots\ldots}{w e_1^2 + w' e_1'^2 + \ldots\ldots\ldots} = 1, \text{ very nearly.}$$

Moreover, in the absence of exact knowledge of the magnitude of the errors of e_0, $e'_0, \ldots\ldots$, it is necessary to admit that they are best represented by the errors $e, e', \ldots\ldots$; hence we have $\frac{\mu}{\mu_0} = 1$, and consequently $\frac{\mu_1}{\mu_0} = 1$, very nearly.

The conditions of the solution (II.) give for the probable value of either of the ratios $\frac{\delta\alpha}{aw}, \frac{\delta\beta}{bw}, \ldots\ldots, \frac{\delta\alpha'}{a'w'}, \frac{\delta\beta'}{b'w'} \ldots\ldots$

(14.) $$\frac{\delta\alpha}{aw} = g, \quad \frac{\delta\beta}{bw} = g, \ldots\ldots\ldots \frac{\delta\alpha'}{a'w'} = g, \quad \frac{\delta\beta'}{b'w'} = g, \ldots\ldots\ldots$$

Because α being by (II.) nearly proportional to aw, the probable value of $\delta\alpha$ will also be proportional to aw; and a similar remark applies equally to $\delta\beta$, $\delta\gamma$, &c.

The probable values of the second numbers of (10) and (11) are then, respectively,

$$\begin{aligned} \delta\alpha e_1 + \delta\alpha' e_1' + \ldots\ldots\ldots &= g\mu_1\sqrt{P}, & aw e_0 + a'w' e_0' + \ldots\ldots\ldots &= \mu_0\sqrt{P}, \\ \delta\beta e_1 + \delta\beta' e_1' + \ldots\ldots\ldots &= g\mu_1\sqrt{Q}, & bw e_0 + b'w' e_0' + \ldots\ldots\ldots &= \mu_0\sqrt{Q}, \\ \ldots\ldots\ldots & & \ldots\ldots\ldots & \end{aligned}$$

Hence, in consequence of the identity of the coefficients $P, P' \ldots\ldots, Q, Q' \ldots\ldots$, &c. in the two systems (10) and (11), we obtain

(15.) $$\frac{\text{Probable value of } (x - x_1)}{\text{Probable value of } (x_0 - x)} = \frac{\mu_1}{\mu_0} g = g\,; \qquad \frac{\text{Probable value of } (y - y_1)}{\text{Probable value of } (y_0 - y)} = \frac{\mu_1}{\mu_0} g = g \ldots\ldots$$

And from (12) the general expression

(16.) $$\frac{\eta''}{\varepsilon} = g.$$

Giving to g the value (3)

$$g < \frac{1}{25},$$

we shall have in the present case

$$\frac{\eta''}{\varepsilon} < \frac{1}{25},$$

and by (6)

$$\varepsilon_1 - \varepsilon < \frac{1}{1250}\,\varepsilon.$$

In other words, by using the form of solution (II.) in the place of a rigorous application of the method of least squares, the probable errors of the concluded results will not be increased by one one-thousandth part, — a difference entirely too small to be sensible. The two processes, as far as regards accuracy, therefore, may be considered as perfectly identical. On the other hand, the advantages of simplicity and convenience are altogether in favor of the second, in which all the operations of multiplication and division required in the construction of the final equations are reduced to their simplest arithmetical forms.

The necessity of distinguishing between the probable error of x_1, that is, the probable value of $(x_0 - x_1)$, and the difference between x_1 and x, or $(x_1 - x)$, deserves particular attention here. While x_1 will often differ very much from x, this fact taken by itself by no means indicates that the chances that x_1 is the true value are not sensibly as good as that x is. The discrepancy really proves that the original observations upon which the discussions have been based are so faulty, that very little confidence can be placed in either result, or in any other that can be deduced from the same data.

To give completeness to the investigation, we will compare the processes by which the probable errors of the values of the indeterminates in the two solutions (I.) and (II.) are obtained.

For the system (I.), let x, y, z, &c. be eliminated in succession from the equations (8), in the following manner.

Multiply the final equation for x by $\frac{P'}{P}$ and subtract it from the final equation for y, and again by $\frac{P''}{P}$ and subtract it from the final equation for z, forming the new equations, in which x does not enter: —

$$(Q - \frac{P'}{P} P') y + (Q' - \frac{P'}{P} P'') z + \ldots\ldots + M - \frac{P'}{P} L = 0,$$

(17.)
$$(Q' - \frac{P''}{P} P') y + (R - \frac{P''}{P} P'') z + \ldots\ldots + N - \frac{P''}{P} L = 0,$$

. . . . . .

to which we shall give the following notation:

$$Q_x\, y + Q'_x z + \ldots\ldots + M_x = 0,$$

(18.)
$$Q'_x y + R_x\, z + \ldots\ldots + N_x = 0,$$

. . . . . .

Let y be eliminated from these new equations (18) in the same manner that x was from the equations (8), multiplying the first by $\frac{Q'_x}{Q_x}$ and subtracting it from the second, giving

$$(R_x - \frac{Q'_x}{Q_x} Q'_x) z + \ldots\ldots + N_x - \frac{Q'_x}{Q_x} M_x = 0,$$

with the corresponding notation,

(19.)
$$R_{xy} z + \ldots\ldots + N_{xy} = 0.$$

For a more complete illustration of the notation, we will collect in one view the equations obtained by the successive eliminations:

(20.)

(a)	$P\ x + P'\ y + P''\ z + \ldots\ldots + L = 0$	Final Equations.
(b)	$P'\ x + Q\ y + Q'\ z + \ldots\ldots + M = 0$	
(c)	$P''\ x + Q'\ y + R\ z + \ldots\ldots + N = 0$	
	. . . . .	
(b_x)	$Q_x\, y + Q'_x z + \ldots\ldots + M_x = 0$	Equations formed by eliminating x.
(c_x)	$Q'_x y + R_x\, z + \ldots\ldots + N_x = 0$	
	. . . . .	
(c_{xy})	$R_{xy} z + \ldots\ldots + N_{xy} = 0$	Equations formed by eliminating x and y.
	. . . . .	

Let μ be the probable error of one of the original equations of the unit of weight. The probable errors of the second members of the equations (20) will be,

(21.)

Probable error of the equation	(a)	$= \mu \sqrt{P}$
" " "	(b)	$= \mu \sqrt{Q}$
" " "	(c)	$= \mu \sqrt{R}$
. . . . .		
" " "	(b_x)	$= \mu \sqrt{Q_x}$
" " "	(c_x)	$= \mu \sqrt{R_x}$
. . . . .		
" " "	(c_{xy})	$= \mu \sqrt{R_{xy}}$
. . . . .		

When the final equations obtained by (II.) are solved in an analogous manner, and the notation is changed so as to indicate the coefficients of x_1, y_1, &c., P_1, P'_1, ... which replace P, P', &c., we have

$$\left.\begin{array}{lll} (a) & P_1 x_1 + P'_1 y_1 + P''_1 z_1 + \ldots\ldots\ldots + L_1 = 0 & \\ (b) & {}'Q_1 x_1 + Q_1 y_1 + Q'_1 z_1 + \ldots\ldots\ldots + M_1 = 0 & \text{Final} \\ (c) & {}''R_1 x_1 + {}'R_1 y_1 + R_1 z_1 + \ldots\ldots\ldots + N_1 = 0 & \text{Equations.} \\ & \ldots\ldots\ldots\ldots\ldots & \end{array}\right\}$$

(22.)

$$\left.\begin{array}{lll} (b_x) & Q_{1x} y_1 + Q'_{1x} z_1 + \ldots\ldots\ldots + M_{1x} = 0 & \\ (c_x) & {}'R_{1x} y_1 + R_{1x} z_1 + \ldots\ldots\ldots + N_{1x} = 0 & \text{Equations formed by} \\ & \ldots\ldots\ldots\ldots\ldots & \text{eliminating } x_1. \end{array}\right\}$$

$$\left.\begin{array}{lll} (c_{xy}) & R_{1xy} z_1 + \ldots\ldots\ldots + N_{1xy} = 0 & \text{Equations formed by} \\ & \ldots\ldots\ldots\ldots & \text{eliminating } x_1 \text{ and } y_1. \end{array}\right\}$$

$$\text{Probable error of the equation (22) } (a) = (1 \pm \tfrac{1}{2} g)\, \mu \sqrt{\frac{P_1}{A}},$$

$$\text{“ “ “ } (b) = (1 \pm \tfrac{1}{2} g)\, \mu \sqrt{\frac{Q_1}{B}},$$

$$\text{“ “ “ } (c) = (1 \pm \tfrac{1}{2} g)\, \mu \sqrt{\frac{R_1}{C}},$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

(23.)

$$\text{“ “ “ } (b_x) = (1 \pm \tfrac{1}{2} g)\, \mu \sqrt{\frac{Q_{1x}}{B}},$$

$$\text{“ “ “ } (c_x) = (1 \pm \tfrac{1}{2} g)\, \mu \sqrt{\frac{R_{1x}}{C}},$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

$$\text{“ “ “ } (c_{xy}) = (1 \pm \tfrac{1}{2} g)\, \mu \sqrt{\frac{R_{1xy}}{C}},$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

To demonstrate these results, (23), it is to be observed that the probable errors of the second members of the equations (22), (a), (b_x), ... are the probable sums of the second members of the equations

$$P_1 (x_0 - x_1) + P'_1 (y_0 - y_1) + \ldots\ldots\ldots = \alpha e_0 + \alpha' e'_0 + \ldots\ldots\ldots$$

$$Q_{1x} (y_0 - y_1) + \ldots\ldots\ldots = (\beta - \frac{{}'Q_1}{P_1} \alpha) e_0 + (\beta' - \frac{{}'Q_1}{P_1} \alpha') e'_0 + \ldots\ldots\ldots$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

The probable value of $\alpha^2 e_0^2$ is, by (13) and (14),

$$\alpha^2 e_0^2 = \frac{A\,\alpha}{A} \alpha e_0^2 = w e_0^2 \left(1 + \frac{\delta \alpha}{\alpha w}\right) \frac{\alpha \alpha}{A} = \mu^2 (1 \pm g) \frac{\alpha \alpha}{A},$$

and the probable value of the sum of the terms $\alpha e_0 + \alpha' e'_0 + \ldots\ldots$ is

$$\alpha e_0 + \alpha' e'_0 + \ldots\ldots = \frac{\mu}{\sqrt{A}} \sqrt{(1 \pm g)} \sqrt{\alpha a + \alpha' a' + \ldots\ldots} = \mu (1 \pm \tfrac{1}{2} g) \sqrt{\frac{P_1}{A}},$$

which is the probable error of the equation (22), (a).

Again, since

$$A\alpha = a w \left(1 + \frac{\delta \alpha}{a w}\right), \qquad B\beta = b w \left(1 + \frac{\delta \beta}{b w}\right),$$

and

$$P_1 = \alpha a + \alpha' a' + \ldots\ldots, \qquad Q_1 = \beta b + \beta' b' + \ldots\ldots$$
$$P'_1 = \alpha b + \alpha' b' + \ldots\ldots, \qquad {}'Q_1 = \beta a + \beta' a' + \ldots\ldots$$

$$\left(\beta - \frac{{}'Q_1}{P_1}\alpha\right)^2 e_0^2 = \frac{w e_0^2}{B}\left(1 + \frac{\delta \beta}{b w}\right)\left(\beta b - \frac{{}'Q_1}{P_1}\alpha b\right) + \frac{w e_0^2}{A}\left(1 + \frac{\delta \alpha}{a w}\right)\left(\frac{{}'Q_1^2}{P_1^2}\alpha a - \frac{{}'Q_1}{P_1}\beta \alpha\right);$$

or, substituting the probable values

$$e_0 \sqrt{w} = \mu, \text{ and } \left(1 + \frac{\delta \alpha}{a w}\right) = \left(1 + \frac{\delta \beta}{b w}\right) = (1 \pm g),$$

we have

$$\left(\beta - \frac{{}'Q_1}{P_1}\alpha\right)^2 e_0^2 = \mu^2 (1 \pm g)\left[\frac{1}{B}\left(\beta b - \frac{{}'Q_1}{P_1}\alpha b\right) + \frac{1}{A}\left(\frac{{}'Q_1^2}{P_1^2}\alpha a - \frac{{}'Q_1}{P_1}\beta a\right)\right].$$

Moreover,

$$\text{The sum of all the terms } \left(\frac{{}'Q_1^2}{P_1^2}\alpha a - \frac{{}'Q_1}{P_1}\beta a\right) = \left(\frac{{}'Q_1^2}{P_1^2}P_1 - \frac{{}'Q_1}{P_1}{}'Q_1\right) = 0,$$
$$\text{“ “ “ } \left(\beta b - \frac{{}'Q_1}{P_1}\alpha b\right) = \left(Q_1 - \frac{{}'Q_1}{P_1}P'_1\right) = Q_{1x}.$$

Therefore the probable sum of the terms

$$(\beta - \frac{{}'Q_1}{P_1}\alpha) e_0 + (\beta' - \frac{{}'Q_1}{P_1}\alpha') e'_0 + \ldots\ldots$$

will be

$$\mu \sqrt{1 \pm g} \sqrt{\frac{Q_{1x}}{B}} = \mu (1 \pm \tfrac{1}{2} g) \sqrt{\frac{Q_{1x}}{B}},$$

which is the probable error of the equation (22), (b_x).

The other probable errors in (23) are readily supplied by analogy.

If we neglect $\frac{1}{2} g$, of which the probable value is less than $\frac{1}{50}$, the probable errors of (22), (a), (b_x) ..... become

$$\text{Probable error of equation (22) } (a) = \mu \sqrt{\frac{P_1}{A}}, \qquad \text{Probable error of equation (22) } (b_x) = \mu \sqrt{\frac{Q_{1x}}{B}}.$$

. . . . . .

We shall now proceed to explain a third form of solution, (III.).

Returning to the equations (10),

$$(24.)\quad \begin{aligned} P\,(x-x_1)+P'\,(y-y_1)+\ldots\ldots\ldots &= e_1\,\delta\,\alpha+e'_1\,\delta\,\alpha'+\ldots\ldots\ldots \\ P'\,(x-x_1)+Q\,(y-y_1)+\ldots\ldots\ldots &= e_1\,\delta\,\beta+e'_1\,\delta\,\beta'+\ldots\ldots\ldots \\ \ldots\ldots\ldots\ldots\ldots\ldots \end{aligned}$$

we find, for the probable values of their second numbers,

$$(25.)\quad \begin{aligned} g\,\mu\sqrt{w\,a\,a+w'\,a'\,a'+\ldots\ldots\ldots} &= g\,\mu\sqrt{P}, \\ g\,\mu\sqrt{w\,b\,b+w'\,b'\,b'+\ldots\ldots\ldots} &= g\,\mu\sqrt{Q}, \\ \ldots\ldots\ldots\ldots\ldots \end{aligned}$$

It is evident that the probable sum $e_1\,\delta\,\alpha+e'_1\,\delta\,\alpha'+\ldots\ldots$, being proportional to the square root of the sum of the squares of the individual terms, depends mainly upon the large terms; or, since $e_1\,\delta\,\alpha=e_1\sqrt{w}\frac{\delta\,\alpha}{\sqrt{w}}$ and $e_1\sqrt{w}=\mu$, this sum will be

$$\mu\sqrt{\frac{\delta\,\alpha^2}{w}+\frac{\delta\,\alpha'^2}{w'}+\ldots\ldots\ldots}$$

If any two or more of the coefficients $\frac{\delta\,\alpha}{\sqrt{w}}$, as, for instance, $\frac{\delta\,\alpha}{\sqrt{w}}$ and $\frac{\delta\,\alpha'}{\sqrt{w'}}$, were equal, any small change increasing the former and diminishing the latter by equal amounts would not alter the coefficient of μ; but if $\frac{\delta\,\alpha'}{\sqrt{w'}}$ were much smaller than $\frac{\delta\,\alpha}{\sqrt{w}}$, we should have, very nearly,

$$\frac{\delta\,\alpha^2}{w}+\frac{\delta\,\alpha'^2}{w}=\frac{\delta\,\alpha^2}{w},$$

and a small change in $\frac{\delta\,\alpha'}{\sqrt{w'}}$ would affect the coefficient of μ by an amount insensible compared with the effect of an equal change in $\frac{\delta\,\alpha}{\sqrt{w}}$.

Let (P) represent the sum of a certain number of the largest of the terms composing the series

$$P=w\,a\,a+w'\,a'\,a'+\ldots\ldots\ldots$$

and (p) the sum of a number of the smallest of the terms of the same series. Let also $(\delta\,P)$ be the sum of the terms $\frac{\delta\,\alpha^2}{w}$ corresponding to the series (P), and $(\delta\,p)$ the sum of the terms $\frac{\delta\,\alpha^2}{w}$, corresponding to the series (p).

Then we have the probable values

$$(26.)\quad \begin{aligned} &\text{For the large terms, } (\delta\,P)=g^2\,(P), \\ &\text{For the small terms, } (\delta\,p)\;=g^2\,(p), \end{aligned}$$

g representing the general probable value of $\frac{\delta\,\alpha}{a\,w}$ for all the terms, whether of large, small, or medium value.

Let us suppose the mode of solution (II.) to be itself varied by changing the factors α, α', &c., corresponding to the large and small terms, so that for the large terms, g, or the probable value of $\frac{\delta\alpha}{a\,w}$, $\frac{\delta\alpha'}{a'\,w'}$, ..., for these particular terms, becomes

$$g = H,$$

and for the small terms,

$$g = h.$$

We shall then have the probable values,

(27.)
$$\begin{aligned} &\text{For the large terms } (\delta P_1) = H^2\,(P), \\ &\text{For the small terms } (\delta p_1) = h^2\ (p). \end{aligned}$$

(δP) and (δp) becoming (δP_1) and (δp_1) when g becomes H and h.

In order that the probable sum of the second member of the equation,

$$P\,(x - x_1) + P'\,(y - y_1) + \ldots\ldots\ldots = e_1\,\delta\alpha + e'_1\,\delta\alpha' + \ldots\ldots\ldots$$

should not be increased by the proposed changes of $\delta\alpha$, we must have

or, by (26) and (27),
$$\begin{aligned} &(\delta P) + (\delta p) > (\delta P_1) + (\delta p_1), \\ &H^2\,(P) + h^2\,(p) < g^2\,(P) + g^2\,(p). \end{aligned}$$

We shall assume, for the terms corresponding to (p), that the probable value of h is

$$h = -1.$$

This condition involves only small changes in the factors α, α' ....., because, for the terms corresponding to (p), $a\,w$ being small, $\delta\alpha = a\,w\,h = -a\,w$, will also be small; we then have

$$H^2\,(P) < g^2\,(P) + (g^2 - 1)\,(p),$$

or, since we can put $g^2 - 1 = -1$ very nearly, g being small compared with unity, we obtain

(28.)
$$g^2 - H^2 > \frac{(p)}{(P)}, \qquad H^2 < g^2 - \frac{(p)}{(P)},$$

representing the condition to be observed in order that the second members of (24) should not be increased by the changes made in the large and small values of α.

This, it will be remembered, can be applied only when the condition $h = -1$ involves only small changes in the factors α, α' ..... of the order of the mean value of $\delta\alpha$ for all the factors. $\frac{(p)}{(P)}$ being necessarily a positive quantity, H must always be less than g.

(28) may easily be extended to the analogous cases of the second members of the equations

$$P'(x-x_1)+Q(y-y_1)+\ldots\ldots=e_1\delta\beta+e'_1\delta\beta'+\ldots\ldots$$
$$P''(x-x_1)+Q'(y-y_1)+\ldots\ldots=e_1\delta\gamma+e'_1\delta\gamma'+\ldots\ldots$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

so that

$$(29.)\qquad g^2-H^2>\frac{(q)}{(Q)},\qquad g^2-H^2>\frac{(r)}{(R)},\qquad \ldots\ldots$$

give the limits within which the proposed changes of the factors $\beta, \beta' \ldots\ldots \gamma, \gamma' \ldots\ldots$ will not increase the probable sums $e_1\delta\beta+e'_1\delta\beta'+\ldots\ldots$ and $e_1\delta\gamma+e'_1\delta\gamma'+\ldots\ldots$

For the factors $\alpha, \alpha' \ldots\ldots, \beta, \beta' \ldots\ldots$ corresponding to the equations most important in their influence upon the final determination of $x, y \ldots\ldots$ respectively, if we use numbers chosen from a series for which $\frac{N-N'}{N}$ is only $\frac{1}{10}$ as large as it is for the series (2), we shall have

$$H=\frac{1}{10}g.$$

And if at the same time we omit altogether a certain number of the unfavorable equations by making in these instances $\alpha=0, \beta=0 \ldots\ldots$, that is, $\delta\alpha=-aw$, $\delta\beta=-bw$, or $h=-1$, we find

$$g^2-H^2=\frac{1}{631}.$$

We shall therefore keep within the limits (28) and (29) as long as the coefficients in the omitted equations satisfy the conditions

$$\frac{(p)}{(P)}<\frac{1}{631},\qquad \frac{(q)}{(Q)}<\frac{1}{631},\qquad \ldots\ldots$$

The probable values of $x-x_1, y-y_1$, will not have been increased, and consequently the solution may be accepted as equivalent to II.

A general method, III., of adjusting the degree of numerical accuracy which should be observed in the expression of the factors $\alpha, \alpha' \ldots\ldots, \beta, \beta' \ldots\ldots$, may be derived from the following considerations.

In II. the adjustment is evidently not so favorable as it might be, since the limit of the intentional inaccuracies $\delta\alpha, \delta\alpha' \ldots\ldots, \delta\beta, \delta\beta' \ldots\ldots$ has been fixed by the relations

$$\delta\alpha=awg,\qquad \delta\alpha'=a'w'g',\ldots\ldots\qquad \delta\beta=bwg,\qquad \delta\beta'=b'w'g',\ldots\ldots$$

g having the same average value whether $aw, bw \ldots\ldots$ be large or small; thus the

largest inaccuracies are committed when $a\,w$, $b\,w$ ..... are largest, that is, when the equation has most influence upon the final result for any particular indeterminate.

In order to secure a more advantageous distribution, it will be necessary to recur again to the equations (10). It appears that, for a given limit of inaccuracy in the expression of the factors, the probable values of $x - x_1$, $y - y_1$ ..... will be least when the separate terms of the second members of these equations, irrespective of their signs, are equal to each other, or

$$e_1\,\delta\alpha = e'_1\,\delta\alpha' = \ldots\ldots\ldots \qquad e_1\,\delta\beta = e'_1\,\delta\beta' = \ldots\ldots\ldots$$

$\delta\alpha$, $\delta\beta$ ..... ought therefore to be inversely proportional to the probable errors of the primitive equations, or directly as the square roots of their weights.

We shall, then, define III. by the relations

$$\begin{aligned} \delta\alpha &= \mathbf{A}\,g\sqrt{w}, & \delta\beta &= \mathbf{B}\,g\sqrt{w}, & \ldots\ldots\ldots \\ \delta\alpha' &= \mathbf{A}\,g\sqrt{w'}, & \delta\beta' &= \mathbf{B}\,g\sqrt{w'}, & \ldots\ldots\ldots \\ &\ldots\ldots & &\ldots\ldots & \end{aligned} \tag{30.}$$

A, **B** ..... *and g being constant quantities.*

To secure the equivalency of II. and III., the values of **A**, **B** ..... must depend on the condition that the probable values of the second members of (10) should remain unchanged, or

$$\begin{aligned} g\,\mu\sqrt{\mathbf{A}^2 + \mathbf{A}^2 + \ldots\ldots\ldots} &= g\,\mu\sqrt{P}, & g\,\mu\sqrt{\mathbf{B}^2 + \mathbf{B}^2 + \ldots\ldots\ldots} &= g\,\mu\sqrt{Q}, & \ldots\ldots\ldots \\ \mathbf{A}\sqrt{n} &= \sqrt{P}, & \mathbf{B}\sqrt{n} &= \sqrt{Q}, & \ldots\ldots\ldots \end{aligned}$$

Hence it is easy to conclude, that, if we make in (30)

$$\mathbf{A} = \text{mean value of } a\sqrt{w}, \qquad \mathbf{B} = \text{mean value of } b\sqrt{w}, \quad \ldots\ldots\ldots$$

the means being in every instance taken without regard to signs, the probable values of $x - x_1$, $y - y_1$ ..... will be smaller in III. than in II., while III. in point of facility has a decided advantage over II.; since by making $\alpha = 0$, $\beta = 0$ ..... in all cases in which $a\sqrt{w} < \mathbf{A}\,g$, $b\sqrt{w} < \mathbf{B}\,g$, ..., a considerable amount of unnecessary computation may often be avoided.

The following will then be the limits of intentional numerical inaccuracies allowed in the expression of the factors α, α' ....., β, β' ..... in the three methods.

I.	II.	III.
$\delta\alpha = 0, \delta\beta = 0$	$\delta\alpha = a\,w\,g, \delta\beta = b\,w\,g$	$\delta\alpha = \mathbf{A}\,g\sqrt{w}, \delta\beta = \mathbf{B}\,g\sqrt{w}$ .....
$\delta\alpha' = 0, \delta\beta' = 0$	$\delta\alpha' = a'\,w'\,g, \delta\beta' = b'\,w'\,g$	$\delta\alpha' = \mathbf{A}\,g\sqrt{w'}, \delta\beta' = \mathbf{B}\,g\sqrt{w'}$ .....
.....	.....	.....

The following tests of the correctness of all the numbers entering into the final equations will be found useful. They apply equally to the three methods.

Let the sums $\mathbf{S}, \mathbf{S}' \ldots\ldots, \Sigma, \Sigma' \ldots\ldots$ be formed as follows: —

$$(31.)\qquad \begin{array}{ll} a + b + \ldots\ldots\ldots + m = \mathbf{S}, & \alpha + \beta + \gamma + \ldots\ldots\ldots = \Sigma, \\ a' + b' + \ldots\ldots\ldots + m' = \mathbf{S}', & \alpha' + \beta' + \gamma' + \ldots\ldots\ldots = \Sigma', \\ \quad . \quad . \quad . \quad . \quad . \quad . & \quad . \quad . \quad . \quad . \quad . \quad . \quad . \end{array}$$

We shall then have the following test controlling at once all the computed quantities, $P_1, P'_1 \ldots\ldots, {}'Q_1, Q_1 \ldots\ldots, L_1, M_1 \ldots\ldots$

$$\Sigma\,(P_1, Q_1, R_1 \ldots\ldots\ldots L_1, M_1, N_1 \ldots\ldots\ldots) = \Sigma\,(\mathbf{S}\,\Sigma).$$

For we have

$$(32.)\qquad \begin{array}{rl} P_1 + P'_1 + \ldots\ldots\ldots + L_1 = & \left.\begin{array}{l} \alpha\ a + \alpha\ b + \ldots\ldots\ldots \\ + \alpha'\ a' + \alpha'\ b' + \ldots\ldots\ldots \\ + \quad . \quad . \quad . \quad . \quad . \end{array}\right\} = \mathbf{S}\,\alpha + \mathbf{S}'\,\alpha' + \ldots\ldots\ldots \\ {}'Q_1 + Q_1 + \ldots\ldots\ldots + M_1 = & \left.\begin{array}{l} \beta\ a + \beta\ b + \ldots\ldots\ldots \\ + \beta'\ a' + \beta'\ b' + \ldots\ldots\ldots \\ + \quad . \quad . \quad . \quad . \quad . \end{array}\right\} = \mathbf{S}\,\beta + \mathbf{S}'\,\beta' + \ldots\ldots\ldots \\ {}''R_1 + {}'R_1 + \ldots\ldots\ldots + N_1 = & \left.\begin{array}{l} \gamma\ a + \gamma\ b + \ldots\ldots\ldots \\ + \gamma'\ a' + \gamma'\ b' + \ldots\ldots\ldots \\ + \quad . \quad . \quad . \quad . \quad . \end{array}\right\} = \mathbf{S}\,\gamma + \mathbf{S}'\,\gamma' + \ldots\ldots\ldots \\ \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . & \end{array}$$

The sum of all the equations (32) is

$$(P_1 + P'_1 + \ldots\ldots\ldots + L_1) + ({}'Q_1 + Q_1 + \ldots\ldots\ldots + M_1) + \ldots\ldots\ldots = \mathbf{S}\,\Sigma + \mathbf{S}'\,\Sigma' + \ldots\ldots\ldots$$

or

$$(33.)\qquad \Sigma\,(P_1, Q_1, R_1 \ldots\ldots\ldots L_1, M_1, N_1 \ldots\ldots\ldots) = \Sigma\,(\mathbf{S}\,\Sigma).$$

When this is not fulfilled, the particular equation at fault may be detected by using the partial tests,

$$(34.)\qquad \begin{array}{l} P_1 + P'_1 + \ldots\ldots\ldots L_1 = \mathbf{S}\,\alpha + \mathbf{S}'\,\alpha' + \ldots\ldots\ldots \\ {}'Q_1 + Q_1 + \ldots\ldots\ldots M_1 = \mathbf{S}\,\beta + \mathbf{S}'\,\beta' + \ldots\ldots\ldots \\ \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \end{array}$$

If all the numbers are not carried out to the same number of figures beyond the decimal point, it will be advisable, in order to apply the test to the best effect, to alter arbitrarily the decimal point, making, for the time being, the number of figures to the right hand of it the same in all the equations.

The successive stages in the computations by (II.) and (III.) will be as follows: —

a) To assign the values of the equivalent factors $\alpha, \beta \ldots\ldots$, which can readily be done by simple inspection. The factors once adopted must be used rigorously in multiplying every term of the equations to which they belong.

b) After the multiplications have been performed, and the sums taken, the numbers adopted in the final equations are to be tested by (33).

c) The solution of the final equations.

d) The determination of weights.

If changes have been made in the decimal pointing, or otherwise, by introducing the constants $A, B \ldots\ldots$, it must be remembered that, although the final equations thus formed will give the same values of x_1, y_1, &c. that would have been obtained if no such alteration had been made, the determination of the weights and probable errors of x_1, y_1, &c. requires that the correct pointing be restored in the coefficients, or else that the probable errors be computed in conformity with the formulæ (23).

When the number of indeterminates is considerable, it will be advisable, in solving the final equations, to eliminate x, y, z, &c., in succession, and then to repeat the operation, commencing the elimination in the reverse order, z, y, x, &c. One of the advantages of so doing is a complete check upon the work by the comparison of the value of that indeterminate which is obtained last by both eliminations. It is, however, mostly recommended from its facilitating the computation of the weights. In this case, the following formulæ may be used, if the number of indeterminates does not exceed six. Let these be x, y, z, ξ, η, ζ, and their weights, $W_{(x)}$, $W_{(y)}$, &c. The ordinary formulæ for computing the weights give

$$W_{(\zeta)} = U_{x\ y\ z\ \xi\ \eta}, \qquad W_{(x)} = P_{\zeta\ \eta\ \xi\ z\ y}. \tag{35.}$$

$W_{(\zeta)}$ is the coefficient of ζ in the equation resulting from the elimination of x, y, z, ξ, and η, by the process indicated in (18), (19), and (20), and $W_{(x)}$ the coefficient of x after ζ, η, ξ, z, and y have been eliminated. We have, also,

$$W_{(\eta)} = \frac{T_{x\ y\ z\ \xi}}{U_{x\ y\ z\ \zeta}} W_{(\zeta)}, \qquad W_{(y)} = \frac{Q_{\zeta\ \eta\ \xi\ z}}{P_{\zeta\ \eta\ \xi\ z}} W_{(x)}. \tag{36.}$$

The factors and divisors required in (36) will have been already computed during the eliminations which have preceded.

From the equations containing only ξ, η, ζ, the latter is to be eliminated; and from the equations containing z, y, and x, x is to be eliminated. We then have

$$W_{(\xi)} = \frac{S_{x\ y\ z\ \zeta}}{T_{x\ y\ z\ \zeta}} W_{(\eta)}, \qquad W_{(z)} = \frac{R_{\zeta\ \eta\ \xi\ x}}{Q_{\zeta\ \eta\ \xi\ x}} W_{(y)}.$$

For the weight of x_1, y_1, &c., when (II.) or (III.) is used, we shall have, from (23),

$$\begin{aligned} \text{Weight of } x_1 &= A\, W_{(x)}, \\ \text{“ } \quad y_1 &= B\, W_{(y)}, \\ &\ldots\ldots \end{aligned} \tag{37.}$$

The limits of effective accuracy appropriate to the numerical representation of the coefficients $a, b \ldots\ldots$ may be investigated in the following manner: —

If we determine $x_1, y_1 \ldots\ldots$ by the method of least squares from the equations,

$$(38.) \qquad (a - da)\,x_1 + (b - db)\,y_1 + \ldots\ldots\ldots + m - dm = e_1, \qquad \text{weight} = w,$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

we shall have from (8) and (38), if $da, db \ldots\ldots$, which may be employed to represent the errors of the adopted coefficients, are small,

$$(39.) \quad P(x_1 - x) + P'(y_1 - y) + \ldots\ldots = aw\left(\frac{da}{a}e + x\,da + y\,db + \ldots\ldots + dm\right) + \ldots\ldots$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

If μ' is the probable value of $dm\sqrt{w}$, the most suitable values of $x\,da$, $y\,db \ldots\ldots$ evidently fulfil the conditions

$$(40.) \quad x\,da\sqrt{w} = y\,db\sqrt{w} \ldots\ldots = dm\sqrt{w} = \mu', \qquad x\,da'\sqrt{w'} = y\,db'\sqrt{w'} \ldots\ldots = dm'\sqrt{w'} = \mu', \ldots\ldots$$

Observing that we may substitute in the second members of (39) the probable values $e < ax$, $e' < a'x \ldots\ldots$, $e < by$, $e' < b'y \ldots\ldots$, we may conclude, by comparing (39) with (11), (12), and (6), that, if μ' is less than the limit

$$(41.) \qquad \mu' = \frac{g'\mu}{\sqrt{n' + 2}},$$

n' denoting the number of indeterminates in (38), the difference $\varepsilon_1 - \varepsilon$ of the probable errors of $x_1, y_1 \ldots\ldots$ derived from (38) and of $x, y \ldots\ldots$ derived from (8) will be

$$(42.) \qquad \varepsilon_1 - \varepsilon < \frac{1}{2}g'^2\varepsilon.$$

Consequently, if $g' < \frac{1}{25}$, $\varepsilon_1 - \varepsilon$ will be less than $\frac{1}{1250}\varepsilon$ or less than in II.

When μ' is known, the limits for admissible values of $da, db \ldots\ldots$ in (38) will be

$$(43.) \quad da < \frac{\mu'}{x\sqrt{w}}, \; da' < \frac{\mu'}{x\sqrt{w'}} \ldots\ldots db = \frac{x}{y}da, \; db' = \frac{x}{y}da' \ldots\ldots dm = x\,da, \; dm' = x\,da' \ldots\ldots$$

If the mean values of ax, $by \ldots\ldots$, irrespective of their signs, are all of the same order of magnitude, we may substitute in (43) the *a priori* probable values

$$(44.) \qquad x < \frac{\mathbf{M}}{\mathbf{A}}\sqrt{\frac{n}{n + n' - 1}}, \qquad \frac{x}{y} = \frac{\mathbf{B}}{\mathbf{A}}, \quad \ldots\ldots\ldots$$

where n is the number of equations (38), n' the number of indeterminates, and, taking the means without regard to signs,

$$(45.) \quad \mathbf{A} = \text{mean value of } a\sqrt{w}, \quad \mathbf{B} = \text{mean value of } b\sqrt{w} \ldots\ldots\ldots \quad \mathbf{M} = \text{mean value of } m\sqrt{w}.$$

We will now proceed to compare the three methods of solution (I.), (II.), (III.), by applying them to the following series of equations of six indeterminates, taken from a memoir, by Gauss, on the elliptic elements of the orbit of the planet Pallas.*

Original Equations.†

$$
\begin{array}{rl}
1 & 0 = -183''.93 + 0.79363\,dL + 143.66\,d\gamma + 0.39493\,d\pi + 0.95920\,d\varphi - 0.18856\,d\Omega + 0.17387\,di \\
2 & 0 = -\ 6.81 - 0.02658\,dL + 46.71\,d\gamma + 0.02658\,d\pi - 0.20858\,d\varphi + 0.15946\,d\Omega + 1.25782\,di \\
3 & 0 = -\ 0.06 + 0.58880\,dL + 358.12\,d\gamma + 0.26208\,d\pi - 0.85234\,d\varphi + 0.14912\,d\Omega + 0.17775\,di \\
4 & 0 = -\ 3.09 + 0.01318\,dL + 28.39\,d\gamma - 0.01318\,d\pi - 0.07861\,d\varphi + 0.91704\,d\Omega + 0.54365\,di \\
5 & 0 = -\ 0.02 + 1.73436\,dL + 1846.17\,d\gamma - 0.54603\,d\pi - 2.05662\,d\varphi - 0.18833\,d\Omega - 0.17445\,di \\
6 & 0 = -\ 8.98 - 0.12606\,dL - 227.42\,d\gamma + 0.12606\,d\pi - 0.38939\,d\varphi + 0.17176\,d\Omega - 1.35441\,di \\
7 & 0 = -\ 2.31 + 0.99584\,dL + 1579.03\,d\gamma + 0.06456\,d\pi + 1.99545\,d\varphi - 0.06040\,d\Omega - 0.33750\,di \\
8 & 0 = +\ 2.47 - 0.08089\,dL - 67.22\,d\gamma + 0.08089\,d\pi - 0.09970\,d\varphi - 0.46359\,d\Omega + 1.22803\,di \\
9 & 0 = +\ 0.01 + 0.65311\,dL + 1329.09\,d\gamma + 0.38994\,d\pi - 0.08439\,d\varphi - 0.04305\,d\Omega + 0.34268\,di \\
9_a & 0 = +\ 38.12 - 0.00218\,dL + 38.47\,d\gamma + 0.00218\,d\pi - 0.18710\,d\varphi + 0.47301\,d\Omega - 1.14371\,di \\
10 & 0 = -317.73 + 0.69957\,dL + 1719.32\,d\gamma + 0.12913\,d\pi - 1.38787\,d\varphi + 0.17130\,d\Omega - 0.08360\,di \\
11 & 0 = +117.97 - 0.01315\,dL - 43.84\,d\gamma + 0.01315\,d\pi + 0.02929\,d\varphi + 1.02138\,d\Omega - 0.27187\,di
\end{array}
$$

The probable error of one of these equations is $\mu = \pm 90''$, the weights being equal, excepting for 9_a, which has been excluded from each of the solutions.

As an illustration of the mode of applying the limits (43), we will make in (41) and (42) $g' = \frac{1}{25}$, we shall then have

$$
\begin{array}{llllll}
\mu = \pm 90'', & n = 11, & \mathbf{A} = \pm 0.5, & \mathbf{M} = \pm 60'', & (x = dL) < \pm 100'', & da < \pm 0.013, \\
g' = \frac{1}{25}, & n' = 6, & \mathbf{B} = \pm 700, & \mu' = \pm 1''.3, & (y = d\gamma) < \pm 0''.07, & db < \pm 18.
\end{array}
$$

C, **D**, **E**, and **F**, being of the same order of magnitude with **A**, we may conclude from (42), (43), and the above values of da and db, that, if we reject in all the equations the two right-hand figures from the values of m, and the three right-hand figures from all the other numbers, writing, for instance, the first equation

$$0 = -184'' + 0.79\,dL + 140\,d\gamma + 0.39\,d\pi + 0.96\,d\varphi - 0.19\,d\Omega + 0.17\,di,$$

and the second

$$0 = -\ 7'' - 0.03\,dL + 50\,d\gamma + 0.03\,d\pi - 0.21\,d\varphi + 0.16\,d\Omega + 1.26\,di,$$

. . . . . .

the probable error of the value of either of the quantities of $dL, d\gamma \ldots\ldots$, when the equations thus written are solved by the method of least squares, will exceed the prob-

* *Disquisitio de Elementis Ellipticis Palladis.* Comment. Soc. Reg. Gottingensis Recent. Vol. I.

† The computations necessary for the solution of these equations have been executed by Messrs. J. F. Flagg and T. H. Safford, jr.

able error of the same quantity obtained with the employment of the exact coefficients by less than $\frac{1}{1250}$ of that error.

We shall, however, for the present confine our attention to a direct comparison between the results of the solutions I., II., and III., and retain in each the exact coefficients of the original equations, adopting the constants A, C, D, E, $F = 1.0$, and $B = 1000.0$, and for the factors $\alpha\,\beta$ ..... a somewhat ruder system of representation, especially in II., than that upon which the previous discussions have been based.

If we employ the limits (28), (29), we find that the most favorable equations are (1), (5), (7), and (10), and the least favorable (2), (4), (8), (11). Applying (III.) in the particular form to which it is limited in (28) and (29), we shall omit (2), (4), (8), and (11), as ineffective in the final equations for $d\,L$. (1), (5), (7), and (10) give

$$(P) = 1 \times 0.8^2 + 1 \times 1.7^2 + 1 \times 1.0^2 + 1 \times 0.7^2 = 5.0000,$$

and (2), (4), (8), and (11),

$$(p) = 1 \times 0.03^2 + 1 \times 0.01^2 + 1 \times 0.08^2 + 1 \times 0.01^2 = 0.0075.$$

$$\frac{(p)}{(P)} = \frac{1}{667}.$$

According to (28), we must have, in this case,

$$H < \frac{1}{100},$$

in order to preserve the equivalency of (II.) and (III.), if the original equations (2), (4), (8), and (11) are omitted in forming the final equation for $d\,L$. We may, then, adopt the following system of factors.

$d\,L$.

No. of Original Equation.	Factors in the Method of Least Squares. I.	Equivalent Factors. II.	Equivalent Factors. III.
1	+ 0.79363	+ 0.8	+ 0.8
2	— 0.02658	— 0.03	0.0
3	+ 0.58880	+ 0.6	+ 0.6
4	+ 0.01318	+ 0.01	0.0
5	+ 1.73436	+ 1.7	$+\left(2-\frac{1}{4}\right)$
6	— 0.12606	— 0.1	— 0.1
7	+ 0.99584	+ 1.0	+ 1.0
8	— 0.08089	— 0.08	0.0
9	+ 0.65311	+ 0.7	+ 0.7
10	+ 0.69957	+ 0.7	+ 0.7
11	— 0.01315	— 0.01	0.0

The mean value of $H = \frac{\delta \alpha}{a w}$ for the equations (1), (5), (7), and (10) is

$$H = \frac{1}{200} \text{ or } < \frac{1}{100},$$

as required by (28).

For the second indeterminate $d\gamma$, the favorable equations are (5), (7), (9), (10). The unfavorable ones are (2), (4), (8), and (11).

$$(Q) = 10600000, \qquad (q) = 9400,$$

$$\frac{(q)}{(Q)} = \frac{1}{1130}, \qquad H \text{ must be } < \frac{1}{37}.$$

$d\gamma$.

No. of Original Equation.	Factors in the Method of Least Squares. I.	Equivalent Factors. II.	Equivalent Factors. III.
1	+ 143.66	+ 0.1	+ 0.1
2	+ 46.71	+ 0.05	0.0
3	+ 358.12	+ 0.4	+ 0.4
4	+ 28.39	+ 0.03	0.0
5	+ 1846.17	+ 2.0	$+\left(2-\frac{1}{7}\right)$
6	− 227.42	− 0.2	− 0.2
7	+ 1579.03	+ 2.0	+ 1.6
8	− 67.22	− 0.07	0.0
9	+ 1329.09	+ 1.0	$+\left(1+\frac{1}{3}\right)$
10	+ 1719.32	+ 2.0	+ 1.7
11	− 43.84	− 0.04	0.0

The mean value of $H = \frac{\delta \beta}{b w}$ for the equations (5), (7), (9), (10), is

$$H = \frac{1}{125} \text{ or } < \frac{1}{37},$$

the limit given by (29).

For $d\pi$ the favorable equations are (1), (3), (5), (9); the unfavorable, (2), (4), (11).

$$\frac{(r)}{(R)} = \frac{1}{675}, \qquad H \text{ must be } < \frac{1}{92}.$$

$d\pi$.

No. of Original Equation.	Factors in the Method of Least Squares. I.	Equivalent Facters. II.	Equivalent Factors. III.
1	+ 0.39493	+ 4.0	+ 4.0
2	+ 0.02658	+ 0.3	0.0
3	+ 0.26208	+ 3.0	+ 2.6
4	— 0.01318	— 0.1	0.0
5	— 0.54603	— 5.0	— 5.5
6	+ 0.12606	+ 1.0	+ 1.0
7	+ 0.06456	+ 0.6	+ 0.6
8	+ 0.08089	+ 0.8	+ 1.0
9	+ 0.38994	+ 4.0	+ 4.0
10	+ 0.12913	+ 1.0	+ 1.0
11	+ 0.01315	+ 0.1	0.0

The mean value of H is $\frac{1}{80}$, which exceeds the limit $H < \frac{1}{92}$.

For $d\varphi$ the favorable equations are (1), (5), 7), (10); the unfavorable, (4), (8), (9), (11).

$$\frac{(s)}{(S)} = \frac{1}{465}.$$

The value of H is imaginary, or $< \sqrt{\frac{1}{631} - \frac{1}{465}}$.

The rejection of the unfavorable equations cannot in this instance be compensated for by increasing the accuracy of treatment of the favorable ones.

$d\varphi$.

No. of Original Equation.	Factors in the Method of Least Squares. I.	Equivalent Factors. II.	Equivalent Factors. III.
1	+ 0.95920	+ 1.0	$+\left(1-\frac{6}{100}\right)$
2	— 0.20858	— 0.2	— 0.2
3	— 0.85234	— 0.9	$-\left(1-\frac{1}{7}\right)$
4	— 0.07861	— 0.08	0.0
5	— 2.05662	— 2.0	— 2.0
6	— 0.38939	— 0.4	— 0.4
7	+ 1.99545	+ 2.0	+ 2.0
8	— 0.09970	— 0.1	0.0
9	— 0.08439	— 0.08	0.0
10	— 1.38787	— 1.0	$-\left(1+\frac{1}{3}\right)$
11	+ 0.02929	+ 0.03	0.0

The mean value of H is $\frac{1}{56}$; it should be as above < 0.

For $d\Omega$ the favorable equations are (4) and (11); the unfavorable ones, (7) and (9).

$$\frac{(t)}{(T)} = \frac{1}{344}.$$

H is again imaginary. In rejecting (7) and (9), we have passed the prescribed limits.

$d\Omega$.

No. of Original Equation.	Factors in the Method of Least Squares. I.	Equivalent Factors. II.	Equivalent Factors. III.
1	-0.18856	-0.2	-0.2
2	$+0.15946$	$+0.2$	$+\frac{1}{6}$
3	$+0.14912$	$+0.1$	$+\frac{1}{7}$
4	$+0.91704$	$+0.9$	$+(1-0.08)$
5	-0.18833	-0.2	-0.2
6	$+0.17176$	$+0.2$	$+\frac{1}{6}$
7	-0.06040	-0.1	0.0
8	-0.46359	-0.5	$-\frac{1}{2}$
9	-0.04305	-0.04	0.0
10	$+0.17130$	$+0.2$	$+\frac{1}{6}$
11	$+1.02138$	$+1.0$	$+(1+0.02)$

For di the favorable equations are (2), (6), (8), and the unfavorable (10).

$$\frac{(u)}{(U)} = \frac{1}{769}, \qquad H < \frac{1}{58}.$$

di.

No. of Original Equation.	Factors in the Method of Least Squares. I.	Equivalent Factors. II.	Equivalent Factors. III.
1	$+0.17387$	$+0.2$	$+\frac{1}{6}$
2	$+1.25782$	$+1.0$	$+\left(1+\frac{1}{4}\right)$
3	$+0.17775$	$+0.2$	$+\frac{1}{6}$
4	$+0.54365$	$+0.5$	$+\frac{1}{2}$
5	-0.17445	-0.2	$-\frac{1}{6}$
6	-1.35441	-1.0	$-\left(1+\frac{1}{3}\right)$
7	-0.33750	-0.3	$-\frac{1}{3}$
8	$+1.22803$	$+1.0$	$+\left(1+\frac{1}{4}\right)$
9	$+0.34268$	$+0.3$	$+\frac{1}{3}$
10	-0.08360	-0.08	0
11	-0.27187	-0.3	$-\frac{1}{4}$

The mean value of H is $\frac{1}{59}$, the computed limit being $H < \frac{1}{58}$.
Applying these factors to the original equations, we obtain, —

By the Method of Least Squares. I.

		Coef. of dL.	Coef. of $d\gamma$.	Coef. of $d\pi$.	Coef. of $d\varphi$.	Coef. of $d\Omega$.	Coef. of di.
$0 =$ —	371.09″ +	5.91569 +	7203.91 —	0.09344 —	2.28516 —	0.34664 —	0.18194
$0 =$ —	580104.00 +	7203.91 +	10834225.00 —	49.06 —	3229.77 —	198.64 —	143.05
$0 =$ —	113.45 —	0.09344 —	49.06 +	0.71917 +	1.13382 +	0.06400 +	0.26341
$0 =$ +	268.53 —	2.28516 —	3229.77 +	1.13382 +	12.00340 —	0.37137 —	0.11762
$0 =$ +	94.26 —	0.34664 —	198.64 +	0.06400 —	0.37137 +	2.28215 —	0.36136
$0 =$ —	31.81 —	0.18194 —	143.05 +	0.26341 —	0.11762 —	0.36136 +	5.62456

By the Equivalent Factors. II.

		Coef. of dL.	Coef. of $d\gamma$.	Coef. of $d\pi$.	Coef. of $d\varphi$.	Coef. of $d\Omega$.	Coef. of di.
$0 =$ —	372.23″ +	5.89945 +	7208.64 —	0.04729 —	2.22332 —	0.33807 —	0.19932
$0 =$ —	662.04 +	7.85800 +	11830.88 —	0.20089 —	3.15658 —	0.16440 —	0.48494
$0 =$ —	1051.81 —	0.02274 +	126.84 +	7.02511 +	10.51379 +	0.45680 +	3.10941
$0 =$ +	137.76 —	1.90276 —	2453.82 +	1.15752 +	11.43969 —	0.33172 —	0.14026
$0 =$ +	84.26 —	0.42389 —	250.17 +	0.05158 —	0.45069 +	2.27706 —	0.39471
$0 =$ —	42.98 —	0.20005 —	247.16 +	0.29878 —	0.04721 —	0.30249 +	4.50959

By the Equivalent Factors. III.

		Coef. of dL.	Coef. of $d\gamma$.	Coef. of $d\pi$.	Coef. of $d\varphi$.	Coef. of $d\Omega$.	Coef. of di.
$0 =$ —	371.03″ +	5.97864 +	7296.25 —	0.06706 —	2.33932 —	0.37876 —	0.08024
$0 =$ —	560.48 +	7.21446 +	10853.11 —	0.05221 —	3.26575 —	0.20615 —	0.18982
$0 =$ —	1061.36 —	1.13102 —	959.72 +	7.19887 +	11.91488 +	0.34031 +	3.07535
$0 =$ +	251.17 —	2.11274 —	2917.00 +	1.13986 +	11.78434 —	0.37820 +	0.08665
$0 =$ +	97.46 —	0.29118 —	75.36 +	0.07546 —	0.22584 +	2.29772 —	0.39567
$0 =$ —	54.37 —	0.12928 —	4.62 +	0.26533 —	0.24548 —	0.37541 +	5.56738

In order to test the numerical values in these final equations by (33), the decimal points for L, M, N, &c., and for the coefficients of $d\gamma$, should be changed three places to the left. This being done, we have for II.

$$\Sigma\,(P_1, Q_1, \ldots\ldots L_1, M_1, \ldots\ldots) = +\,57.87362,$$
$$\Sigma\,(\mathrm{S}\,z) = +\,57.87354.$$

And for III.

$$\Sigma\,(P_1, Q_1, \ldots\ldots L_1, M_1, \ldots\ldots) = +\,57.56917,$$
$$\Sigma\,(\mathrm{S}\,z) = +\,57.56916.$$

In both cases, the agreement is as near as could be desired.

We have, then, the following equations by successive eliminations: —

I.

		Coef. of dL.	Coef. of $d\gamma$.	Coef. of $d\pi$.	Coef. of $d\varphi$.	Coef. of $d\Omega$.	Coef. of di.
$0 =$	$-$ 371.09″	$+$ 5.91569	$+$ 7203.91	$-$ 0.09344	$-$ 2.28516	$-$ 0.34664	$-$ 0.18194
$0 =$	$-$138534.00		$+$ 2458225.00	$+$ 62.13	$-$ 510.58	$+$ 213.84	$+$ 73.45
$0 =$	$-$ 115.81			$+$ 0.71612	$+$ 1.11063	$-$ 0.06392	$+$ 0.25868
$0 =$	$+$ 25.66				$+$ 9.29213	$-$ 0.36175	$-$ 0.57384
$0 =$	$+$ 75.23					$+$ 2.22346	$-$ 0.37766
$0 =$	$+$ 17.11						$+$ 5.42383

II.

		Coef. of dL.	Coef. of $d\gamma$.	Coef. of $d\pi$.	Coef. of $d\varphi$.	Coef. of $d\Omega$.	Coef. of di.
$0 =$	$-$ 372.23″	$+$ 5.89945	$+$ 7208.64	$-$ 0.04729	$-$ 2.22332	$-$ 0.33807	$-$ 0.19932
$0 =$	$-$ 166.23		$+$ 2229.06	$-$ 0.13790	$-$ 0.19504	$+$ 0.28590	$-$ 0.21945
$0 =$	$-$ 1041.71			$+$ 7.03449	$+$ 10.51875	$+$ 0.43566	$+$ 3.12386
$0 =$	$+$ 176.07				$+$ 9.01520	$-$ 0.49449	$-$ 0.72094
$0 =$	$+$ 100.43					$+$ 2.17690	$-$ 0.46611
$0 =$	$+$ 16.00						$+$ 4.24758

III.

		Coef. of dL.	Coef. of $d\gamma$.	Coef. of $d\pi$.	Coef. of $d\varphi$.	Coef. of $d\Omega$.	Coef. of di.
$0 =$	$-$ 371.03″	$+$ 5.97864	$+$ 7296.25	$-$ 0.06706	$-$ 2.33932	$-$ 0.37876	$-$ 0.08024
$0 =$	$-$ 112.76		$+$ 2048.68	$+$ 0.02871	$-$ 0.44288	$+$ 0.25090	$-$ 0.09299
$0 =$	$-$ 1108.40			$+$ 7.18029	$+$ 11.56325	$+$ 0.21715	$+$ 3.07926
$0 =$	$+$ 274.45				$+$ 9.07933	$-$ 0.50448	$-$ 0.43778
$0 =$	$+$ 117.10					$+$ 2.22130	$-$ 0.43492
$0 =$	$+$ 30.76						$+$ 5.33957

From which are finally deduced the values of the six unknown quantities: —

	I.	II.	III.
$di =$	$-$ 3.15″	$-$ 3.77″	$-$ 5.76″
$d\Omega =$	$-$ 34.37	$-$ 46.94	$-$ 53.85
$d\varphi =$	$-$ 4.29	$-$ 22.41	$-$ 33.50
$d\pi =$	$+$ 166.44	$+$ 186.17	$+$ 212.41
$d\gamma =$	$+$ 0.054335	$+$ 0.08963	$+$ 0.05115
$dL =$	$-$ 3.06	$-$ 56.32	$-$ 14.58

The following are the outstanding errors of the original equations: —

	I.	II.	III.
1	— 111″.00	— 155″.51	— 127″.23
2	— 8.31	— 3.70	— 7.29
3	+ 59.18	+ 59.08	+ 84.73
4	— 36.67	— 47.02	— 54.55
5	+ 19.92	+ 21.77	+ 33.12
6	+ 0.07	+ 6.92	+ 19.63
7	+ 85.77	+ 54.52	+ 16.00
8	+ 25.01	+ 35.37	+ 38.66
9	+ 135.88	+ 157.61	+ 144.46
10	— 204.64	— 155.64	— 174.86
11	+ 83.44	+ 69.63	+ 64.28

The sums of the squares of these errors are

I.	II.	III.
$\Omega = 92919$	88556	85205

It is obvious that the solution I., as given by Gauss in the memoir above quoted, is incorrect, since the sum of the squares of the errors should be less by the method of least squares than by any other mode of combination.* A revised solution gives the following equations for I. Those for II. and III. are repeated for the sake of comparison.

I. (Revised solution.)

		Coef. of dL.	Coef. of $d\gamma$.	Coef. of $d\pi$.	Coef. of $d\varphi$.	Coef. of $d\Omega$.	Coef. of di.
$0 =$	— 371″.09	+ 5.91569	+ 7203.91	— 0.09344	— 2.28516	— 0.34664	— 0.18194
$0 =$	— 128204.00		+ 2061567.00	+ 64.72780	— 446.986	+ 223.4856	+ 78.50985
$0 =$	— 115.28			+ 0.71566	+ 1.11176	+ 0.05150	+ 0.25807
$0 =$	+ 276.46				+ 9.29666	— 0.53681	— 0.57179
$0 =$	+ 110.68					+ 2.20290	— 0.43212
$0 =$	+ 41.94						+ 5.40298

II.

		Coef. of dL.	Coef. of $d\gamma$.	Coef. of $d\pi$.	Coef. of $d\varphi$.	Coef. of $d\Omega$.	Coef. of di.
$0 =$	— 372″.23	+ 5.89945	+ 7208.64	— 0.04729	— 2.22332	— 0.33807	— 0.19932
$0 =$	— 166.23		+ 2229.06	— 0.13790	— 0.19504	+ 0.28590	— 0.21945
$0 =$	— 1041.71			+ 7.03449	+ 10.51875	+ 0.43566	+ 3.12386
$0 =$	+ 176.07				+ 9.01520	— 0.49449	— 0.72094
$0 =$	+ 100.43					+ 2.17690	— 0.46611
$0 =$	+ 16.00						+ 4.24758

* The errors of equations (10) and (11) given in the *Disq. de Elementis Palladis* are —216″.54 and +83″.01; the joint effect of these would increase still further the discrepancy in Ω.

III.

		Coef. of dL.	Coef. of $d\gamma$.	Coef. of $d\pi$.	Coef. of $d\varphi$.	Coef. of $d\Omega$.	Coef. of di.
$0 = -$	$371''.03$	$+ 5.97864$	$+ 7296.25$	$- 0.06706$	$- 2.33932$	$- 0.37876$	$- 0.08024$
$0 = -$	112.76	$+$	$+ 2048.68$	$+ 0.02871$	$- 0.44288$	$+ 0.25090$	$- 0.09299$
$0 = -$	1108.40			$+ 7.18029$	$+ 11.56325$	$+ 0.21715$	$+ 3.07926$
$0 = +$	274.45				$+ 9.07933$	$- 0.50448$	$- 0.43778$
$0 = +$	117.10				$+$	$+ 2.22130$	$- 0.43492$
$0 = +$	30.76					$+$	$+ 5.33957$

Giving, for the unknown quantities,

		I. (Revised solution.)	II.	III.
	di	$= - 7''.76$	$- 3''.77$	$- 5''.76$
	$d\Omega$	$= - 51.76$	$- 46.94$	$- 53.85$
(46.)	$d\varphi$	$= - 33.20$	$- 22.41$	$- 33.50$
	$d\pi$	$= + 219.19$	$+ 186.17$	$+ 212.41$
	$d\gamma$	$= + 0.05401$	$+ 0.08963$	$- 0.05115$
	dL	$= - 15.68$	$- 56.32$	$- 14.58$

These results will form the basis for a comparison of the relative probability of the three systems.

In view of the apparently gross discrepancies of the solutions II. and III. from I., and with the admitted fact before us that the latter reduces perfectly to a minimum the sum of the squares of the residual errors, we should at first sight scarcely be disposed to admit that there is in reality no sensible difference in the accuracy of the three systems. This unfavorable impression must have its origin in the erroneous inference, that, inasmuch as I. is theoretically the best of all solutions, the errors of the results of other systems must be proportional to their deviation from I.

For instance, in I. we have $dL = -16''$, but in II. $dL = -56''$; from which is inferred that in II. the error of dL is proportional, or nearly so, to $-16'' + 56'' = +40''$; and in a similar way, $d\Omega$, $d\varphi$, &c. will be condemned or approved by the standard of their disagreement or accordance with the corresponding values in I.

Such a mistake may, we repeat, be easily committed, in a cursory glance at the numbers in question. That it is a violation of the fundamental principles of the method of least squares will appear on a very little consideration.

To apply the criterion proposed in that method for determining the relative proba-

bility of the three systems, we obtain first the residual errors of the original equations as follows: —

Residual Errors of Original Equations.

	I. (Revised solution.)	II.	III.
1	— 125.″45	— 155.″51	— 127.″23
2	— 9.14	— 3.70	— 7.29
3	+ 86.62	+ 59.08	+ 84.73
4	— 53.78	— 47.02	— 54.55
5	+ 32.12	+ 21.77	+ 33.12
6	+ 22.92	+ 6.92	+ 19.63
7	+ 21.00	+ 54.52	+ 16.00
8	+ 35.51	+ 35.37	+ 38.66
9	+ 149.37	+ 157.61	+ 144.46
10	— 169.77	— 155.64	— 174.86
11	+ 66.95	+ 69.63	+ 64.28

The sums of the squares of these errors are

I.	II.	III.
$\Omega = 85091$	88556	85205

The probable value of a residual error for one of the original equations — since there are eleven equations* and six indeterminates — will be obtained from the expression

$$\mu = 0.67459 \sqrt{\frac{\Omega}{11 - 6}},$$

giving the values

	I.	II.	III.
(47.)	$\mu = \pm$ 88″.00	$\pm$ 89″.77	$\pm$ 88″.06.

The agreement of μ in I. and III. is a conclusive proof of the equivalency of the two solutions, notwithstanding the freedom which has been exercised in the choice of factors for the latter. In the case of II., the discrepancy amounts to $\frac{1}{50}$ of μ; but it will be noticed that the factors actually employed were based upon a system of representation considerably less exact than the series (2). It might easily be shown that this difference would have been reduced to less than one fifth of its present amount if the numbers for the factors had been selected from (2), agreeably to the conditions by which II. has been defined.

* Equation 9_a having been excluded from each of the solutions.

If we compute the limits of these values of μ, we find that it is only an even chance that μ, for the best solution, is comprised within the limits

$$\mu = \pm\ 69''.3, \qquad \text{and} \qquad \mu = \pm\ 106''.7.$$

Such is the extreme uncertainty of the only element by which the question of preference between I., II., and III. can be decided. Compared with it, the inconsiderable differences which we find between the values of μ in I., II., and III. will admit of but the single inference, that either of the systems of values of di, $d\Omega$, $d\varphi$, &c., presented in (46), notwithstanding their great disagreements with each other, actually fulfils the criterion of accuracy proposed in the method of least squares so nearly, that it is impossible to give a decisive reason for adopting one rather than another as the most probable solution. It is worthy of notice, moreover, that the arithmetical mean of the above residual errors, irrespective of their signs, is *less* in II. and III. than in I. Thus in this instance the latter would rank lowest of the three, if we were to compute the relative probabilities according to a process recommended by the highest authorities* as the most suitable for ordinary use, in which the probable error is directly proportional to the arithmetical mean of the errors irrespective of their signs.

* Laplace, *Théorie Analytique des Probabilités;* Gauss, *Zeitschrift für Astronomie*, B. I.; Peters, *Astr. Nach.*, No. 1034.

IV.

Magnetic Observations on the Boundary Line between the United States and Mexico, made in 1855, *under the Direction of* Major W. H. Emory, *United States Commissioner under the Treaty of* 1853; *and General Discussion of the Magnetic Observations made in Connection with the Mexican Boundary Surveys.*

Recomputed by J. E. HILGARD, U. S. Coast-Survey.

(*With a Map.*)

(*Communicated September* 8, 1856.)

I. Magnetic Observations in 1855.

Observations of declination, dip, and absolute horizontal intensity were made at eight stations, being those at which astronomical observations were made in determining the boundary between the United States and Mexico, under the treaty of 1853. The magnetic observations were intrusted to Mr. Marine T. W. Chandler, who succeeded in obtaining very complete determinations, as the subjoined abstracts show.

The *declination* was obtained by referring the direction of the needle to the astronomical meridian carefully determined for the survey of the line. The needle of a goniometer by Young was found to show a fair mean of five good needles of different lengths, and was therefore relied on at subsequent stations. The results are given in the general table below.

Observations of *inclination* were made with a ten-inch dip-circle by Gambey, of superior construction. Two needles were used at each of the stations; and at three of them, viz. Carrizalillo, Espia, and Los Nogales, the poles were repeatedly reversed, so as

to obtain the corrections to be applied when no reversal of poles was made. These corrections are +12′ for needle No. 1, and —15′ for No. 2, in the position of the poles called direct, and have been so applied in the following abstract of results.

Station.	Needle No. 1.		Needle No. 2.		Remarks.
	Dip.	No. of Sets.	Dip.	No. of Sets.	
Initial Point,	58° 39′	3	58° 19′	3	
Carrizalillo,	58 31	3	58 13	3	Poles reversed in each set.
Espia,	57 59	1	57 50	2	" " " "
Agua del Perro,	57 28	2	57 5	2	
San Luis Springs,	57 37	1	57 21	1	
San Bernardino,	57 19	4	56 58	4	
Santa Cruz River,	57 28	2	57 17	2	
Los Nogales,	57 13	1	57 1	1	Poles reversed in each set.

The difference of about 16′ between the results by the two needles is too large to admit of the mean being taken. An examination of the pivots having shown some corrosion on a pivot of No. 2, the probability is that the results by No. 1 are to be preferred, especially as the observations with that needle show a greater consistency among themselves. The results by No. 1 are therefore adopted in the general table.

Observations for horizontal intensity were made with a unifilar magnetometer by Jones. The deflections were measured on a nine-inch circle according to Lamont's method, in which the two magnets remain at right angles. In the vibration experiments, the time of 400 vibrations is usually observed, of which six values are obtained in each set, in the usual way. Experiments to determine the moment of inertia of the magnet and its attachments were made repeatedly by vibrating it loaded with a brass ring, marked No. 11, of which the outside diameter is 2.899 inches, the inside diameter 2.462 inches, and the weight 719.90 grains; hence its moment of inertia, K, = 9.04 expressed in feet and grains. The magnet used, marked X 7, is of the usual form, being a hollow cylinder of 0.3 inch in diameter, and 3.66 inches in length, and carrying a mirror. Its temperature coefficient was determined at Washington City in February, 1856, by vibrations at temperature near 30° and 70°, and was ascertained

$$q = 0.0003.$$

The following is an abstract of the observations; to which is to be added, that, in the experiments without the inertia ring, the effect of 90° of torsion was 7′.5; in those with the ring, 15′.

Abstract of Observations for Horizontal Intensity.

Station.	Vibrations				Deflections. $r = 1.3$ feet.		Date. 1855.
	Without Ring.		With Ring.				
	T Time of 1 Vibr.	Temperature.	T_r Time of 1 Vibr.	Temperature.	u	Temperature.	
	s.	°	s.	°	° ′	°	
Initial Point,	3.795	74.5	7.946	69.5	2 29.6	61	
	3.795	59	7.935	63	28.7	53.5	
					30.0	41	
Mean,	3.795	67	7.941	66	2 29.4	52	January 4.
Carrizalillo,	3.817	70			2 31.2	59	
	3.823	71.5	7.983	76	2 31	67.5	
	3.826	83			2 29.9	64.5	
Mean,	3.822	75	7.983	76	2 30.7	64	March 1.
Espia,	3.770	63	7.910	70			March 22.
Agua del Perro,	3.791	63					April 3.
San Luis Springs,	3.751	61			2 30.0	64.5	
	3.757	73			2 30.0	66.5	
					2 27.0	65	
Mean,	3.754	67			2 29.0	65	April 19.
San Bernardino,	3.776	78.5					
	3.778	82.5					
	3.764	81					
Mean,	3.773	81					April 28.
Santa Cruz River,	3.798	72					
	3.804	74					
Mean,	3.801	73					May 14.
Los Nogales,	3.805	94	7.949	80	2 26.5	81.5	
					25.2	83	
Mean,					2 25.85	82	June 16.

From the preceding data we first deduce the moment of inertia, K, of the magnet and its attachments, by the equation $K = K_r \frac{T^2}{T_r^2 - T^2}$, where T_r and T are the terms of one vibration with and without the inertia ring, corrected for torsion, and reduced to the temperature of experiments without the ring, and obtain the following values: —

At Initial Point,	$K = 2.669$
Carrizalillo,	2.680
Espia,	2.659
Los Nogales,	2.668
Mean,	2.669

From the experiments of deflection we next deduce the values of ratio of m, the

magnetic moment of the magnet, to X, the horizontal component of the earth's form, by the expression $\frac{m}{X} = \frac{1}{2} r^3 \sin u$, and obtain at

Initial Point,	$\frac{m}{X} = 0.0477$,	temp. 52°
Carrizalillo,	0.0481,	" 64°
San Luis,	0.0476,	" 65°
Los Nogales,	0.0466,	" 82°

Computing for the same stations the product $m\,X = \frac{\pi^2 K}{T^2}$, where T is corrected for torsion, and reduced to the temperature of the corresponding deflections, and eliminating X, we get the following values of m.

Station.	Date.	m	Temperature.	m reduced to 66°.
Initial Point,	Jan. 4	0.2959	52°	0.2947
Carrizalillo,	March 1	0.2951	64	0.2949
San Luis,	April 19	0.2982	65	0.2981
Los Nogales,	June 16	0.2915	82	0.2929

Although the difference in these values of m may be in a great measure due to errors of observations, rather than to fluctuations in the magnetism of the magnet, still the best results appear to be obtained by using the above values of m for the respective stations, and assuming a uniform rate of change during the intervals.

Computing, lastly, $m\,X$ for each of the stations, and dividing by m determined in the manner indicated and reduced to the temperature of the vibrations, we obtain the values of X given in the subjoined table, which exhibits collectively the results obtained.

General Table of Results.

Station.	Latitude.	Longitude.	Declination East.	Dip.	Horizontal Intensity.	Total Intensity.
Initial Point,	31° 47′	106° 28′	11° 55′	58° 39′	6.202	11.92
Carrizalillo,	31 51	107 56	12 2	58 31	6.125	11.73
Espia,	31 21	107 56	12 5	57 59	6.242	11.77
Agua del Perro,	31 21	108 20	11 58	57 28	6.156	11.45
San Luis Springs,	31 20	108 48	11 45	57 37	6.265	11.70
San Bernardino,	31 20	109 14	11 45	57 19	6.252	11.58
Santa Cruz River,	31 18	110 31	12 13	57 28	6.169	11.47
Los Nogales,	31 21	110 51	11 45	57 13	6.262	11.56

II. Discussion of Lines of equal Magnetic Declination, Dip, and Horizontal Intensity.

In this discussion, the observations made in previous years in connection with the Mexican boundary surveys, and published in the fifth volume, new series, of the Memoirs of the Academy, have been combined with those communicated in the present paper. Observations made under the direction of Professor A. D. Bache, Superintendent of the Coast Survey, at stations Dollar Point, East Base, and Jupiter, near Galveston, Texas, and near San Diego, Monterey, and San Francisco, and affording important co-ordinates for the curvature of the lines, have also been introduced; likewise, an observation of the declination at the Great Salt Lake, by Captain Howard Stansbury, U. S. Topographical Engineers, published in his report of the survey of that region.

The method employed in determining the lines of equal declination and dip was partly graphical and partly analytical, being the same pursued by Professor Bache and Mr. J. E. Hilgard in their discussion of the Coast-Survey magnetic observations. (Coast-Survey Report for 1855, Appendix, p. 47.) The stations were projected on a map, and their positions referred to a right line graphically assumed as axis of co-ordinates, the origin being chosen about the mean position of the stations, and the direction so as nearly to divide the positive and negative ordinates equally.

The co-ordinates being read off on any convenient linear scale, conditional equations are formed for each station or group of stations, and the whole scheme is solved by the method of least squares. The conditional equations representing an interpolation by second differences are of the form,

$$V = V_0 + v + x\,X + y\,Y + z\,X\,Y + p\,X^2 + q\,y^2,$$

when V is the observed declination (or dip);

V_0, the assumed declination at the origin; v, the correction to be applied;

X and Y, co-ordinates of position.

x, y, z, p, q, coefficients to be determined.

The solution of a considerable number of such equations involves a great deal of labor, which the results amply repay, however. The process being well known, there is no occasion to give the steps of the calculations in this place. After determining the coefficients, the co-ordinates of points in the lines sought were computed, the lines projected on the map, and the latitudes and longitudes of points read off and tabulated.

In the absence of any data to determine the secular changes, the results are doubt-

less liable to an uncertainty from that source. We know, however, that the changes are small, and, for the limited period over which the observations extend, they may be considered as merged in the local errors, and the average date of 1852 as belonging to the resulting lines on the map.

The following tables give a general *résumé* of the observations, and the corresponding values in the computed system; also the residuals, the distribution of which is the best evidence of the successful representation of the general facts involved.

The geographical position of points in the lines of equal declination and dip — isogonic and isoclinal lines — are also given in tables from which they may be readily projected in any map.

Observations of Declinations.

No.	Station.	Latitude.	Longitude.	Date.	Declination East, Observed.	Declination East, Computed.	Residual, Comp. — Obs.
		° ′	° ′		° ′	° ′	′
1	Dollar Point,	29 26	94 53	1848	8 57	9 3	+ 6
2	East Base,	29 13	94 55	1853	9 5	9 2	— 3
3	Jupiter,	28 55	95 20	1853	9 9	9 10	+ 1
4	Rio Grande, Mouth,	25 57	97 7	1853	9 0	8 56	— 4
5	Ringgold Barracks,	26 23	98 43	1853	9 15	9 18	+ 3
6	Fort McIntosh,	27 30	100 5	1852	10 0	9 46	— 4
7	Eagle Pass,	28 42	100 30	1852	10 1	10 7	+ 6
8	Presidio del Norte,	29 34	104 25	1852	10 16	10 53	+37
9	Mouth of Cañon,	31 2	105 37	1852	12 1	11 28	—33
10	Emory's Initial Point,	31 47	106 28	1855	11 55	11 48	— 7
11	Frontera,	31 49	106 29	1852	12 24	11 49	+25
12	Doña Ana,	32 22	106 45	1851	12 7	12 2	— 5
13	Carrizalillo,	31 51	107 56	1855	12 2	11 58	— 4
14	Espia,	31 21	107 56	1855	12 5	11 48	—17
15	Copper Mines,	32 48	108 4	1851	11 22	12 18	+56
16	Agua del Perro,	31 21	108 20	1855	11 59	11 50	— 9
17	San Luis Springs,	31 20	108 48	1855	11 45	11 52	+ 7
18	San Bernardino,	31 20	109 14	1855	11 45	11 53	+ 8
19	Santa Cruz River,	31 18	110 31	1855	11 45	11 58	+13
20	Los Nogales,	31 21	110 51	1855	12 13	12 0	—13
21	San Pedro,	32 59	110 40	1851	12 25	12 37	+12
22	Pimos Villages,	33 7	111 44	1851	12 52	12 46	— 6
23	Gila Junction,	32 43	114 53	1851	12 50	12 45	— 5
24	San Isabel,	33 9	116 38	1852	12 34	12 55	+21
25	Camp Riley,	32 36	117 5	1849	12 57	12 44	—13
26	San Diego,	32 42	117 12	1849	13 15	12 47	—28
27	San Diego C. S.,	32 41	117 13	1851	12 29	12 48	+19
28	Monterey,	36 38	121 54	1851	14 58	14 54	— 4
29	San Francisco,	37 48	122 27	1852	15 30	15 34	+ 4
30	Salt Lake City,	40 46	112 8	1850	15 34	15 34	0

Isogonic Lines.

Geographical Positions of Points.

Longitude.	9°	10°	11°	12°	13°	14°	15°	Declination East.
95	28° 50′							
96	27 28							
97	26 23							
98	25 34	30° 17′						
99	24 57	29 18						
100		28 32						
101		27 54						
102		27 27	31° 12′					
103		27 4	30 35					
104			30 7					
105			29 45	33° 8′				
106			29 27	32 36				
107			29 14	32 13				
108			29 4	31 54	34° 54′			
109				31 39	34 29			
110				31 28	34 9			
111				31 20	33 54			
112				31 14	33 43			
113				31 10	33 33	36° 2′		Latitude.
114					33 24	35 47		
115					33 17	35 35	38° 3′	
116					33 14	35 25	37 46	
117					33 12	35 17	37 31	
118						35 10	37 19	
119						35 5	37 9	
120						35 2	37 1	
121						35 0	36 54	
122						34 58	36 48	
123							36 44	
124							36 41	

Observations of Dip.

No.	Station.	Latitude.	Longitude.	Date.	Dip, Observed.	Dip, Computed.	Residual, Comp. — Obs.
1	Dollar Point,	29° 26′	94° 53′	1848	57° 58′	58° 0′	+ 2′
2	East Base,	29 13	94 55	1853	57 42	57 45	+ 3
3	Jupiter,	28 55	95 20	1853	57 12	57 7	— 5
4	Rio Grande, Mouth,	25 57	97 7	1853	52 23	52 14	— 9
5	Ringgold Barracks,	26 23	98 43	1853	52 27	52 35	+ 8
6	Fort McIntosh,	27 30	100 5	1852	54 7	53 58	— 9
7	Fort Duncan,	28 42	100 30	1852	55 31	55 35	+ 4
8	Presidio del Norte,	29 34	104 25	1852	55 41	55 59	+18
9	Mouth of Cañon,	31 2	105 37	1852	57 38	57 45	+ 7
10	San Elceario,	31 35	106 16	1852	58 57	58 17	—30
11	Frontera,	31 48	106 33	1852	59 5	58 32	—33
12	Doña Ana,	32 22	106 47	1851	59 6	59 8	+ 2
13	IX.,	22 22	107 24	1851	59 9	59 0	— 9
14	Copper Mines,	32 47	108 4	1851	59 17	59 23	+ 6

No.	Station.	Latitude.	Longitude.	Date.	Dip, Observed.	Dip, Computed.	Residual, Comp. — Obs.
		° ′	° ′		° ′	° ′	′
15	Emory's Initial Point,	31 47	106 28	1855	58 39	58 30	— 9
16	Carrizalillo,	31 51	107 56	1855	58 31	58 23	— 8
17	Espia,	31 21	107 56	1855	57 39	57 41	—18
18	Agua del Perro,	31 21	108 20	1855	57 28	57 40	+12
19	San Luis,	31 20	108 48	1855	57 37	57 36	— 1
20	San Bernardino,	31 20	109 14	1855	57 19	57 30	+11
21	Santa Cruz River,	31 18	110 31	1855	57 28	57 21	— 7
22	Los Nogales.	31 21	110 51	1855	57 13	57 21	+ 8
23	Ojo de Inez,	32 45	108 14	1851	59 18	59 22	+ 5
24	Station 1,	32 50	109 34	1851	59 19	59 12	— 7
25	" 2,	32 50	109 37	1851	59 12	59 12	0
26	" 3,	32 53	109 44	1851	59 12	59 15	+ 3
27	" 4,	32 57	109 49	1851	59 20	59 18	— 2
28	" 5,	33 4	109 55	1851	59 27	59 25	— 2
29	" 6,	33 6	110 0	1851	59 38	59 30	— 8
30	" 7,	33 10	110 3	1851	59 42	59 33	— 9
31	" 8,	33 12	110 10	1851	59 37	59 35	— 2
32	" 9,	33 13	110 19	1851	59 45	59 35	—10
33	" 10,	33 12	110 19	1851	59 34	59 30	— 4
34	" 12,	33 9	110 26	1851	59 37	59 28	— 9
35	" 13,	33 9	110 28	1851	58 58	59 26	+28
36	" 15,	33 9	110 31	1851	59 28	59 25	— 3
37	" 17,	33 12	110 42	1851	59 23	59 28	+ 5
38	" 19,	33 5	110 35	1851	59 5	59 19	+14
39	" 20,	32 59	110 40	1851	59 11	59 13	+ 2
40	" 21,	33 3	110 46	1851	58 59	59 16	+17
41	" 22,	33 5	110 50	1851	59 13	59 18	+ 5
42	" 23,	33 7	110 55	1851	59 23	59 20	— 3
43	" 24,	33 6	111 2	1851	59 20	59 18	— 2
44	" 26,	33 4	111 11	1851	59 25	59 14	—11
45	" 27,	33 3	111 16	1851	59 20	59 12	— 8
46	" 28,	33 1	111 23	1851	59 16	59 10	— 6
47	" 29,	33 4	111 34	1851	59 6	59 10	+ 4
48	" 30,	33 8	111 44	1851	59 6	59 14	+ 8
49	" 31,	33 10	111 54	1851	59 28	59 16	—12
50	" 32,	33 9	111 57	1851	59 22	59 16	— 6
51	" 38,	33 0	112 39	1851	58 53	58 57	+ 4
52	" 39,	32 59	112 43	1851	58 49	58 56	+ 7
53	" 40,	33 2	112 55	1851	59 16	58 59	—17
54	" 42,	32 58	113 11	1851	59 17	58 52	—25
55	" 43,	32 49	113 33	1851	58 43	58 39	— 4
56	" 44,	32 44	113 50	1851	58 30	58 30	0
57	" 45,	32 41	114 5	1851	58 25	58 26	+ 1
58	Gila Junction,	32 43	114 33	1851	58 30	58 28	— 2
59	New River,	32 42	115 25	1849	58 19	58 20	+ 1
60	Santa Isabella,	33 8	116 41	1849	58 48	58 44	— 4
61	Santa Maria,	33 2	116 51	1849	58 42	58 37	— 5
62	San Diego,	32 42	117 8	1849	57 33	58 14	+41
63	San Diego C. S.,	32 41	117 13	1851	57 38	58 12	+34
64	San Francisco,	37 46	122 27	1852	62 32	62 40	+ 8
65	Sacramento,	38 34	121 17	1852	64 3	63 37	—26

Isoclinal Lines.

Geographical Positions of Points.

Longitude.	52°	53°	54°	55°	56°	57°	58°	59°	60°	61°	62°	63°	Dip.
	° ′	° ′	° ′	° ′	° ′	° ′	° ′						
95	25 30	26 9	26 48	27 27	28 7	28 47	29 26						
96	25 38	26 18	26 57	27 37	28 17	28 57	29 37						
97	25 46	26 26	27 6	27 47	28 27	29 8	29 49						
98	25 34	26 35	27 15	27 56	28 37	29 18	30 0						
99	26 2	26 43	27 24	28 5	28 47	29 28	30 11						
100	26 9	26 51	27 33	28 14	28 56	29 38	30 21						
101		26 59	27 41	28 22	29 5	29 48	30 22						
102			27 49	28 31	29 14	29 57	30 42						
103				28 40	29 23	30 6	30 52						
104					29 32	30 16	31 2						
105					29 40	30 24	31 11	31 59	32 49				
106					29 47	30 32	31 20	32 9	32 58				
107					29 54	30 39	31 28	32 18	33 7				
108					30 0	30 46	31 36	32 27	33 16				
109					29 5	30 53	31 43	32 35	33 25				
110					30 10	30 59	31 50	32 43	33 33				
111						31 5	31 57	32 50	33 41				
112						31 11	32 4	32 57	33 49				
113						31 17	32 11	33 4	33 57				
114						31 22	32 16	33 10	34 4				
115						31 26	32 21	33 16	34 11	35 7			
116						31 31	32 26	33 22	34 18	35 15			
117						31 35	32 31	33 28	34 24	35 22	36 19		
118						31 39	32 26	33 33	34 30	35 29	36 27		
119										35 36	36 35	37 35	
120											36 42	37 45	
121											36 49	37 54	
122												38 2	
123												38 11	

Latitude.

Horizontal Intensity. — Combining the eight stations of 1855 among themselves, we obtain as a mean result, in latitude 31° 27′, longitude 108° 45′, $X = 6.21$, with a probable error of ± 0.01; also an increase of $+0.10$ in going south 30′.7 or east 506′, and the direction of the line of equal horizontal intensity N. $87\frac{1}{2}°$ E.

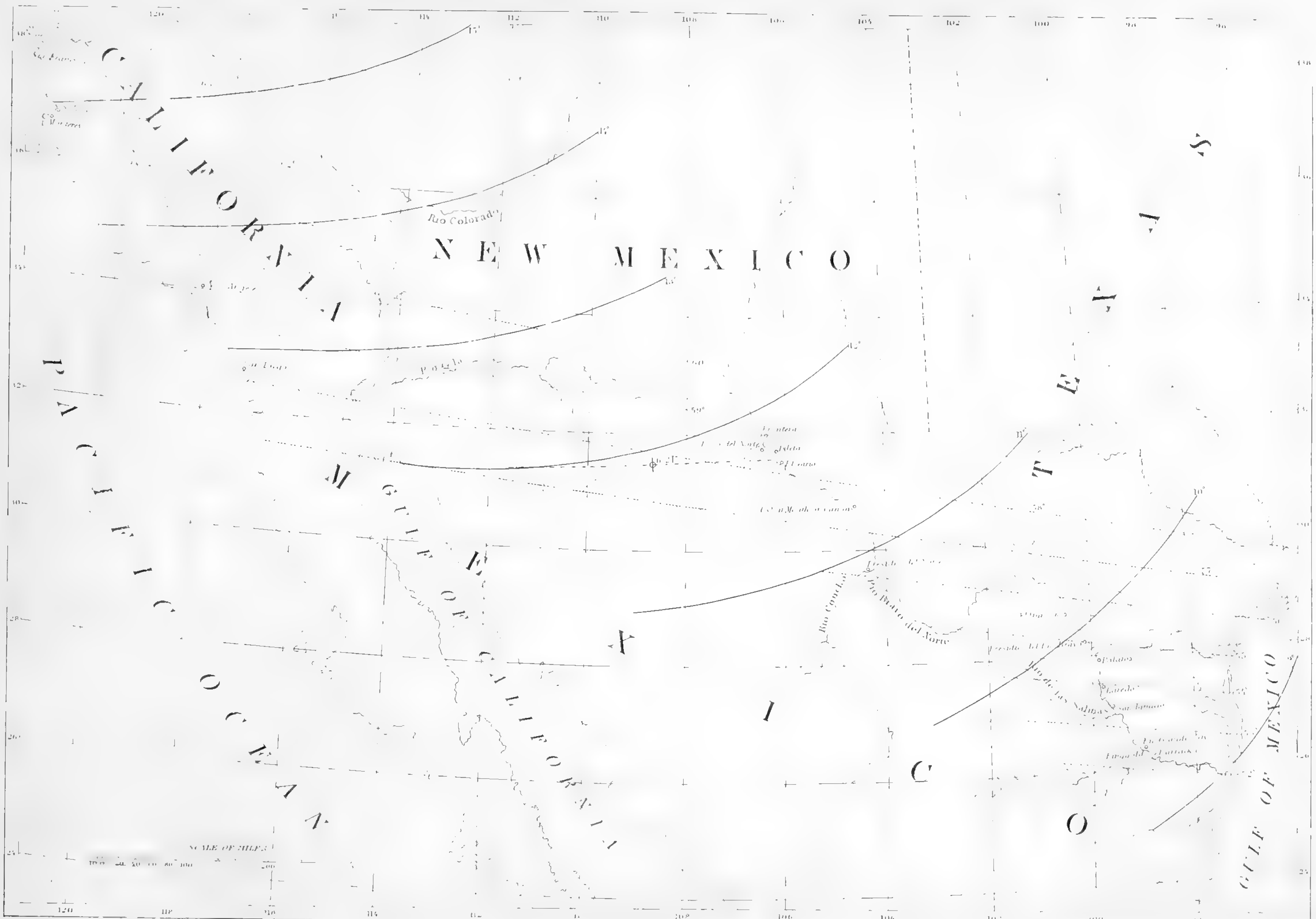
It may be observed, that this rate of change in going south is evidently too large, for according to the decrease of dip it would require a southing of 42′ to cause an increase of the horizontal force of $+0.10$, if the total force was constant; but as the latter also decreases in going south, the actual rate of change of horizontal force is probably only half of that above obtained. Moreover, when we consider that the same value of X is found on the coast of Mississippi, between New Orleans and Mobile, we see that the small increase in going east should be decrease of similar amount, and that the direction of the line should be about N. 94° E. The distribution of stations is such that these discrepancies in the rate of change are quite within the probable errors of obser-

vation and station errors; nor is the value of the mean result affected thereby, which forms a valuable datum in absolute measure, in an almost inaccessible region of the globe.

In order to compare this measure of force with that previously obtained on the northern line by observations with a Fox apparatus, and expressed in the arbitrary scale, we may have recourse to the observations of Captain Lefroy at Toronto, which gives the total force in British units = 13.86 at the same time that it is found 1.836 in the arbitrary scale. Applying the same ratio to our mean total intensity, 11.65, we find 1.543, and we have the following comparison:—

Latitude.	Longitude.	Total Intensity.
31° 27′	108° 45′	1.543
32 43	108 30	1.580

the latter from three stations in 1851; exhibiting a closer correspondence than might be expected from the circuitous comparison involved.



—— Lines of equal declination
Lines of equal dip
- - - - Line of equal horizontal force

United States & Mexican Boundary Survey.

W. H. Emory U.S. Comm.

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V.

On the Death of Pliny the Elder.

By JACOB BIGELOW, M.D.

(*Communicated December* 9, 1856.)

It is commonly represented by authors and compilers that Pliny the elder, who died during an eruption of Vesuvius in the year of Christ 79, perished by suffocation from the exhalations of the volcano; and a great preciseness of expression on this subject has been perpetuated by most writers who have touched upon it in modern times.

In the preface of Broterius to the Life and Writings of Pliny, it is said: "Flammis et flammarum prænuntio odore sulphuris exanimatus est." Mason, in Smith's "Greek and Roman Biography," says: "He almost immediately dropped down *suffocated*, as his nephew conjectures, by the vapors." In Lemprière's "Classical Dictionary" the same is stated: "He soon fell down, *suffocated* by the thick vapors that surrounded him." Rees's "Cyclopædia," art. Pliny, has a similar statement: "In his flight he was *suffocated*, being then in the 56th year of his age." Cuvier, in the *Biographie Universelle*, thus particularizes the closing scene: "Deux esclaves seulement restèrent aupres du malheureux Pline, qui périt *suffoqué* par les cendres et par les exhalaisons sulfureuses du volcan." Simond, in his "Tour in Italy," says of Pliny at Stabiæ: "Although not much nearer to Vesuvius than Naples is, he there met his death, from mere *suffocation* probably, as his body was afterwards found externally uninjured." Sir Charles Lyell, in his "Principles of Geology," says of Pliny: "In his anxiety to obtain a nearer view of the phenomena, he lost his life, being *suffocated* by sulphureous vapors."

The only authentic and contemporaneous narrative extant of the death of Pliny, and that on which subsequent opinions are necessarily founded, is that contained in the letter of his nephew, Pliny the younger. After an examination of this celebrated

epistle, it appears to me highly probable that the elder Pliny got his death, not from suffocation or asphyxia, as is commonly believed, but from some more specific and natural disease. The following is a part of the translation by Mr. Melmoth of this epistle: —

"In the mean while, the fire from Vesuvius flamed forth from several parts of the mountain with great violence, which the darkness of the night contributed to render still more visible and dreadful. But my uncle, in order to calm the apprehensions of his friend, assured him that it was only the conflagration of the villages which the country people had abandoned. After this, he retired to rest, and it is most certain he was so little discomposed as to fall into a deep sleep; for, being corpulent and breathing hard, the attendants in the antechamber actually heard him snore. The court which led to his apartment being now almost filled with stones and ashes, it would have been impossible for him, if he had continued there any longer, to have made his way out. It was thought proper, therefore, to awaken him. He got up, and joined Pomponianus and the rest of the company, who had not been sufficiently unconcerned to think of going to bed. They consulted together whether it would be most prudent to trust to the houses, which now shook from side to side with frequent and violent concussions, or flee to the open fields, where the calcined stones and cinders, though levigated indeed, yet fell in large showers, and threatened them with instant destruction. In this distress, they resolved upon the fields, as the less dangerous situation of the two; a resolution which, while the rest of the company were hurried into by their fears, my uncle embraced upon cool and deliberate consideration. They went out then, having pillows tied upon their heads with napkins; and this was their whole defence against the storm of stones which fell around them. It was now day everywhere else, but *there* a deeper darkness prevailed than in the blackest night, which, however, was in some degree dissipated by torches and other lights of various kinds. They thought it expedient to go down farther upon the shore, in order to observe if they might safely put out to sea; but they found the waves still running extremely high and boisterous. There my uncle, having drunk a draught or two of cold water, laid himself down upon a sail-cloth which was spread for him; when immediately the flames, preceded by a strong smell of sulphur, dispersed the rest of the company and obliged him to rise. He raised himself up with the assistance of two of his servants, and instantly fell down dead, suffocated, I conjecture, by some gross and noxious vapor, having always had weak lungs, and being frequently subject to a difficulty of breathing."

Notwithstanding the elegance and general accuracy of Mr. Melmoth's translation, there is room for doubting the exactness of that part which contains the closing scene

of Pliny's life. The words of the younger Pliny are as follows: "Deinde flammæ, flammarumque prænuntius odor sulfuris, alios in fugam vertunt, excitant illum. Innixus servis duobus adsurrexit, et statim concidit, ut ego conjecto crassiore caligine spiritu obstructo, clausoque stomacho, qui illi natura invalidus et angustus et frequenter interæstuans erat." The more exact translation of this passage would be as follows: "Then the flames and the odor of sulphur premonitory of the flames put the others to flight and aroused him. He rose, leaning upon two slaves, and immediately fell dead, his breath being obstructed, as I conjecture, by the thick mist (caligine), and his stomach being shut up, which in him was by nature weak, narrow, and subject to frequent commotion." The fact here is that he fell suddenly dead. The theory of Pliny, his nephew, who was not present, and who was not much versed in anatomy, is, that he died from obstruction of his breath by the "caligo," a word which means darkness, fog, mist, also metaphorically blindness, dizziness, and ignorance, but does not mean a noxious or irrespirable vapor.

That this "caligo" was not composed of materials necessarily destructive of life, there is abundant collateral evidence. Pliny had been attended to the spot by a considerable party, and two slaves were actually supporting him at the time of his death. Yet it does not appear from record that any of these persons suffered death or detriment from the inhalation of noxious gas on the occasion. The character of the "caligo" is further elucidated by the personal experience of the younger Pliny, who witnessed its effects during the same eruption, and has described its phenomena in a subsequent letter, the nephew being at Misenum, while the uncle was at Stabiæ, in the same vicinity to the mountain.

"It was now morning, but the light was exceedingly faint and languid. The buildings all around us tottered, and though we stood upon open ground, yet, as the place was narrow and confined, there was no remaining without imminent danger. We therefore resolved to leave the town. The people followed us in the utmost consternation, and pressed in great crowds about us in our way out. Being advanced at a convenient distance from the houses, we stood still in the midst of a most hazardous and tremendous scene. The chariots which we had ordered to be drawn out were so agitated backwards and forwards, though upon the most level ground, that we could not keep them steady even by supporting them with large stones. The sea seemed to roll back upon itself, and to be driven from its banks by the convulsive motion of the earth. On the other side, a black and dreadful cloud, bursting with an igneous, serpentine vapor, darted out a long train of fire resembling flashes of lightning. . . . . Soon afterwards the cloud seemed to descend and cover the whole ocean, as indeed it entirely hid the island of Caprea and the promontory of Misenum. . . . . .

"The ashes now began to fall upon us, though in no great quantity. I turned my head, and observed behind us a thick smoke, which came rolling after us like a torrent. I proposed, while we had yet any light, to turn out of the high road, lest [we] should be pressed to death in the dark by the crowd that followed us. We had scarcely stepped out of the path when the darkness overspread us, not like that of a cloudy night, or when there is no moon, but of a room when it is shut up and all the lights extinct. Nothing then was to be heard but the shrieks of women, the screams of children, and the cries of men, some calling for their children, others for their parents, others for their husbands, and only distinguishing each other by their voices, one lamenting his own fate, another that of his family, some wishing to die from the very fear of dying. . . . . At length a glimmering light appeared, ... then again we were immersed in thick darkness, and a heavy shower of ashes rained upon us, which we were obliged every now and then to shake off, otherwise we should have been overwhelmed and buried in the heap. . . . . At last this terrible darkness [caligo] was dissipated by degrees, like a cloud or smoke, the real day returned, and even the sun appeared, though very faintly, as when an eclipse is coming on. Every object that presented itself to our eyes seemed changed, being covered with white ashes, as with a deep snow."

From these descriptions we are justified in believing that the "caligo" which pervaded the air during this eruption of Vesuvius was simply the darkness or dark haze existing in an atmosphere rendered nearly opaque by falling ashes. These ashes (cinis) appear to have consisted mainly of particles of solid substance, thrown out from the crater, or sublimed in the volcano and condensed in the atmosphere, such as now cover the ruins of Pompeii. As to the "odor sulfuris," mentioned in the first letter, it is not spoken of as a thing in itself deleterious, but merely as the forerunner (prænuntius) of the flames. Had the air been highly charged with sulphurous or hydrosulphuric acids, which are among the gaseous products of volcanoes, or even with the sublimed chlorides more common among volcanic gases, it is hardly probable that Pliny would have been the only sufferer on the occasion, or that eyewitnesses would have survived to be narrators of a catastrophe in which they themselves had no share, or even that the inhabitants of Herculaneum and Pompeii, which cities were buried in the same eruption of Vesuvius, would so generally have escaped as they appear to have done.

The important facts which belong to the object of the present inquiry may be summed up briefly as follows. Pliny the elder, a corpulent man, subject to laborious breathing and to other infirmities which had excited the notice, if not the apprehensions, of his friends, was on the day and night preceding his death exposed to unusual

fatigue and anxiety. In the evening he had had himself carried to a bath, ate his supper, and went to bed, where he slept so profoundly as to be insensible to the noise and danger which kept his companions awake. At length, the danger growing more imminent, he was awakened, and with his companions fled from the house, the whole company carrying pillows on their heads to ward off the falling stones. In this way they groped their way through the darkness till the next morning (jam dies alibi, illic nox). He then lay down on a sail-cloth spread out for him, a measure which, we may suppose, would hardly have been resorted to under the continuance of danger from the falling stones, except from want of strength on his part to proceed. Neither under the same circumstances would he have stopped repeatedly to demand cold water, unless suffering unusual thirst (Semel atque iterum frigidam poposcit hausitque). At length, under a fresh alarm, he raised himself up, and immediately fell dead while leaning upon his two servants.

A medical man may be excused for believing that Pliny died from apoplexy following unusual exertion and excitement, or possibly from a fatal crisis in some disease of the heart previously existing.

VI.

Register of the Thermometer for 36 *Years, from* 1821 *to* 1856, *to which is added the Quantity of Rain falling in Boston, Mass., for* 34 *Years, from* 1823 *to* 1856.

By JONATHAN P. HALL.

All the observations during the period of thirty-six years have been made at the same house, No. 51 Hancock Street, but the thermometers have been changed. During an early portion of the observations, one thermometer only was used, placed on the eastern side of the house, and during some part of the year the observation at 7 A. M. may have been affected by reflected heat. Afterwards, the observation at that hour was made by a thermometer placed on the western side of the house, in no way affected by reflected heat. Since June, 1851, all the observations have been made by a standard thermometer of the manufacture of Troughton and Simms, London, and so placed as not to be affected by reflected heat, at any part of the year, or hour of the day. The estimated height of the thermometer above marsh level is eighty-two or eighty-three feet. Hours of observation, 7 A. M., $2\frac{1}{2}$ P. M., and 9 P. M.

The rain has been collected in a tin cylindrical vessel, eighteen inches in height, and twelve inches in diameter, placed about ninety feet above marsh level, and measured by a scale graduated to tenths of an inch. The snow has been melted and then measured.

In the tables,		F	denotes	Fair.
"	"	C	"	Cloudy.
"	"	R	"	Rain.
"	"	S	"	Snow.
"	"	—	"	Below zero.

Deductions from the Record of Temperature.

In the 12 years from 1821 to 1832, the thermometer was at $2\frac{1}{2}$ P. M. at 102°, July 11th and 12th, 1825, and at 12° below zero at 7 A. M., January 25th, 1821, and February 1st, 1826.

In the 12 years from 1833 to 1844, it was at $2\frac{1}{2}$ P. M. at 99°, July 26th, 1834, and at 10° below zero at 7 A. M., January 4th, 1835, and January 24th, 1839.

In the 12 years from 1845 to 1856, it was at $2\frac{1}{2}$ P. M. at 98°, July 12th, 1845, and July 13th, 1849, and at 16° below zero at 7 A. M., February 7th, 1855.

The hottest day in 36 years, was July 11th, 1825, when the thermometer at 7 A. M. was 82°, at $2\frac{1}{2}$ P. M. at 102°, at 9 P. M. at 87°.

The coldest day was February 6th, 1855, when it was at 6° below zero at 7 A. M. at $2\frac{1}{2}$ P. M. at $5\frac{1}{2}$° below, and at 9 P. M. at $11\frac{1}{2}$° below.

The hottest seven successive days were from July 10th to 17th, 1825, the mean temperature for that time being 83°.05.

The coldest seven successive days, were the last seven days in January, 1844, the mean temperature for that time being 6°.71.

The thermometer was once below zero in March, at 7 A. M., March 3d, 1833.

January is colder than February for 19 years.

February is colder than January for 15 years.

Temperature about equal for 2 years.

December is colder than January for 9 years.

December is colder than February for 11 years.

March, 1843, was colder than January or December of that year.

July is warmer than August for 33 years.

August is warmer than July for 3 years.

The warmest year was 1828; this year all the months excepting April and October were above the mean of the 36 years for the same months, the mean of the year being	51°.78
The coldest year was 1836; this year all the months were below the mean; the mean of the year being	45°.34
Range of mean annual temperature	6°.44
The highest mean monthly temperature, July, 1825	77°.61
The lowest mean monthly temperature, January, 1856	18°.97
Extreme range of mean monthly temperature	58°.64
The mean temperature for the 36 years is	48°.66

3° below the mean constitutes a cold year.

3° above the mean constitutes a warm year.

This small difference we find distributed over all the months.

Range of the Mean Temperature of the Months in different Years.

	Lowest.	Highest.	Range.	Mean of Extremes.	Mean of all.
	1856	1843			
January,	18°.97	34°.20	15°.23	26°.59	27°.03
	1838	1828			
February,	19°.27	37°.51	18.24	28.39	27.61
	1856	1831			
March,	28°.25	41°.34	13.09	34.79	35.52
	1852	1827			
April,	41°.06	50°.33	9.27	45.70	45.74
	1850	1826			
May,	51°.55	63°.59	12.04	57.57	56.37
	1836	1831			
June,	58°.91	71°.47	12.56	65.19	66.43
	1832	1825			
July,	68°.04	77°.61	9.57	72.82	71.97
	1836	1828			
August,	65°.12	74°.09	8.97	69.60	69.24
	1835	1846			
September,	57°.90	67°.12	9.22	62.51	62.00
	1836	1851			
October,	45°.22	54°.16	8.94	49.69	51.08
	1827	1849			
November,	34°.99	46°.80	11.81	40.89	40.40
	1831	1829			
December,	19°.14	37°.40	18.26	28.27	30.58
				48.50	48.66

The order in which the months arrange themselves in regard to *variable mean* temperature is, December greatest, next February, then January, March, June, May, November, July, April, September, August, October.

July is the warmest month.

January is the coldest month.

October nearest the mean temperature of the year, being 2°.42 higher.

April next nearest the mean temperature of the year, being 2°.92 lower.

Mean Temperature of three Winter Months.		*Mean Temperature of three Spring Months.*	
December,	30°.58	March,	35°.52
January,	27.03	April,	45.74
February,	27.61	May,	56.37
Mean of Winter,	28.41	Mean of Spring,	45.88

Mean Temperature of three Summer Months.		*Mean Temperature of three Autumnal Months.*	
June,	66.43°	September,	62.00°
July,	71.97	October,	51.08
August,	69.24	November,	40.40
Mean of Summer,	69.21	Mean of Autumn,	51.16

Deductions from Record of Rain.

	Inches.
In the period of thirty-four years, the greatest quantity of rain falling in one year was in 1850	53.98
The smallest quantity in one year in 1846	29.95
Range	24.03
The greatest quantity falling in one year, 1850	53.98
Mean quantity falling in thirty-four years	43.05
Excess in 1850	10.93
Mean quantity falling in thirty-four years	43.05
Smallest quantity falling in one year, 1846	29.95
Deficiency in 1846	13.10
November is the month in which the greatest mean quantity of rain falls, being	4.31
June is the month in which the smallest mean quantity of rain falls, being	2.64
During the period of thirty-four years, the greatest quantity of rain which fell in one month was in August, 1826	12.10
The smallest quantity in April, 1844	0.20
Range	11.90
August is the most variable month as to quantity of rain, there falling in August, 1826	12.10
In August, 1828	0.37
Range,	11.73
June is the least variable month, there falling in June, 1842	5.30
In June, 1853	0.30
Range	5.00

JANUARY, 1821.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	18	F	29	F	23	F
2	20	F	21	F	16	F
3	6	F	17	F	16	F
4	16	F	25	F	19	F
5	16	F	21	F	14	F
6	13	F	25	F	22	C
7	17	S	14	S	11	S
8	11	F	24	F	17	F
9	18	C	35	C	28	C
10	22	F	24	F	16	F
11	15	C	34	C	28	C
12	20	F	34	F	28	C
13	26	C	36	C	28	C
14	16	S	14	S	16	S
15	11	F	19	F	14	F
16	6	F	21	F	10	F
17	12	S	23	S	12	S
18	6	F	16	F	5	F
19	—2	F	19	F	12	F
20	10	F	26	F	16	F
21	21	C	34	C	27	F
22	21	F	31	C	32	C
23	26	F	37	F	23	F
24	1	F	2	F	—8	F
25	—12	F	5	F	0	F
26	— 2	F	24	F	17	F
27	21	H	38	R	31	R
28	29	F	41	C	30	C
29	22	F	37	F	22	F
30	33	F	47	F	26	F
31	43	F	54	F	47	F
M.	15.48		26.67		19.61	
H.	43.		54.		47.	
L.	—12.		2.		—8.	

Mean of the Month, . . 20.58

FEBRUARY, 1821.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	44	R	42	R	36	C
2	31	C	41	C	38	C
3	35	C	40	C	33	C
4	32	C	33	C	32	C
5	28	C	33	C	22	F
6	16	F	31	F	22	F
7	29	C	36	C	28	F
8	25	F	30	F	22	F
9	20	F	41	C	39	C
10	35	F	44	F	36	F
11	28	F	40	F	32	F
12	36	R	49	C	40	F
13	41	F	44	F	35	F
14	33	C	33	S	30	S
15	26	F	37	F	27	F
16	22	C	36	S	30	S
17	30	S	34	C	26	C
18	26	F	36	F	26	F
19	20	F	43	F	34	F
20	39	F	49	R	42	C
21	35	F	43	F	33	F
22	31	C	43	C	35	C
23	35	S	35	R	30	C
24	24	F	31	F	21	F
25	17	F	32	F	27	F
26	25	F	40	C	34	C
27	36	F	29	F	20	F
28	16	C	32	S	31	R
M.	29.10		37.75		30.75	
H.	44.		49.		42.	
L.	16.		29.		21.	

Mean of the Month, . . 32.53

MARCH, 1821.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	34	R	36	R	35	R
2	35	F	37	F	30	F
3	29	F	39	F	32	F
4	23	F	30	F	23	F
5	13	F	24	F	20	F
6	17	F	31	F	15	F
7	19	F	33	F	27	F
8	21	F	37	F	28	F
9	24	F	45	F	36	F
10	35	F	50	F	41	F
11	40	C	36	C	33	C
12	30	F	42	F	35	F
13	33	F	54	F	44	F
14	42	R	48	C	38	F
15	35	F	57	F	43	F
16	42	F	61	F	47	F
17	49	C	29	C	19	C
18	19	F	26	F	19	F
19	14	F	24	F	19	F
20	19	C	32	S	36	R
21	49	C	44	F	32	F
22	29	F	37	F	32	F
23	33	C	42	C	36	C
24	38	R	56	F	41	R
25	34	S	43	R	38	F
26	32	F	41	F	37	F
27	28	C	41	S	23	F
28	20	F	35	F	26	F
29	21	F	37	F	30	F
30	26	F	41	F	37	F
31	37	F	56	F	46	F
M.	29.67		40.25		32.19	
H.	49.		61.		47.	
L.	13.		24.		15.	

Mean of the Month, . . 34.03

APRIL, 1821.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	38	F	43	C	37	C
2	35	S	44	F	33	S
3	26	F	34	F	28	F
4	25	F	40	F	32	F
5	30	F	41	F	33	F
6	38	F	55	F	42	F
7	40	F	65	F	49	F
8	54	C	64	C	44	C
9	37	F	52	F	38	F
10	33	F	56	F	41	F
11	36	C	43	S	36	R
12	36	S	35	S	35	R
13	34	F	50	C	40	C
14	36	F	52	F	43	F
15	38	F	51	C	40	C
16	35	F	50	C	40	C
17	33	S	32	S	31	S
18	31	C	39	C	33	C
19	32	F	44	F	37	F
20	34	F	50	F	39	F
21	39	F	64	F	54	F
22	48	R	56	C	45	F
23	40	F	59	F	46	F
24	46	F	69	F	59	F
25	44	F	58	C	44	F
26	38	F	50	F	42	F
27	41	F	51	F	42	F
28	38	F	61	F	43	F
29	42	F	70	F	58	F
30	56	R	70	F	58	F
M.	37.76		51.60		41.40	
H.	56.		70.		59.	
L.	25.		32.		28.	

Mean of the Month, . . 43.58

MAY, 1821.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	53	R	75	F	61	R
2	54	F	60	C	52	C
3	47	R	53	C	45	F
4	46	R	48	C	44	R
5	40	R	44	R	41	R
6	41	R	45	R	39	R
7	40	C	55	F	53	F
8	50	F	59	F	44	F
9	42	F	71	F	51	F
10	50	F	76	F	58	F
11	56	R	61	R	54	R
12	52	F	57	F	52	F
13	54	F	79	F	58	R
14	53	C	60	F	50	F
15	46	F	57	F	49	F
16	48	F	69	F	52	F
17	52	C	61	R	51	R
18	52	C	63	F	58	F
19	53	F	62	F	52	F
20	52	F	68	F	52	F
21	51	F	61	C	51	C
22	46	F	67	F	52	F
23	49	F	61	F	53	F
24	51	F	61	C	52	C
25	54	F	61	F	51	F
26	54	R	52	R	52	C
27	55	C	71	F	60	R
28	58	F	80	F	66	F
29	64	F	83	F	60	F
30	63	F	75	F	67	F
31	68	F	82	C	61	R
M.	51.41		63.77		52.93	
H.	68.		83.		67.	
L.	40.		44.		39.	

Mean of the Month, . . 56.03

JUNE, 1821.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	56	R	51	R	50	C
2	48	F	73	F	59	F
3	60	F	81	C	64	C
4	60	F	85	F	68	F
5	67	F	91	C	67	C
6	63	F	84	F	68	F
7	64	F	78	F	67	F
8	63	F	70	F	64	F
9	62	R	73	R	68	C
10	64	F	77	F	61	F
11	60	F	71	F	62	F
12	60	F	80	F	67	F
13	64	F	91	C	58	R
14	54	R	52	R	49	R
15	49	C	59	C	54	F
16	53	F	76	F	62	F
17	60	F	71	F	60	F
18	55	C	72	C	60	F
19	60	C	66	C	61	F
20	61	C	81	R	61	F
21	61	C	70	C	61	C
22	61	C	73	F	63	F
23	64	F	71	F	60	F
24	63	F	90	F	75	F
25	72	F	76	F	69	F
26	70	F	92	F	70	F
27	70	F	88	F	70	F
28	70	C	74	C	64	C
29	61	C	67	F	60	F
30	61	F	80	F	66	F
M.	61.20		75.43		62.93	
H.	72.		92.		75.	
L.	48.		51.		49.	

Mean of the Month, . . 66.52

JULY, 1821.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	64	F	84	F	63	F
2	63	F	84	R	66	R
3	65	C	69	F	60	F
4	52	F	66	F	56	F
5	56	C	65	F	57	F
6	57	F	64	F	58	F
7	58	F	73	F	61	F
8	64	F	80	R	64	R
9	62	F	75	F	67	F
10	63	F	83	F	63	F
11	63	R	65	R	63	R
12	57	F	71	F	62	F
13	58	F	77	F	65	F
14	63	F	77	F	63	F
15	60	F	82	F	65	F
16	65	F	87	F	64	F
17	64	F	87	F	70	F
18	70	C	86	F	67	F
19	61	F	83	F	65	F
20	62	C	78	C	63	C
21	62	F	70	R	62	F
22	62	F	72	F	62	F
23	60	C	74	C	66	C
24	64	R	67	R	66	R
25	63	C	71	R	67	R
26	69	C	77	F	66	F
27	66	F	74	F	67	F
28	64	F	85	F	73	F
29	71	F	72	F	64	C
30	65	F	91	F	79	F
31	78	F	92	F	79	F
M.	62.93		76.80		64.93	
H.	78.		92.		79.	
L.	52.		64.		56.	

Mean of the Month, . . 68.22

AUGUST, 1821.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	77	F	97	F	80	F
2	77	F	82	F	72	F
3	72	C	74	R	70	F
4	71	F	89	F	74	F
5	68	F	83	F	70	F
6	65	F	78	F	67	F
7	64	F	73	F	63	F
8	63	C	68	F	60	F
9	56	F	78	F	62	F
10	62	F	87	F	72	F
11	69	F	90	F	77	F
12	72	C	75	F	63	F
13	62	F	84	F	67	F
14	65	F	91	F	78	F
15	73	F	96	F	83	F
16	75	F	81	F	70	F
17	67	C	73	C	67	C
18	68	F	92	F	70	R
19	65	F	76	F	69	F
20	67	F	89	F	74	F
21	69	C	79	F	66	F
22	62	F	75	F	64	F
23	60	F	69	F	64	F
24	60	F	75	F	64	F
25	63	F	73	F	62	F
26	60	R	82	F	69	R
27	63	F	67	F	60	C
28	55	F	69	F	58	F
29	59	C	70	F	62	F
30	68	C	71	R	64	C
31	66	F	87	F	73	F
M.	66.54		79.77		68.19	
H.	77.		97.		83.	
L.	55.		67.		58.	

Mean of the Month, . . 71.50

SEPTEMBER, 1821.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	70	R	74	R	72	R
2	71	R	80	R	72	R
3	72	F	86	C	74	R
4	70	F	76	C	70	C
5	67	F	78	F	66	F
6	62	F	77	F	62	F
7	57	F	71	F	63	F
8	64	F	86	F	70	F
9	70	C	83	F	75	C
10	71	F	76	F	67	F
11	57	F	65	C	58	R
12	57	R	74	C	58	F
13	57	F	69	F	58	F
14	55	F	70	F	57	F
15	51	F	66	F	56	F
16	57	F	75	C	58	R
17	57	R	59	C	58	C
18	56	C	65	C	60	C
19	57	F	65	F	57	F
20	50	F	59	C	52	C
21	62	F	73	F	65	F
22	53	F	68	F	55	F
23	51	F	70	F	57	F
24	53	C	59	R	56	R
25	55	F	73	F	59	F
26	47	F	59	F	52	F
27	43	F	60	F	52	F
28	50	F	70	F	59	F
29	49	F	68	F	57	F
30	49	F	64	C	57	C
M.	58.06		70.60		61.06	
H.	70.		86.		75.	
L.	43.		59.		52.	

Mean of the Month, . . 63.24

OCTOBER, 1821.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	57	C	64	R	62	R
2	60	C	69	C	57	C
3	56	F	69	R	57	F
4	53	F	64	F	52	F
5	48	F	71	F	52	F
6	59	F	75	F	57	F
7	48	C	60	C	54	C
8	54	R	59	R	51	C
9	42	F	55	F	46	F
10	46	F	52	F	40	F
11	34	F	49	F	42	F
12	46	R	53	C	56	C
13	58	F	66	F	53	F
14	49	C	57	R	48	R
15	43	F	56	F	51	F
16	49	F	62	F	47	F
17	40	F	53	F	42	F
18	37	C	44	C	40	C
19	35	C	45	C	35	C
20	31	F	54	F	40	F
21	41	F	63	F	52	F
22	51	F	53	F	38	F
23	32	F	46	F	37	F
24	30	F	49	F	38	F
25	30	F	47	F	41	F
26	35	F	61	F	49	F
27	45	F	68	F	56	F
28	46	F	58	F	48	F
29	43	F	67	F	57	F
30	47	F	61	F	45	F
31	38	F	50	F	47	F
M.	44.61		58.06		48.06	
H.	60.		75.		62.	
L.	30.		44.		35.	

Mean of the Month, . . 50.24

NOVEMBER, 1821.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	50	R	51	R	43	F
2	40	F	51	F	40	F
3	34	C	55	C	52	C
4	54	R	60	R	48	C
5	47	R	47	R	45	R
6	45	R	47	R	47	R
7	49	R	54	C	44	F
8	44	F	55	F	44	F
9	39	F	55	F	49	F
10	50	R	56	C	42	F
11	34	F	46	F	42	F
12	48	C	48	R	38	R
13	34	F	43	F	34	F
14	31	F	42	C	34	C
15	32	C	44	C	37	C
16	31	C	48	C	44	C
17	45	R	41	R	40	C
18	38	F	48	C	38	C
19	37	R	41	S	34	C
20	34	F	42	F	35	F
21	36	C	43	C	36	C
22	38	C	44	R	44	R
23	38	F	45	F	36	F
24	36	C	40	R	40	R
25	42	F	42	F	35	F
26	31	F	42	F	31	F
27	31	F	36	F	28	F
28	22	F	34	F	26	F
29	26	C	32	C	28	S
30	22	C	29	C	24	C
M.	37.96		45.36		38.60	
H.	54.		60.		52.	
L.	22.		29.		24.	

Mean of the Month, . . 40.64

DECEMBER, 1821.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	24	C	31	C	24	C
2	25	C	40	C	37	C
3	38	F	44	F	34	F
4	35	F	42	F	35	F
5	36	C	42	C	36	C
6	34	F	35	F	27	F
7	27	F	39	F	28	F
8	31	C	38	S	36	R
9	33	F	43	F	33	F
10	27	F	37	C	35	C
11	36	R	41	R	33	F
12	25	F	32	F	26	F
13	31	C	35	S	38	R
14	30	F	33	F	25	F
15	19	F	24	F	17	F
16	13	F	27	F	20	F
17	22	F	40	F	32	F
18	36	R	47	R	34	F
19	21	F	31	F	25	F
20	26	F	36	C	33	C
21	33	R	41	R	38	R
22	56	R	33	R	31	R
23	24	F	23	F	20	C
24	20	F	32	F	27	F
25	24	S	26	C	25	C
26	18	F	23	F	17	F
27	17	F	31	F	23	C
28	27	F	43	F	26	F
29	16	F	13	F	6	F
30	5	F	21	C	23	C
31	18	F	30	F	18	F
M.	26.03		33.96		27.80	
H.	38.		47.		38.	
L.	5.		13.		6.	

Mean of the Month, . . 29.26

JANUARY, 1822.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	16	F	36	F	36	F
2	37	F	37	F	22	F
3	14	F	34	F	34	F
4	16	F	15	F	5	F
5	—6	F	7	F	2	E
6	12	F	24	C	18	C
7	13	F	27	F	21	F
8	28	S	37	S	37	R
9	36	F	35	F	18	F
10	10	F	16	F	7	F
11	2	F	27	F	18	F
12	28	F	35	F	25	C
13	27	S	30	C	6	F
14	—5	F	8	F	8	F
15	20	F	36	F	22	F
16	17	F	22	F	10	F
17	2	F	17	F	13	F
18	19	F	37	F	35	F
19	41	R	44	C	35	F
20	35	C	42	C	35	C
21	29	F	45	C	37	C
22	36	F	47	F	40	F
23	27	F	17	F	4	F
24	0	F	4	F	1	F
25	—1	F	12	F	10	F
26	10	F	30	F	24	F
27	26	C	33	S	24	F
28	20	F	38	F	30	F
29	31	F	38	C	32	C
30	30	C	34	S	34	R
31	21	C	26	C	22	S
M.	19.70		28.70		21.45	
H.	41.		47.		40.	
L.	—6.		4.		1.	

Mean of the Month, . . 23.28

FEBRUARY, 1822.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	24	F	31	F	23	F
2	14	F	31	F	20	F
3	13	F	36	F	30	F
4	32	R	38	R	32	S
5	12	F	29	F	18	F
6	26	C	41	C	26	S
7	11	F	18	F	12	F
8	14	F	33	F	19	F
9	9	F	39	F	25	F
10	23	F	33	F	17	F
11	11	F	25	F	24	F
12	28	F	32	C	24	C
13	19	S	26	C	19	C
14	16	S	26	C	20	C
15	12	F	27	F	17	F
16	13	F	38	C	38	R
17	40	R	41	C	36	F
18	32	F	32	C	23	S
19	26	F	33	F	22	F
20	19	F	45	F	34	C
21	34	C	52	R	50	R
22	41	F	50	F	40	C
23	23	F	30	F	23	F
24	23	F	43	F	35	F
25	21	F	22	F	13	F
26	13	F	40	F	31	F
27	32	F	56	F	44	F
28	38	F	54	F	43	F
M.	22.10		35.75		27.07	
H.	40.		56.		50.	
L.	9.		18.		13.	

Mean of the Month, . . 28.30

MARCH, 1822.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	43	F	62	F	49	F
2	46	F	54	C	49	R
3	46	F	51	F	35	F
4	34	F	44	F	34	F
5	32	F	54	F	42	F
6	38	F	61	F	45	F
7	36	F	40	C	35	C
8	31	S	31	S	21	C
9	16	F	28	F	21	F
10	20	F	39	F	27	F
11	27	F	48	F	44	F
12	40	F	57	F	40	F
13	31	F	36	F	24	F
14	24	F	38	F	25	F
15	26	F	46	F	33	F
16	30	F	50	C	35	F
17	32	F	44	F	44	F
18	38	F	47	F	45	F
19	33	F	41	F	37	F
20	37	F	59	C	43	C
21	36	F	40	F	32	F
22	32	C	39	R	37	R
23	38	C	40	F	30	F
24	30	F	47	F	37	F
25	32	F	42	F	33	F
26	32	F	59	F	45	F
27	39	F	42	F	41	F
28	50	R	55	R	55	R
29	41	F	43	F	30	F
30	29	F	42	C	32	S
31	34	S	42	F	35	F
M.	33.96		45.83		36.29	
H.	50.		62.		55.	
L.	16.		28.		21.	

Mean of the Month, . . 38.70

APRIL, 1822.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	44	C	49	R	35	F
2	27	F	45	F	34	F
3	37	F	58	F	40	F
4	35	F	51	F	36	F
5	42	C	42	C	35	R
6	34	F	47	F	36	F
7	36	F	61	C	46	C
8	50	R	48	C	38	C
9	35	C	40	S	36	S
10	36	S	38	S	38	R
11	38	C	50	F	44	R
12	41	F	50	F	40	F
13	41	C	42	R	44	R
14	41	R	62	C	50	F
15	41	F	52	F	39	F
16	41	C	44	R	40	R
17	39	F	52	F	41	F
18	37	F	48	C	36	R
19	37	C	47	C	41	C
20	40	R	47	C	39	C
21	38	C	44	F	42	F
22	40	F	45	C	41	C
23	40	F	43	F	41	F
24	44	F	62	F	48	F
25	48	F	53	F	61	F
26	56	F	55	F	48	F
27	45	C	58	F	57	C
28	61	R	63	C	51	F
29	51	F	68	F	51	F
30	50	F	71	F	56	F
M.	41.50		51.16		42.80	
H.	61.		71.		61.	
L.	27.		38.		34.	

Mean of the Month, . . 45.15

MAY, 1822.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	58	F	78	R	60	F
2	60	F	82	F	69	F
3	60	F	67	F	52	F
4	46	F	65	F	53	F
5	48	R	48	R	47	C
6	43	F	59	F	47	F
7	43	F	70	F	57	C
8	58	F	69	F	56	F
9	50	F	59	F	53	F
10	50	F	67	F	52	F
11	48	F	67	F	51	F
12	46	F	71	F	51	F
13	51	F	78	F	57	F
14	56	F	81	F	59	F
15	60	F	83	R	68	F
16	53	F	64	F	52	F
17	52	F	66	C	54	C
18	54	F	76	R	61	R
19	61	F	65	R	57	F
20	55	F	61	F	54	F
21	54	F	73	C	64	C
22	64	F	80	C	67	C
23	67	F	80	F	62	F
24	56	F	70	F	53	F
25	48	F	57	F	52	F
26	55	F	69	F	57	F
27	57	C	76	R	67	F
28	67	F	91	F	72	F
29	70	F	87	F	67	F
30	61	F	66	F	59	F
31	59	C	75	F	68	F
M.	55.16		70.96		58.00	
H.	70.		91.		72.	
L.	43.		48.		47.	

Mean of the Month, . . 61.37

JUNE, 1822.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	66	F	80	C	69	C
2	70	C	80	F	64	R
3	60	F	80	F	66	F
4	63	C	59	R	56	R
5	53	F	63	F	54	F
6	55	F	65	F	53	F
7	55	F	70	F	53	F
8	63	C	79	R	60	F
9	62	F	79	F	67	F
10	64	F	83	F	68	F
11	68	F	69	C	71	C
12	70	F	81	F	64	F
13	62	F	64	F	57	F
14	56	F	67	F	57	F
15	57	F	82	F	70	F
16	70	F	91	F	65	F
17	58	F	81	C	61	R
18	58	R	61	C	53	F
19	52	F	63	F	56	F
20	56	C	67	C	59	R
21	59	F	80	F	68	F
22	64	R	80	C	64	F
23	64	F	84	F	67	F
24	65	R	68	R	64	C
25	60	F	66	F	61	F
26	61	F	82	F	65	F
27	64	F	81	F	65	F
28	60	F	83	F	70	F
29	68	F	87	F	73	F
30	70	F	87	F	70	F
M.	61.76		75.40		63.00	
H.	70.		91.		73.	
L.	53.		59.		53.	

Mean of the Month, . . 66.72

JULY, 1822.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	72	F	95	F	75	F
2	72	F	75	C	63	C
3	61	R	81	R	68	F
4	66	F	92	F	78	F
5	78	F	74	F	69	F
6	72	C	90	C	78	C
7	70	F	88	F	79	F
8	69	R	72	R	64	C
9	62	F	79	F	66	F
10	62	F	87	C	68	R
11	66	R	86	F	72	C
12	71	R	82	R	68	C
13	68	F	88	C	73	C
14	71	R	80	C	72	R
15	71	F	88	R	71	R
16	68	F	79	F	69	R
17	66	F	80	F	70	F
18	68	F	86	F	74	F
19	70	F	84	F	74	F
20	72	F	96	F	80	F
21	74	F	92	C	75	C
22	70	F	80	F	67	F
23	67	F	73	F	70	F
24	70	F	88	F	72	F
25	68	R	82	R	64	R
26	58	F	71	F	59	F
27	54	F	69	F	62	F
28	66	R	74	R	70	C
29	64	F	82	F	66	F
30	63	F	74	F	64	F
31	55	F	71	F	64	F
M.	67.22		81.87		69.67	
H.	78.		96.		80.	
L.	54.		69.		62.	

Mean of the Month, . . 72.92

AUGUST, 1822.

Day of Month	7 A. M.		2½ P. M.		9 P. M.	
1	55	F	73	F	64	F
2	64	F	89	F	73	F
3	71	R	92	F	77	F
4	73	F	90	F	73	R
5	70	C	77	C	68	C
6	58	F	71	F	59	F
7	55	F	69	F	58	F
8	58	C	67	F	58	F
9	58	F	76	F	64	F
10	62	F	79	F	70	F
11	66	F	86	F	74	F
12	70	F	94	F	74	F
13	71	F	83	R	70	F
14	61	F	74	F	67	C
15	64	R	81	C	70	R
16	60	F	81	F	69	F
17	66	F	87	F	69	F
18	60	F	72	F	63	F
19	65	R	75	C	70	C
20	69	C	85	R	71	F
21	66	F	70	F	64	F
22	64	C	70	F	61	C
23	60	C	67	F	60	F
24	57	F	67	F	62	F
25	57	F	73	F	60	F
26	58	F	73	F	62	F
27	57	F	68	F	60	F
28	60	C	68	C	63	C
29	64	F	81	F	63	F
30	53	F	70	F	58	F
31	53	F	72	F	61	F
M.	62.09		76.77		65.64	
H.	73.		94.		77.	
L.	53.		67.		58.	

Mean of the Month, . . 68.16

SEPTEMBER, 1822.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	58	F	80	F	65	F
2	63	C	83	C	69	R
3	67	F	87	F	72	F
4	64	F	77	C	67	C
5	56	F	77	F	62	F
6	57	F	74	F	58	F
7	55	F	79	F	67	F
8	61	F	82	F	65	F
9	63	F	84	F	68	F
10	65	F	80	F	71	F
11	70	F	87	C	72	C
12	64	F	74	F	71	F
13	66	F	82	F	68	F
14	65	F	69	C	65	C
15	65	C	83	F	72	F
16	69	F	75	F	62	F
17	52	F	64	F	51	F
18	45	F	65	F	52	F
19	51	F	71	C	60	C
20	60	R	60	R	65	R
21	58	F	71	F	56	F
22	49	F	60	F	48	F
23	41	F	68	F	52	F
24	46	F	70	F	56	F
25	50	F	67	F	57	F
26	58	F	80	C	68	C
27	67	C	81	C	72	C
28	72	F	83	C	73	C
29	73	R	75	R	69	R
30	69	F	79	F	64	F
M.	59.96		75.56		63.90	
H.	73.		87.		73.	
L.	41.		60.		48.	

Mean of the Month, . . 66.47

OCTOBER, 1822.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	51	F	59	F	52	F
2	47	F	56	C	47	C
3	45	F	56	F	47	F
4	44	F	57	F	47	F
5	45	F	60	F	52	F
6	49	F	70	F	56	F
7	52	F	66	F	59	F
8	55	C	66	R	59	F
9	52	C	60	F	55	F
10	54	C	72	C	63	R
11	62	R	64	C	59	C
12	60	C	71	F	59	F
13	54	F	70	F	55	F
14	47	C	52	R	45	R
15	41	F	53	F	43	F
16	42	F	64	C	58	C
17	50	F	67	F	53	F
18	51	F	73	F	62	F
19	62	C	70	C	64	C
20	68	R	54	C	51	R
21	54	R	56	C	53	F
22	52	F	53	F	43	F
23	38	F	50	F	41	F
24	37	F	50	C	43	C
25	36	F	47	F	39	F
26	32	F	45	F	36	F
27	34	F	48	C	44	C
28	41	R	47	R	47	R
29	39	F	52	C	45	C
30	41	F	49	F	41	F
31	40	F	57	F	51	F
M.	47.58		58.51		50.61	
H.	68.		73.		64.	
L.	32.		45.		36.	

Mean of the Month, . . 52.23

NOVEMBER, 1822.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	42	F	51	F	37	F
2	32	F	46	C	41	C
3	37	F	46	C	36	C
4	30	F	45	F	35	F
5	29	F	55	F	44	F
6	38	F	47	F	40	F
7	43	C	55	C	52	C
8	51	C	52	C	46	C
9	41	F	42	F	36	F
10	30	F	45	F	36	F
11	42	C	57	C	53	C
12	53	F	65	C	58	C
13	46	C	43	C	46	C
14	46	R	44	R	43	R
15	40	F	48	F	39	F
16	37	F	57	F	44	F
17	41	F	60	F	45	F
18	45	C	44	R	47	R
19	43	F	53	F	44	F
20	39	F	50	C	46	C
21	46	R	57	C	48	R
22	41	C	44	R	42	R
23	38	C	49	F	44	F
24	37	F	38	F	29	F
25	27	C	45	C	49	C
26	42	C	43	F	34	F
27	28	F	42	F	32	F
28	37	C	46	R	51	R
29	46	F	52	F	43	F
30	49	F	66	C	60	R
M.	39.86		49.56		43.33	
H.	58.		66.		60.	
L.	27.		38.		29.	

Mean of the Month, . . 44.25

DECEMBER, 1822.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	66	C	55	R	42	R
2	34	F	40	F	34	F
3	34	S	29	S	24	S
4	16	F	28	F	24	F
5	18	F	35	F	30	F
6	23	F	29	F	19	F
7	17	F	29	F	29	F
8	32	C	42	F	36	F
9	26	F	36	F	33	F
10	36	C	41	C	36	C
11	39	F	52	F	40	F
12	30	F	37	F	32	F
13	34	C	40	C	34	C
14	35	C	39	R	45	R
15	43	F	35	F	17	F
16	11	F	22	F	21	F
17	33	C	39	F	30	F
18	23	F	32	F	32	F
19	40	R	48	R	45	C
20	37	F	39	F	29	F
21	28	C	30	C	27	S
22	29	F	37	F	25	F
23	20	F	20	F	10	F
24	10	F	26	F	19	F
25	18	C	34	C	30	C
26	20	F	34	C	21	C
27	18	F	30	C	26	C
28	27	C	33	C	28	C
29	20	F	36	F	27	F
30	22	F	29	F	19	F
31	16	F	24	F	17	F
M.	27.58		34.83		28.41	
H.	66.		55.		45.	
L.	10.		20.		10.	

Mean of the Month, . . 30.27

JANUARY, 1823.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	23	S	29	S	34	S
2	27	F	41	F	32	F
3	24	C	37	C	31	C
4	29	C	28	C	22	C
5	31	R	20	C	16	F
6	11	F	18	F	10	F
7	1	F	17	F	9	F
8	16	F	32	F	20	F
9	19	F	35	F	30	C
10	33	F	40	C	32	C
11	7	F	13	F	12	F
12	15	C	22	F	19	F
13	7	F	15	F	12	F
14	3	F	14	F	7	F
15	15	F	32	F	22	F
16	12	F	31	F	22	F
17	16	F	33	F	25	F
18	26	F	41	F	38	F
19	40	C	48	C	41	F
20	38	R	37	R	36	R
21	34	F	40	F	32	F
22	29	F	40	F	34	F
23	31	C	34	C	27	F
24	18	F	32	F	26	F
25	24	C	36	C	33	C
26	32	C	38	S	34	S
27	34	C	38	R	34	S
28	32	F	41	F	34	F
29	28	F	34	F	24	F
30	24	F	37	F	24	F
31	22	C	31	S	28	S
M.	22.61		31.74		25.80	
H.	40.		48.		41.	
L.	1.		13.		7.	

Mean of the Month, . . 26.72

FEBRUARY, 1823.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	19	F	21	F	18	F
2	18	F	31	F	23	F
3	27	C	33	S	32	S
4	27	F	35	F	22	F
5	9	F	21	F	15	F
6	5	F	14	F	8	F
7	0	F	13	F	8	F
8	5	C	17	C	17	C
9	12	F	27	F	19	F
10	16	F	33	F	30	F
11	27	F	38	C	32	C
12	33	S	39	C	33	C
13	22	F	33	F	21	F
14	18	F	34	C	29	S
15	23	F	40	C	20	C
16	16	C	24	C	12	C
17	2	F	26	C	18	C
18	20	C	35	F	18	F
19	7	F	16	F	13	F
20	15	C	30	C	20	C
21	20	F	40	F	34	F
22	33	F	42	F	30	F
23	19	F	34	F	31	F
24	20	S	21	S	19	S
25	22	S	34	C	26	C
26	17	F	41	C	32	C
27	24	F	32	F	13	F
28	6	F	19	F	10	F
M.	17.21		29.40		21.53	
H.	33.		42.		34.	
L.	0.		13.		8.	

Mean of the Month, . . 22.71

MARCH, 1823.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	8	F	30	F	21	F
2	10	C	42	C	37	C
3	20	F	13	F	7	F
4	1	F	19	F	14	F
5	22	F	46	C	40	C
6	45	R	50	R	46	R
7	34	F	35	F	24	F
8	22	F	43	F	34	F
9	37	C	40	C	30	C
10	21	F	30	F	26	F
11	28	C	35	S	35	R
12	33	C	41	C	34	C
13	27	F	44	F	34	F
14	37	C	40	R	34	S
15	33	F	37	F	30	F
16	25	F	34	F	30	F
17	31	F	52	F	39	F
18	37	R	37	R	36	R
19	36	R	41	C	32	F
20	32	S	35	S	30	S
21	27	F	36	F	26	F
22	29	F	53	F	41	F
23	42	F	44	F	37	F
24	49	F	54	F	37	F
25	33	F	46	C	37	C
26	33	S	35	S	33	S
27	30	F	41	F	32	F
28	32	F	42	F	33	F
29	31	F	46	F	36	F
30	38	C	40	C	33	C
31	29	S	34	S	37	S
M.	29.42		39.19		32.10	
H.	49.		54.		46.	
L.	1.		13.		7.	

Mean of the Month, . . 33.57

APRIL, 1823.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	33	F	51	F	39	F
2	35	F	59	F	43	F
3	45	F	52	C	51	C
4	41	F	41	F	32	F
5	28	F	45	F	33	F
6	36	F	61	F	54	F
7	54	C	62	C	56	R
8	55	F	55	C	40	C
9	36	F	45	F	38	F
10	39	S	35	R	34	R
11	34	S	35	S	32	C
12	31	F	43	F	34	F
13	34	F	55	F	43	F
14	40	F	51	F	41	F
15	40	F	55	F	45	F
16	46	F	71	C	57	C
17	55	F	67	C	58	C
18	58	F	64	C	56	R
19	47	F	60	F	49	F
20	45	C	54	R	49	R
21	54	C	48	R	40	R
22	40	F	47	C	40	C
23	42	C	61	R	49	R
24	41	F	50	F	38	F
25	33	F	54	C	44	C
26	42	F	67	F	57	F
27	54	F	65	C	54	C
28	40	F	51	F	42	F
29	40	F	51	F	43	F
30	42	F	51	F	45	F
M.	42.00		53.53		44.53	
H.	58.		71.		58.	
L.	28.		41.		32.	

Mean of the Month, . . 46.68

MAY, 1823.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	45	F	48	C	44	C
2	44	R	49	R	47	R
3	46	F	64	F	51	F
4	50	F	65	C	43	C
5	35	F	47	C	39	C
6	34	F	56	F	50	F
7	46	F	54	C	46	C
8	46	F	49	C	43	R
9	41	R	43	C	41	C
10	41	C	47	C	42	C
11	44	C	52	R	46	F
12	43	F	52	F	48	F
13	46	C	51	R	44	R
14	42	R	47	R	45	C
15	43	F	58	F	50	F
16	49	F	67	F	52	F
17	51	R	68	C	55	F
18	54	F	75	F	61	F
19	59	F	83	F	66	F
20	65	F	62	F	52	F
21	53	F	64	F	63	F
22	61	R	80	R	59	F
23	54	F	73	F	56	F
24	52	F	69	C	55	C
25	64	C	84	F	61	R
26	50	F	64	F	54	F
27	46	F	69	F	51	F
28	53	F	59	F	56	F
29	57	R	62	R	60	R
30	58	C	72	F	53	F
31	47	F	63	F	52	F
M.	49.00		61.16		51.13	
H.	65.		84.		66.	
L.	34.		43.		39.	

Mean of the Month, . . 53 76

JUNE, 1823.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	54	F	64	F	57	F
2	54	F	70	F	60	F
3	56	F	60	F	60	F
4	53	C	61	F	62	F
5	68	F	89	F	71	F
6	56	F	72	F	60	F
7	58	F	82	F	63	F
8	63	R	55	C	53	C
9	50	F	53	F	47	F
10	47	F	58	F	52	F
11	50	F	66	F	55	F
12	55	F	71	F	53	F
13	53	F	79	F	61	F
14	61	R	83	F	68	F
15	66	F	62	F	60	F
16	58	C	75	F	61	F
17	63	F	93	F	75	F
18	70	F	96	R	73	F
19	72	F	95	R	76	F
20	66	F	67	F	61	F
21	62	F	80	F	70	F
22	53	F	67	F	52	F
23	54	F	78	F	60	F
24	57	C	82	F	69	F
25	65	F	74	F	64	F
26	64	F	79	F	64	F
27	59	R	61	C	58	C
28	60	F	81	C	70	C
29	70	F	79	F	68	F
30	57	F	80	F	69	F
M.	59.13		73.73		62.40	
H.	72.		96.		76.	
L.	47.		53.		47.	

Mean of the Month, . . 65.09

JULY, 1823.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	62	F	85	F	72	F
2	70	F	92	C	76	C
3	63	F	69	F	56	F
4	58	F	69	F	58	F
5	62	F	92	F	76	F
6	66	R	59	R	59	C
7	64	F	68	C	66	C
8	66	F	88	F	73	F
9	70	F	93	F	78	F
10	74	F	96	F	74	F
11	69	F	92	F	74	R
12	74	F	93	F	79	F
13	72	F	87	F	68	F
14	62	F	83	F	70	F
15	69	R	69	R	72	R
16	66	F	69	R	60	R
17	59	F	79	F	66	F
18	65	C	73	C	62	C
19	61	F	77	F	62	F
20	57	F	79	F	65	F
21	61	F	67	F	60	F
22	60	F	77	F	64	F
23	62	F	80	F	67	F
24	67	F	89	F	73	F
25	67	C	80	R	62	R
26	61	R	67	C	64	R
27	68	F	87	F	74	F
28	70	F	86	F	74	F
29	68	F	77	C	75	R
30	73	C	77	R	63	R
31	62	C	67	C	61	C
M.	65.41		79.35		67.84	
H.	74.		96.		79.	
L.	57.		67.		56.	

Mean of the Month, . . 70.87

AUGUST, 1823.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	62	C	69	F	68	F
2	66	F	84	F	72	F
3	70	C	79	R	69	R
4	67	F	74	F	64	R
5	63	F	81	F	68	F
6	65	F	86	F	73	F
7	69	F	89	F	76	F
8	74	C	91	F	83	F
9	71	F	80	F	67	F
10	61	F	83	C	69	R
11	62	R	69	C	64	R
12	71	F	88	C	74	C
13	66	F	74	F	68	F
14	65	F	74	F	62	F
15	63	R	75	F	64	C
16	63	R	68	C	63	C
17	63	C	69	C	61	C
18	60	C	67	F	63	F
19	64	R	77	C	67	F
20	64	F	86	F	70	F
21	66	F	74	R	68	R
22	64	F	72	F	60	F
23	54	F	73	F	61	F
24	55	F	72	F	61	F
25	56	F	82	F	62	F
26	58	F	88	F	66	F
27	65	F	90	F	73	F
28	70	F	92	F	74	F
29	66	F	76	F	66	F
30	65	C	77	F	70	F
31	71	F	94	F	74	F
M.	64.48		79.13		67.74	
H.	74.		94.		83.	
L.	54.		67.		60.	

Mean of the Month, . . 70.45

SEPTEMBER, 1823.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	63	F	65	F	58	F
2	54	F	65	F	56	F
3	52	F	75	F	67	F
4	71	F	78	R	67	F
5	58	F	73	F	62	F
6	60	F	86	F	74	F
7	63	C	61	R	52	R
8	54	C	61	F	52	F
9	52	F	64	F	56	F
10	48	C	63	F	56	F
11	48	F	64	F	58	F
12	58	F	64	F	58	F
13	54	F	65	F	56	F
14	60	C	79	F	67	F
15	56	F	66	C	56	C
16	50	F	67	F	60	F
17	59	C	66	F	62	R
18	70	C	82	F	69	F
19	67	F	71	F	60	F
20	56	F	77	F	69	F
21	57	C	62	F	48	F
22	42	F	58	C	46	C
23	38	F	56	C	51	C
24	52	C	52	C	51	C
25	48	C	62	C	56	C
26	54	R	62	C	56	C
27	52	C	57	C	48	C
28	42	F	62	F	46	F
29	41	F	64	R	42	R
30	35	F	53	F	44	F
M.	53.80		66.00		56.76	
H.	71.		86.		74.	
L.	35.		52.		42.	

Mean of the Month, . . 58.85

OCTOBER, 1823.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	42	F	67	F	51	F
2	46	F	71	F	56	F
3	50	F	76	F	58	F
4	54	F	74	F	61	F
5	62	F	73	F	66	F
6	58	F	61	F	49	F
7	44	F	57	C	53	C
8	50	C	57	C	52	C
9	55	F	70	C	58	C
10	52	F	61	F	46	F
11	41	F	52	F	41	F
12	38	F	54	F	45	F
13	47	R	58	C	52	R
14	43	F	48	F	37	F
15	34	F	58	F	52	F
16	51	F	63	C	52	R
17	55	F	62	C	47	C
18	41	R	43	R	39	R
19	37	F	49	F	37	F
20	37	F	59	F	46	F
21	44	F	62	C	52	C
22	53	F	54	F	41	F
23	38	F	55	F	52	C
24	48	F	55	F	43	F
25	47	C	49	R	38	R
26	40	C	43	C	40	C
27	40	R	45	C	44	R
28	43	F	53	C	46	C
29	43	F	55	F	44	F
30	43	C	45	F	40	F
31	37	C	43	C	43	C
M.	45.58		57.16		47.77	
H.	62.		76.		66.	
L.	34.		43.		37.	

Mean of the Month, . . 50.17

NOVEMBER, 1823.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	43	R	47	R	43	R
2	45	R	45	C	34	F
3	31	F	43	F	34	F
4	36	F	51	F	41	F
5	32	F	44	F	31	F
6	27	F	42	C	40	C
7	41	R	42	R	37	R
8	35	F	42	F	42	F
9	31	F	51	F	40	F
10	45	F	58	C	50	R
11	54	R	43	R	36	R
12	29	F	37	F	29	F
13	35	C	41	C	31	C
14	26	F	47	F	41	F
15	36	F	49	F	37	F
16	25	F	34	F	29	F
17	27	C	33	C	27	C
18	20	F	34	F	26	F
19	24	F	37	F	29	F
20	29	F	48	F	38	F
21	36	F	52	F	43	F
22	47	C	50	F	40	F
23	30	F	38	F	29	F
24	22	F	35	F	26	F
25	26	C	39	S	36	R
26	41	C	40	C	37	C
27	38	C	45	F	37	F
28	30	F	31	F	21	F
29	16	F	29	F	26	F
30	25	C	36	F	32	F
M.	32.73		42.10		34.40	
H.	54.		58.		50.	
L.	16.		29.		21.	

Mean of the Month, . . 36.41

DECEMBER, 1823.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	27	F	42	F	32	F
2	36	C	41	C	32	C
3	31	F	49	F	37	F
4	40	C	48	R	51	R
5	38	F	37	F	31	F
6	26	F	35	F	30	F
7	38	F	51	C	40	C
8	31	F	33	C	17	C
9	12	C	25	S	30	S
10	19	S	30	C	31	C
11	23	F	28	F	19	F
12	21	S	29	S	30	S
13	22	F	34	F	29	F
14	27	F	39	C	36	C
15	36	S	31	S	30	S
16	28	S	32	S	30	S
17	26	F	31	F	24	F
18	18	F	37	F	35	F
19	37	R	47	R	37	R
20	34	F	40	F	31	F
21	29	F	32	F	22	C
22	14	C	27	C	28	C
23	40	R	43	R	38	R
24	37	R	35	F	28	F
25	22	F	33	F	26	F
26	23	F	26	F	20	F
27	22	F	40	C	38	C
28	41	F	45	F	36	F
29	28	F	41	F	32	F
30	27	F	41	F	40	F
31	39	R	49	F	43	F
M.	28.77		37.13		31.71	
H.	41.		51.		51.	
L.	12.		25.		17.	

Mean of the Month, . . 32.54

JANUARY, 1824.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	34	C	27	S	22	R
2	22	C	28	C	25	C
3	32	F	40	C	35	C
4	27	F	45	F	41	F
5	38	C	47	C	43	C
6	46	C	51	R	32	F
7	22	F	29	F	25	F
8	32	F	40	F	30	F
9	27	F	43	C	40	C
10	45	C	48	R	38	R
11	32	S	34	R	36	S
12	29	C	35	F	34	F
13	33	C	38	R	36	R
14	42	C	38	F	22	F
15	14	F	24	F	22	F
16	27	F	38	C	31	C
17	30	F	29	F	21	F
18	24	C	31	S	24	S
19	21	C	30	C	22	C
20	15	C	26	C	19	C
21	23	C	26	C	17	F
22	6	F	21	F	18	F
23	15	F	28	F	21	F
24	13	F	32	F	24	F
25	20	C	37	C	34	C
26	31	S	32	S	30	S
27	26	F	34	F	26	F
28	21	F	35	F	28	F
29	27	F	40	F	37	F
30	34	F	40	F	33	F
31	31	S	36	R	31	C
M.	27.06		34.90		28.93	
H.	46.		51.		43.	
L.	6.		21.		17.	

Mean of the Month, . . 30.30

FEBRUARY, 1824.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	15	F	18	F	9	F
2	4	F	19	F	15	F
3	10	F	29	F	28	F
4	30	F	38	F	30	F
5	—6	F	4	F	3	F
6	4	F	27	F	22	F
7	23	F	40	F	30	F
8	26	C	37	S	34	F
9	24	F	40	F	29	F
10	34	C	50	F	45	C
11	49	C	54	R	57	R
12	36	F	32	F	22	F
13	16	F	24	F	24	F
14	28	C	34	C	33	C
15	33	C	36	S	34	R
16	35	R	36	S	34	C
17	33	F	38	F	30	F
18	26	F	45	C	43	R
19	23	F	26	F	23	F
20	29	F	45	F	34	F
21	33	F	53	F	41	F
22	34	R	33	S	25	S
23	19	F	28	F	24	F
24	21	F	29	F	19	F
25	13	F	26	C	24	C
26	29	C	41	R	44	R
27	51	F	42	F	31	F
28	29	C	36	F	28	F
29	22	F	29	F	23	F
M.	24.93		34.10		28.90	
H.	51.		54.		57.	
L.	—6.		4.		3.	

Mean of the Month, . . 29.31

MARCH, 1824.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	16	F	23	F	18	F
2	17	C	27	F	24	F
3	21	F	45	F	34	F
4	35	F	51	C	41	C
5	39	C	46	C	35	C
6	33	F	43	F	36	F
7	39	C	44	R	41	R
8	47	F	43	F	33	F
9	30	F	40	F	36	F
10	34	F	42	C	34	C
11	30	F	43	F	32	F
12	27	F	41	F	35	F
13	35	F	47	F	35	F
14	29	F	42	C	34	C
15	27	F	44	F	34	F
16	34	S	33	S	30	S
17	24	S	34	S	29	S
18	31	F	38	C	31	C
19	24	F	38	F	32	F
20	34	S	46	R	30	F
21	17	F	29	F	26	F
22	21	F	37	F	33	F
23	30	C	37	S	34	S
24	35	F	43	F	34	F
25	38	C	50	C	37	F
26	35	F	49	F	39	F
27	35	F	47	F	40	F
28	39	F	49	F	44	F
29	39	R	41	R	38	R
30	37	F	56	C	43	C
31	37	F	49	F	38	F
M.	31.26		41.83		34.20	
H.	47.		56.		44.	
L.	16.		23.		18.	

Mean of the Month, . . 35.76

APRIL, 1824.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	35	F	46	F	39	F
2	34	F	45	C	41	C
3	37	F	54	F	45	F
4	38	F	60	F	47	F
5	41	F	64	F	50	F
6	46	F	69	C	49	R
7	44	F	43	F	35	F
8	33	F	46	F	36	F
9	34	F	53	F	41	F
10	38	F	56	C	44	C
11	49	R	49	R	46	R
12	43	R	42	R	42	R
13	42	C	55	R	45	R
14	44	F	58	F	49	F
15	49	R	57	R	44	F
16	41	F	56	F	47	F
17	43	F	51	R	42	R
18	37	F	50	C	37	R
19	35	F	55	C	43	F
20	40	F	59	F	49	F
21	49	F	58	C	48	R
22	46	F	51	F	46	F
23	47	R	61	R	49	C
24	50	F	61	F	50	F
25	45	F	70	F	50	F
26	56	F	74	C	64	C
27	46	F	49	C	42	R
28	39	R	42	R	41	C
29	42	C	57	F	50	F
30	45	F	67	F	52	F
M.	42.26		55.26		45.77	
H.	56.		74.		64.	
L.	33.		42.		35.	

Mean of the Month, . . 47.76

MAY, 1824.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	48	F	55	F	47	F
2	47	C	58	R	47	C
3	47	C	63	C	60	C
4	63	C	74	R	46	F
5	42	F	47	F	38	F
6	37	F	65	C	47	C
7	46	R	58	C	51	F
8	49	F	76	F	61	F
9	53	F	60	F	48	F
10	43	F	62	F	52	F
11	52	F	69	F	57	F
12	51	F	56	F	51	F
13	49	C	55	C	51	C
14	43	F	45	C	43	C
15	43	F	61	F	50	F
16	45	F	65	C	47	C
17	46	F	67	F	54	F
18	49	F	71	F	56	F
19	50	R	51	C	49	C
20	48	F	64	C	51	C
21	48	F	61	C	52	C
22	50	F	61	C	54	C
23	54	F	70	F	54	F
24	51	F	74	F	57	F
25	60	F	67	C	48	C
26	38	F	62	F	48	F
27	50	F	72	F	54	F
28	62	F	86	F	66	F
29	66	F	72	F	54	F
30	54	F	56	F	51	F
31	49	F	82	F	64	F
M.	49.45		64.03		51.87	
H.	66.		86.		66.	
L.	37.		45.		38.	

Mean of the Month, . . 55.12

JUNE, 1824.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	64	F	89	F	73	F
2	70	F	63	C	53	C
3	51	R	50	R	47	R
4	50	C	60	C	63	R
5	63	R	76	F	63	F
6	65	F	72	F	68	F
7	64	F	74	C	69	C
8	69	F	79	F	62	F
9	60	C	63	C	57	C
10	60	C	75	F	60	F
11	54	F	71	F	60	F
12	56	F	75	F	62	F
13	57	F	66	C	57	C
14	53	F	71	F	51	F
15	48	F	67	F	54	F
16	52	F	71	F	58	F
17	54	F	59	C	55	R
18	55	F	69	F	61	F
19	60	F	81	F	65	F
20	63	R	71	R	64	C
21	58	C	64	C	56	C
22	55	C	60	C	55	C
23	57	C	67	F	64	F
24	64	R	69	R	66	R
25	67	F	81	R	65	F
26	63	F	82	R	68	F
27	68	F	89	F	73	F
28	64	F	87	F	74	F
29	68	F	74	F	72	F
30	70	F	92	C	76	C
M.	60.07		72.23		62.53	
H.	70.		92.		76.	
L.	48.		50.		47.	

Mean of the Month, . . 64.94

JULY, 1824.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	74	F	87	F	72	F
2	66	F	83	C	68	C
3	67	C	87	F	69	F
4	64	F	77	F	67	F
5	59	F	75	F	65	F
6	63	C	76	C	71	C
7	74	F	85	F	69	F
8	64	F	85	F	72	F
9	67	F	88	F	74	F
10	69	C	63	R	62	R
11	65	F	82	F	69	F
12	61	F	74	F	64	F
13	61	C	75	F	65	R
14	63	C	70	F	64	F
15	67	F	81	F	69	F
16	62	F	77	F	65	F
17	60	F	79	F	67	F
18	65	C	86	F	73	F
19	71	F	76	C	72	R
20	67	F	71	F	65	F
21	62	F	73	F	64	F
22	62	F	84	F	69	F
23	65	F	90	F	72	F
24	70	R	77	R	68	F
25	63	F	80	F	72	F
26	68	F	90	C	73	C
27	70	F	75	C	67	C
28	65	F	70	F	63	F
29	63	F	72	C	71	R
30	70	R	86	R	72	F
31	71	F	89	F	73	F
M.	65.74		79.45		68.58	
H.	74.		90.		74.	
L.	59.		63.		62.	

Mean of the Month, . . 71.26

AUGUST, 1824.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	63	F	81	F	65	F
2	61	F	85	F	69	F
3	66	R	74	R	68	C
4	62	C	74	C	62	F
5	54	F	66	F	59	F
6	56	F	74	F	64	F
7	63	F	73	C	65	C
8	65	F	78	C	68	R
9	65	C	73	R	69	R
10	65	F	80	F	69	F
11	62	F	79	F	67	F
12	61	F	74	F	69	F
13	63	C	62	F	57	R
14	55	F	69	F	57	F
15	54	F	71	F	57	F
16	54	F	77	F	64	F
17	62	F	87	F	70	F
18	65	F	86	F	70	F
19	67	F	92	F	74	F
20	61	F	67	F	59	F
21	53	F	75	F	64	C
22	70	C	85	F	74	F
23	63	F	79	F	64	F
24	58	F	69	F	64	F
25	59	F	69	F	64	F
26	59	C	73	C	66	C
27	65	C	75	R	68	R
28	68	C	73	C	67	C
29	61	F	73	F	62	F
30	57	F	75	F	64	F
31	62	C	62	R	62	R
M.	61.26		75.16		65.19	
H.	70.		92.		74.	
L.	53.		62.		57.	

Mean of the Month, . . 67.20

SEPTEMBER, 1824.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	60	C	70	C	60	F
2	55	F	79	F	66	F
3	57	F	81	F	68	F
4	70	R	79	C	70	F
5	70	F	86	F	72	F
6	70	F	82	F	69	F
7	62	F	67	C	63	R
8	63	R	69	R	66	R
9	52	F	64	C	55	F
10	51	F	66	F	55	F
11	55	F	66	C	60	C
12	58	F	70	C	62	C
13	61	F	79	C	68	R
14	63	F	84	F	70	F
15	66	F	87	F	73	F
16	70	F	86	F	74	F
17	74	R	84	C	67	F
18	53	F	59	F	52	F
19	52	C	63	C	56	R
20	53	F	66	F	56	F
21	56	F	63	C	54	C
22	50	F	65	C	57	C
23	46	F	58	F	48	F
24	47	F	62	F	48	F
25	44	F	66	F	52	F
26	45	F	59	F	51	F
27	47	F	61	C	56	R
28	56	R	62	R	56	R
29	53	R	55	R	51	R
30	51	C	58	F	51	F
M.	58.66		69.86		60.20	
H.	74.		87.		74.	
L.	44.		55.		48.	

Mean of the Month, . . 62.91

OCTOBER, 1824.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	50	F	60	F	50	F
2	46	F	66	F	53	F
3	47	F	65	F	53	F
4	49	F	73	C	58	C
5	55	F	75	C	60	C
6	58	C	67	C	62	C
7	61	R	67	C	52	F
8	41	F	58	F	46	F
9	47	F	69	F	58	F
10	58	F	67	C	56	C
11	59	F	73	C	64	C
12	64	F	64	F	49	F
13	40	F	56	F	47	F
14	49	C	63	C	48	C
15	40	F	53	F	45	F
16	43	F	65	F	51	F
17	50	F	69	F	52	F
18	40	F	52	F	51	F
19	55	F	65	F	51	F
20	51	C	60	C	59	C
21	59	R	64	C	48	F
22	42	F	53	F	44	F
23	42	F	49	F	39	F
24	36	F	50	F	40	F
25	35	F	49	F	39	F
26	42	C	50	R	57	R
27	49	F	57	F	45	F
28	39	F	52	F	41	F
29	42	R	47	C	36	F
30	32	F	45	F	31	F
31	27	F	43	F	38	F
M.	46.71		59.55		49.12	
H.	64.		75.		64.	
L.	27.		43.		31.	

Mean of the Month, . . 51.79

NOVEMBER, 1824.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	37	C	45	C	41	C
2	40	C	47	R	44	R
3	34	F	35	F	29	F
4	24	F	41	F	35	F
5	41	C	47	R	48	R
6	44	F	48	C	43	C
7	38	C	47	F	39	F
8	34	F	43	F	32	F
9	33	C	44	R	44	R
10	43	C	50	F	44	F
11	35	F	45	F	34	F
12	26	F	35	F	28	F
13	22	F	39	F	33	F
14	32	C	47	C	42	C
15	43	C	51	R	56	R
16	59	R	50	R	47	C
17	41	C	48	C	40	C
18	32	F	41	F	33.	F
19	29	F	41	F	34	F
20	33	F	41	F	34	F
21	31	F	47	F	38	F
22	35	F	56	C	48	C
23	42	F	48	F	40	C
24	40	C	42	R	39	R
25	31	F	38	F	30	F
26	28	F	47	C	48	R
27	53	R	53	R	42	C
28	38	C	38	R	35	R
29	32	C	39	C	35	C
30	35	C	37	C	35	C
M.	36.16		44.33		39.00	
H.	59.		56.		56.	
L.	22.		35.		28.	

Mean of the Month, . . 39.83

DECEMBER, 1824.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	29	F	41	F	32	F
2	34	R	42	R	42	R
3	44	R	48	R	45	R
4	46	R	35	R	24	S
5	18	F	28	F	26	F
6	27	F	39	F	34	F
7	37	C	40	C	33	C
8	33	C	36	F	28	F
9	28	F	35	F	27	F
10	32	F	39	C	42	C
11	36	C	37	R	26	S
12	27	C	33	C	30	S
13	37	R	47	C	38	F
14	33	F	39	F	33	F
15	23	F	31	F	24	F
16	19	F	29	F	21	F
17	19	F	36	C	36	C
18	44	R	56	R	55	R
19	42	F	46	F	37	F
20	35	F	42	F	33	F
21	30	F	41	F	34	F
22	34	C	37	C	34	C
23	28	F	32	F	22	F
24	20	F	35	C	36	C
25	34	F	43	F	32	F
26	32	C	40	C	36	C
27	38	C	49	F	36	F
28	31	C	33	C	32	C
29	27	F	41	F	34	F
30	30	F	45	F	33	F
31	30	F	43	F	40	F
M.	31.51		39.29		33.39	
H.	46.		56.		55.	
L.	18.		28.		21.	

Mean of the Month, . . 34.73

JANUARY, 1825.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	40	F	47	F	36	R
2	31	S	21	C	16	F
3	15	F	22	F	16	F
4	14	F	29	F	22	F
5	20	F	35	F	27	F
6	23	F	35	F	22	F
7	10	F	20	F	15	F
8	9	F	27	C	30	C
9	32	C	40	F	22	F
10	12	F	27	F	21	F
11	21	F	38	F	29	F
12	24	F	41	F	31	F
13	31	C	36	C	32	C
14	34	R	37	R	39	R
15	36	C	43	C	38	C
16	33	C	40	C	35	C
17	35	C	36	C	35	C
18	29	F	34	F	29	F
19	29	F	39	F	30	F
20	23	F	35	F	26	F
21	32	C	41	F	27	F
22	16	C	24	C	22	C
23	14	C	17	C	17	C
24	20	F	35	F	27	F
25	25	F	32	F	22	F
26	31	C	44	F	34	F
27	30	F	42	C	36	C
28	32	C	39	C	36	C
29	42	C	40	R	16	S
30	12	F	24	F	20	F
31	17	F	36	F	30	F
M.	25.00		34.06		27.03	
H.	42.		47.		39.	
L.	9.		17.		15.	

Mean of the Month, . . 28.70

FEBRUARY, 1825.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	31	C	33	S	31	S
2	30	S	37	R	23	C
3	15	F	22	F	14	F
4	9	F	23	F	16	F
5	15	F	31	F	27	F
6	24	F	42	F	34	F
7	35	F	48	F	40	F
8	20	F	25	F	18	F
9	10	F	29	F	24	F
10	24	F	40	F	30	F
11	22	F	42	F	36	F
12	37	R	39	R	34	R
13	29	C	42	F	38	F
14	34	F	43	F	31	F
15	29	C	39	S	31	S
16	31	C	42	F	32	F
17	28	F	39	C	37	R
18	36	F	42	F	31	F
19	25	C	34	C	29	C
20	22	C	33	C	29	C
21	30	S	29	S	30	S
22	32	C	41	C	35	C
23	29	F	39	F	30	F
24	26	F	48	F	37	F
25	37	R	46	C	36	C
26	34	S	33	S	34	S
27	31	C	29	S	29	S
28	29	C	37	S	34	S
M.	26.93		36.67		30.35	
H.	37.		48.		40.	
L.	9.		22.		14.	

Mean of the Month, . . 31.31

MARCH, 1825.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	33	C	43	C	35	C
2	29	F	44	F	36	F
3	32	F	42	F	38	F
4	36	F	45	F	35	F
5	37	C	39	C	38	C
6	37	F	49	F	38	F
7	35	F	44	F	35	F
8	35	F	40	C	40	R
9	37	C	42	R	40	R
10	36	F	43	F	34	F
11	31	F	45	F	38	F
12	48	C	56	F	43	F
13	37	F	50	F	41	F
14	38	F	56	F	43	F
15	40	F	45	F	38	F
16	38	C	43	C	39	R
17	46	C	46	R	45	R
18	45	F	48	F	39	F
19	35	F	52	F	41	F
20	41	F	63	F	51	F
21	40	C	45	F	35	F
22	30	F	39	F	31	F
23	27	F	52	F	46	F
24	37	F	55	F	39	F
25	29	F	41	C	36	C
26	35	S	34	S	34	R
27	33	C	50	C	36	C
28	31	F	40	F	32	F
29	28	F	44	F	34	F
30	33	F	45	C	40	R
31	38	C	45	R	42	F
M.	35.71		45.97		38.45	
H.	48.		63.		51.	
L.	27.		34.		31.	

Mean of the Month, . . 40.04

APRIL, 1825.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	36	F	50	F	40	F
2	32	F	40	F	32	F
3	37	C	34	C	37	S
4	38	F	59	F	47	F
5	45	F	46	F	42	F
6	42	F	64	C	52	C
7	44	F	50	F	42	F
8	40	F	45	F	40	F
9	38	F	61	F	49	F
10	47	F	60	F	56	F
11	50	F	59	F	42	F
12	39	F	56	F	39	F
13	40	C	45	C	43	C
14	42	C	48	C	39	C
15	37	F	66	F	52	F
16	50	F	77	F	59	F
17	50	F	63	F	58	F
18	55	F	75	F	52	F
19	46	F	50	C	45	C
20	44	C	49	C	40	C
21	30	F	51	F	37	F
22	42	F	61	F	50	F
23	46	F	52	F	44	F
24	42	F	52	C	44	C
25	43	F	51	C	48	C
26	50	F	62	C	52	C
27	55	F	70	C	56	F
28	48	F	64	C	51	C
29	49	C	60	R	59	R
30	51	F	66	F	48	F
M.	43.60		56.20		46.50	
H.	55.		77.		59.	
L.	30.		34.		32.	

Mean of the Month, . . 48.77

MAY, 1825.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	44	F	65	F	54	F
2	37	S	52	S	41	C
3	37	F	59	C	46	C
4	40	F	52	C	46	C
5	42	R	51	R	46	C
6	45	F	60	F	55	F
7	53	F	66	F	54	F
8	48	F	49	F	44	F
9	43	F	55	F	50	F
10	51	F	69	C	55	C
11	47	F	52	F	45	F
12	45	F	73	F	56	F
13	52	F	56	F	47	F
14	46	F	56	F	43	F
15	47	F	57	F	50	F
16	51	F	67	F	52	F
17	58	C	69	C	54	R
18	61	F	76	F	59	F
19	62	F	74	C	60	R
20	57	F	61	F	55	F
21	54	F	81	F	63	F
22	57	F	73	F	61	F
23	58	F	75	F	63	F
24	60	F	79	C	60	C
25	63	C	66	F	61	C
26	61	F	69	F	55	F
27	53	F	70	F	59	F
28	56	F	68	F	54	F
29	54	F	68	F	60	F
30	58	F	68	F	62	F
31	61	F	83	F	64	F
M.	51.74		65.20		54.00	
H.	63.		83.		64.	
L.	37.		52.		41.	

Mean of the Month, . . 56.98

JUNE, 1825.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	69	F	82	F	65	F
2	63	R	72	R	64	R
3	63	R	69	R	61	R
4	58	R	56	R	51	R
5	54	R	60	R	60	R
6	59	F	75	F	64	F
7	68	F	88	F	76	F
8	73	F	87	F	79	F
9	72	F	85	F	77	F
10	82	F	90	F	81	F
11	79	F	96	R	74	F
12	72	F	69	C	59	C
13	60	F	78	F	70	F
14	60	F	74	F	65	F
15	64	F	80	F	69	F
16	69	F	78	R	52	R
17	60	F	75	F	60	F
18	62	C	71	R	62	R
19	70	F	85	F	70	F
20	70	F	72	F	67	F
21	70	R	86	F	72	C
22	73	F	80	F	68	F
23	63	F	81	C	64	C
24	63	C	81	F	68	F
25	65	C	64	R	60	R
26	61	C	81	F	65	F
27	63	F	74	F	63	F
28	66	C	66	R	64	R
29	64	F	81	F	65	F
30	64	F	86	F	67	F
M.	66.00		77.40		66.06	
H.	82.		96.		81.	
L.	54.		56.		51.	

Mean of the Month, . . 69.82

JULY, 1825.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	68	C	75	C	69	F
2	69	F	86	C	71	C
3	73	C	89	C	73	C
4	71	R	75	R	63	C
5	67	C	80	C	70	C
6	67	F	86	F	69	F
7	73	F	88	C	72	C
8	65	F	72	F	61	F
9	65	F	87	F	73	F
10	75	F	96	F	84	F
11	82	F	102	F	87	F
12	82	F	102	F	82	F
13	80	F	87	C	77	C
14	69	F	88	F	77	F
15	74	F	88	F	70	F
16	69	F	81	F	72	F
17	73	F	94	F	76	F
18	72	F	89	F	71	F
19	72	F	85	F	77	F
20	77	F	99	F	84	F
21	81	F	100	F	85	F
22	79	F	83	F	69	C
23	70	C	76	F	77	F
24	77	F	97	F	80	F
25	76	C	82	C	73	C
26	67	F	86	F	71	F
27	62	F	86	F	70	F
28	63	F	81	F	69	F
29	66	F	86	F	71	F
30	64	F	91	F	69	F
31	75	F	94	F	72	F
M.	71.71		87.45		73.68	
H.	82.		102.		87.	
L.	62.		72.		61.	

Mean of the Month, . . 77.61

AUGUST, 1825.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	73	F	73	C	68	F
2	67	C	61	R	60	C
3	60	F	69	F	64	F
4	63	F	87	F	71	F
5	70	F	80	F	69	F
6	69	F	89	F	69	F
7	67	F	90	F	73	F
8	70	F	86	F	76	F
9	74	F	89	F	74	F
10	69	F	84	F	72	F
11	64	F	78	F	66	F
12	58	F	73	F	62	F
13	63	F	87	F	74	F
14	71	F	82	F	69	F
15	68	C	74	F	76	F
16	75	F	76	F	68	F
17	62	F	71	C	64	C
18	65	F	64	C	59	C
19	58	F	66	C	60	C
20	60	R	59	R	60	R
21	60	R	60	R	56	C
22	59	C	64	F	58	F
23	61	F	80	F	68	F
24	63	F	77	F	71	F
25	72	F	82	F	66	F
26	65	F	69	F	60	F
27	56	F	78	F	61	F
28	58	F	82	F	65	F
29	70	F	80	F	64	F
30	63	F	84	F	68	F
31	65	F	84	F	71	F
M.	65.09		76.71		66.51	
H.	75.		90.		76.	
L.	56.		59.		56.	

Mean of the Month, . . 69.44

SEPTEMBER, 1825.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	60	F	70	F	57	F
2	53	F	72	F	57	F
3	55	F	66	F	59	F
4	56	C	64	F	54	F
5	52	F	68	F	55	F
6	53	F	64	F	55	F
7	49	F	64	F	57	F
8	62	C	68	R	62	R
9	57	F	67	F	57	F
10	54	F	67	F	50	F
11	46	F	63	F	53	F
12	56	F	72	C	60	C
13	60	F	79	C	66	C
14	63	F	77	R	66	R
15	59	F	79	F	63	F
16	59	F	77	C	63	C
17	63	R	67	C	58	F
18	59	F	75	F	60	F
19	56	F	75	F	58	F
20	55	C	62	C	51	C
21	50	F	68	F	59	F
22	57	F	72	F	57	F
23	62	C	67	C	62	C
24	69	C	67	F	52	F
25	44	F	67	F	51	F
26	50	C	60	C	57	C
27	52	R	52	R	51	R
28	50	C	61	F	49	F
29	47	F	71	F	53	F
30	50	F	69	F	56	F
M.	55.27		68.33		56.93	
H.	69.		79.		66.	
L.	44.		52.		49.	

Mean of the Month, . . 60.18

OCTOBER, 1825.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	56	F	75	F	60	F
2	57	F	74	F	63	F
3	61	F	82	F	65	F
4	67	C	65	R	64	R
5	63	C	68	F	62	F
6	62	F	77	F	66	F
7	64	F	85	F	71	F
8	62	C	57	C	52	C
9	41	C	60	C	51	C
10	54	C	65	C	66	C
11	69	F	73	F	55	F
12	46	C	49	C	47	C
13	42	F	65	F	51	F
14	53	C	53	C	53	C
15	53	R	58	C	54	C
16	57	R	63	F	48	F
17	41	C	49	C	37	C
18	35	F	49	F	37	C
19	31	F	46	F	40	F
20	42	F	57	F	44	F
21	47	C	43	F	33	F
22	29	F	44	F	34	F
23	35	F	60	F	48	F
24	45	F	56	F	39	F
25	35	F	46	F	42	F
26	44	C	53	C	60	C
27	63	C	68	C	65	C
28	44	F	47	F	40	F
29	37	F	51	F	40	F
30	35	F	51	F	44	C
31	43	C	54	C	52	C
M.	48.80		59.45		51.06	
H.	69.		85.		71.	
L.	29.		43.		33.	

Mean of the Month, . . 53.11

NOVEMBER, 1825.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	46	C	52	F	48	F
2	44	F	55	F	44	F
3	37	F	47	F	36	F
4	31	F	47	F	42	F
5	39	F	58	F	47	F
6	46	F	59	F	45	F
7	38	F	57	F	45	F
8	39	F	58	F	46	F
9	42	F	59	C	45	C
10	35	F	46	F	37	F
11	34	F	51	C	40	C
12	33	F	44	F	33	F
13	29	F	49	F	42	F
14	53	R	52	C	40	F
15	33	F	49	F	38	F
16	42	C	46	F	38	F
17	39	C	48	C	42	C
18	34	F	36	F	23	F
19	17	F	30	F	24	F
20	33	C	41	C	33	F
21	32	F	41	C	32	C
22	29	S	27	S	29	S
23	24	C	38	F	32	F
24	35	C	39	C	32	C
25	32	F	40	C	36	C
26	35	C	43	C	35	C
27	33	C	41	C	37	C
28	31	F	45	F	35	F
29	30	F	46	F	36	F
30	30	C	44	C	43	R
M.	35.17		46.26		37.83	
H.	53.		59.		48.	
L.	17.		27.		23.	

Mean of the Month, . . 39.76

DECEMBER, 1825.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	43	R	46	R	45	R
2	43	C	53	C	46	C
3	43	C	45	F	43	F
4	36	C	43	C	39	C
5	33	F	38	F	29	F
6	25	F	35	F	30	F
7	30	C	39	F	30	F
8	22	F	36	F	31	F
9	50	C	51	R	34	C
10	24	F	29	F	24	F
11	28	C	32	F	22	F
12	16	F	23	F	12	F
13	—5	F	3	F	1	F
14	11	F	28	C	24	C
15	30	F	48	F	35	F
16	35	F	48	F	46	F
17	51	R	57	R	50	R
18	45	R	45	R	41	R
19	35	F	43	F	35	F
20	32	F	38	F	27	F
21	21	F	29	F	27	F
22	19	F	21	F	11	F
23	6	F	21	F	16	F
24	12	C	31	C	29	C
25	36	C	48	C	48	R
26	33	F	32	F	22	F
27	17	C	34	C	36	C
28	28	F	40	F	31	F
29	26	C	36	S	31	S
30	35	R	35	R	41	R
31	40	C	44	R	39	R
M.	29.03		37.13		31.45	
H.	51.		57.		50.	
L.	—5.		3.		1.	

Mean of the Month, . . 32.54

JANUARY, 1826.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	36	C	40	R	44	R
2	27	F	33	F	26	F
3	26	F	35	F	27	F
4	36	C	35	C	21	C
5	13	F	19	F	14	F
6	12	F	26	F	22	F
7	27	C	35	C	38	C
8	34	R	46	C	40	C
9	36	C	39	C	37	R
10	48	C	55	F	44	F
11	39	C	46	C	41	C
12	37	F	42	F	33	F
13	26	F	35	F	30	F
14	31	C	36	R	40	R
15	50	R	43	C	38	C
16	32	C	34	F	26	F
17	24	F	34	F	24	F
18	21	F	35	F	26	F
19	21	F	35	F	26	F
20	18	F	30	F	27	F
21	22	C	32	C	27	C
22	15	F	31	C	22	C
23	20	C	36	C	35	C
24	33	S	36	S	34	C
25	20	F	20	F	12	F
26	4	F	21	F	13	F
27	7	F	28	C	36	R
28	30	F	42	F	31	F
29	31	F	38	C	21	C
30	16	C	21	S	18	S
31	2	F	—1	F	—5	F
M.	25.61		33.45		28.00	
H.	50.		55.		44.	
L.	2.		—1.		—5.	

Mean of the Month, . . 29.02

FEBRUARY, 1826.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	—12	F	9	F	9	F
2	20	C	23	C	29	C
3	31	C	29	S	21	C
4	12	F	29	F	21	F
5	25	C	35	F	33	C
6	20	F	37	F	27	F
7	31	C	42	R	36	R
8	37	F	39	F	30	F
9	18	F	30	F	24	F
10	32	C	46	R	40	R
11	41	C	46	R	41	R
12	28	F	44	F	37	F
13	28	F	34	F	28	F
14	32	C	34	C	21	F
15	14	F	26	F	19	F
16	19	C	36	C	33	C
17	30	F	33	C	23	C
18	17	C	37	C	21	C
19	20	F	37	F	28	F
20	28	F	38	C	35	C
21	34	C	38	R	35	R
22	29	F	30	F	24	F
23	17	F	38	C	34	C
24	36	F	48	F	36	F
25	36	C	56	C	51	C
26	50	F	54	F	44	F
27	33	S	35	S	33	S
28	31	S	33	S	31	S
M.	26.32		36.28		30.14	
H.	50.		56.		50.	
L.	—12.		9.		9.	

Mean of the Month, . . 30.92

MARCH, 1826.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	31	C	36	R	35	R
2	34	R	39	R	36	C
3	33	R	41	C	36	C
4	35	C	37	R	36	R
5	36	C	44	C	41	C
6	41	C	45	C	37	C
7	32	F	37	C	34	C
8	34	R	38	C	36	C
9	39	C	40	C	38	C
10	38	C	46	C	42	C
11	38	F	45	F	33	F
12	25	F	38	F	32	F
13	37	C	48	F	36	F
14	21	F	41	F	32	F
15	28	F	39	F	36	F
16	40	F	51	F	28	F
17	16	F	32	F	24	F
18	19	F	36	F	28	F
19	28	C	38	C	33	R
20	34	C	38	C	38	R
21	35	S	45	F	33	F
22	31	F	50	F	37	F
23	37	F	44	C	33	C
24	50	C	62	C	57	C
25	51	C	50	C	40	C
26	28	S	34	C	26	C
27	22	R	37	C	29	C
28	25	F	46	F	32	F
29	37	C	50	C	38	C
30	29	F	39	F	31	F
31	25	F	38	F	34	F
M.	32.55		42.06		35.20	
H.	51.		62.		57.	
L.	16.		32.		24.	

Mean of the Month, . . 36.60

APRIL, 1826.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	32	F	53	F	41	F
2	35	F	53	F	42	F
3	31	F	44	F	35	F
4	33	F	47	F	40	F
5	42	F	61	F	45	F
6	36	F	42	C	34	S
7	35	S	42	C	34	F
8	30	F	48	F	37	F
9	40	R	54	C	47	C
10	33	S	35	S	29	S
11	21	F	30	F	20	F
12	20	F	34	F	30	F
13	22	F	40	F	33	F
14	40	F	56	F	42	F
15	42	F	62	F	49	F
16	50	C	53	C	41	R
17	47	C	58	F	49	F
18	44	F	64	F	53	F
19	54	R	50	C	49	F
20	49	C	61	R	45	F
21	36	F	52	F	37	F
22	35	F	46	F	35	F
23	37	F	52	F	44	F
24	41	F	56	C	43	C
25	44	C	52	C	44	C
26	45	F	50	C	44	C
27	47	C	50	C	48	C
28	43	F	49	F	41	F
29	48	C	59	C	57	R
30	49	F	61	F	48	F
M.	38.70		50.77		41.20	
H.	54.		64.		57.	
L.	20.		30.		20.	

Mean of the Month, . . 43.56

MAY, 1826.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	45	F	63	F	49	F
2	52	F	74	F	54	F
3	51	C	62	F	64	F
4	64	F	72	F	63	F
5	57	C	72	F	53	F
6	57	F	77	F	55	F
7	52	F	71	F	58	F
8	55	C	63	F	53	F
9	51	F	60	F	52	F
10	50	F	60	F	51	F
11	50	F	69	F	54	F
12	52	F	76	F	55	F
13	60	F	88	F	72	F
14	68	F	75	C	66	F
15	73	F	95	F	78	F
16	73	F	95	F	80	F
17	73	F	94	F	71	F
18	59	F	76	F	60	F
19	54	F	59	F	52	F
20	53	F	75	F	58	F
21	58	F	74	F	64	F
22	63	R	75	F	61	F
23	65	F	84	F	71	F
24	65	F	67	F	64	F
25	57	F	60	F	54	F
26	54	F	71	F	61	F
27	61	F	67	C	61	C
28	64	C	82	F	57	F
29	53	F	61	C	49	C
30	52	F	62	C	52	C
31	57	F	80	F	64	F
M.	58.00		72.87		59.88	
H.	73.		95.		80.	
L.	45.		59.		49.	

Mean of the Month, . . 63.59

JUNE, 1826.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	63	F	86	F	69	F
2	65	R	82	C	67	C
3	71	F	81	F	77	F
4	75	F	70	R	54	R
5	50	C	54	C	49	F
6	50	F	75	F	57	F
7	62	F	82	F	68	F
8	73	F	93	F	76	F
9	73	F	78	F	69	F
10	69	F	91	F	69	F
11	70	F	93	F	79	F
12	60	F	77	F	64	F
13	62	F	78	F	62	F
14	59	F	82	F	74	F
15	61	C	69	F	56	F
16	59	F	68	F	54	F
17	53	F	80	F	59	F
18	57	F	84	F	64	F
19	66	C	71	C	58	C
20	61	C	58	R	56	R
21	57	C	56	C	54	C
22	57	C	59	C	53	C
23	57	C	58	C	57	C
24	60	R	59	R	60	R
25	66	F	83	F	66	F
26	71	R	83	R	69	C
27	70	R	83	F	67	F
28	66	F	82	F	70	F
29	70	C	86	R	72	C
30	72	C	87	F	74	F
M.	63.50		76.27		64.10	
H.	75.		93.		79.	
L.	50.		54.		49.	

Mean of the Month, . . 67.96

JULY, 1826.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	69	F	84	F	72	F
2	72	F	90	R	66	R
3	65	F	87	F	72	F
4	68	F	90	R	68	F
5	68	F	73	C	67	C
6	68	F	83	F	73	F
7	67	F	90	F	77	F
8	72	F	78	F	68	F
9	67	F	79	F	70	F
10	69	F	86	F	77	F
11	73	F	94	F	82	F
12	78	F	96	F	83	F
13	79	F	94	F	76	F
14	75	C	66	R	63	R
15	66	C	72	F	61	F
16	62	F	77	F	70	F
17	74	C	78	R	70	R
18	72	F	84	F	72	F
19	64	F	82	F	70	F
20	69	F	76	F	64	F
21	66	F	85	C	70	C
22	74	F	90	F	76	F
23	75	F	87	F	73	F
24	66	F	79	F	68	F
25	64	F	74	F	64	F
26	62	F	74	R	62	F
27	61	F	68	F	62	F
28	59	F	69	F	62	F
29	59	F	73	F	63	F
30	62	F	76	F	67	F
31	67	F	84	F	64	F
M.	68.13		81.22		69.42	
H.	79.		96.		83.	
L.	59.		66.		61.	

Mean of the Month, . . 72.92

AUGUST, 1826.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	67	F	79	R	71	C
2	68	F	87	F	70	F
3	59	F	73	F	63	F
4	59	F	71	F	64	F
5	61	F	72	F	63	F
6	64	F	75	C	68	R
7	71	F	76	C	72	C
8	67	F	77	C	64	C
9	67	F	75	C	64	C
10	67	C	72	C	66	R
11	68	R	66	R	66	R
12	68	R	70	C	67	C
13	69	R	68	R	65	R
14	67	R	69	R	66	F
15	69	R	71	R	67	C
16	68	C	75	C	67	C
17	68	C	73	F	67	C
18	68	C	68	R	66	R
19	68	C	77	F	70	F
20	71	F	84	F	74	F
21	74	C	77	R	74	F
22	73	F	87	F	73	F
23	68	C	69	R	66	R
24	67	C	73	R	67	R
25	66	R	69	R	64	R
26	68	R	75	C	67	C
27	67	R	74	R	66	C
28	71	C	79	R	72	R
29	69	F	82	F	69	F
30	63	F	84	F	71	F
31	61	F	75	F	66	F
M.	67.13		74.90		67.58	
H.	74.		87.		74.	
L.	59.		66.		63.	

Mean of the Month, . . 69.87

SEPTEMBER, 1826.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	62	C	67	C	60	C
2	59	F	70	F	64	F
3	68	R	84	F	72	C
4	74	F	87	C	72	F
5	73	F	89	C	74	F
6	65	F	77	C	63	F
7	59	F	67	C	59	F
8	57	F	66	C	61	C
9	56	F	80	F	69	F
10	68	R	79	F	67	R
11	65	F	75	C	66	C
12	68	F	71	F	65	F
13	65	C	75	C	64	C
14	67	F	84	C	68	R
15	61	F	70	F	59	F
16	51	F	64	F	52	F
17	45	F	62	F	55	F
18	58	C	67	R	63	R
19	63	F	70	C	59	C
20	56	F	66	F	57	F
21	58	F	65	F	57	F
22	60	F	77	F	63	F
23	65	C	70	R	54	R
24	49	C	53	R	51	R
25	50	F	55	C	53	C
26	51	C	59	C	56	C
27	63	C	79	C	69	C
28	70	F	83	C	70	C
29	58	F	67	F	56	R
30	49	F	67	F	54	F
M.	60.43		71.50		61.73	
H.	74.		89.		74.	
L.	45.		53.		51.	

Mean of the Month, . . 64.56

OCTOBER, 1826.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	57	R	70	F	55	F
2	47	F	68	F	55	F
3	63	C	67	F	52	F
4	46	F	66	F	54	F
5	48	F	61	F	56	F
6	59	F	75	F	61	F
7	61	F	75	F	62	C
8	51	C	58	F	47	F
9	41	F	59	F	49	F
10	48	F	56	F	49	F
11	49	F	57	F	53	F
12	55	C	58	C	54	R
13	54	R	57	C	57	C
14	55	C	56	F	50	F
15	46	F	56	F	52	F
16	52	C	64	C	55	C
17	51	F	65	F	50	F
18	42	F	64	F	53	F
19	60	R	59	C	47	F
20	46	R	58	C	52	R
21	51	R	53	R	54	C
22	58	R	53	C	47	F
23	39	F	49	C	39	F
24	38	F	49	F	39	F
25	30	F	45	F	42	F
26	47	F	54	C	43	C
27	31	F	43	F	33	F
28	28	F	52	C	54	R
29	52	F	65	F	55	R
30	52	F	54	F	42	F
31	35	F	50	F	45	F
M.	48.13		58.58		48.90	
H.	63.		75.		62.	
L.	28.		43.		33.	

Mean of the Month, . . 51.87

NOVEMBER, 1826.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	51	F	59	C	57	C
2	49	C	53	R	50	R
3	46	F	50	F	37	F
4	30	F	42	C	37	C
5	27	F	44	F	33	F
6	28	F	46	C	44	R
7	52	R	61	F	49	C
8	41	F	45	F	36	F
9	32	F	50	F	44	F
10	48	R	53	F	41	F
11	36	F	50	F	38	F
12	36	F	53	F	42	F
13	31	F	38	F	30	F
14	27	C	43	C	46	R
15	48	F	53	F	44	F
16	40	F	56	F	47	F
17	57	C	61	R	61	R
18	52	C	49	F	35	F
19	30	S	36	F	29	F
20	24	C	40	C	38	C
21	34	C	36	C	31	F
22	24	C	33	C	29	C
23	25	C	33	C	27	C
24	20	F	31	F	27	F
25	28	F	41	F	35	F
26	36	C	49	C	51	R
27	34	F	44	F	33	F
28	31	F	43	F	36	F
29	32	F	43	F	36	F
30	40	F	48	F	41	F
M.	36.30		46.10		39.47	
H.	57.		61.		61.	
L.	20.		31.		27.	

Mean of the Month, . . 40.62

DECEMBER, 1826.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	46	C	50	C	36	F
2	29	F	35	F	27	F
3	18	F	28	F	22	F
4	20	C	33	F	26	F
5	21	F	40	F	30	F
6	25	F	46	F	37	F
7	39	F	54	F	44	F
8	39	F	52	C	50	C
9	58	C	61	C	54	R
10	50	C	50	C	38	F
11	31	F	46	F	37	F
12	30	F	43	F	40	F
13	34	F	45	C	36	C
14	23	F	31	F	26	F
15	26	C	41	F	40	F
16	36	F	52	F	44	F
17	46	C	56	F	42	F
18	35	C	43	C	38	C
19	29	F	33	F	24	C
20	17	F	27	F	20	F
21	21	C	33	C	41	R
22	32	F	39	F	32	F
23	27	F	33	C	26	C
24	10	F	19	F	16	F
25	10	F	16	F	13	F
26	22	C	40	R	46	R
27	33	C	38	C	24	C
28	4	F	14	F	12	F
29	6	F	20	F	17	F
30	14	C	23	S	22	S
31	19	C	25	S	26	C
M.	27.42		37.61		31.80	
H.	58.		61.		54.	
L.	4.		14.		12.	

Mean of the Month, . . 32.28

JANUARY, 1827.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	25	S	30	S	26	S
2	18	C	24	C	18	F
3	21	F	34	F	22	F
4	18	F	32	C	21	C
5	7	F	21	F	19	F
6	15	F	34	F	24	F
7	27	C	32	C	30	C
8	28	C	37	C	33	C
9	33	S	33	R	36	R
10	33	C	31	C	30	C
11	19	F	38	F	28	F
12	27	C	35	S	32	S
13	32	C	29	C	26	C
14	21	F	29	F	20	F
15	16	F	28	F	18	F
16	20	C	35	C	13	F
17	3	F	17	F	7	F
18	—2	F	9	F	5	F
19	—1	F	11	F	2	F
20	—1	C	9	C	0	F
21	—7	F	16	F	8	F
22	3	F	22	F	15	F
23	17	C	22	S	21	S
24	18	F	23	F	16	F
25	6	F	26	F	15	F
26	21	C	39	C	32	C
27	25	F	37	F	30	F
28	40	C	41	C	32	F
29	27	F	36	F	28	F
30	26	S	34	S	24	C
31	25	S	32	S	18	S
M.	18.06		28.26		21.58	
H.	40.		41.		36.	
L.	—7.		9.		0.	

Mean of the Month, . . 22.64

FEBRUARY, 1827.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	9	F	23	F	14	F
2	7	F	33	C	30	C
3	34	C	44	C	34	C
4	21	F	24	F	15	F
5	14	S	23	S	20	S
6	23	F	34	F	21	F
7	9	F	34	F	26	F
8	30	C	41	F	32	F
9	8	F	26	C	21	C
10	31	F	34	F	20	F
11	23	F	21	F	8	F
12	—3	F	19	C	14	C
13	21	F	45	C	38	C
14	18	F	33	F	21	F
15	10	F	35	C	33	R
16	34	F	44	F	34	F
17	29	F	34	F	26	F
18	32	F	46	F	39	F
19	27	F	28	F	20	F
20	12	F	34	F	27	F
21	27	F	45	F	39	C
22	41	F	42	F	30	F
23	21	F	42	F	34	F
24	30	C	43	C	35	C
25	34	C	42	C	35	C
26	35	F	47	F	36	F
27	33	C	37	R	36	C
28	38	C	51	C	42	C
M.	23.14		35.85		27.86	
H.	41.		51.		42.	
L.	—3.		19.		8.	

Mean of the Month, . . 28.95

MARCH, 1827.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	33	C	37	S	32	R
2	28	C	39	F	30	F
3	24	F	30	F	20	F
4	11	F	33	F	24	F
5	19	F	37	F	30	F
6	28	F	39	C	35	R
7	33	C	43	F	37	F
8	29	F	39	F	30	F
9	32	C	41	F	34	F
10	31	F	47	F	34	F
11	30	F	44	F	34	F
12	33	F	48	C	44	R
13	43	F	44	F	31	F
14	26	F	40	F	33	F
15	26	F	40	F	33	F
16	30	F	44	F	33	F
17	28	F	48	F	34	F
18	32	C	48	R	51	R
19	48	C	50	C	40	C
20	28	F	40	F	30	F
21	22	F	35	F	34	F
22	38	C	57	F	45	F
23	42	F	51	F	34	F
24	24	F	38	F	29	F
25	30	F	47	F	38	F
26	46	F	65	F	54	F
27	51	F	70	F	53	F
28	57	R	64	R	44	F
29	29	F	44	F	35	F
30	28	F	40	F	38	F
31	35	S	35	S	33	C
M.	32.06		44.42		35.68	
H.	57.		70.		54.	
L.	11.		30.		20.	

Mean of the Month, . . 37.38

APRIL, 1827.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	32	F	46	F	37	F
2	37	F	62	F	49	F
3	50	F	70	F	56	F
4	54	F	72	F	59	F
5	56	C	68	C	59	R
6	54	R	58	C	46	C
7	44	F	53	F	46	F
8	43	F	59	F	43	F
9	38	F	53	C	44	R
10	55	F	71	F	53	F
11	56	F	76	F	62	F
12	55	C	51	C	56	C
13	53	F	69	F	57	F
14	51	F	70	F	52	F
15	52	C	58	C	45	F
16	41	R	45	C	39	F
17	36	F	53	F	44	F
18	36	F	47	F	40	F
19	39	F	54	F	43	F
20	36	F	57	F	49	F
21	48	C	59	R	47	R
22	47	F	62	F	50	F
23	48	F	57	C	47	C
24	47	R	49	R	47	R
25	50	F	57	C	46	C
26	44	C	51	C	46	C
27	45	C	54	F	49	F
28	49	C	44	R	42	R
29	42	C	42	R	38	R
30	43	C	49	C	42	C
M.	46.03		57.20		47.77	
H.	56.		76.		62.	
L.	32.		42.		37.	

Mean of the Month, . . 50.33

MAY, 1827.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	39	R	42	R	40	R
2	39	C	42	C	40	C
3	39	F	50	F	47	F
4	49	F	67	F	52	F
5	52	F	72	F	52	F
6	54	F	70	F	60	F
7	57	R	61	R	45	R
8	46	C	55	F	47	F
9	50	F	69	F	52	F
10	50	F	60	C	46	R
11	42	C	52	R	46	R
12	44	C	54	C	48	C
13	47	F	49	F	43	F
14	46	F	50	F	45	F
15	46	F	60	F	51	F
16	56	F	60	F	51	F
17	58	F	78	F	65	F
18	63	F	74	C	52	F
19	54	C	54	F	50	F
20	53	F	68	F	54	F
21	50	F	63	F	54	F
22	55	F	73	F	59	F
23	60	R	61	R	59	R
24	63	C	66	C	55	C
25	60	F	72	F	65	F
26	67	F	83	F	69	F
27	68	F	92	F	73	F
28	68	F	83	C	70	C
29	64	R	62	C	56	F
30	59	F	62	F	55	F
31	55	F	77	R	57	F
M.	53.32		63.90		53.48	
H.	68.		92.		73.	
L.	39.		42.		40.	

Mean of the Month, . . 56.90

JUNE, 1827.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	54	F	58	C	51	R
2	50	F	65	C	61	C
3	57	F	74	F	60	F
4	61	F	69	F	56	F
5	60	F	85	F	67	F
6	65	F	83	F	66	F
7	67	F	76	C	68	C
8	71	F	83	C	69	C
9	70	F	81	R	71	C
10	71	F	77	C	55	R
11	58	F	75	F	61	F
12	60	F	76	F	62	F
13	61	F	64	F	57	F
14	57	F	74	F	65	F
15	67	R	64	C	56	C
16	60	R	67	C	62	C
17	67	C	70	R	57	F
18	52	F	71	F	59	F
19	60	F	79	F	60	F
20	59	F	78	F	66	F
21	65	R	72	C	65	C
22	71	R	70	R	64	C
23	49	F	67	F	59	F
24	56	F	73	F	60	F
25	61	F	67	F	59	F
26	61	F	80	C	62	C
27	67	C	76	C	65	C
28	68	F	74	C	69	F
29	65	F	82	F	69	F
30	66	F	84	F	70	F
M.	61.87		73.80		62.36	
H.	71.		85.		71.	
L.	49.		58.		51.	

Mean of the Month, . . 66.01

JULY, 1827.

Day of Month	7 A. M.		2½ P. M.		9 P. M.	
1	67	F	94	F	77	F
2	77	F	94	C	70	R
3	68	R	65	C	62	C
4	70	F	85	C	73	C
5	69	F	85	R	65	F
6	60	F	79	F	68	F
7	64	F	84	F	67	F
8	66	F	82	C	70	F
9	72	F	75	F	65	F
10	67	F	75	F	72	F
11	72	F	77	C	75	C
12	73	R	80	C	74	C
13	75	F	87	F	75	F
14	67	F	77	F	74	F
15	72	F	90	F	75	F
16	69	C	77	F	65	F
17	64	F	79	F	69	F
18	68	F	86	C	68	C
19	66	F	72	F	66	F
20	69	F	87	F	72	F
21	68	F	79	F	64	F
22	62	F	79	F	64	F
23	65	C	70	C	62	C
24	66	C	65	F	58	F
25	58	F	71	C	62	C
26	62	R	63	C	61	C
27	60	F	79	F	68	F
28	66	F	85	F	72	F
29	71	F	86	F	74	F
30	64	F	85	F	71	F
31	64	F	75	F	68	F
M.	67.13		79.58		68.58	
H.	77.		94.		77.	
L.	58.		63.		58.	

Mean of the Month, . . 71.76

AUGUST, 1827.

Day of Month	7 A. M.		2½ P. M.		9 P. M.	
1	68	F	90	F	75	F
2	75	C	90	C	76	C
3	69	F	80	C	75	C
4	77	F	95	F	80	F
5	75	F	80	F	76	F
6	78	F	98	F	80	F
7	70	F	78	F	71	F
8	67	F	79	F	67	F
9	63	F	86	F	70	F
10	63	F	76	F	73	F
11	75	C	88	C	72	C
12	70	R	70	C	66	F
13	69	F	73	F	61	F
14	57	C	66	C	58	R
15	59	F	67	F	60	F
16	59	F	62	C	56	R
17	60	C	69	F	59	F
18	60	F	69	F	62	F
19	59	F	75	F	63	F
20	64	F	81	F	73	F
21	74	R	83	C	66	F
22	58	F	77	F	64	F
23	59	F	68	F	60	F
24	56	F	67	F	60	F
25	60	F	78	C	62	C
26	61	C	70	C	61	R
27	62	R	58	R	58	R
28	54	F	69	F	58	F
29	52	F	68	F	58	F
30	58	F	76	F	61	F
31	66	F	84	F	66	F
M.	64.42		76.45		66.03	
H.	78.		98.		80.	
L.	52.		58.		56.	

Mean of the Month, . . 68.97

SEPTEMBER, 1827.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	61	F	74	F	65	F
2	61	F	80	F	70	F
3	67	F	89	F	72	F
4	64	F	75	F	61	F
5	62	F	68	F	59	F
6	57	C	70	F	61	F
7	59	C	62	F	54	F
8	54	F	61	F	52	F
9	51	F	72	F	57	F
10	55	F	74	F	63	F
11	62	F	80	F	65	F
12	60	F	69	F	55	F
13	59	F	74	F	64	F
14	66	C	74	C	66	C
15	65	F	81	F	66	F
16	58	F	69	F	56	F
17	53	F	73	F	57	F
18	53	C	68	C	60	C
19	59	R	57	R	57	R
20	58	R	59	R	59	R
21	62	R	63	C	61	R
22	62	F	68	C	64	R
23	63	C	66	F	62	F
24	60	C	64	C	58	C
25	57	F	71	F	61	F
26	59	F	73	F	52	F
27	51	F	69	F	56	F
28	54	F	60	F	53	F
29	52	C	58	C	52	C
30	50	F	64	F	52	F
M.	58.47		69.50		59.66	
H.	67.		89.		72.	
L.	50.		57.		52.	

Mean of the Month, . . 62.54

OCTOBER, 1827.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	51	F	66	F	54	F
2	59	C	58	R	58	R
3	59	C	64	R	58	R
4	59	C	69	F	58	R
5	55	F	73	F	62	F
6	63	R	62	C	49	F
7	41	F	56	F	46	F
8	45	F	62	C	56	C
9	64	R	67	C	65	C
10	67	C	67	R	52	F
11	45	F	60	F	52	F
12	49	C	57	C	51	C
13	51	C	66	C	52	C
14	50	F	56	C	52	R
15	58	C	60	F	58	C
16	44	F	49	F	39	F
17	33	F	51	C	46	C
18	47	F	61	F	48	F
19	42	F	64	F	53	F
20	52	F	72	F	60	F
21	53	C	53	C	49	C
22	50	C	50	C	53	R
23	63	F	67	C	54	C
24	49	F	57	F	46	F
25	40	F	53	F	40	F
26	38	F	48	C	35	C
27	31	F	44	F	35	F
28	35	F	50	F	45	C
29	48	F	60	F	55	C
30	50	F	67	C	52	R
31	33	F	46	F	36	F
M.	49.16		59.20		50.61	
H.	67.		73.		65.	
L.	31.		44.		35.	

Mean of the Month, . . 52.99

NOVEMBER, 1827.

Day of Month	7 A. M.		2½ P. M.		9 P. M.	
1	32	F	41	F	33	F
2	29	F	51	C	44	C
3	44	F	56	C	50	C
4	50	C	54	C	48	R
5	44	F	45	F	30	F
6	31	F	41	F	40	F
7	36	R	34	R	28	S
8	30	C	38	S	40	C
9	32	F	34	F	26	F
10	26	C	30	F	23	F
11	16	F	36	F	32	F
12	36	C	50	C	50	C
13	49	R	50	R	40	R
14	34	S	29	S	30	S
15	29	F	33	F	29	F
16	24	F	36	F	28	F
17	30	F	41	F	35	F
18	32	F	36	C	31	C
19	25	F	34	C	31	F
20	24	F	36	F	30	C
21	27	F	34	C	27	C
22	22	F	34	F	30	F
23	25	F	40	C	36	C
24	31	C	37	C	27	C
25	30	F	33	F	22	C
26	19	F	32	F	24	F
27	27	F	35	F	26	F
28	24	F	40	F	30	F
29	31	C	45	C	46	C
30	55	R	55	R	49	R
M.	31.47		39.66		33.83	
H.	55.		56.		50.	
L.	16.		29.		22.	

Mean of the Month, . . 34.99

DECEMBER, 1827.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	34	F	43	F	34	F
2	34	F	45	F	33	F
3	35	C	36	C	35	S
4	35	C	45	C	46	R
5	36	C	37	C	33	C
6	33	C	40	C	41	C
7	52	C	48	C	37	C
8	29	C	39	C	41	R
9	36	C	39	C	37	R
10	37	C	42	R	41	R
11	35	F	40	C	32	C
12	32	F	35	F	25	F
13	23	F	35	F	33	F
14	34	F	47	C	45	C
15	46	R	51	C	46	C
16	25	F	33	C	31	C
17	28	F	35	C	32	S
18	32	S	26	S	26	C
19	27	C	37	F	24	F
20	18	F	29	F	27	F
21	28	F	32	F	24	F
22	16	F	21	F	12	F
23	4	F	20	F	14	F
24	9	C	33	C	34	C
25	29	F	40	C	34	C
26	24	F	22	F	13	F
27	9	C	21	S	30	R
28	35	R	36	C	33	C
29	24	C	34	C	24	C
30	18	F	33	F	31	F
31	27	F	39	C	32	C
M.	28.51		35.90		31.61	
H.	52.		51.		46.	
L.	4.		20.		12.	

Mean of the Month, . . 32.01

JANUARY, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	29	C	32	S	30	F
2	29	C	40	R	42	R
3	45	C	49	C	40	C
4	32	F	41	F	39	F
5	40	F	51	F	44	F
6	40	C	43	C	41	C
7	41	C	44	C	42	C
8	30	C	29	C	23	C
9	17	F	33	F	29	F
10	32	C	32	C	30	C
11	30	R	40	C	38	C
12	36	C	49	C	45	R
13	44	C	51	C	44	F
14	31	F	40	C	39	R
15	39	F	40	F	29	F
16	16	F	25	C	23	S
17	24	F	40	F	26	F
18	26	F	38	F	28	F
19	26	C	40	C	34	R
20	34	F	32	F	26	F
21	16	F	22	F	11	F
22	2	F	16	F	11	F
23	11	C	22	C	14	C
24	5	F	21	F	15	F
25	11	C	40	C	42	R
26	44	F	48	F	38	F
27	32	C	31	S	35	R
28	35	F	36	C	26	C
29	25	F	34	F	24	C
30	15	F	29	F	28	F
31	32	F	42	F	33	F
M.	28.03		36.45		31.26	
H.	45.		51.		45.	
L.	2.		16.		11.	

Mean of the Month, . . 31.91

FEBRUARY, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	27	C	35	C	34	S
2	34	C	41	C	34	C
3	37	C	43	C	36	F
4	36	F	50	F	37	F
5	33	C	45	F	35	F
6	35	C	45	C	42	R
7	53	C	57	C	49	R
8	35	F	45	F	35	F
9	37	C	44	C	46	C
10	44	C	58	F	45	F
11	32	F	36	F	26	F
12	16	F	23	F	18	F
13	13	F	39	F	36	F
14	33	C	32	C	29	C
15	24	C	36	C	31	S
16	30	C	44	F	33	F
17	30	F	50	F	40	F
18	35	C	48	C	45	R
19	52	F	56	F	42	F
20	37	F	54	F	43	F
21	49	C	55	R	48	F
22	34	F	39	F	30	F
23	29	F	41	F	34	F
24	26	F	37	C	34	S
25	26	F	37	C	28	F
26	21	F	37	F	32	F
27	35	R	45	C	52	C
28	35	F	37	F	29	F
29	32	F	42	C	29	C
M.	33.10		43.14		36.27	
H.	53.		58.		52.	
L.	13.		23.		18.	

Mean of the Month, . . 37.51

MARCH, 1828.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	16	F	32	F	25	F
2	25	C	37	S	37	R
3	36	F	49	F	35	F
4	27	C	32	F	22	F
5	14	F	34	F	26	F
6	26	C	40	C	36	C
7	36	F	43	F	28	F
8	21	C	34	C	32	C
9	32	C	43	C	39	R
10	37	F	48	F	36	F
11	36	C	40	S	34	S
12	36	C	47	F	39	F
13	35	F	52	F	36	F
14	31	F	41	F	36	F
15	35	C	32	S	28	S
16	22	F	39	F	27	F
17	25	F	40	F	30	F
18	26	F	46	F	34	F
19	32	F	42	F	37	F
20	31	F	44	F	34	F
21	33	F	51	F	30	F
22	23	F	39	F	30	F
23	27	F	42	F	40	F
24	39	R	49	C	45	C
25	46	F	57	F	41	F
26	37	F	46	F	37	F
27	40	C	48	C	45	C
28	44	F	69	F	52	F
29	43	F	46	F	43	F
30	45	F	66	C	57	C
31	48	R	50	C	42	C
M.	32.39		44.45		36.23	
H.	48.		69.		57.	
L.	14.		32.		22.	

Mean of the Month, . . 37.69

APRIL, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	34	F	50	F	39	F
2	33	F	55	F	40	F
3	43	F	57	F	42	F
4	39	S	35	S	34	S
5	35	C	49	S	38	S
6	33	F	51	C	40	C
7	34	F	44	F	34	F
8	34	F	50	F	38	F
9	35	F	54	F	43	F
10	43	F	61	F	51	F
11	43	F	56	F	44	F
12	42	F	55	F	42	F
13	39	F	42	F	39	F
14	32	F	39	C	38	C
15	38	C	44	F	40	F
16	36	F	55	F	44	F
17	40	F	60	F	49	F
18	43	F	48	F	40	F
19	40	F	49	F	42	F
20	42	R	40	R	38	R
21	38	R	40	R	40	R
22	38	C	48	C	43	C
23	43	C	54	C	47	C
24	43	F	60	F	45	F
25	42	F	47	C	41	C
26	41	C	43	R	40	R
27	41	C	49	C	44	C
28	50	F	62	C	52	C
29	51	F	68	C	48	C
30	52	F	52	C	48	C
M.	39.90		50.57		42.10	
H.	52.		68.		52.	
L.	32.		35.		34.	

Mean of the Month, . . 44.19

MAY, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	49	F	57	F	47	F
2	49	F	65	C	55	C
3	57	C	68	C	57	C
4	63	F	78	F	56	F
5	50	F	58	F	50	F
6	53	C	67	C	58	C
7	62	F	77	F	52	F
8	50	F	65	F	52	F
9	53	F	74	F	60	F
10	53	F	58	F	50	F
11	48	F	57	F	47	F
12	52	C	67	F	59	F
13	62	F	62	F	49	F
14	50	C	50	C	50	R
15	52	R	51	R	48	R
16	55	R	56	C	52	C
17	58	F	70	F	60	F
18	55	C	51	R	49	R
19	54	C	51	C	48	C
20	50	C	49	C	47	C
21	48	R	51	R	47	R
22	50	R	51	R	53	R
23	56	F	73	F	60	F
24	60	F	78	R	58	R
25	50	F	72	C	60	C
26	53	F	64	C	53	C
27	50	F	63	C	54	C
28	53	F	73	F	58	F
29	58	F	79	C	60	C
30	63	F	66	C	54	R
31	53	C	62	R	57	R
M.	53.84		63.32		53.55	
H.	63.		79.		60.	
L.	48.		49.		47.	

Mean of the Month, . . 56.90

JUNE, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	56	C	61	C	56	C
2	54	F	58	F	54	F
3	61	C	59	R	59	R
4	60	C	80	F	57	F
5	61	C	67	C	59	R
6	65	C	66	F	58	F
7	68	C	80	F	65	C
8	67	F	82	F	68	F
9	59	F	69	C	60	C
10	62	F	67	F	62	F
11	61	F	61	C	61	C
12	67	R	80	F	69	C
13	70	C	78	C	68	R
14	69	F	88	F	71	F
15	67	F	70	F	69	F
16	69	F	84	F	71	F
17	73	F	87	F	74	F
18	75	F	94	F	73	F
19	72	C	86	F	66	F
20	67	F	77	F	68	F
21	67	F	76	F	70	F
22	66	F	71	F	63	F
23	66	F	88	F	72	F
24	75	F	92	F	75	F
25	75	F	86	C	61	C
26	61	C	70	C	61	C
27	69	C	77	C	69	C
28	74	F	91	F	77	F
29	78	F	78	C	74	R
30	79	F	90	C	73	R
M.	67.10		77.10		66.10	
H.	79.		94.		77.	
L.	54.		58.		54.	

Mean of the Month, . . 70.10

JULY, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	71	F	89	C	70	R
2	73	F	80	F	71	F
3	63	F	86	F	69	F
4	65	F	74	F	67	F
5	65	C	71	C	62	C
6	66	F	85	F	74	F
7	72	F	90	F	73	F
8	72	F	87	C	72	C
9	71	R	75	F	69	F
10	62	F	80	F	68	F
11	70	F	68	R	64	F
12	62	F	79	F	67	F
13	66	F	75	C	59	R
14	63	C	66	R	59	R
15	65	F	82	C	70	R
16	69	R	70	R	67	C
17	72	F	80	F	70	F
18	65	F	86	F	73	F
19	69	F	90	C	72	C
20	73	C	87	C	73	C
21	69	F	83	F	73	F
22	73	C	79	R	70	R
23	70	F	89	C	78	C
24	74	F	92	F	78	F
25	77	F	92	F	79	F
26	74	C	93	F	81	F
27	70	F	92	F	75	F
28	70	F	84	F	70	F
29	62	F	85	F	70	F
30	62	F	75	F	67	F
31	69	C	77	R	68	F
M.	68.51		81.97		70.26	
H.	77.		93.		81.	
L.	62.		66.		59.	

Mean of the Month, . . 73.58

AUGUST, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	67	C	86	F	73	C
2	70	F	83	F	69	F
3	65	F	83	F	71	F
4	69	C	78	C	69	C
5	71	C	76	C	64	C
6	65	C	72	C	62	C
7	67	C	76	F	66	F
8	69	F	90	F	73	F
9	71	F	86	F	71	F
10	73	F	90	F	76	F
11	76	C	90	F	76	F
12	75	F	92	F	74	F
13	66	F	86	F	71	F
14	67	F	90	F	73	F
15	75	F	90	F	72	F
16	66	F	85	F	68	F
17	61	F	72	F	68	F
18	73	C	71	R	65	F
19	62	F	76	F	63	F
20	60	F	79	F	64	F
21	59	F	73	F	63	F
22	67	F	85	F	69	F
23	67	F	86	F	70	F
24	71	F	94	F	79	F
25	75	F	97	F	80	F
26	76	F	97	F	78	F
27	70	F	72	F	63	F
28	60	F	87	F	68	F
29	66	F	94	F	74	F
30	72	F	73	F	64	F
31	67	F	92	F	75	F
M.	68.32		83.90		70.03	
H.	76.		97.		80.	
L.	59.		71.		62.	

Mean of the Month, . . 74.09

SEPTEMBER, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	72	F	97	F	80	F
2	73	C	78	R	68	R
3	66	R	69	R	72	C
4	76	F	83	C	70	R
5	72	F	80	F	66	F
6	58	F	77	F	64	F
7	58	F	70	F	60	F
8	59	F	80	C	69	C
9	57	C	57	R	56	R
10	56	C	66	F	54	F
11	51	F	76	F	57	F
12	57	F	77	F	63	F
13	62	F	82	F	64	F
14	63	F	69	F	61	F
15	65	C	65	C	61	C
16	62	C	62	C	69	C
17	58	R	60	R	58	C
18	54	F	65	F	55	F
19	52	F	68	F	58	F
20	59	F	65	F	58	F
21	59	C	66	C	60	C
22	61	C	70	F	62	F
23	59	F	70	F	61	F
24	66	C	72	R	65	C
25	64	F	79	F	66	F
26	55	F	72	F	57	F
27	51	F	70	F	56	F
28	54	C	64	C	58	C
29	57	C	58	R	55	C
30	52	F	67	F	54	F
M.	60.27		71.13		61.57	
H.	76.		97.		80.	
L.	51.		57.		54.	

Mean of the Month, . . 64.32

OCTOBER, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	55	C	66	C	59	R
2	60	R	64	R	50	F
3	47	F	66	F	54	F
4	48	F	62	F	54	F
5	55	F	60	C	57	R
6	54	F	61	F	49	F
7	47	F	67	F	55	F
8	53	F	73	F	60	F
9	55	F	75	F	61	F
10	58	F	62	C	56	C
11	59	C	66	F	56	C
12	49	F	53	F	42	F
13	40	F	61	C	59	C
14	49	F	53	C	44	C
15	34	F	45	F	35	C
16	28	F	45	F	34	F
17	27	F	47	F	41	F
18	45	F	59	F	48	F
19	37	F	46	F	35	F
20	29	F	47	F	38	F
21	31	F	54	F	42	F
22	39	F	61	F	48	F
23	42	F	65	F	50	F
24	50	F	56	F	50	F
25	47	F	69	C	59	C
26	51	F	62	F	54	F
27	35	F	50	F	49	F
28	56	R	62	F	53	F
29	44	F	52	F	42	F
30	33	F	51	F	45	F
31	47	C	55	C	50	C
M.	45.29		58.55		49.32	
H.	60.		75.		61.	
L.	27.		45.		34.	

Mean of the Month, . . 51.05

NOVEMBER, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	48	C	52	F	49	C
2	50	R	49	R	50	R
3	54	R	62	C	62	R
4	64	R	70	C	63	R
5	58	F	65	F	57	F
6	56	R	55	C	44	F
7	40	F	55	C	49	C
8	57	R	59	C	45	C
9	35	F	47	F	38	F
10	32	F	47	F	40	F
11	42	F	55	F	49	F
12	37	R	41	S	32	C
13	26	F	40	F	36	F
14	29	C	41	F	34	F
15	29	F	41	C	34	C
16	26	F	42	C	38	C
17	34	F	38	C	28	C
18	25	F	35	F	26	F
19	24	C	38	C	46	C
20	54	R	61	R	56	C
21	38	F	47	F	37	F
22	36	C	46	C	44	R
23	45	C	40	C	32	C
24	35	F	46	C	37	C
25	36	F	43	F	37	F
26	32	F	42	F	33	F
27	31	C	40	C	42	C
28	55	R	57	R	53	C
29	48	R	49	F	40	F
30	38	F	43	F	39	F
M.	40.47		48.20		42.33	
H.	64.		70.		63.	
L.	24.		35.		26.	

Mean of the Month, . . 43.67

DECEMBER, 1828.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	27	F	35	F	28	F
2	34	C	48	C	44	C
3	45	F	58	F	52	F
4	56	F	56	C	42	C
5	35	C	42	F	34	F
6	34	C	43	C	38	C
7	30	F	44	F	39	F
8	34	F	46	F	40	F
9	40	C	52	C	46	C
10	38	F	47	F	37	F
11	39	C	48	R	40	F
12	31	F	42	F	35	F
13	38	F	46	C	43	C
14	52	C	51	F	36	C
15	28	F	42	F	35	F
16	29	C	44	F	40	F
17	40	F	50	C	36	C
18	25	F	28	F	19	F
19	9	F	30	C	26	C
20	24	F	43	F	41	F
21	41	F	39	F	27	F
22	12	F	26	C	22	C
23	26	C	39	F	32	F
24	22	F	44	F	40	F
25	34	F	34	F	22	F
26	22	F	45	F	35	F
27	31	F	41	F	32	F
28	32	C	42	C	36	C
29	32	F	43	C	40	C
30	39	F	38	F	19	F
31	8	F	22	F	24	F
M.	31.84		42.19		34.84	
H.	56.		58.		52.	
L.	8.		22.		19.	

Mean of the Month, . . 36.29

JANUARY, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	35	C	38	C	36	R
2	25	C	21	S	13	S
3	—4	F	6	F	—1	F
4	—2	F	12	F	4	F
5	4	F	22	F	18	F
6	22	C	27	C	22	C
7	33	F	47	F	36	F
8	34	S	35	R	34	R
9	32	R	33	C	21	C
10	3	F	14	F	8	F
11	—2	F	12	F	8	F
12	8	F	25	F	20	F
13	22	C	34	F	30	F
14	33	C	39	C	38	C
15	38	R	51	R	44	R
16	33	F	44	F	33	F
17	30	C	37	C	36	C
18	36	R	38	R	37	R
19	34	F	42	F	32	F
20	28	F	40	F	35	F
21	32	C	38	C	34	C
22	31	C	35	F	26	F
23	19	F	40	F	30	F
24	32	F	38	F	18	F
25	7	F	27	F	28	F
26	38	C	51	F	34	F
27	32	C	34	R	29	S
28	22	F	26	F	20	F
29	16	F	28	F	17	F
30	8	F	26	F	14	F
31	3	F	28	F	18	F
M.	21.93		31.87		24.90	
H.	38.		51.		44.	
L.	—4.		6.		—1.	

Mean of the Month, . . 26.23

FEBRUARY, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	11	F	29	F	20	F
2	13	F	30	C	30	S
3	24	F	25	F	16	F
4	8	F	24	F	14	C
5	4	F	29	C	21	C
6	12	F	31	F	21	F
7	21	F	41	F	31	F
8	22	C	38	C	38	R
9	36	C	36	F	27	F
10	21	C	35	C	29	S
11	20	F	37	C	32	C
12	12	F	27	F	17	F
13	10	F	26	F	16	F
14	13	F	30	F	21	F
15	22	F	34	F	24	F
16	17	F	33	F	24	F
17	17	F	35	F	26	F
18	19	F	29	F	22	F
19	16	F	24	F	18	F
20	10	C	22	S	28	S
21	22	C	27	S	20	S
22	13	F	27	F	15	F
23	5	F	19	F	13	F
24	5	F	30	C	22	C
25	19	C	30	S	33	R
26	34	R	39	S	31	F
27	20	F	26	F	16	F
28	11	F	28	F	18	F
M.	16.32		30.04		22.96	
H.	36.		41.		38.	
L.	4.		19.		13.	

Mean of the Month, . . 23.11

MARCH, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	13	F	32	C	26	C
2	24	F	40	F	24	F
3	19	F	42	F	34	F
4	35	F	52	C	39	C
5	37	C	37	R	33	S
6	26	S	32	F	21	F
7	15	F	29	F	22	F
8	25	C	38	C	32	C
9	31	F	42	F	32	F
10	25	F	45	F	33	F
11	31	F	49	F	36	F
12	36	R	38	R	36	R
13	38	F	39	F	29	F
14	21	F	30	F	22	F
15	15	F	27	F	26	F
16	21	C	33	C	26	C
17	26	C	37	S	30	S
18	19	F	30	F	22	F
19	16	F	36	F	28	F
20	24	C	39	C	27	C
21	19	F	38	F	30	F
22	28	S	28	S	27	S
23	23	F	39	F	30	F
24	27	F	37	F	30	F
25	28	F	40	F	29	F
26	24	F	39	F	26	F
27	27	F	41	F	36	F
28	34	F	50	F	40	F
29	37	F	58	F	44	F
30	44	R	52	C	42	R
31	39	R	53	F	46	C
M.	27.00		39.10		30.90	
H.	44.		58.		46.	
L.	13.		27.		21.	

Mean of the Month, . . 32.33

APRIL, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	40	F	45	F	36	F
2	38	R	39	R	39	R
3	38	F	47	C	40	R
4	38	F	53	F	39	F
5	37	F	57	C	44	R
6	40	F	49	F	41	F
7	36	C	48	F	41	F
8	39	F	57	F	44	F
9	41	R	37	R	38	R
10	37	C	42	R	40	R
11	40	C	47	C	42	C
12	38	F	50	C	42	F
13	41	F	53	F	42	F
14	39	F	59	F	45	F
15	41	F	60	F	48	F
16	47	F	55	C	45	F
17	47	F	67	C	56	C
18	45	F	49	F	44	F
19	45	F	64	F	52	C
20	54	C	66	C	56	F
21	53	R	57	C	45	F
22	43	F	54	F	48	F
23	50	F	70	F	54	F
24	53	C	55	R	44	R
25	42	F	56	C	41	C
26	35	F	50	F	38	F
27	38	F	54	F	47	F
28	40	F	47	F	42	F
29	47	F	51	F	47	F
30	45	C	47	C	44	R
M.	42.23		52.83		44.14	
H.	54.		70.		56.	
L.	35.		37.		36.	

Mean of the Month, . . 46.40

MAY, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	46	C	55	C	48	C
2	45	F	51	F	49	C
3	49	C	43	R	41	R
4	42	C	49	R	46	R
5	46	R	65	C	57	F
6	54	F	81	F	60	F
7	52	F	73	F	54	F
8	50	C	55	C	48	C
9	55	F	62	F	58	F
10	55	C	64	R	50	R
11	45	F	62	C	53	R
12	53	R	60	F	48	F
13	46	F	66	F	52	F
14	47	F	62	F	52	F
15	50	F	60	F	52	F
16	56	C	70	R	56	R
17	57	F	72	F	56	F
18	58	F	77	F	61	F
19	64	F	82	F	66	R
20	65	F	67	F	52	C
21	55	C	62	F	59	F
22	64	F	81	F	58	F
23	57	F	70	F	60	F
24	62	F	88	F	74	F
25	71	F	91	F	71	F
26	72	C	74	R	67	R
27	69	C	79	F	70	F
28	70	F	73	F	64	F
29	62	F	75	R	54	R
30	53	C	56	F	55	F
31	61	C	70	F	52	C
M.	55.84		67.58		56.22	
H.	72.		91.		74.	
L.	42.		43.		41.	

Mean of the Month, . . 59.88

JUNE, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	56	C	60	C	52	C
2	57	C	64	F	56	F
3	56	F	76	F	61	R
4	62	C	79	F	67	F
5	68	F	79	F	70	F
6	66	C	73	F	71	F
7	69	C	82	F	72	F
8	74	C	75	R	66	R
9	63	R	77	C	64	F
10	62	F	64	F	55	F
11	56	F	64	F	55	F
12	55	F	64	F	56	F
13	54	F	69	F	66	F
14	71	F	82	F	66	R
15	68	F	86	F	66	F
16	63	F	82	F	67	F
17	62	F	78	F	70	F
18	69	F	88	F	66	F
19	62	F	81	F	68	F
20	66	F	77	C	68	R
21	64	F	76	F	62	F
22	60	F	76	F	64	F
23	65	C	78	C	70	C
24	65	F	72	F	61	F
25	57	F	70	F	57	F
26	57	F	82	F	68	F
27	61	F	73	F	64	F
28	62	C	58	R	61	F
29	62	F	66	C	60	R
30	60	C	57	R	56	R
M.	62.40		73.60		63.50	
H.	74.		88.		72.	
L.	54.		57.		52.	

Mean of the Month, . . 66.50

JULY, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	60	R	62	F	54	F
2	58	F	64	F	58	F
3	62	F	64	F	59	F
4	61	C	62	R	55	R
5	57	R	60	C	56	C
6	63	F	78	F	67	F
7	63	F	85	F	69	F
8	67	F	84	C	71	C
9	62	F	80	F	70	F
10	64	F	87	F	72	F
11	70	F	85	F	69	C
12	69	F	74	F	68	F
13	63	F	78	F	66	F
14	65	F	85	F	72	F
15	72	F	94	F	77	R
16	74	C	83	C	72	F
17	63	F	74	F	65	F
18	61	F	80	F	66	C
19	65	C	74	R	66	F
20	67	C	69	C	66	F
21	66	F	89	F	74	F
22	72	F	91	F	76	F
23	74	F	77	F	70	C
24	63	F	72	F	64	F
25	61	F	70	F	64	F
26	61	F	72	F	63	F
27	63	F	77	F	66	F
28	67	C	74	F	67	F
29	65	F	78	C	70	C
30	72	F	72	R	69	R
31	72	R	84	C	76	F
M.	65.22		76.71		67.00	
H.	74.		94.		77.	
L.	57.		60.		54.	

Mean of the Month, . . 69.64

AUGUST, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	66	C	70	R	55	R
2	59	F	71	F	63	F
3	67	F	85	F	70	F
4	73	F	74	R	71	R
5	71	F	73	F	66	F
6	69	F	84	F	71	F
7	72	F	85	F	73	F
8	74	C	88	F	70	F
9	73	F	86	F	76	F
10	73	F	83	F	67	F
11	58	F	73	F	66	F
12	60	F	82	F	67	F
13	67	F	88	F	70	F
14	64	F	78	C	70	C
15	65	R	72	F	60	C
16	62	F	66	F	60	F
17	63	F	72	F	63	F
18	62	C	61	R	62	R
19	62	F	74	F	61	F
20	62	F	81	F	68	F
21	62	F	85	F	71	F
22	65	F	78	F	68	F
23	65	F	87	F	68	F
24	68	F	80	R	73	F
25	71	F	74	F	64	F
26	55	F	73	F	60	F
27	54	F	67	F	58	F
28	54	F	67	F	58	F
29	60	F	67	C	60	R
30	59	F	76	F	64	F
31	58	F	79	F	68	F
M.	64.29		76.74		65.84	
H.	74.		88.		76.	
L.	54.		61.		55.	

Mean of the Month, . . 68.96

SEPTEMBER, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	62	F	77	F	73	F
2	70	F	89	F	74	F
3	62	F	66	F	54	F
4	53	F	70	F	57	F
5	53	F	74	F	60	F
6	57	F	79	F	66	F
7	63	F	70	F	55	F
8	50	F	65	C	50	C
9	50	F	67	F	54	F
10	52	F	70	F	52	F
11	49	F	63	C	54	C
12	54	F	60	F	53	F
13	48	F	70	F	58	F
14	60	F	74	F	61	F
15	53	R	66	F	55	F
16	50	C	55	R	48	R
17	49	F	66	F	51	F
18	46	F	58	F	50	F
19	43	F	62	F	52	F
20	51	F	69	C	58	R
21	60	F	76	F	67	F
22	50	F	55	F	46	F
23	46	F	66	F	55	F
24	46	F	56	F	49	F
25	52	R	64	C	62	C
26	54	F	64	F	49	F
27	45	F	55	F	44	F
28	41	F	64	F	49	F
29	52	R	62	C	58	F
30	52	F	67	C	57	C
M.	52.43		66.64		55.70	
H.	70.		89.		74.	
L.	41.		55.		44.	

Mean of the Month, . . 58.26

OCTOBER, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	50	F	51	F	42	F
2	39	F	63	F	52	F
3	53	F	71	C	60	C
4	57	R	57	C	50	C
5	43	F	52	F	42	F
6	43	F	61	F	47	F
7	47	F	67	F	56	F
8	45	F	48	F	43	F
9	36	F	52	F	45	F
10	39	F	52	F	48	F
11	51	C	64	C	59	C
12	56	C	66	F	50	F
13	41	F	52	F	43	F
14	41	F	60	F	48	F
15	42	F	67	F	54	F
16	48	F	56	F	48	F
17	46	C	51	C	48	C
18	48	F	55	C	52	C
19	54	C	68	F	58	F
20	48	F	52	F	41	F
21	32	F	43	F	34	F
22	28	F	46	F	36	F
23	32	F	54	F	44	F
24	45	F	65	F	52	F
25	56	F	71	F	58	F
26	59	F	71	C	59	C
27	42	F	53	F	42	F
28	36	F	48	C	44	C
29	42	C	52	C	48	C
30	48	C	50	C	45	C
31	46	R	43	R	45	R
M.	44.93		56.81		48.16	
H.	59.		71.		60.	
L.	28.		43.		34.	

Mean of the Month, . . 49.97

NOVEMBER, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	43	C	45	C	45	R
2	43	R	45	C	46	C
3	46	R	48	C	43	R
4	42	C	50	F	41	F
5	39	C	46	F	38	F
6	32	F	46	C	40	C
7	39	R	45	R	42	R
8	43	F	49	C	41	F
9	35	F	46	F	40	F
10	46	C	59	R	51	R
11	35	F	41	F	31	F
12	25	F	37	F	29	F
13	26	F	37	F	28	F
14	34	S	43	R	40	C
15	32	F	42	F	32	F
16	27	C	45	C	42	C
17	53	C	56	R	53	R
18	53	C	61	C	52	C
19	47	F	55	F	41	F
20	28	F	36	F	34	F
21	38	C	44	C	40	C
22	42	C	48	C	41	C
23	50	R	60	R	40	C
24	30	F	34	F	27	F
25	23	F	39	F	36	F
26	40	R	42	R	38	R
27	34	F	38	F	29	F
28	27	F	40	C	38	C
29	39	C	40	R	38	R
30	35	F	48	C	44	C
M.	37.53		45.50		39.33	
H.	53.		61.		53.	
L.	23.		34.		27.	

Mean of the Month, . . 40.78

DECEMBER, 1829.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	42	F	47	F	37	F
2	40	F	56	C	43	C
3	34	F	36	F	23	F
4	12	F	25	F	22	F
5	33	C	44	R	36	C
6	31	F	41	C	36	C
7	38	C	45	C	42	C
8	48	F	52	C	44	R
9	36	C	35	C	33	F
10	24	F	35	F	28	F
11	24	F	37	C	40	R
12	37	C	59	C	60	R
13	31	F	37	F	29	F
14	27	F	41	F	35	F
15	36	F	48	F	41	F
16	40	C	37	F	30	F
17	26	F	34	F	32	F
18	27	C	30	C	24	C
19	27	S	36	C	30	F
20	35	F	36	F	30	F
21	40	F	49	F	36	F
22	26	F	32	F	26	F
23	20	F	31	F	28	F
24	36	C	57	R	52	R
25	48	F	54	F	43	C
26	37	F	43	F	36	F
27	36	F	45	C	42	C
28	37	C	50	F	42	F
29	35	F	47	F	42	F
30	34	F	44	F	41	F
31	46	R	51	C	38	C
M.	33.64		42.39		36.16	
H.	48.		59.		60.	
L.	12.		25.		22.	

Mean of the Month, . . 37.40

JANUARY, 1830.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	23	F	31	F	28	F
2	35	C	44	F	34	F
3	28	F	40	C	39	C
4	44	F	42	F	32	F
5	30	F	33	F	26	F
6	24	F	36	F	27	F
7	26	F	42	F	38	F
8	32	F	39	F	27	F
9	18	F	32	F	27	F
10	34	R	50	R	37	R
11	9	F	19	F	18	F
12	14	F	30	F	24	F
13	17	C	19	C	18	C
14	17	C	29	C	28	C
15	30	C	33	C	34	R
16	36	R	38	R	36	F
17	35	C	43	C	35	R
18	22	C	24	F	15	F
19	9	F	28	F	28	F
20	37	C	38	R	30	S
21	24	F	27	F	17	F
22	24	C	38	C	34	C
23	29	F	24	F	14	F
24	12	F	22	F	16	F
25	20	S	30	S	21	C
26	10	F	17	F	12	F
27	9	C	28	C	30	S
28	13	F	21	F	12	F
29	7	F	20	C	18	C
30	13	F	12	F	—2	F
31	—8	F	15	F	13	F
M.	21.71		30.45		25.03	
H.	44.		50.		39.	
L.	—8.		12.		—2.	

Mean of the Month, . . 25.73

FEBRUARY, 1830.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	22	S	23	S	20	S
2	12	C	27	C	21	C
3	16	F	30	F	24	F
4	25	F	34	F	24	F
5	16	F	21	F	11	F
6	—4	F	12	F	4	F
7	—4	F	19	C	14	C
8	14	S	22	C	12	F
9	6	F	26	F	17	F
10	19	F	43	F	38	F
11	39	C	27	F	7	F
12	0	F	20	C	18	C
13	12	F	19	F	8	F
14	0	F	24	C	18	C
15	17	C	30	C	24	C
16	23	C	27	C	22	C
17	22	C	30	C	28	C
18	28	F	40	F	30	F
19	26	F	41	F	35	F
20	39	F	50	F	43	F
21	35	F	45	F	41	F
22	38	C	44	C	36	C
23	30	F	40	F	31	F
24	25	F	38	F	35	F
25	34	C	46	F	39	C
26	36	F	46	F	36	F
27	33	F	44	F	34	F
28	26	F	32	F	24	F
M.	20.90		32.14		24.78	
H.	39.		50.		43.	
L.	—4.		12.		4.	

Mean of the Month, . . 25.94

MARCH, 1830.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	18	F	32	F	23	F
2	30	C	33	C	33	C
3	26	F	35	F	30	F
4	22	F	35	F	28	F
5	25	F	50	F	35	F
6	36	C	49	C	41	C
7	37	C	41	C	39	R
8	42	F	53	F	33	F
9	18	F	30	F	23	F
10	21	F	44	F	36	C
11	37	F	49	C	35	C
12	20	F	31	F	26	F
13	34	C	54	F	46	C
14	51	R	55	F	36	C
15	29	F	40	F	30	F
16	25	F	38	F	33	F
17	35	C	46	R	50	R
18	53	R	58	C	41	F
19	33	F	47	F	35	F
20	32	F	49	F	36	F
21	37	C	55	F	48	C
22	47	F	68	F	47	F
23	32	C	33	S	29	S
24	28	F	40	F	31	F
25	26	F	40	F	36	F
26	33	S	39	S	30	S
27	33	F	39	F	34	F
28	32	F	44	F	36	F
29	37	F	54	F	45	F
30	42	C	50	F	41	F
31	40	R	43	R	41	C
M.	32.61		44.32		35.71	
H.	53.		68.		50.	
L.	18.		30.		23.	

Mean of the Month, . . 37.55

APRIL, 1830.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	39	F	58	F	44	F
2	39	F	52	C	43	C
3	43	F	53	F	38	F
4	34	F	47	F	40	F
5	37	F	46	F	40	F
6	38	F	49	F	50	F
7	42	C	46	C	43	R
8	40	C	49	C	45	R
9	44	C	45	C	43	R
10	43	C	42	C	40	R
11	40	C	41	R	40	C
12	40	C	40	R	40	C
13	39	R	37	S	32	S
14	40	F	40	F	40	F
15	40	F	47	F	40	F
16	40	F	52	F	40	F
17	40	F	50	F	42	F
18	42	F	47	F	42	F
19	42	F	73	F	54	F
20	54	F	74	F	62	F
21	57	F	80	F	60	F
22	59	F	80	F	66	F
23	62	F	57	C	50	C
24	44	C	40	C	41	R
25	41	C	47	C	44	C
26	58	C	59	F	53	F
27	40	F	56	F	45	F
28	44	F	68	F	50	F
29	46	F	70	F	50	F
30	56	F	82	F	59	F
M.	44.10		54.23		45.87	
H.	62.		82.		66.	
L.	34.		37.		32.	

Mean of the Month, . . 48.07

MAY, 1830.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	60	F	75	F	60	F
2	62	C	76	F	60	C
3	58	C	55	C	48	C
4	50	R	58	C	60	F
5	63	F	75	F	63	F
6	65	C	76	F	60	F
7	49	F	58	F	50	F
8	47	F	66	F	52	F
9	44	F	50	F	46	F
10	45	F	55	F	49	F
11	48	F	60	C	53	C
12	50	F	66	F	56	F
13	56	C	64	C	54	R
14	53	R	61	C	50	C
15	52	F	74	F	56	F
16	51	F	61	F	53	F
17	51	R	47	R	47	R
18	48	C	58	C	51	C
19	54	F	61	F	56	F
20	57	F	77	F	58	R
21	52	F	63	F	49	F
22	47	F	64	F	50	F
23	47	F	70	F	53	F
24	54	F	60	F	51	F
25	49	C	56	F	51	F
26	50	F	59	F	53	F
27	52	F	67	F	56	F
28	59	F	73	F	58	F
29	60	C	66	R	54	C
30	62	C	71	C	61	C
31	55	F	64	F	55	F
M.	53.22		64.06		53.97	
H.	65.		77.		63.	
L.	44.		47.		46.	

Mean of the Month, . . 57.08

JUNE, 1830.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	55	C	66	C	61	R
2	64	F	78	F	64	F
3	61	F	80	F	67	F
4	65	C	71	F	61	F
5	59	C	68	F	61	F
6	61	C	57	R	55	R
7	66	C	73	R	66	F
8	64	R	73	C	59	F
9	59	F	68	F	62	F
10	62	R	73	F	59	F
11	60	F	78	F	62	F
12	57	F	82	F	63	F
13	61	R	65	R	53	R
14	58	F	78	C	62	C
15	66	F	88	F	70	F
16	66	F	75	F	72	R
17	71	F	70	C	60	C
18	60	C	73	F	63	F
19	63	F	80	F	67	F
20	64	R	63	C	57	C
21	57	C	54	R	53	C
22	60	F	72	C	60	C
23	59	F	79	F	63	F
24	60	F	80	F	66	F
25	63	F	83	F	67	F
26	65	F	87	F	70	F
27	70	F	86	F	70	R
28	70	F	83	C	66	C
29	63	F	80	R	67	F
30	62	F	78	F	67	F
M.	62.20		74.70		63.10	
H.	71.		88.		72.	
L.	55.		54.		53.	

Mean of the Month, . . 66.67

JULY, 1830.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	65	F	78	C	70	C
2	68	F	78	F	73	F
3	73	F	76	C	72	C
4	71	F	75	F	71	F
5	66	F	71	F	68	F
6	67	F	84	C	70	C
7	65	F	75	F	70	F
8	69	C	68	R	65	R
9	64	F	71	F	65	F
10	59	F	75	F	63	F
11	65	F	73	C	65	C
12	63	C	65	R	61	R
13	64	R	69	R	68	R
14	70	F	84	C	70	C
15	67	F	85	F	74	F
16	73	F	95	F	77	F
17	74	F	96	F	80	F
18	76	F	98	F	82	F
19	77	F	87	F	78	F
20	75	F	82	F	79	F
21	77	F	99	F	85	F
22	80	F	99	F	82	F
23	72	F	73	C	66	C
24	66	F	92	F	79	F
25	80	F	67	C	62	R
26	65	C	67	R	62	R
27	65	C	68	C	59	C
28	59	C	68	C	62	C
29	64	R	62	R	60	R
30	61	R	66	C	62	F
31	63	F	70	F	61	F
M.	68.48		77.92		69.71	
H.	80.		99.		85.	
L.	59.		62.		59.	

Mean of the Month, . . 72.04

AUGUST, 1830.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	62	C	76	C	65	C
2	69	F	76	F	68	F
3	70	F	76	C	67	F
4	65	F	74	F	71	F
5	68	F	86	F	67	F
6	60	F	80	F	67	F
7	67	F	87	F	74	F
8	74	F	87	C	72	C
9	71	C	75	F	68	F
10	72	F	73	F	65	F
11	65	F	84	F	70	F
12	71	F	84	F	70	F
13	60	F	74	F	64	F
14	60	F	82	F	68	F
15	65	F	82	R	72	C
16	68	F	84	F	72	F
17	70	C	80	C	65	C
18	60	F	76	F	62	F
19	60	F	78	F	65	F
20	63	F	85	F	68	F
21	64	F	79	F	62	F
22	65	C	72	C	61	R
23	65	F	74	C	66	C
24	67	F	83	C	69	C
25	67	C	65	C	61	C
26	59	R	57	R	58	R
27	64	C	78	F	64	F
28	61	F	80	F	67	F
29	64	F	75	F	66	F
30	65	C	78	R	65	C
31	64	F	76	F	65	F
M.	65.32		77.94		66.58	
H.	74.		87.		74.	
L.	59.		57.		58.	

Mean of the Month, . . 69.95

SEPTEMBER, 1830.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	62	F	68	F	57	F
2	52	F	69	F	57	F
3	55	F	68	C	62	C
4	64	F	69	C	59	C
5	54	F	66	F	56	F
6	57	F	76	C	65	C
7	62	R	62	C	58	C
8	58	R	61	C	59	R
9	61	R	66	C	61	C
10	61	C	70	F	59	F
11	58	F	68	F	60	F
12	57	F	66	C	59	C
13	59	C	65	F	58	F
14	60	C	66	C	62	C
15	63	F	71	F	55	F
16	51	F	66	F	51	F
17	45	F	58	F	45	F
18	41	F	56	F	47	F
19	43	F	60	F	48	F
20	46	F	61	F	53	F
21	49	F	65	F	55	F
22	54	C	63	F	56	C
23	58	F	73	C	60	C
24	60	F	73	F	62	F
25	62	C	67	F	59	C
26	60	R	61	C	57	F
27	57	F	72	F	60	F
28	61	F	70	F	57	F
29	48	F	61	F	50	F
30	41	F	61	F	50	F
M.	55.30		65.93		56.57	
H.	64.		76.		65.	
L.	41.		56.		45.	

Mean of the Month, . . 59.27

OCTOBER, 1830.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	50	F	71	F	56	F
2	49	F	69	F	56	F
3	57	F	58	F	43	F
4	37	F	60	F	48	F
5	49	F	70	F	56	F
6	50	F	59	F	48	F
7	45	F	54	F	44	F
8	39	F	55	F	47	F
9	47	C	53	R	52	R
10	54	C	64	F	56	F
11	54	F	57	F	51	F
12	55	F	68	F	56	F
13	54	C	55	R	59	R
14	58	F	68	F	62	F
15	62	C	64	R	53	R
16	47	F	64	F	53	F
17	45	F	54	F	51	F
18	52	C	51	R	51	R
19	51	C	57	C	53	C
20	47	F	59	R	50	F
21	44	F	58	F	46	F
22	45	F	63	C	54	C
23	50	F	56	F	45	F
24	43	F	54	F	46	F
25	36	F	49	F	39	F
26	33	F	52	C	48	C
27	49	F	62	F	52	F
28	54	C	64	F	60	C
29	50	F	52	F	42	F
30	38	F	54	F	44	F
31	50	F	60	F	52	F
M.	48.20		59.16		50.74	
H.	62.		71.		62.	
L.	33.		49.		39.	

Mean of the Month, . . 52.70

NOVEMBER, 1830.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	59	C	62	F	54	F
2	47	F	59	F	50	F
3	51	C	52	R	48	R
4	49	F	50	F	40	F
5	38	F	54	F	43	F
6	44	C	50	C	48	C
7	48	C	52	C	49	C
8	50	C	52	C	50	R
9	50	R	49	C	50	C
10	47	C	50	R	48	R
11	48	C	48	C	47	R
12	46	R	47	R	47	R
13	48	R	48	R	48	R
14	48	R	49	R	49	C
15	50	C	53	C	51	C
16	55	C	64	F	53	F
17	53	F	60	C	50	C
18	52	C	57	F	45	F
19	40	F	48	F	44	F
20	43	F	50	C	41	C
21	35	F	43	F	39	F
22	41	R	47	R	48	R
23	43	F	49	F	40	F
24	43	R	38	C	37	C
25	43	R	45	R	45	R
26	36	R	41	C	37	C
27	33	F	42	F	38	F
28	34	F	44	F	36	F
29	40	C	42	C	42	C
30	41	R	42	R	42	R
M.	45.17		49.56		45.30	
H.	59.		64.		54.	
L.	33.		38.		36.	

Mean of the Month, . . 46.68

DECEMBER, 1830.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	34	C	37	F	32	F
2	30	F	43	F	39	F
3	45	C	53	C	55	C
4	44	F	48	F	38	F
5	33	F	45	F	36	F
6	42	R	33	S	29	S
7	28	F	32	F	28	F
8	25	C	35	C	35	R
9	36	C	40	C	37	C
10	35	C	38	F	34	F
11	34	F	40	F	34	F
12	30	F	37	F	28	F
13	24	F	34	F	28	F
14	29	C	40	R	38	R
15	57	R	57	C	35	F
16	29	F	36	C	28	C
17	25	F	32	F	24	F
18	22	C	33	C	31	C
19	29	C	33	S	30	S
20	27	C	33	C	33	C
21	32	S	30	S	19	F
22	9	F	21	F	9	F
23	6	F	25	C	23	F
24	17	F	36	F	36	C
25	42	C	50	R	52	R
26	45	F	51	F	45	F
27	40	R	42	R	45	R
28	38	C	39	F	34	F
29	35	F	43	F	32	F
30	30	F	40	C	40	C
31	41	C	60	R	59	R
M.	32.03		39.23		34.39	
H.	57.		60.		59.	
L.	6.		21.		9.	

Mean of the Month, . . 35.22

JANUARY, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	50	C	38	F	30	F
2	29	F	37	F	29	F
3	26	F	37	F	35	F
4	40	C	55	F	53	C
5	55	C	57	R	46	R
6	29	F	36	F	30	F
7	28	F	40	F	33	F
8	27	F	32	F	29	F
9	23	S	26	S	21	S
10	19	C	26	F	16	F
11	14	F	34	C	31	C
12	32	C	28	F	16	F
13	6	F	16	F	10	F
14	4	F	20	F	15	F
15	22	S	31	S	27	S
16	26	S	27	S	26	C
17	19	F	26	F	14	F
18	6	F	23	F	18	F
19	16	F	29	F	20	F
20	22	S	29	F	3	F
21	—3	F	17	F	14	C
22	13	S	22	S	17	S
23	4	F	13	F	8	F
24	1	F	15	F	6	F
25	1	F	21	F	14	F
26	11	F	25	F	18	F
27	12	F	29	F	24	F
28	15	F	26	F	16	F
29	12	F	33	F	23	F
30	12	F	27	F	16	F
31	13	F	30	F	27	F
M.	18.84		29.19		22.10	
H.	55.		57.		53.	
L.	—3.		13.		3.	

Mean of the Month, . . 23.38

FEBRUARY, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	32	S	33	S	30	C
2	25	F	36	F	23	F
3	14	F	29	F	29	C
4	40	R	34	C	18	F
5	12	F	19	F	10	F
6	10	F	26	F	18	F
7	11	F	28	F	18	F
8	11	F	29	F	18	F
9	11	F	24	F	13	F
10	8	F	27	F	19	F
11	14	C	31	C	24	C
12	14	F	29	F	20	F
13	10	F	23	F	13	F
14	6	F	26	F	17	F
15	12	F	34	F	28	F
16	33	C	44	R	40	C
17	36	F	41	F	29	F
18	16	F	27	F	20	F
19	26	F	43	F	34	F
20	30	F	26	F	16	F
21	6	F	24	F	18	F
22	26	F	42	C	35	R
23	38	R	43	C	34	C
24	14	F	25	F	22	F
25	18	F	27	F	18	F
26	18	F	38	F	27	F
27	22	F	42	F	31	F
28	29	F	42	F	32	F
M.	19.35		31.86		23.36	
H.	40.		44.		40.	
L.	6.		19.		10.	

Mean of the Month, . . 24.86

MARCH, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	32	F	51	F	39	F
2	37	F	50	F	39	F
3	45	R	52	F	38	C
4	36	F	53	F	41	F
5	41	F	58	F	46	F
6	40	R	39	R	38	R
7	36	F	49	F	39	F
8	29	F	37	F	27	F
9	29	F	44	F	34	F
10	33	F	43	F	33	F
11	26	F	49	F	37	F
12	40	F	51	C	42	R
13	35	F	53	F	39	C
14	33	F	43	F	34	F
15	34	C	45	F	40	F
16	42	C	49	C	41	C
17	34	F	42	C	27	C
18	21	F	38	F	30	F
19	33	S	41	R	32	C
20	26	F	38	F	28	F
21	26	F	40	F	31	F
22	33	F	54	F	42	F
23	38	F	61	F	46	F
24	46	C	54	R	49	R
25	52	C	64	F	54	C
26	49	F	62	F	45	F
27	41	R	44	C	38	C
28	39	C	44	F	38	C
29	39	C	42	C	38	R
30	53	R	55	R	44	R
31	44	F	60	F	49	F
M.	36.84		48.55		38.64	
H.	53.		64.		54.	
L.	21.		37.		27.	

Mean of the Month, . . 41.34

APRIL, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	47	F	55	F	41	F
2	35	F	60	F	50	F
3	43	F	52	F	48	F
4	45	C	45	C	42	R
5	53	R	56	R	41	F
6	37	F	58	F	46	F
7	50	F	67	F	56	F
8	46	C	54	R	56	R
9	42	F	46	C	36	C
10	34	F	51	C	43	C
11	48	F	53	C	43	R
12	30	S	41	C	34	F
13	35	F	57	F	47	F
14	49	F	69	F	51	F
15	52	C	64	F	54	F
16	50	R	52	R	47	R
17	48	R	52	R	48	R
18	49	F	54	F	48	F
19	52	F	61	R	53	F
20	54	F	69	C	55	C
21	41	F	55	F	46	F
22	43	F	49	C	44	F
23	45	C	57	F	50	F
24	45	F	58	F	50	F
25	45	C	53	F	58	F
26	48	F	50	C	44	F
27	43	F	52	C	48	C
28	43	R	42	R	43	R
29	41	R	44	R	44	R
30	44	C	50	C	47	C
M.	44.57		54.20		46.77	
H.	54.		69.		56.	
L.	30.		41.		34.	

Mean of the Month, . . 48.51

MAY, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	45	C	60	C	50	C
2	51	C	56	C	53	C
3	51	F	70	F	58	F
4	55	F	60	R	49	F
5	46	F	58	F	44	F
6	42	F	62	F	52	F
7	50	F	66	F	54	F
8	50	R	52	C	51	C
9	50	F	57	C	40	F
10	39	C	55	F	45	F
11	49	F	74	F	56	F
12	59	F	79	F	57	F
13	58	F	75	F	59	F
14	57	F	61	F	53	F
15	55	C	61	F	53	C
16	54	C	61	C	53	C
17	56	C	62	C	61	C
18	63	F	71	F	62	F
19	60	C	52	C	51	R
20	51	R	68	C	56	F
21	56	C	77	F	57	F
22	60	F	62	F	61	F
23	58	C	69	F	60	F
24	56	R	52	R	54	R
25	56	C	56	C	55	C
26	60	F	70	F	58	F
27	59	F	67	F	57	F
28	58	F	66	F	60	F
29	65	F	88	F	74	F
30	72	F	95	F	75	F
31	73	F	94	F	78	F
M.	55.29		66.32		56.32	
H.	73.		95.		78.	
L.	39.		52.		40.	

Mean of the Month, . . 59 31

JUNE, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	75	F	94	F	80	F
2	77	F	88	F	65	F
3	66	C	68	F	70	F
4	67	C	89	F	68	F
5	72	F	84	F	71	F
6	71	C	80	F	68	F
7	64	C	69	F	60	C
8	63	C	71	F	65	F
9	63	F	84	F	64	F
10	68	F	90	F	75	F
11	72	F	77	F	72	F
12	72	F	91	F	74	F
13	72	F	90	F	71	F
14	71	F	82	C	71	R
15	69	C	62	R	61	R
16	61	C	69	C	60	C
17	61	C	80	R	65	F
18	70	F	84	F	76	F
19	76	C	89	F	72	R
20	73	F	92	F	76	F
21	76	F	86	R	70	R
22	64	F	89	F	69	F
23	62	R	54	R	54	R
24	54	F	69	F	58	F
25	58	F	66	F	58	F
26	56	F	67	F	62	F
27	66	F	77	C	65	C
28	72	F	84	F	71	C
29	71	R	79	C	69	C
30	69	F	73	C	64	C
M.	67.70		79.23		67.47	
H.	77.		94.		80.	
L.	54.		54.		54.	

Mean of the Month, . . 71.47

JULY, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	66	C	69	R	67	F
2	70	C	83	R	73	F
3	73	F	90	F	75	F
4	72	F	93	F	78	F
5	74	F	93	F	75	F
6	76	C	78	R	69	R
7	70	F	74	C	63	F
8	70	C	86	F	73	C
9	72	R	86	F	72	C
10	58	F	76	F	59	F
11	55	F	64	F	58	F
12	57	F	71	F	60	F
13	60	F	79	F	60	F
14	60	R	62	R	60	R
15	65	F	83	F	70	F
16	66	C	68	R	60	F
17	62	F	80	C	65	F
18	68	C	76	C	71	C
19	72	F	94	F	75	F
20	73	F	92	F	75	F
21	70	F	89	F	71	F
22	70	F	87	F	73	F
23	71	C	88	C	75	C
24	74	F	90	F	75	F
25	71	F	90	F	74	F
26	73	R	66	R	65	F
27	67	F	83	F	70	F
28	70	F	81	C	75	C
29	72	F	84	F	70	F
30	66	F	87	F	71	F
31	74	F	90	R	72	F
M.	68.30		81.64		69.32	
H.	76.		94.		78.	
L.	55.		62.		58.	

Mean of the Month, . . 73.09

AUGUST, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	72	F	78	R	69	R
2	76	F	87	C	76	C
3	73	R	74	F	70	C
4	65	F	72	F	62	F
5	59	F	72	F	64	F
6	60	F	82	F	64	F
7	64	F	71	F	62	F
8	62	F	67	C	62	C
9	63	R	75	C	74	F
10	77	C	88	F	74	F
11	70	F	84	F	70	F
12	68	F	88	F	70	F
13	66	F	90	F	74	F
14	71	F	90	F	74	F
15	74	F	95	F	70	F
16	69	F	78	F	70	F
17	71	F	82	F	68	F
18	71	F	93	F	72	F
19	66	F	84	F	72	F
20	71	F	93	F	78	F
21	77	F	92	F	75	F
22	78	F	89	F	76	F
23	77	F	86	C	74	R
24	68	R	71	C	66	F
25	72	C	69	R	68	R
26	70	F	85	C	74	C
27	71	R	79	C	65	C
28	56	F	64	F	55	F
29	53	F	70	F	59	F
30	59	F	70	F	61	F
31	64	F	71	C	62	F
M.	68.16		80.29		68.71	
H.	78.		95.		78.	
L.	53.		64.		55.	

Mean of the Month, . . 72.39

SEPTEMBER, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	62	F	81	F	65	F
2	65	F	75	F	63	F
3	65	C	76	F	68	R
4	53	F	66	F	56	F
5	54	F	71	F	62	F
6	58	F	79	F	63	F
7	56	F	75	C	62	C
8	66	C	72	C	69	C
9	68	F	84	F	69	F
10	64	F	76	C	68	F
11	69	F	89	F	76	F
12	64	F	72	F	60	F
13	56	F	73	F	57	F
14	58	C	71	C	63	C
15	62	C	66	R	59	R
16	57	C	60	C	56	C
17	54	R	57	C	52	F
18	46	F	65	F	54	F
19	50	F	70	F	57	F
20	57	F	78	F	60	F
21	58	C	62	F	53	F
22	52	C	62	C	52	C
23	60	C	76	F	63	R
24	60	F	73	F	60	F
25	56	F	64	F	60	F
26	61	R	60	C	59	C
27	69	R	71	C	64	R
28	63	F	64	F	53	F
29	51	F	64	F	51	C
30	44	F	63	F	50	F
M.	58.60		70.50		60.13	
H.	69.		89.		76.	
L.	44.		57.		50.	

Mean of the Month, . . 63.08

OCTOBER, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	43	F	58	F	53	F
2	56	F	73	F	61	F
3	62	F	79	F	66	F
4	61	C	60	C	54	C
5	55	R	61	R	56	C
6	48	F	61	F	48	F
7	42	F	60	F	50	F
8	50	F	58	F	55	C
9	65	C	66	R	64	R
10	53	R	53	C	49	R
11	47	C	49	R	44	R
12	42	C	49	C	43	F
13	38	F	60	F	53	F
14	50	F	57	F	45	F
15	39	F	53	F	46	F
16	50	F	67	F	56	F
17	56	F	74	F	60	F
18	56	F	74	F	62	F
19	48	F	63	F	49	F
20	44	F	60	F	47	F
21	41	F	55	F	52	F
22	54	F	60	C	55	F
23	58	F	71	F	56	F
24	59	F	65	R	58	F
25	47	F	60	F	47	F
26	44	F	59	F	48	F
27	51	C	59	R	54	R
28	44	C	52	F	42	F
29	37	F	50	F	42	F
30	41	F	50	F	48	F
31	44	R	48	C	48	C
M.	49.20		60.13		51.96	
H.	65.		79.		66.	
L.	37.		48.		42.	

Mean of the Month, . . 53.76

NOVEMBER, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	42	F	56	C	48	C
2	41	F	55	F	46	C
3	39	F	52	F	40	F
4	35	F	50	C	46	C
5	46	F	52	F	39	F
6	34	F	50	F	46	F
7	39	F	56	F	43	F
8	36	F	48	F	36	F
9	32	F	48	C	44	C
10	44	C	49	C	44	C
11	56	R	63	C	47	F
12	38	F	53	F	40	F
13	40	C	50	F	44	F
14	40	R	45	C	40	C
15	37	F	48	F	38	F
16	34	F	47	F	39	F
17	36	F	46	F	39	F
18	35	F	52	F	47	F
19	44	R	50	F	38	F
20	37	C	44	C	40	C
21	35	F	44	F	38	F
22	39	R	42	R	38	C
23	37	F	43	F	39	F
24	35	F	43	F	36	F
25	33	F	42	F	32	F
26	28	F	40	C	36	C
27	35	R	38	R	34	R
28	29	F	36	F	28	F
29	24	F	30	C	24	C
30	22	F	29	F	22	F
M.	36.73		46.70		39.03	
H.	56.		63.		48.	
L.	22.		29.		22.	

Mean of the Month, . . 40.82

DECEMBER, 1831.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	22	S	29	F	19	F
2	12	F	21	F	17	F
3	14	S	19	C	20	C
4	18	S	23	S	18	S
5	18	S	22	F	17	F
6	16	F	25	F	17	F
7	12	F	27	F	22	F
8	9	F	24	F	16	F
9	20	C	32	C	20	C
10	9	F	26	F	15	F
11	6	F	36	F	28	F
12	19	F	27	F	14	F
13	8	F	20	F	11	F
14	10	F	22	F	17	F
15	12	S	19	F	9	F
16	4	C	24	C	26	C
17	23	S	27	F	14	C
18	0	F	14	F	10	F
19	12	C	27	F	15	F
20	14	F	26	F	23	F
21	24	C	34	F	21	F
22	6	F	7	F	2	F
23	2	F	19	F	13	F
24	24	S	42	R	32	C
25	30	F	31	F	23	F
26	18	F	27	F	18	F
27	20	F	26	F	15	F
28	10	C	29	S	24	S
29	22	S	29	S	26	S
30	19	F	20	F	14	F
31	4	F	27	C	26	S
M.	14.10		25.20		18.12	
H.	30.		42.		32.	
L.	0.		7.		2.	

Mean of the Month, . . 19.14

JANUARY, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	12	F	29	F	16	F
2	6	F	27	F	18	F
3	24	S	36	C	23	F
4	4	F	18	F	13	F
5	18	C	39	C	35	C
6	33	R	43	C	39	C
7	22	F	34	C	26	C
8	11	C	31	R	35	R
9	40	F	43	F	34	F
10	28	F	40	F	34	F
11	32	S	38	C	23	F
12	14	F	23	F	18	F
13	22	F	38	F	30	F
14	23	F	38	F	30	F
15	32	F	47	F	39	F
16	38	F	50	F	40	F
17	31	F	42	F	31	F
18	34	R	49	C	44	C
19	47	F	49	F	40	F
20	35	F	42	F	35	F
21	31	F	39	F	26	F
22	17	F	27	F	18	F
23	9	F	32	F	27	F
24	29	C	42	C	38	C
25	50	R	39	C	22	C
26	2	F	10	F	3	F
27	—6	C	16	C	4	C
28	—4	F	21	F	18	F
29	18	S	23	C	23	S
30	32	R	36	R	38	R
31	31	F	35	F	25	F
M.	20.16		34.71		27.26	
H.	50.		50.		44.	
L.	—4.		10.		3.	

Mean of the Month, . . 27.38

FEBRUARY, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	19	F	32	F	27	F
2	29	C	42	F	39	F
3	43	F	55	C	41	C
4	34	C	40	C	33	S
5	28	S	23	S	13	F
6	2	F	24	F	20	F
7	28	F	35	F	20	F
8	17	C	29	C	21	C
9	22	S	29	S	22	S
10	14	C	33	C	20	F
11	17	F	38	C	32	C
12	46	C	47	C	48	C
13	36	F	38	F	29	F
14	26	C	36	C	34	C
15	30	S	38	C	32	C
16	18	C	24	F	10	F
17	3	F	24	F	21	F
18	26	C	42	C	33	C
19	32	C	38	R	33	C
20	32	R	34	C	33	R
21	24	F	33	F	19	F
22	10	F	31	F	25	F
23	32	S	38	R	35	C
24	9	F	14	F	8	F
25	8	C	26	S	22	S
26	24	F	40	F	30	F
27	22	F	40	F	30	F
28	32	S	37	R	35	C
29	34	F	46	F	32	F
M.	24.03		34.69		27.48	
H.	46.		55.		48.	
L.	2.		14.		8.	

Mean of the Month, . . 28.73

MARCH, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	20	F	34	F	24	F
2	17	C	36	C	34	C
3	37	C	49	F	36	F
4	29	F	40	F	35	F
5	35	R	40	R	40	R
6	39	C	43	R	37	C
7	29	F	34	F	24	F
8	21	F	42	F	37	F
9	40	F	58	F	45	F
10	46	F	60	F	43	F
11	40	F	44	C	40	R
12	54	R	60	C	50	F
13	44	F	56	F	41	F
14	20	C	29	F	20	F
15	15	F	37	F	26	F
16	30	F	45	F	34	F
17	37	R	40	C	38	C
18	18	C	26	F	20	F
19	14	F	30	F	22	F
20	20	F	42	F	34	F
21	40	R	44	R	34	C
22	25	F	38	F	24	F
23	23	F	44	F	35	F
24	40	F	61	F	47	F
25	45	F	66	F	52	F
26	53	C	59	R	38	R
27	26	F	39	F	30	F
28	27	F	39	F	32	F
29	32	F	36	C	30	C
30	27	F	42	F	34	F
31	36	F	61	F	50	F
M.	31.58		44.32		35.03	
H.	54.		66.		52.	
L.	14.		26.		20.	

Mean of the Month, . . 36.98

APRIL, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	42	F	60	F	40	F
2	31	F	50	F	38	F
3	38	S	38	R	34	C
4	27	F	49	C	40	C
5	26	F	34	F	29	F
6	24	F	42	F	26	F
7	26	F	48	F	34	F
8	32	F	42	F	32	F
9	24	F	32	F	30	F
10	32	F	56	F	40	F
11	42	R	58	C	40	F
12	42	F	64	F	52	F
13	50	F	74	F	42	F
14	40	C	44	C	38	C
15	38	C	40	R	38	R
16	38	C	40	R	37	R
17	38	R	38	R	38	R
18	38	R	36	R	38	R
19	39	R	38	R	36	R
20	35	R	40	R	38	R
21	38	C	54	F	48	F
22	40	F	53	F	40	F
23	32	F	41	F	34	F
24	38	F	49	F	36	F
25	39	F	61	F	53	F
26	56	F	77	F	61	F
27	62	F	75	F	54	F
28	41	R	42	C	39	C
29	38	R	43	R	41	C
30	42	R	48	C	41	F
M.	37.60		48.87		39.50	
H.	62.		77.		61.	
L.	24.		32.		26.	

Mean of the Month, . . 41.99

MAY, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	43	R	58	C	45	F
2	42	F	50	F	45	F
3	46	F	51	C	51	C
4	50	C	54	R	57	F
5	44	R	53	F	48	C
6	42	F	48	F	42	F
7	42	F	52	F	42	F
8	47	F	71	F	56	F
9	58	C	70	C	56	F
10	52	F	54	F	47	F
11	45	F	56	F	48	F
12	46	F	76	F	62	F
13	60	F	74	F	64	F
14	61	F	83	F	65	F
15	65	F	81	C	62	R
16	61	F	76	F	58	F
17	54	F	74	F	60	F
18	60	F	55	F	52	F
19	54	R	53	C	47	R
20	53	R	53	R	49	R
21	50	C	63	F	52	F
22	51	R	54	C	46	C
23	44	F	49	C	42	C
24	44	C	43	R	41	R
25	39	R	43	R	42	R
26	47	C	54	R	48	R
27	45	R	44	R	44	R
28	47	F	62	F	53	F
29	51	F	71	F	57	F
30	53	R	53	C	48	C
31	47	R	46	C	48	C
M.	49.77		58.84		50.84	
H.	65.		83.		65.	
L.	39.		43.		41.	

Mean of the Month, . . 53.15

JUNE, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	50	C	59	C	53	C
2	54	F	65	C	54	C
3	50	C	54	C	49	C
4	48	C	50	C	46	C
5	49	F	54	C	49	C
6	53	F	55	C	53	C
7	55	C	60	C	52	C
8	56	F	55	F	51	F
9	57	C	68	F	54	F
10	54	C	64	C	55	C
11	57	C	74	C	62	F
12	66	F	90	F	62	F
13	59	C	62	F	56	C
14	56	F	82	F	71	F
15	70	F	89	F	64	F
16	60	F	90	F	77	F
17	77	F	92	F	72	F
18	70	F	79	R	69	C
19	57	C	70	F	57	F
20	51	F	72	F	60	F
21	57	F	80	F	62	F
22	60	F	87	F	62	F
23	62	F	87	F	71	F
24	66	F	72	F	62	F
25	64	F	91	F	71	F
26	62	F	87	F	68	F
27	69	C	71	F	70	F
28	70	F	81	F	62	F
29	59	F	76	F	66	F
30	62	F	82	F	65	F
M.	59.33		73.27		60.83	
H.	77.		92.		77.	
L.	48.		50.		46.	

Mean of the Month, . . 64.48

JULY, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	67	F	92	F	78	F
2	75	F	95	F	77	F
3	73	F	91	F	76	F
4	66	F	77	F	68	F
5	64	F	86	F	65	F
6	64	F	93	F	70	F
7	70	F	71	C	56	C
8	57	C	61	C	57	C
9	56	C	56	C	53	C
10	56	C	63	C	56	C
11	54	R	52	R	51	R
12	55	C	70	F	60	F
13	60	F	69	C	60	C
14	56	F	67	F	61	C
15	58	F	67	F	62	F
16	56	F	68	F	64	F
17	66	F	71	F	68	F
18	66	F	87	F	71	F
19	71	F	92	R	71	C
20	69	F	86	C	72	C
21	66	C	63	R	60	F
22	62	F	70	C	63	C
23	60	F	72	F	62	F
24	60	F	78	C	66	C
25	67	R	81	F	64	R
26	60	C	68	F	61	R
27	60	F	79	F	66	F
28	62	F	85	F	67	F
29	68	F	83	F	68	F
30	70	F	84	C	70	F
31	72	F	74	C	68	R
M.	63.42		75.83		64.87	
H.	75.		95.		78.	
L.	54.		52.		51.	

Mean of the Month, . . 68.04

AUGUST, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	69	F	66	R	64	C
2	66	C	74	F	69	F
3	68	F	84	F	71	F
4	68	F	90	F	76	F
5	75	F	90	C	72	R
6	70	C	69	R	65	R
7	70	F	82	C	72	R
8	73	F	88	C	74	R
9	73	C	70	R	68	R
10	67	R	82	C	71	F
11	62	F	77	F	65	F
12	62	F	83	F	68	F
13	70	F	89	F	72	F
14	73	F	91	F	75	F
15	74	F	90	F	77	R
16	74	C	66	C	62	C
17	57	R	63	C	56	F
18	57	F	66	F	57	C
19	59	R	74	C	57	R
20	57	F	74	F	62	F
21	65	F	81	F	64	F
22	63	F	80	C	69	C
23	69	F	86	F	72	F
24	65	F	83	R	63	R
25	50	F	65	F	53	F
26	52	F	73	F	61	F
27	56	F	81	F	64	F
28	60	C	74	F	63	F
29	64	F	75	F	68	F
30	64	F	68	F	66	F
31	66	F	78	C	70	C
M.	65.10		77.80		66.64	
H.	75.		91.		77.	
L.	50.		63.		53.	

Mean of the Month, . . 69.85

SEPTEMBER, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	60	C	70	F	54	F
2	56	F	68	F	59	F
3	56	F	75	F	61	F
4	60	R	60	C	62	R
5	67	F	71	F	55	F
6	52	F	71	F	55	F
7	53	F	74	F	63	F
8	57	F	73	F	60	F
9	60	F	71	F	54	F
10	48	F	66	F	54	F
11	57	F	74	C	67	R
12	63	F	71	F	55	F
13	47	F	62	F	49	F
14	44	F	66	F	53	F
15	56	F	74	F	60	F
16	60	F	78	F	58	F
17	58	F	68	F	56	F
18	56	F	78	F	64	F
19	62	F	85	F	70	F
20	65	F	79	F	65	F
21	60	C	60	R	62	C
22	67	C	72	C	58	C
23	52	F	65	F	51	F
24	48	F	67	C	56	C
25	56	C	60	R	52	F
26	49	F	64	F	52	F
27	50	F	61	F	57	F
28	60	F	72	F	58	F
29	57	C	59	R	58	R
30	59	R	65	C	60	C
M.	56.50		69.30		57.93	
H.	67.		85.		70.	
L.	44.		59.		49.	

Mean of the Month, . . 61.24

OCTOBER, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	59	C	59	R	57	C
2	58	F	66	F	57	C
3	50	F	63	F	53	F
4	53	F	65	F	58	F
5	50	F	70	F	54	F
6	50	C	57	F	50	C
7	48	F	58	C	53	R
8	51	C	60	F	50	C
9	45	C	59	F	50	F
10	54	C	66	C	63	C
11	68	C	63	R	53	F
12	50	F	64	F	51	F
13	52	F	70	F	58	F
14	55	C	58	F	43	F
15	35	F	50	F	40	F
16	37	F	56	F	48	F
17	48	F	65	F	56	F
18	56	F	75	F	62	C
19	53	F	53	C	51	C
20	54	F	70	F	65	F
21	54	F	62	F	51	F
22	50	C	50	R	46	R
23	52	C	61	C	53	C
24	40	F	52	C	42	C
25	38	F	53	F	38	F
26	28	F	44	F	34	F
27	31	F	53	F	46	F
28	38	C	44	C	40	C
29	31	F	53	F	40	F
30	34	F	57	F	44	F
31	40	F	60	F	48	F
M.	47.16		59.16		50.13	
H.	68.		75.		65.	
L.	28.		44.		34.	

Mean of the Month, . . 52.15

NOVEMBER, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	43	F	62	F	53	F
2	54	F	60	F	45	F
3	36	F	52	F	41	F
4	40	C	59	F	53	R
5	51	F	54	C	44	F
6	38	C	42	R	44	C
7	43	C	50	C	41	C
8	32	F	40	F	30	F
9	24	F	42	F	36	F
10	35	F	49	F	37	F
11	38	F	56	F	42	F
12	31	F	52	F	42	F
13	42	F	56	F	47	F
14	36	F	42	C	29	C
15	23	C	31	F	24	F
16	20	F	40	F	32	F
17	32	F	52	C	45	R
18	46	C	49	C	47	R
19	46	C	53	C	52	C
20	52	F	42	F	36	F
21	22	F	36	F	32	F
22	41	C	44	R	42	R
23	36	F	45	F	41	F
24	38	C	41	S	33	F
25	29	F	38	F	32	F
26	36	C	52	C	46	C
27	50	F	55	C	44	F
28	42	C	47	C	42	C
29	40	F	47	F	36	F
30	32	C	40	R	36	S
M.	37.60		47.60		40.13	
H.	54.		62.		53.	
L.	20.		31.		24.	

Mean of the Month, . . 41.78

DECEMBER, 1832.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	26	S	26	S	24	S
2	14	F	30	F	26	F
3	29	C	38	R	40	R
4	35	C	42	C	34	C
5	28	C	32	F	22	F
6	20	C	39	C	37	C
7	27	F	38	C	35	C
8	42	R	50	R	48	R
9	47	R	43	R	40	F
10	32	F	44	F	35	F
11	32	F	46	F	40	F
12	40	R	38	R	28	R
13	21	C	25	C	26	C
14	27	C	38	C	38	C
15	36	C	35	C	35	C
16	27	C	31	C	30	C
17	36	R	41	R	43	R
18	36	C	40	F	35	C
19	30	F	35	F	32	F
20	25	F	34	F	26	F
21	21	F	30	F	20	F
22	14	F	22	F	17	F
23	11	C	27	C	24	C
24	17	F	30	F	23	F
25	33	C	43	F	29	F
26	26	C	35	C	33	S
27	35	R	32	C	34	C
28	33	F	30	F	22	F
29	20	F	27	F	18	F
30	10	F	27	F	24	F
31	33	F	44	C	43	F
M.	27.84		35.22		31.00	
H.	47.		50.		48.	
L.	10.		22.		17.	

Mean of the Month, . . 31.35

JANUARY, 1833.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	49	R	52	R	44	F
2	33	F	39	F	34	F
3	34	C	41	C	41	C
4	44	F	56	F	52	F
5	51	F	60	F	51	F
6	46	F	58	F	47	F
7	34	F	36	C	24	F
8	19	F	34	F	30	C
9	28	F	38	F	29	F
10	32	R	38	R	32	C
11	21	C	17	C	12	F
12	10	F	25	F	17	F
13	14	F	30	F	27	F
14	22	F	41	F	16	F
15	4	F	21	C	21	C
16	45	C	42	F	32	C
17	11	F	18	F	13	F
18	22	F	31	F	27	F
19	—2	F	12	C	9	C
20	25	C	40	C	38	C
21	34	C	46	C	36	C
22	32	C	36	C	35	C
23	35	R	37	C	36	C
24	34	C	38	R	36	R
25	33	R	35	C	33	C
26	31	F	27	F	26	F
27	21	F	34	F	30	F
28	30	F	33	F	20	F
29	13	C	30	C	28	C
30	31	C	46	C	37	C
31	26	S	18	S	14	S
M.	27.80		35.77		29.90	
H.	51.		60.		52.	
L.	—2.		12.		9.	

Mean of the Month, . . 31.16

FEBRUARY, 1833.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	10	C	23	F	12	F
2	4	F	20	F	13	F
3	6	F	23	F	13	F
4	7	F	22	F	18	F
5	10	F	28	F	20	F
6	22	S	33	C	22	F
7	6	S	14	S	14	S
8	9	F	24	F	21	F
9	27	C	39	F	34	F
10	28	C	38	C	34	C
11	26	C	30	C	27	C
12	31	R	29	R	28	R
13	26	S	32	S	33	R
14	23	F	32	F	23	F
15	16	C	36	C	28	C
16	20	F	35	F	25	F
17	25	C	40	F	33	F
18	38	R	47	C	40	F
19	36	C	45	C	40	C
20	36	C	48	F	30	C
21	14	F	28	F	20	F
22	22	F	43	F	36	F
23	32	F	41	F	23	F
24	30	R	34	S	17	S
25	6	F	19	F	11	F
26	6	F	30	F	24	F
27	36	C	39	F	22	F
28	12	F	23	C	18	C
M.	20.14		31.96		24.25	
H.	38.		48.		40.	
L.	4.		14.		11.	

Mean of the Month, . . 25.45

MARCH, 1833.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	13	S	22	S	15	S
2	11	C	30	C	1	C
3	—5	F	21	F	18	F
4	11	F	20	F	10	F
5	0	F	18	F	16	F
6	17	S	28	C	19	F
7	10	C	36	C	26	C
8	28	F	42	F	35	F
9	32	F	45	F	32	F
10	28	F	44	F	30	F
11	26	S	38	C	33	C
12	33	C	40	R	42	R
13	39	R	37	S	25	F
14	18	F	34	F	26	F
15	34	C	46	C	34	F
16	30	F	40	F	28	F
17	22	F	37	F	29	F
18	32	F	46	C	41	F
19	40	F	52	F	40	F
20	39	C	43	R	40	R
21	38	C	52	C	51	R
22	45	F	57	F	44	F
23	39	F	56	F	43	F
24	36	F	44	F	44	F
25	39	R	48	C	40	F
26	33	F	46	F	36	F
27	28	F	42	F	31	F
28	26	F	39	F	30	F
29	26	F	44	F	33	F
30	32	F	49	F	38	F
31	37	F	60	F	49	F
M.	27.00		40.51		31.58	
H.	45.		60.		51.	
L.	—5.		18.		1.	

Mean of the Month, . . 33.03

APRIL, 1833.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	46	F	69	F	46	F
2	39	F	50	F	48	F
3	40	F	53	F	52	F
4	46	R	60	C	53	C
5	46	C	61	R	45	F
6	42	F	54	F	44	F
7	38	F	52	F	44	F
8	47	R	52	R	52	R
9	48	F	60	C	48	F
10	43	F	56	F	45	F
11	42	C	48	F	42	F
12	54	C	60	R	47	R
13	41	R	47	C	38	F
14	37	F	58	F	41	F
15	28	F	38	F	32	F
16	35	F	42	F	38	F
17	37	C	45	C	43	C
18	40	F	64	F	49	F
19	40	F	47	F	45	F
20	48	F	74	F	57	F
21	49	F	65	F	56	F
22	55	F	62	F	48	F
23	46	F	59	C	41	C
24	37	C	43	C	35	F
25	34	F	60	F	46	F
26	42	F	46	F	40	F
27	37	F	49	F	42	F
28	47	F	62	F	54	F
29	57	F	89	F	70	F
30	66	F	62	F	52	F
M.	43.57		56.23		46.43	
H.	66.		89.		70.	
L.	28.		38.		32.	

Mean of the Month, . . 48.74

MAY, 1833.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	51	F	53	F	47	F
2	53	F	79	F	52	F
3	39	F	62	F	47	F
4	41	F	60	F	50	F
5	48	C	47	C	45	C
6	41	F	58	F	54	F
7	55	F	87	F	66	R
8	64	F	82	F	66	F
9	60	F	56	F	50	F
10	49	F	52	F	47	F
11	53	C	73	F	62	C
12	62	R	75	C	62	F
13	67	F	79	C	66	C
14	53	C	53	R	50	R
15	65	R	80	C	61	C
16	56	C	53	C	50	C
17	52	C	57	C	56	C
18	63	F	84	F	70	F
19	71	F	80	F	55	F
20	52	C	53	R	49	R
21	51	R	60	C	60	C
22	64	F	80	F	62	F
23	63	F	70	C	59	C
24	53	F	61	F	53	F
25	50	F	59	F	53	F
26	59	R	58	C	54	C
27	54	R	63	C	53	C
28	56	F	64	F	54	F
29	56	C	61	R	54	R
30	58	R	67	C	54	F
31	55	F	78	F	60	F
M.	55.29		65.93		55.52	
H.	71.		87.		70.	
L.	39.		47.		45.	

Mean of the Month, . . 58.91

JUNE, 1833.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	57	F	80	F	63	F
2	64	R	79	F	66	R
3	69	F	83	C	55	C
4	49	F	72	F	59	F
5	55	F	66	F	61	F
6	58	F	78	F	61	F
7	61	F	64	F	61	F
8	58	F	64	F	56	F
9	55	F	60	C	50	F
10	50	F	62	C	54	R
11	50	F	64	C	53	C
12	52	F	71	F	54	F
13	57	F	65	C	64	C
14	67	F	84	F	69	F
15	65	F	86	F	66	F
16	67	R	82	F	63	F
17	61	F	74	C	62	F
18	57	F	66	C	60	F
19	60	F	66	F	59	F
20	61	R	68	C	64	C
21	66	C	74	C	66	R
22	61	R	73	C	58	F
23	61	F	66	F	58	F
24	59	R	62	C	57	C
25	57	R	54	R	53	R
26	52	F	67	C	54	C
27	55	R	68	F	56	F
28	52	F	73	F	61	F
29	57	F	81	F	66	F
30	63	F	86	F	68	F
M.	58.53		71.27		59.90	
H.	69.		86.		69.	
L.	49.		54.		50.	

Mean of the Month, . . 63.23

JULY, 1833.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	68	F	93	F	78	F
2	70	F	84	F	72	F
3	70	C	69	R	61	R
4	63	F	82	F	66	F
5	60	F	82	F	66	F
6	62	F	85	F	68	F
7	68	C	84	C	70	C
8	73	F	94	F	76	F
9	73	R	80	C	62	F
10	61	F	83	F	68	F
11	63	F	83	F	68	F
12	66	F	83	F	68	F
13	65	F	88	F	72	F
14	74	F	94	R	75	F
15	73	F	86	F	72	F
16	61	F	80	F	64	F
17	64	F	81	F	63	F
18	60	F	75	R	61	F
19	59	F	82	F	65	F
20	66	F	73	C	66	C
21	67	F	78	F	68	F
22	72	F	98	F	77	F
23	66	F	74	F	68	F
24	70	F	96	F	74	R
25	63	F	78	F	68	F
26	58	F	71	F	64	F
27	64	F	91	F	77	F
28	71	F	75	F	60	F
29	57	F	81	C	66	C
30	69	R	80	C	62	F
31	59	F	75	F	64	F
M.	65.64		82.52		68.03	
H.	74.		98.		78.	
L.	57.		69.		60.	

Mean of the Month, . . 72.06

AUGUST, 1833.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	58	F	80	F	64	F
2	66	F	66	F	60	F
3	59	F	81	F	63	F
4	66	F	79	C	66	R
5	65	C	68	F	63	C
6	66	C	82	C	70	F
7	69	F	87	F	75	F
8	67	F	66	F	60	F
9	60	R	60	C	54	F
10	52	F	76	F	61	F
11	59	F	81	F	68	F
12	61	F	83	F	70	F
13	74	R	82	C	72	F
14	69	F	84	F	69	F
15	62	F	74	C	68	C
16	68	F	75	F	65	F
17	65	C	72	C	62	F
18	60	F	72	F	63	F
19	58	F	80	F	62	F
20	58	F	75	F	62	F
21	59	F	73	F	62	F
22	57	C	72	F	70	F
23	66	C	63	C	59	F
24	55	F	66	F	57	F
25	59	F	87	F	70	F
26	67	F	79	F	72	F
27	68	F	90	F	76	F
28	59	F	66	F	59	F
29	52	F	62	F	55	F
30	50	F	72	F	60	F
31	60	R	65	F	66	F
M.	61.74		74.77		64.61	
H.	74.		90.		76.	
L.	50.		60.		54.	

Mean of the Month, . . 67.04

SEPTEMBER, 1833.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	70	R	74	R	64	R
2	55	F	68	F	56	F
3	46	F	70	F	59	F
4	58	R	70	R	59	R
5	66	R	82	F	73	F
6	63	F	83	F	69	F
7	62	F	76	F	63	F
8	59	C	64	F	57	C
9	56	F	65	C	56	C
10	58	R	74	C	64	F
11	56	F	69	F	58	F
12	50	F	71	R	51	F
13	47	F	58	F	46	F
14	44	F	66	F	53	F
15	48	F	69	F	58	F
16	52	F	60	F	50	F
17	44	F	66	F	57	F
18	60	C	62	R	63	R
19	67	F	84	R	68	F
20	70	F	89	F	73	R
21	68	R	69	C	61	C
22	51	F	60	F	52	F
23	48	F	62	C	52	C
24	49	F	70	F	54	F
25	52	F	75	F	61	F
26	61	F	80	F	64	F
27	62	F	77	F	62	F
28	50	F	61	F	54	F
29	62	F	78	C	67	F
30	61	F	75	F	59	F
M.	56.50		70.90		59.43	
H.	70.		89.		73.	
L.	44.		58.		46.	

Mean of the Month, . . 62.28

OCTOBER, 1833.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	53	F	57	C	51	R
2	69	C	67	R	63	F
3	52	F	68	F	53	F
4	47	F	62	F	46	F
5	38	F	57	F	47	F
6	49	C	66	C	56	C
7	52	F	64	F	57	F
8	60	R	62	R	62	R
9	58	R	70	C	58	F
10	56	F	61	C	57	C
11	39	F	50	F	41	F
12	33	F	52	C	53	C
13	58	R	57	C	48	F
14	44	F	54	F	45	F
15	44	F	61	F	53	F
16	60	F	69	C	62	R
17	57	C	58	C	65	C
18	57	F	62	F	46	F
19	40	F	53	F	43	F
20	41	C	43	R	42	R
21	41	R	45	R	46	R
22	49	R	55	R	49	R
23	39	F	54	F	44	F
24	44	F	60	F	55	F
25	52	F	60	C	47	C
26	43	F	57	F	44	F
27	39	C	56	C	50	C
28	44	C	50	F	38	F
29	31	F	43	F	32	F
30	26	F	40	C	30	C
31	25	F	38	F	28	F
M.	46.45		56.48		48.74	
H.	69.		70.		65.	
L.	25.		38.		28.	

Mean of the Month, . . 50.56

NOVEMBER, 1833.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	24	F	47	F	42	F
2	42	F	52	F	38	C
3	29	F	38	F	28	F
4	23	F	35	F	26	F
5	21	F	39	F	28	F
6	26	F	46	C	40	C
7	34	F	52	F	41	F
8	44	C	52	F	52	C
9	57	C	64	C	60	C
10	45	F	54	F	44	F
11	41	F	60	F	52	R
12	59	F	62	C	43	F
13	40	F	48	F	38	F
14	34	F	54	F	53	R
15	47	C	53	F	38	C
16	31	F	44	F	33	F
17	26	F	40	F	34	F
18	27	F	40	F	29	F
19	25	F	36	F	29	F
20	21	F	28	F	21	F
21	15	F	37	F	36	F
22	42	R	45	R	46	R
23	38	F	46	F	36	F
24	34	F	42	F	38	F
25	36	S	35	S	34	S
26	29	S	35	C	24	F
27	29	F	40	C	34	C
28	28	F	31	F	24	F
29	22	C	32	C	33	C
30	35	R	40	R	42	R
M.	33.47		44.23		37.20	
H.	59.		64.		60.	
L.	15.		28.		21.	

Mean of the Month, . . 38.30

DECEMBER, 1833.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	36	C	41	C	38	C
2	35	C	40	C	37	C
3	39	C	40	C	37	C
4	34	C	35	C	33	C
5	34	C	42	C	40	C
6	37	F	40	F	29	F
7	24	F	36	C	35	C
8	35	C	39	C	42	R
9	38	F	43	F	36	F
10	32	F	38	F	34	F
11	27	F	33	F	23	F
12	21	C	28	C	26	C
13	18	F	29	C	18	C
14	16	C	28	C	26	C
15	30	C	32	C	28	C
16	25	C	32	C	36	C
17	37	C	39	R	34	R
18	36	R	36	S	32	S
19	24	C	28	C	21	F
20	16	F	31	F	24	F
21	18	F	32	F	28	F
22	31	R	36	F	29	F
23	27	F	35	F	35	F
24	34	S	40	R	32	R
25	31	C	35	C	32	C
26	30	F	39	F	30	F
27	28	F	33	F	24	F
28	20	F	30	F	28	F
29	25	F	36	F	30	F
30	20	C	31	C	33	C
31	37	R	43	C	36	F
M.	28.87		35.48		31.16	
H.	39.		43.		42.	
L.	16.		28.		18.	

Mean of the Month, . . 31.84

JANUARY, 1834.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	33	F	37	F	28	F
2	26	C	38	R	38	C
3	30	F	29	F	21	F
4	13	F	22	C	18	F
5	15	C	22	C	15	F
6	9	F	22	C	18	S
7	11	F	22	F	20	F
8	20	F	36	F	26	F
9	17	F	36	F	28	F
10	30	F	40	C	31	C
11	28	C	32	S	23	S
12	27	R	34	C	33	R
13	31	F	30	F	22	F
14	16	F	32	F	26	F
15	16	F	22	F	16	F
16	11	F	29	F	23	F
17	36	C	46	C	46	R
18	42	F	50	C	38	R
19	33	C	42	C	38	C
20	37	C	42	C	27	C
21	16	F	21	F	15	F
22	5	F	15	F	11	F
23	2	F	13	F	8	F
24	2	F	15	F	8	F
25	10	C	22	C	21	C
26	25	S	32	S	24	F
27	18	F	28	F	16	F
28	12	F	34	F	25	F
29	18	F	22	F	14	F
30	15	C	40	F	33	F
31	27	C	37	F	28	F
M.	20.35		30.39		23.80	
H.	42.		50.		46.	
L.	2.		13.		8.	

Mean of the Month, . . 24.85

FEBRUARY, 1834.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	21	F	38	F	34	C
2	27	F	41	F	32	F
3	28	F	46	F	34	F
4	34	F	47	F	40	F
5	34	C	47	F	38	F
6	30	F	37	F	26	F
7	14	S	19	C	13	F
8	2	F	29	F	19	F
9	27	C	38	C	34	C
10	29	C	36	C	31	C
11	27	F	42	C	40	F
12	11	F	20	F	15	F
13	12	F	36	C	30	C
14	32	C	46	F	40	F
15	37	C	48	C	46	C
16	43	C	47	F	36	F
17	33	C	40	C	32	C
18	25	F	47	F	36	F
19	32	F	51	C	45	R
20	39	F	53	F	38	F
21	31	F	45	C	36	C
22	33	F	46	F	40	F
23	38	C	43	C	41	C
24	41	C	44	C	39	C
25	35	S	35	C	33	S
26	26	F	34	F	23	F
27	24	F	42	F	31	F
28	29	F	46	F	36	F
M.	28.36		40.82		33.50	
H.	43.		53.		46.	
L.	2.		19.		13.	

Mean of the Month, . . 34.23

MARCH, 1834.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	30	F	42	C	37	C
2	35	S	40	C	31	C
3	21	C	27	F	22	F
4	28	F	46	F	37	F
5	33	F	58	F	43	F
6	42	C	48	C	42	F
7	36	F	43	F	34	F
8	39	C	53	R	45	F
9	32	F	39	F	28	F
10	18	F	38	F	30	F
11	30	F	50	C	43	F
12	39	F	59	C	45	C
13	33	F	41	F	30	F
14	24	F	38	F	34	F
15	33	C	40	C	34	C
16	28	F	40	F	32	F
17	32	F	47	C	37	C
18	32	F	48	F	38	F
19	46	F	67	F	58	F
20	48	C	46	C	52	C
21	51	F	47	F	28	F
22	19	F	30	F	24	F
23	22	F	45	F	35	F
24	33	C	46	C	36	C
25	33	C	40	S	35	R
26	33	F	36	F	26	F
27	22	F	37	F	32	F
28	32	F	53	F	44	F
29	42	F	66	F	37	F
30	20	F	33	F	27	F
31	26	F	47	F	32	F
M.	32.00		44.84		35.74	
H.	51.		67.		58.	
L.	18.		27.		22.	

Mean of the Month, . . 37.53

APRIL, 1834.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	36	R	45	C	50	C
2	54	R	52	C	44	F
3	40	F	49	F	41	F
4	34	F	44	F	37	F
5	32	F	43	F	36	F
6	29	F	47	F	38	F
7	39	F	50	F	42	F
8	44	F	52	C	46	R
9	47	R	47	C	42	F
10	41	F	44	F	37	F
11	38	F	50	F	41	F
12	42	F	71	F	52	F
13	56	F	74	F	61	F
14	51	F	68	F	53	F
15	55	F	82	F	64	F
16	58	F	56	F	48	F
17	50	C	80	F	50	C
18	38	F	46	F	43	F
19	38	F	57	C	46	R
20	47	R	56	C	46	F
21	44	C	64	F	50	C
22	42	C	44	C	42	C
23	42	R	42	C	41	C
24	45	F	52	F	38	F
25	35	F	52	F	42	F
26	34	F	48	F	41	F
27	41	R	42	S	36	S
28	35	F	54	C	42	C
29	42	F	52	C	45	F
30	41	C	46	F	46	F
M.	42.33		53.63		44.67	
H.	58.		82.		64.	
L.	29.		42.		36.	

Mean of the Month, . . 46.88

MAY, 1834.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	44	F	62	F	49	F
2	45	F	54	F	48	F
3	45	F	63	F	52	F
4	49	F	64	F	50	F
5	51	F	58	C	48	C
6	46	R	47	R	44	C
7	45	C	43	R	45	C
8	47	F	63	C	55	C
9	52	F	66	F	54	F
10	50	R	47	R	45	F
11	46	F	66	C	52	R
12	49	F	61	C	45	C
13	41	F	60	C	44	C
14	38	F	59	F	42	C
15	33	F	48	C	40	F
16	38	F	54	F	47	F
17	44	F	65	F	52	F
18	54	F	77	F	58	F
19	58	F	87	F	67	F
20	61	C	61	F	54	F
21	59	F	86	R	60	F
22	60	F	57	F	54	F
23	57	C	52	C	48	C
24	50	C	82	F	65	R
25	59	C	55	C	50	C
26	54	C	61	F	52	F
27	55	C	59	F	51	C
28	53	C	53	C	47	C
29	47	C	47	R	45	R
30	49	C	52	C	49	C
31	50	C	63	C	57	C
M.	49.32		60.39		50.61	
H.	61.		87.		67.	
L.	33.		43.		40.	

Mean of the Month, . . 53.44

JUNE, 1834.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	60	C	74	R	56	R
2	62	C	69	R	51	F
3	51	F	65	F	54	F
4	52	F	73	F	56	F
5	56	R	51	R	52	R
6	54	C	64	C	53	C
7	56	F	65	C	58	F
8	60	F	71	F	67	F
9	69	F	88	F	75	F
10	69	F	77	C	69	F
11	66	C	83	F	67	F
12	57	F	72	F	60	F
13	60	C	68	C	59	C
14	56	F	68	F	54	F
15	53	F	74	F	58	F
16	58	R	59	C	55	C
17	58	C	64	C	55	C
18	55	R	57	R	56	C
19	58	F	72	C	62	C
20	62	F	78	C	62	F
21	60	F	72	C	62	C
22	61	F	73	F	67	F
23	67	F	71	F	67	F
24	69	C	85	F	72	F
25	64	F	80	F	68	F
26	68	F	87	R	66	F
27	60	F	79	F	62	F
28	58	F	74	C	59	C
29	59	R	57	C	56	R
30	57	C	64	F	59	F
M.	59.83		71.13		60.57	
H.	69.		88.		75.	
L.	51.		51.		51.	

Mean of the Month, . . 63.84

JULY, 1834.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	63	F	72	C	64	F
2	65	R	73	C	64	R
3	63	C	77	C	67	F
4	67	F	81	F	68	F
5	65	F	77	F	69	F
6	71	F	91	F	75	F
7	75	C	91	F	76	F
8	76	F	97	F	84	F
9	79	F	88	F	80	F
10	76	F	92	C	75	R
11	68	F	79	F	68	F
12	63	F	74	F	68	F
13	67	F	75	C	66	R
14	71	C	82	F	76	F
15	77	F	92	R	75	F
16	74	C	90	F	78	F
17	76	F	92	R	73	F
18	67	F	72	F	66	F
19	62	F	71	F	61	F
20	60	F	72	F	60	F
21	59	F	84	F	69	F
22	73	F	90	F	74	F
23	68	F	78	F	72	F
24	65	F	70	F	66	F
25	70	F	94	F	80	F
26	77	F	99	F	79	F
27	78	F	97	F	77	F
28	69	C	73	F	67	F
29	71	F	84	C	67	R
30	55	F	76	F	62	F
31	59	F	80	F	67	F
M.	68.68		82.67		70.74	
H.	79.		99.		84.	
L.	55.		70.		60.	

Mean of the Month, . . 74.03

AUGUST, 1834.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	63	F	74	F	66	F
2	65	F	74	F	65	F
3	68	C	77	F	68	F
4	68	F	88	F	71	F
5	68	F	91	F	77	F
6	73	F	86	F	75	F
7	73	F	90	F	76	F
8	65	F	73	F	69	F
9	66	F	72	F	66	F
10	63	C	70	C	64	C
11	66	F	81	F	74	F
12	73	F	94	R	74	R
13	72	C	70	F	61	F
14	67	C	73	C	72	C
15	66	F	80	F	65	F
16	62	F	71	C	61	F
17	57	F	82	C	64	R
18	69	F	76	F	66	F
19	61	C	68	C	62	C
20	58	C	60	C	58	R
21	59	C	69	R	61	F
22	61	F	82	C	62	C
23	61	F	85	F	68	F
24	65	F	88	F	70	F
25	61	F	66	C	58	F
26	56	F	79	F	63	F
27	54	F	66	F	59	F
28	55	C	68	F	59	C
29	52	F	67	F	59	F
30	61	F	68	C	61	F
31	59	F	66	F	59	F
M.	63.45		75.94		65.45	
H.	73.		94.		77.	
L.	52.		60.		58.	

Mean of the Month, . . 68.28

SEPTEMBER, 1834.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	62	C	65	R	60	R
2	62	C	67	C	62	F
3	62	F	78	F	70	F
4	69	F	88	F	75	F
5	75	C	76	R	70	R
6	70	F	82	F	67	F
7	65	C	65	R	60	R
8	62	C	66	R	64	R
9	72	C	79	R	67	F
10	62	F	73	F	56	F
11	50	F	66	F	52	F
12	46	F	61	F	48	F
13	45	F	56	F	49	F
14	48	F	71	F	53	F
15	53	F	75	F	58	F
16	54	F	71	F	58	F
17	58	C	70	F	62	C
18	65	F	78	C	69	F
19	68	C	73	C	64	C
20	65	F	73	F	64	F
21	57	F	70	C	64	F
22	60	F	74	F	60	F
23	59	C	64	C	62	C
24	60	F	71	C	60	C
25	56	F	73	F	60	F
26	53	F	69	F	58	F
27	61	C	75	F	61	C
28	58	C	61	C	53	C
29	45	F	57	F	41	F
30	35	F	59	F	47	F
M.	58.57		70.20		59.80	
H.	75.		88.		75.	
L.	35.		56.		41.	

Mean of the Month, . . 62.86

OCTOBER, 1834.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	56	C	66	R	68	R
2	72	F	79	F	65	C
3	55	F	71	F	58	C
4	54	C	67	R	61	R
5	52	F	58	F	45	F
6	40	F	59	F	47	F
7	45	F	66	C	55	C
8	55	F	72	C	60	C
9	62	F	63	C	66	R
10	44	F	51	F	40	F
11	34	F	52	F	42	F
12	43	F	63	F	53	F
13	55	F	66	C	52	C
14	38	R	46	C	34	F
15	29	F	44	F	37	F
16	30	F	46	F	44	F
17	48	C	64	F	55	C
18	54	F	70	F	60	F
19	65	C	64	F	51	R
20	43	R	49	C	42	F
21	36	F	49	F	39	F
22	38	C	53	C	44	F
23	41	F	52	F	40	F
24	36	F	46	F	34	F
25	29	F	42	F	32	F
26	34	S	40	R	48	R
27	33	F	52	F	39	F
28	34	F	51	C	42	C
29	31	F	46	C	40	C
30	32	C	42	C	39	C
31	38	C	43	C	40	C
M.	43.74		55.87		47.49	
H.	72.		79.		68.	
L.	29.		40.		32.	

Mean of the Month, . . 49.03

NOVEMBER, 1834.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	32	F	36	C	30	C
2	26	F	42	F	30	F
3	26	F	43	F	34	F
4	32	F	54	F	44	F
5	50	C	52	C	44	C
6	36	F	46	F	40	F
7	32	F	48	F	45	F
8	40	F	48	F	36	C
9	29	F	48	F	40	F
10	41	F	56	F	46	F
11	42	R	47	F	37	C
12	37	C	47	C	42	C
13	37	F	46	F	39	F
14	50	C	57	C	51	C
15	23	F	29	F	24	F
16	24	C	32	F	24	F
17	24	C	39	C	40	C
18	43	R	48	R	46	R
19	39	R	43	C	40	C
20	36	F	47	F	37	F
21	33	F	44	C	34	C
22	32	C	42	C	43	C
23	45	F	48	F	37	F
24	33	F	42	F	34	C
25	30	F	34	F	27	C
26	25	F	36	F	30	F
27	28	F	33	F	25	F
28	27	F	41	F	35	F
29	35	C	48	R	50	R
30	43	F	44	F	33	F
M.	34.33		44.00		37.23	
H.	50.		57.		51.	
L.	23.		29.		24.	

Mean of the Month, . . 38.52

DECEMBER, 1834.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	32	F	45	C	43	C
2	45	R	48	C	43	C
3	33	F	41	C	32	C
4	26	F	34	F	30	F
5	29	F	40	F	32	F
6	40	R	54	F	41	C
7	33	F	46	F	40	F
8	42	R	51	C	40	F
9	27	F	34	F	24	F
10	19	F	33	F	28	F
11	28	F	40	F	33	F
12	30	C	34	C	31	C
13	31	S	37	C	34	F
14	30	S	11	F	0	F
15	—5	F	12	C	15	C
16	26	C	36	C	24	C
17	13	C	23	C	18	C
18	20	C	30	C	27	C
19	28	C	36	C	31	C
20	29	C	35	F	32	F
21	22	F	26	F	19	F
22	12	F	31	C	30	C
23	29	C	37	F	26	F
24	26	C	34	S	24	S
25	22	S	30	F	14	F
26	10	C	18	C	17	C
27	17	F	27	F	17	F
28	11	F	25	F	21	F
29	20	C	32	C	30	C
30	22	S	30	C	29	C
31	20	F	29	F	24	F
M.	24.74		33.52		27.39	
H.	45.		54.		43.	
L.	—5.		11.		0.	

Mean of the Month, . . 28.55

JANUARY, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	10	F	19	F	16	F
2	16	F	24	F	16	F
3	7	F	12	F	1	F
4	—10	F	8	F	1	F
5	— 4	F	19	F	10	F
6	12	C	8	C	4	F
7	— 3	F	9	F	7	F
8	1	F	22	F	12	F
9	6	F	22	F	12	F
10	10	F	29	F	22	F
11	17	F	34	F	23	F
12	15	F	36	F	27	F
13	23	F	44	F	34	F
14	53	C	39	R	41	C
15	35	F	46	F	36	F
16	36	F	46	C	35	F
17	35	F	42	F	34	F
18	28	F	36	F	25	F
19	18	F	31	F	24	F
20	28	F	39	F	30	F
21	23	F	36	C	35	C
22	39	F	41	F	32	F
23	35	F	45	F	34	F
24	28	F	32	F	24	F
25	21	C	35	R	42	R
26	46	F	54	C	43	C
27	40	F	49	F	37	F
28	36	R	41	C	36	F
29	32	F	40	F	32	F
30	34	R	36	R	42	R
31	57	C	50	F	40	F
M.	22.71		33.03		26.03	
H.	57.		54.		43.	
L.	—10.		8.		1.	

Mean of the Month, . . 27.26

FEBRUARY, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	32	F	37	F	27	F
2	26	F	23	F	18	F
3	12	F	23	F	13	F
4	4	F	16	F	8	C
5	6	F	24	F	16	F
6	17	C	32	S	29	S
7	23	F	32	F	16	F
8	5	F	16	F	9	F
9	5	F	24	F	14	F
10	7	F	24	F	15	F
11	6	F	31	F	24	F
12	17	F	28	F	19	F
13	20	F	40	C	34	C
14	34	C	32	F	19	F
15	9	C	19	C	18	C
16	18	C	28	C	26	C
17	26	C	32	R	33	R
18	32	C	36	C	36	C
19	33	C	44	C	35	C
20	28	F	39	F	31	F
21	33	C	45	C	38	C
22	38	F	54	F	48	F
23	38	C	40	C	34	C
24	31	C	36	C	34	C
25	33	C	41	C	37	C
26	27	F	37	C	26	C
27	16	S	18	S	15	S
28	4	F	23	F	12	F
M.	20.71		31.21		24.45	
H.	38.		54.		48.	
L.	4.		16.		8.	

Mean of the Month, . . 25.46

MARCH, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	4	F	23	F	13	F
2	3	F	28	F	18	F
3	11	F	22	F	10	F
4	8	F	28	F	19	F
5	9	F	34	F	21	F
6	16	F	40	F	28	F
7	20	F	38	C	32	S
8	32	C	34	C	33	C
9	30	C	34	S	29	S
10	29	C	36	S	30	S
11	31	F	42	F	32	F
12	27	F	47	F	35	F
13	37	F	50	F	37	F
14	33	F	47	F	40	F
15	36	F	52	F	42	F
16	43	C	53	F	48	F
17	42	R	43	F	23	F
18	16	F	28	F	27	F
19	33	R	39	C	34	F
20	34	F	47	F	41	F
21	44	F	57	F	39	F
22	32	S	32	S	26	S
23	22	F	33	F	23	F
24	24	F	38	F	30	F
25	20	F	33	F	27	F
26	28	F	45	C	41	C
27	44	C	50	R	39	F
28	37	F	53	F	41	F
29	37	C	40	C	34	C
30	32	S	35	R	36	R
31	38	R	47	R	43	R
M.	27.48		39.61		31.32	
H.	44.		57.		48.	
L.	3.		22.		10.	

Mean of the Month, . . 32.80

APRIL, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	38	F	56	F	45	F
2	42	C	50	C	44	C
3	41	F	47	C	40	C
4	38	R	43	C	39	C
5	38	R	38	R	40	R
6	40	F	54	C	43	C
7	40	C	51	F	40	F
8	40	F	56	F	46	F
9	46	F	68	F	55	F
10	44	F	50	F	45	F
11	40	F	50	F	40	F
12	34	F	54	F	44	F
13	46	C	50	R	49	R
14	36	F	45	C	34	C
15	27	F	47	F	46	F
16	38	S	36	R	36	R
17	32	F	40	F	27	F
18	23	F	41	F	32	F
19	32	F	49	C	46	C
20	53	R	62	C	51	F
21	41	F	53	F	46	F
22	44	F	62	C	47	C
23	40	C	55	F	41	F
24	38	F	52	F	40	F
25	38	C	38	S	36	S
26	37	C	42	C	35	F
27	35	F	49	F	45	F
28	40	R	44	C	41	F
29	40	F	63	F	48	F
30	49	C	61	F	49	C
M.	39.00		50.20		42.33	
H.	53.		68.		55.	
L.	23.		36.		27.	

Mean of the Month, . . 43.84

MAY, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	45	F	49	C	49	C
2	45	F	63	F	50	F
3	43	F	56	F	47	F
4	47	C	52	C	46	C
5	44	R	46	R	43	R
6	46	C	57	R	49	F
7	46	F	63	F	52	F
8	48	C	46	C	42	F
9	38	F	58	C	47	C
10	48	F	56	F	48	F
11	48	F	72	F	57	F
12	52	F	74	F	54	F
13	45	F	53	F	45	F
14	48	C	47	R	43	R
15	41	R	44	R	42	R
16	41	F	56	C	47	C
17	52	F	66	F	54	F
18	58	F	74	F	56	F
19	54	F	77	F	62	F
20	64	F	85	F	71	F
21	58	C	59	F	49	F
22	47	F	54	F	48	F
23	45	F	54	F	48	F
24	49	F	73	F	58	F
25	54	F	83	F	64	F
26	66	F	81	F	63	F
27	59	F	68	F	58	F
28	58	C	57	C	53	C
29	61	F	76	R	63	F
30	63	F	73	F	61	F
31	59	F	65	F	61	F
M.	50.71		62.48		52.58	
H.	66.		85.		71.	
L.	38.		44.		42.	

Mean of the Month, . . 55.26

JUNE, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	60	R	78	C	62	F
2	59	F	84	F	70	F
3	64	F	61	F	57	F
4	59	F	84	F	67	F
5	70	C	88	F	67	R
6	64	F	71	F	58	F
7	57	F	58	F	50	F
8	50	F	74	F	53	F
9	55	F	82	F	66	F
10	67	F	62	C	53	C
11	55	C	67	F	63	F
12	69	F	82	C	68	R
13	69	F	90	C	70	R
14	72	F	83	C	59	F
15	58	F	62	F	54	F
16	52	F	74	F	55	F
17	59	F	74	F	60	F
18	55	F	80	F	65	F
19	62	F	80	C	67	R
20	67	F	72	F	54	F
21	52	F	72	F	55	F
22	50	F	73	C	61	C
23	55	F	73	F	64	F
24	57	F	71	F	62	F
25	62	F	74	F	68	F
26	65	F	70	C	60	C
27	60	R	61	R	58	C
28	63	R	80	C	68	F
29	61	F	82	F	66	F
30	64	F	78	F	56	F
M.	60.40		74.67		61.20	
H.	72.		90.		70.	
L.	50.		58.		50.	

Mean of the Month, . . 65.42

JULY, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	51	F	65	F	55	F
2	55	F	79	F	65	F
3	65	F	86	F	72	F
4	70	F	91	F	71	F
5	70	F	92	R	70	R
6	68	F	66	R	64	F
7	60	F	87	F	69	F
8	71	F	87	C	63	C
9	64	F	69	C	62	C
10	61	R	62	C	61	C
11	57	F	79	F	65	F
12	64	F	81	F	69	F
13	73	F	93	F	80	R
14	71	F	92	F	78	F
15	74	C	89	F	69	R
16	64	C	74	R	68	F
17	62	F	79	F	67	F
18	63	F	79	F	69	F
19	67	F	88	F	69	F
20	69	F	90	F	71	F
21	70	C	83	F	72	F
22	65	F	81	F	71	F
23	66	F	90	F	73	F
24	68	F	90	F	75	F
25	70	F	92	F	75	R
26	67	F	68	F	60	F
27	60	F	74	F	64	F
28	60	F	81	C	67	C
29	64	R	69	R	66	C
30	69	C	81	F	68	F
31	69	F	90	R	71	R
M.	65.39		81.52		68.35	
H.	74.		93.		80.	
L.	51.		62.		55.	

Mean of the Month, . . 71.75

AUGUST, 1835.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	69	F	87	F	64	R
2	62	F	78	F	61	F
3	56	F	81	F	59	F
4	50	F	69	F	54	F
5	55	F	77	F	63	F
6	60	F	67	C	59	C
7	58	R	56	R	56	R
8	55	F	75	F	63	F
9	63	F	86	F	70	F
10	64	F	88	F	68	F
11	68	F	89	F	74	F
12	73	C	88	F	73	F
13	74	F	90	F	75	F
14	71	F	92	R	66	C
15	65	F	70	F	62	F
16	65	C	78	F	64	F
17	68	F	84	F	72	F
18	68	F	84	C	74	C
19	70	F	82	F	64	F
20	58	F	73	F	63	F
21	64	R	76	F	58	F
22	57	F	73	F	60	F
23	57	F	76	F	60	F
24	56	F	71	F	61	F
25	62	F	78	F	64	F
26	69	C	72	R	68	R
27	62	F	75	F	64	F
28	65	F	73	C	68	R
29	68	F	81	F	71	F
30	72	F	79	F	64	F
31	59	F	78	F	63	F
M.	63.32		78.26		64.68	
H.	74.		92.		75.	
L.	50.		56.		54.	

Mean of the Month, . . 68.75

SEPTEMBER, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	52	F	65	C	58	C
2	60	C	58	R	57	F
3	54	F	75	F	61	F
4	57	F	80	F	64	F
5	61	F	85	F	70	F
6	67	F	87	F	71	F
7	69	F	73	F	57	C
8	48	F	71	F	56	F
9	59	F	73	F	58	F
10	58	F	79	C	60	F
11	49	F	70	F	55	F
12	56	F	63	C	57	F
13	59	F	66	F	55	C
14	59	F	65	C	50	C
15	44	F	63	F	50	F
16	45	F	59	F	50	F
17	41	F	59	F	50	F
18	46	F	62	F	52	F
19	56	F	60	C	54	F
20	57	C	60	C	55	F
21	56	F	70	F	61	F
22	51	F	70	F	52	F
23	47	F	66	F	52	F
24	46	F	61	C	53	F
25	48	F	58	F	47	F
26	42	F	58	F	49	F
27	45	F	59	F	49	F
28	42	F	61	C	55	F
29	50	F	61	C	51	R
30	42	F	56	F	43	F
M.	52.20		66.43		55.07	
H.	69.		87.		71.	
L.	41.		56.		43.	

Mean of the Month, . . 57.90

OCTOBER, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	41	F	59	F	50	F
2	50	F	66	F	54	F
3	46	F	64	F	48	F
4	43	F	61	C	54	C
5	52	C	56	C	54	C
6	65	R	68	R	60	R
7	52	C	61	F	51	F
8	43	F	60	F	45	F
9	39	F	58	F	44	F
10	39	F	58	F	50	F
11	50	F	54	C	44	F
12	36	F	55	F	44	F
13	42	F	65	F	53	F
14	49	F	59	F	50	F
15	46	C	56	F	50	C
16	46	F	55	F	50	F
17	47	F	60	F	56	F
18	56	C	69	F	62	F
19	62	F	76	F	63	F
20	56	C	63	F	56	F
21	57	C	59	C	54	C
22	56	C	71	C	58	F
23	52	C	56	F	56	F
24	58	C	58	F	45	F
25	36	F	47	F	39	F
26	40	F	57	F	44	F
27	49	F	55	F	46	F
28	44	F	66	F	54	F
29	55	F	60	F	51	F
30	52	C	70	F	63	R
31	47	F	55	F	48	F
M.	48.58		60.55		51.48	
H.	65.		76.		63.	
L.	36.		47.		39.	

Mean of the Month, . . 53.54

NOVEMBER, 1835.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	32	F	44	F	36	F
2	33	F	50	F	45	F
3	41	F	56	F	44	F
4	50	F	65	F	53	F
5	50	F	65	F	56	F
6	42	F	50	C	46	C
7	45	R	48	C	47	C
8	44	C	58	F	46	F
9	50	C	55	C	50	F
10	38	F	47	F	38	F
11	40	R	54	C	44	C
12	40	F	46	F	36	F
13	32	F	36	F	28	F
14	26	F	45	C	37	C
15	45	C	54	C	49	C
16	56	C	62	C	58	C
17	44	C	49	C	38	C
18	33	F	55	F	44	F
19	39	F	54	C	48	C
20	47	C	56	R	59	R
21	48	F	50	C	42	C
22	39	C	38	C	29	C
23	26	S	34	S	32	R
24	22	C	31	C	28	C
25	20	F	32	F	24	F
26	22	F	37	F	28	F
27	14	F	25	F	22	F
28	21	C	32	C	28	C
29	20	C	26	F	15	F
30	13	C	23	S	21	C
M.	35.73		45.90		39.03	
H.	56.		65.		59.	
L.	13.		23.		15.	

Mean of the Month, . . 40.22

DECEMBER, 1835.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	15	F	26	F	25	F
2	18	F	14	F	9	F
3	6	F	27	F	22	F
4	26	C	40	F	35	C
5	32	F	31	C	19	C
6	9	F	23	F	20	F
7	14	F	22	F	18	F
8	18	F	28	F	22	F
9	18	C	30	C	22	F
10	17	F	24	F	15	F
11	8	F	23	F	20	F
12	25	S	34	S	28	S
13	28	C	37	F	23	F
14	25	C	35	F	28	F
15	8	F	24	F	20	F
16	0	F	—4	F	—8	F
17	—5	F	10	F	4	F
18	—2	F	16	C	6	C
19	17	C	24	C	22	C
20	22	C	30	C	30	C
21	34	C	42	C	34	F
22	29	F	34	F	22	F
23	14	F	26	F	19	F
24	9	F	29	F	26	F
25	36	C	42	R	40	R
26	42	R	46	R	40	R
27	38	F	35	F	24	F
28	17	C	29	F	22	F
29	20	F	37	C	36	C
30	31	C	34	C	32	C
31	26	F	30	F	21	F
M.	19.20		28.32		22.77	
H.	42.		46.		40.	
L.	—5.		—4.		—8.	

Mean of the Month, . . 23.43

JANUARY, 1836.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	17	F	33	F	25	F
2	26	F	40	C	30	C
3	23	F	27	F	22	F
4	22	C	36	C	36	R
5	33	C	34	R	33	S
6	18	C	23	C	20	C
7	32	C	33	C	33	C
8	32	C	36	C	35	C
9	32	R	28	R	32	S
10	32	S	35	R	36	R
11	35	C	40	F	37	F
12	37	F	45	F	35	F
13	32	F	44	F	33	F
14	22	C	40	C	35	C
15	29	F	34	F	14	F
16	5	F	18	F	13	F
17	7	F	21	C	22	S
18	32	C	27	S	26	C
19	24	F	33	F	20	F
20	18	F	27	F	16	F
21	5	F	30	F	32	F
22	42	C	44	F	28	F
23	19	F	25	F	16	F
24	9	F	26	F	25	F
25	33	R	27	S	23	S
26	17	F	32	F	20	F
27	17	F	26	F	18	F
28	6	F	20	F	8	F
29	0	F	22	F	18	F
30	24	F	39	C	30	C
31	31	S	36	S	33	S
M.	23.26		31.64		25.93	
H.	42.		45.		37.	
L.	0.		18.		8.	

Mean of the Month, . . 26.94

FEBRUARY, 1836.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	23	C	28	F	8	F
2	—4	F	9	F	0	F
3	1	F	18	F	6	F
4	1	F	15	C	5	C
5	—4	F	14	F	2	F
6	—3	F	22	F	11	F
7	4	C	26	C	23	C
8	32	S	39	R	33	R
9	26	F	35	F	28	F
10	25	F	35	F	25	F
11	15	F	31	F	20	F
12	20	C	33	C	30	C
13	31	S	37	R	32	R
14	23	C	25	F	8	F
15	1	F	23	C	16	C
16	4	F	21	F	8	F
17	5	C	26	C	13	C
18	2	F	20	F	6	F
19	—3	F	26	C	16	C
20	19	S	37	C	32	C
21	33	C	46	C	37	C
22	30	F	46	F	35	F
23	26	F	44	C	37	C
24	34	C	38	R	41	R
25	37	C	33	F	20	F
26	16	C	22	S	17	S
27	10	F	26	F	14	F
28	6	F	28	F	15	F
29	5	C	35	C	32	C
M.	14.31		28.90		19.65	
H.	37.		46.		41.	
L.	—4.		9.		0.	

Mean of the Month, . . 20.95

MARCH, 1836.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	33	C	42	C	36	R
2	25	F	27	F	13	F
3	10	F	31	F	23	F
4	21	F	44	F	37	F
5	36	F	44	F	21	F
6	12	C	36	C	29	C
7	30	F	39	F	27	F
8	24	F	42	F	27	F
9	17	F	37	F	34	F
10	32	C	41	C	45	R
11	46	F	42	F	32	F
12	16	F	28	F	18	F
13	10	F	30	F	26	F
14	40	C	45	C	32	C
15	21	F	35	F	24	F
16	18	F	37	F	27	F
17	31	C	40	C	38	C
18	38	F	41	F	29	F
19	17	F	32	C	28	C
20	22	F	36	F	26	F
21	20	F	36	F	30	F
22	28	F	39	C	28	S
23	30	F	42	F	26	F
24	23	F	45	C	36	C
25	27	F	38	F	28	F
26	20	F	38	F	28	F
27	28	F	49	F	38	F
28	38	F	45	C	37	C
29	35	C	40	C	36	C
30	34	F	41	C	36	C
31	33	F	50	F	39	F
M.	26.29		39.09		30.13	
H.	46.		50.		45.	
L.	10.		27.		13.	

Mean of the Month, . . 31.84

APRIL, 1836.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	35	F	54	F	41	F
2	36	F	49	C	43	C
3	38	F	48	F	41	F
4	37	F	52	C	41	C
5	33	F	39	F	31	F
6	26	F	34	C	31	C
7	24	F	46	F	35	F
8	34	F	60	F	47	F
9	51	C	66	F	52	C
10	54	C	56	C	34	F
11	27	F	40	F	34	F
12	22	F	41	F	32	F
13	34	C	42	S	36	R
14	37	F	52	C	44	C
15	40	C	35	S	34	S
16	32	C	44	F	34	F
17	35	F	45	F	36	F
18	43	F	65	C	55	C
19	52	C	54	C	48	C
20	44	F	50	F	40	F
21	41	R	54	C	49	R
22	43	F	44	F	36	F
23	36	C	49	C	44	C
24	42	F	51	F	36	F
25	30	F	51	F	41	F
26	45	C	70	F	59	C
27	57	F	58	F	47	F
28	42	F	58	F	52	F
29	53	C	53	C	48	C
30	46	F	57	F	49	F
M.	38.97		50.56		41.66	
H.	57.		70.		59.	
L.	22.		34.		31.	

Mean of the Month, . . 43.73

MAY, 1836.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	48	F	73	F	56	F
2	54	F	86	F	64	R
3	66	F	55	F	44	R
4	48	F	67	F	48	F
5	47	F	60	F	50	F
6	45	F	59	F	52	F
7	54	F	62	C	50	R
8	48	F	57	F	49	F
9	44	F	55	F	48	F
10	47	F	75	F	55	F
11	53	F	80	F	60	F
12	58	F	83	F	59	F
13	62	C	49	C	44	C
14	38	F	50	F	43	F
15	46	F	66	F	49	F
16	55	F	81	F	63	F
17	63	F	82	F	67	F
18	64	F	82	F	66	F
19	54	F	74	F	57	F
20	53	F	70	C	57	C
21	63	F	84	F	70	F
22	55	C	53	C	47	C
23	49	C	54	C	47	C
24	50	C	50	C	46	C
25	47	R	52	C	47	C
26	46	C	47	C	45	C
27	47	C	47	R	44	R
28	46	C	55	C	48	C
29	51	C	53	R	47	C
30	45	R	47	C	44	C
31	44	F	49	F	43	F
M.	51.29		63.13		51.90	
H.	66.		86.		70.	
L.	38.		47.		43.	

Mean of the Month, . . 55.44

JUNE, 1836.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	42	F	57	F	49	F
2	49	F	57	F	50	F
3	52	F	58	F	50	F
4	53	C	58	C	52	C
5	54	C	60	F	52	C
6	57	C	56	R	53	C
7	55	C	63	R	58	C
8	61	C	74	R	64	F
9	67	F	90	F	70	F
10	61	F	60	F	54	F
11	57	F	79	F	68	F
12	69	F	80	F	66	F
13	58	F	69	F	58	F
14	54	F	64	F	53	F
15	54	F	73	F	54	F
16	52	F	75	F	61	F
17	67	F	62	C	54	R
18	58	C	62	C	58	C
19	67	F	83	C	68	C
20	54	R	54	R	52	R
21	51	R	52	R	48	R
22	50	R	55	C	51	C
23	53	R	52	C	50	C
24	53	C	53	R	49	R
25	52	R	51	R	50	R
26	52	C	56	C	51	C
27	53	F	58	F	52	F
28	55	F	80	F	68	F
29	61	F	65	F	58	F
30	59	F	80	F	65	F
M.	56.00		64.53		56.20	
H.	69.		90.		70.	
L.	42.		51.		48.	

Mean of the Month, . . 58.91

JULY, 1836.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	67	F	81	F	70	F
2	68	F	84	F	74	F
3	64	C	64	C	58	C
4	66	C	79	C	69	C
5	71	F	91	F	73	F
6	72	F	86	F	74	F
7	74	F	93	F	78	F
8	74	F	95	F	81	F
9	73	F	90	F	74	F
10	75	C	80	F	68	R
11	66	C	64	R	60	R
12	61	R	64	C	59	R
13	60	C	66	C	60	C
14	65	C	68	F	64	C
15	66	C	67	C	61	C
16	59	F	65	F	57	F
17	55	F	63	F	56	F
18	56	F	70	F	62	F
19	60	F	87	F	70	F
20	69	F	87	F	74	F
21	73	F	87	C	68	C
22	67	F	78	F	63	F
23	57	F	68	F	61	F
24	64	C	75	C	67	C
25	69	F	73	C	66	F
26	65	R	61	C	61	C
27	57	F	72	F	61	F
28	59	F	74	F	63	F
29	64	F	69	C	62	C
30	67	C	82	F	69	F
31	65	F	74	F	67	F
M.	65.42		76.03		66.13	
H.	75.		95.		81.	
L.	55.		63.		56.	

Mean of the Month, . . 69.19

AUGUST, 1836.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	65	F	88	F	73	F
2	63	F	73	F	64	F
3	60	F	79	F	64	F
4	71	F	84	F	67	F
5	62	F	78	F	62	F
6	62	C	72	C	60	C
7	57	F	70	F	65	F
8	65	F	87	F	72	F
9	56	F	67	F	56	F
10	49	F	67	F	58	F
11	56	C	70	C	59	C
12	60	C	66	F	60	F
13	56	F	67	F	62	F
14	65	F	81	C	62	R
15	60	F	72	F	64	F
16	58	F	70	F	62	F
17	56	F	70	F	60	F
18	55	F	69	F	61	F
19	62	C	68	C	66	R
20	66	F	71	F	58	F
21	51	F	72	F	58	F
22	61	F	75	F	58	F
23	50	F	70	F	54	F
24	48	F	63	F	56	F
25	55	F	80	F	63	F
26	60	F	82	F	67	F
27	63	F	71	F	62	F
28	60	F	82	F	67	F
29	66	F	78	F	66	F
30	67	C	80	F	58	F
31	52	F	74	F	59	F
M.	59.26		74.06		62.03	
H.	71.		88.		73.	
L.	48.		63.		54.	

Mean of the Month, . . 65.12

SEPTEMBER, 1836.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	60	F	77	F	62	F
2	52	F	70	F	54	F
3	56	C	68	F	58	F
4	64	F	82	F	65	F
5	68	F	63	C	55	C
6	45	F	55	F	49	F
7	45	F	63	F	52	F
8	52	C	62	F	53	F
9	57	F	82	F	66	R
10	54	C	55	C	52	C
11	58	C	64	C	58	C
12	61	C	63	C	60	C
13	64	C	70	C	65	C
14	64	F	84	F	71	F
15	70	F	73	F	64	F
16	58	F	60	F	58	F
17	58	C	62	C	60	C
18	60	F	64	F	60	F
19	64	F	87	F	74	F
20	72	F	86	F	72	F
21	59	F	66	C	57	C
22	56	F	79	C	64	C
23	63	C	64	C	59	C
24	60	C	68	C	63	C
25	60	F	61	F	49	F
26	43	F	61	F	52	F
27	56	C	60	C	50	C
28	46	R	50	C	43	F
29	44	R	46	C	44	C
30	37	F	55	F	47	F
M.	56.86		66.67		57.86	
H.	72.		87.		74.	
L.	37.		46.		43.	

Mean of the Month, . . 60.46

OCTOBER, 1836.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	47	F	60	F	53	F
2	56	F	74	F	58	F
3	49	C	55	F	48	F
4	45	C	46	R	43	R
5	47	R	50	F	50	F
6	43	F	51	F	45	F
7	40	F	58	F	48	F
8	40	F	57	F	43	F
9	40	F	52	F	42	F
10	34	F	50	F	39	F
11	34	F	45	C	43	C
12	46	R	52	R	44	C
13	39	F	58	F	48	F
14	50	F	64	F	54	F
15	52	F	62	F	46	F
16	40	F	56	C	48	F
17	39	F	56	F	46	F
18	36	F	49	F	39	F
19	40	C	54	C	58	C
20	63	C	55	R	40	F
21	39	F	46	F	34	F
22	30	F	48	F	37	F
23	36	F	63	F	50	F
24	49	F	62	F	56	F
25	29	F	38	F	30	F
26	26	F	40	F	31	F
27	25	F	43	F	32	F
28	25	F	44	F	41	F
29	39	F	50	F	39	F
30	32	F	41	F	29	F
31	30	F	40	F	33	F
M.	40.00		52.22		43.45	
H.	63.		74.		58.	
L.	25.		38.		29.	

Mean of the Month, . . 45.22

NOVEMBER, 1836.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	29	F	50	F	36	F
2	30	C	45	C	42	C
3	35	S	37	R	36	C
4	35	C	41	C	37	C
5	33	F	43	F	35	F
6	32	F	43	F	32	F
7	29	F	49	F	38	F
8	42	C	48	F	38	F
9	32	F	46	C	42	C
10	36	F	48	C	38	F
11	44	R	49	C	46	C
12	53	R	58	C	53	F
13	42	F	50	F	40	F
14	39	C	46	R	42	R
15	36	R	37	R	37	F
16	34	F	45	F	40	F
17	36	S	40	C	38	C
18	29	F	39	F	32	F
19	25	F	37	F	31	F
20	32	F	47	C	38	C
21	44	R	49	C	49	C
22	38	F	48	F	41	F
23	36	F	44	C	35	C
24	30	F	39	F	30	F
25	22	F	30	F	19	F
26	17	F	29	F	21	F
27	17	F	29	F	22	F
28	25	F	33	F	26	F
29	19	C	27	C	28	C
30	22	F	37	C	31	F
M.	32.43		42.10		35.77	
H.	53.		58.		53.	
L.	17.		27.		19.	

Mean of the Month, . . 36.77

DECEMBER, 1836.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	37	C	36	F	22	F
2	13	F	28	F	22	F
3	23	F	34	F	30	F
4	30	F	42	F	32	F
5	39	F	47	C	37	F
6	29	F	38	F	25	F
7	16	F	28	C	22	C
8	16	F	38	F	32	F
9	28	F	47	F	35	F
10	38	F	50	C	46	C
11	42	F	45	F	34	F
12	35	F	43	F	37	F
13	33	C	42	C	44	R
14	49	F	43	C	31	F
15	25	F	27	F	22	F
16	14	F	28	C	25	C
17	34	R	53	R	40	R
18	31	F	36	F	27	F
19	23	F	34	F	25	F
20	24	F	42	F	38	F
21	46	R	54	R	26	F
22	14	F	21	F	15	F
23	10	F	24	C	31	C
24	26	F	39	F	29	F
25	30	C	39	R	34	C
26	49	R	50	R	36	S
27	15	F	19	F	12	F
28	3	F	17	F	13	F
29	14	F	29	F	25	F
30	4	F	10	F	2	F
31	—1	F	12	F	13	F
M.	25.45		35.32		27.81	
H.	49.		54.		46.	
L.	—1.		10.		2.	

Mean of the Month, . . 29.52

JANUARY, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	21	S	35	C	35	R
2	24	C	22	C	16	C
3	4	F	13	F	6	F
4	— 4	F	14	F	13	F
5	4	F	19	C	11	C
6	12	C	26	C	27	C
7	25	C	30	C	25	C
8	20	F	28	F	24	F
9	20	F	30	F	21	F
10	20	C	28	C	28	C
11	21	F	31	F	24	F
12	27	F	34	F	27	F
13	19	F	24	F	12	F
14	3	F	15	F	8	F
15	3	F	18	F	16	F
16	16	F	27	F	22	F
17	16	F	28	F	18	F
18	10	F	28	F	19	F
19	14	F	32	F	22	F
20	16	F	34	F	26	F
21	27	S	32	S	32	S
22	27	S	28	C	22	C
23	16	F	25	F	18	F
24	13	F	27	F	23	F
25	14	F	20	F	12	F
26	1	F	19	F	10	F
27	— 1	F	28	F	24	F
28	27	S	39	C	26	F
29	19	F	35	F	28	F
30	33	C	43	C	36	C
31	35	R	39	C	38	C
M.	16.19		27.45		21.58	
H.	35.		43.		38.	
L.	— 4.		13.		6.	

Mean of the Month, . . 21.74

FEBRUARY, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	35	C	41	C	37	F
2	27	F	32	F	21	F
3	8	F	20	F	16	F
4	17	C	30	F	21	F
5	17	C	23	C	22	C
6	21	C	32	F	23	F
7	22	C	38	C	36	C
8	27	C	28	C	26	C
9	17	F	25	F	17	F
10	9	F	34	F	27	F
11	21	F	37	F	27	F
12	22	F	39	F	30	F
13	16	F	8	F	2	F
14	— 1	F	24	F	24	F
15	31	C	44	F	37	F
16	37	F	38	C	30	C
17	22	S	9	C	8	C
18	— 3	F	15	F	10	F
19	10	F	34	F	26	F
20	22	F	45	F	31	F
21	32	S	33	C	31	C
22	24	F	39	F	31	F
23	27	S	33	S	34	R
24	27	F	40	C	28	C
25	21	F	40	F	33	F
26	23	F	35	F	25	F
27	28	C	41	R	36	R
28	22	S	19	F	13	F
M.	20.75		31.28		25.07	
H.	37.		45.		37.	
L.	— 3.		8.		2.	

Mean of the Month, . . 25.70

MARCH, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	7	F	22	F	12	F
2	3	F	20	F	15	F
3	12	F	24	F	12	F
4	5	F	25	F	16	F
5	20	C	34	C	22	F
6	15	F	32	F	25	F
7	24	F	38	C	32	F
8	33	C	35	C	34	C
9	35	R	36	R	35	R
10	34	C	42	F	32	F
11	30	F	40	F	30	F
12	23	F	41	C	34	C
13	36	R	46	R	46	R
14	44	F	43	F	32	F
15	23	F	30	F	26	F
16	19	F	34	F	28	F
17	24	F	47	F	33	F
18	36	F	50	C	42	R
19	27	F	36	F	25	F
20	21	F	35	C	32	C
21	32	C	36	C	32	C
22	33	C	36	C	34	C
23	36	R	37	C	35	C
24	34	F	39	F	32	F
25	31	F	52	F	43	F
26	34	F	45	F	34	F
27	33	C	44	C	40	C
28	39	C	54	F	43	C
29	41	F	47	F	33	F
30	25	F	38	F	30	F
31	28	F	35	C	34	F
M.	27.00		37.84		30.74	
H.	44.		54.		46.	
L.	3.		20.		12.	

Mean of the Month, . . 31.86

APRIL, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	34	R	38	C	34	F
2	31	F	43	F	34	F
3	35	C	51	F	36	F
4	32	F	45	F	35	F
5	31	F	48	F	36	F
6	36	F	56	F	40	F
7	36	F	51	C	44	C
8	44	R	56	R	45	C
9	40	C	48	C	40	F
10	38	C	49	C	38	C
11	37	F	57	F	43	F
12	40	F	56	F	43	F
13	38	F	57	F	45	F
14	42	C	56	F	43	F
15	42	F	60	F	48	F
16	45	C	44	R	44	C
17	42	F	54	F	40	F
18	37	C	48	F	39	F
19	38	F	50	F	43	C
20	38	F	56	C	45	C
21	40	F	46	C	41	C
22	36	F	50	F	39	F
23	35	F	55	C	41	C
24	42	C	43	C	39	C
25	40	C	51	C	43	C
26	44	F	62	F	48	F
27	42	F	56	F	48	F
28	44	F	69	F	53	F
29	48	F	73	F	53	F
30	54	F	52	C	44	R
M.	39.37		52.66		42.13	
H.	54.		73.		53.	
L.	31.		38.		34.	

Mean of the Month, . . 44.72

MAY, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	42	F	40	F	29	F
2	32	F	53	F	42	F
3	49	F	70	F	50	F
4	43	F	61	F	50	F
5	49	R	60	C	48	R
6	52	C	59	C	46	R
7	43	F	55	F	44	F
8	39	F	52	F	44	F
9	41	F	59	C	45	R
10	46	C	52	R	46	F
11	47	F	58	F	51	F
12	50	F	55	F	51	F
13	52	C	55	C	49	C
14	57	F	71	F	63	F
15	54	C	47	C	43	C
16	44	R	46	R	46	R
17	54	C	64	F	56	F
18	52	F	68	C	55	C
19	54	R	66	C	58	C
20	55	F	68	F	54	F
21	54	F	74	F	57	F
22	56	R	54	R	52	R
23	52	F	69	F	52	F
24	47	F	70	C	52	R
25	50	R	48	R	46	R
26	47	C	54	C	48	C
27	50	C	67	F	55	F
28	46	F	60	F	50	F
29	47	F	68	F	54	F
30	51	F	64	F	60	F
31	62	F	64	F	62	F
M.	48.93		59.71		50.26	
H.	62.		74.		63.	
L.	32.		40.		29.	

Mean of the Month, . . 52 97

JUNE, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	59	F	62	F	66	F
2	64	F	88	C	68	C
3	64	F	79	C	64	R
4	64	F	79	F	70	F
5	65	F	70	C	60	C
6	61	F	70	F	64	F
7	60	F	64	F	56	F
8	62	C	60	C	59	C
9	60	C	64	F	55	F
10	53	C	54	C	49	C
11	51	F	59	F	49	F
12	51	F	78	F	61	F
13	57	C	69	C	57	C
14	58	F	64	F	59	F
15	61	C	69	F	56	F
16	56	F	61	C	55	F
17	53	C	51	R	48	R
18	51	F	60	F	55	F
19	56	F	79	F	61	F
20	60	R	59	C	60	C
21	58	F	74	C	58	R
22	57	R	74	C	63	F
23	64	F	86	F	66	F
24	64	C	74	F	64	C
25	69	F	84	F	68	F
26	62	F	75	F	62	F
27	62	C	77	R	64	R
28	65	F	77	F	64	F
29	58	F	82	C	67	C
30	66	F	88	F	69	F
M.	59.70		71.00		60.56	
H.	69.		88.		70.	
L.	51.		51.		48.	

Mean of the Month, . . 63.75

JULY, 1837.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	71	F	94	R	75	F
2	71	F	81	F	64	F
3	63	F	74	C	62	R
4	62	F	77	F	66	F
5	61	F	82	F	67	F
6	64	C	74	F	66	F
7	64	F	77	F	66	F
8	64	F	81	F	68	F
9	61	F	74	F	61	F
10	60	F	75	F	62	F
11	59	F	73	C	66	C
12	62	F	66	F	56	C
13	56	F	66	F	60	F
14	63	F	90	F	70	F
15	69	F	92	R	67	R
16	63	F	78	F	67	F
17	60	F	80	F	67	F
18	61	F	75	F	68	F
19	65	F	84	F	70	F
20	70	F	85	F	69	F
21	62	F	72	F	65	F
22	59	F	78	F	66	F
23	62	F	80	F	66	F
24	69	C	76	C	67	C
25	62	F	77	F	62	F
26	58	F	74	F	64	F
27	61	F	76	F	68	F
28	65	F	73	R	64	R
29	63	C	62	F	64	F
30	59	C	64	F	61	F
31	64	F	72	R	67	C
M.	63.00		76.84		65.52	
H.	71.		94.		75.	
L.	56.		62.		56.	

Mean of the Month, . . 68.45

AUGUST, 1837.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	63	F	88	F	70	F
2	66	F	90	F	76	F
3	72	F	89	C	65	R
4	60	F	74	F	64	F
5	54	F	72	F	61	F
6	56	F	69	F	60	F
7	58	F	73	C	66	C
8	66	F	76	F	70	F
9	71	C	74	R	73	R
10	68	C	69	F	60	C
11	57	F	64	C	59	C
12	59	R	65	C	59	C
13	59	C	66	C	59	C
14	60	C	68	C	59	C
15	62	C	70	C	62	C
16	63	C	64	C	61	C
17	61	F	74	C	64	C
18	66	C	73	C	64	C
19	65	F	76	F	66	F
20	62	F	67	F	59	F
21	56	F	69	F	60	F
22	61	C	74	C	58	F
23	54	F	71	F	56	F
24	51	F	74	F	58	F
25	60	C	62	F	56	F
26	55	F	65	C	62	C
27	66	C	82	F	67	F
28	61	F	70	F	60	F
29	58	F	74	F	62	F
30	66	R	82	C	59	C
31	58	C	67	C	55	C
M.	61.10		72.61		62.26	
H.	72.		90.		76.	
L.	51.		62.		55.	

Mean of the Month, . . 65.32

SEPTEMBER, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	50	F	70	F	57	F
2	52	F	62	C	53	C
3	53	F	70	F	54	F
4	47	F	67	F	54	F
5	51	F	71	F	58	F
6	56	F	79	F	59	F
7	56	F	75	F	60	F
8	62	F	70	C	62	F
9	59	F	82	F	62	F
10	65	F	82	F	68	F
11	71	F	84	C	68	F
12	56	F	69	C	56	C
13	49	F	69	F	52	F
14	44	F	63	F	53	F
15	47	F	63	F	52	F
16	54	F	62	C	54	C
17	56	F	66	F	58	F
18	61	C	68	C	62	C
19	62	C	69	C	56	C
20	46	F	63	F	50	F
21	44	F	59	F	50	F
22	52	F	62	F	53	F
23	52	F	64	F	51	F
24	43	F	58	F	49	F
25	46	F	71	F	54	F
26	56	F	73	C	61	C
27	53	F	57	F	50	F
28	52	C	64	C	61	C
29	62	C	54	C	51	C
30	54	C	52	R	53	R
M.	53.70		67.27		56.03	
H.	71.		84.		68.	
L.	43.		52.		49.	

Mean of the Month, . . 59.00

OCTOBER, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	54	F	67	F	56	F
2	53	F	72	F	60	F
3	46	F	60	F	46	F
4	36	F	46	F	38	F
5	33	F	54	C	46	R
6	50	F	56	C	47	F
7	38	F	57	F	46	F
8	40	F	49	F	37	F
9	31	F	46	F	40	F
10	34	F	64	C	56	C
11	51	F	70	F	57	F
12	53	F	71	C	60	R
13	44	R	41	C	33	F
14	28	F	43	F	36	F
15	38	F	58	F	52	F
16	49	F	61	F	48	F
17	41	F	54	F	46	F
18	50	F	68	F	60	F
19	53	F	50	F	43	F
20	48	C	53	R	52	C
21	45	F	51	F	40	F
22	32	F	49	F	45	F
23	46	F	54	F	50	F
24	54	F	67	F	53	F
25	52	R	54	C	49	C
26	48	R	48	R	47	R
27	49	R	51	C	48	C
28	38	F	47	F	38	F
29	32	C	36	C	36	C
30	32	F	47	F	40	F
31	39	C	42	C	39	C
M.	43.13		54.39		46.58	
H.	54.		72.		60.	
L.	28.		36.		33.	

Mean of the Month, . . 48.03

NOVEMBER, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	33	F	50	F	38	F
2	32	F	48	F	39	F
3	32	F	48	F	42	F
4	38	F	58	F	46	F
5	47	R	60	C	57	C
6	46	F	49	F	40	F
7	43	R	45	F	36	F
8	28	F	35	F	28	F
9	25	C	36	C	34	C
10	48	F	54	F	39	F
11	30	F	45	C	43	C
12	50	R	50	C	40	F
13	31	F	42	F	36	F
14	31	S	24	S	27	S
15	23	F	34	F	26	F
16	21	F	39	F	29	F
17	27	F	42	F	37	F
18	40	F	50	F	43	F
19	53	C	54	F	47	F
20	46	F	63	F	58	F
21	54	F	68	F	55	F
22	53	C	55	R	52	C
23	44	F	43	C	32	C
24	32	F	40	C	35	C
25	26	S	30	S	24	F
26	15	F	24	F	18	F
27	14	F	28	F	20	F
28	15	F	34	F	31	F
29	38	F	46	C	41	C
30	41	F	49	F	42	F
M.	35.20		44.76		37.83	
H.	54.		68.		58.	
L.	14.		24.		18.	

Mean of the Month, . . 39.26

DECEMBER, 1837.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	40	C	48	F	42	C
2	46	C	44	R	43	C
3	46	C	56	F	41	C
4	37	C	42	F	37	F
5	30	F	37	F	30	F
6	24	F	38	F	34	F
7	30	F	40	F	32	F
8	34	F	41	C	21	C
9	15	F	28	C	24	C
10	25	S	33	S	27	S
11	23	C	30	S	30	S
12	23	F	32	F	24	F
13	25	F	34	F	22	F
14	11	F	21	F	14	F
15	6	F	21	F	14	F
16	8	F	25	C	18	C
17	13	C	26	S	25	C
18	35	R	51	R	38	C
19	33	F	36	C	32	C
20	24	F	21	F	16	F
21	7	F	19	F	13	F
22	4	F	16	F	12	F
23	7	F	27	F	23	F
24	27	C	36	C	27	C
25	22	F	34	F	31	F
26	34	F	43	F	33	F
27	18	F	26	F	22	F
28	29	C	40	C	31	C
29	24	F	40	C	36	C
30	32	F	44	F	33	F
31	30	C	40	F	35	F
M.	24.58		34.48		27.74	
H.	46.		56.		43.	
L.	4.		16.		12.	

Mean of the Month, . . 28.93

JANUARY, 1838.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	36	C	41	C	37	C
2	35	F	44	F	37	F
3	36	F	51	F	42	F
4	43	C	42	C	40	C
5	41	C	58	F	50	C
6	39	F	46	F	35	F
7	30	F	49	F	48	F
8	47	C	43	C	33	C
9	28	C	37	C	37	C
10	35	F	34	F	26	F
11	15	F	22	F	17	F
12	18	F	34	C	28	C
13	2[illegible]	F	38	F	30	F
14	32	F	47	F	38	F
15	44	F	42	F	33	F
16	27	F	45	F	41	F
17	43	F	53	C	50	C
18	46	C	40	R	36	R
19	36	R	37	C	27	F
20	18	F	26	F	20	F
21	19	C	29	C	26	C
22	16	F	27	C	18	C
23	12	F	28	F	27	F
24	26	F	42	F	32	F
25	27	C	36	C	37	C
26	40	C	54	R	41	F
27	35	F	36	C	36	R
28	33	C	42	F	34	C
29	24	F	30	C	18	F
30	8	F	13	F	10	F
31	4	F	18	F	13	F
M.	29.48		38.20		32.16	
H.	47.		58.		50.	
L.	4.		13.		10.	

Mean of the Month, . . 33.28

FEBRUARY, 1838.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	7	F	28	C	22	C
2	13	F	23	F	13	F
3	7	C	21	C	14	C
4	10	F	21	F	16	F
5	10	F	23	F	15	F
6	9	F	28	F	20	F
7	13	F	33	C	30	C
8	32	C	37	C	34	C
9	33	S	34	C	30	C
10	22	F	31	F	23	F
11	21	F	33	C	24	S
12	12	F	26	F	24	F
13	21	C	35	C	34	R
14	30	F	30	F	19	F
15	9	S	21	C	16	C
16	16	S	23	S	17	S
17	5	F	12	F	9	F
18	7	F	29	F	17	F
19	15	F	22	F	15	F
20	8	F	19	F	12	F
21	6	F	20	F	15	F
22	10	F	27	F	18	F
23	8	F	28	F	20	F
24	14	F	30	C	18	F
25	4	F	20	F	12	F
26	5	F	18	F	9	F
27	3	F	24	F	17	F
28	6	F	30	F	24	F
M.	12.71		25.93		19.17	
H.	33.		37.		34.	
L.	3.		12.		9.	

Mean of the Month, . . 19.27

MARCH, 1838.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	22	C	34	F	22	F
2	15	F	31	F	27	F
3	28	F	33	F	25	F
4	18	F	40	F	28	F
5	24	C	37	R	40	R
6	36	F	46	F	37	F
7	37	S	35	S	34	S
8	34	S	39	C	32	S
9	29	F	41	F	32	F
10	34	F	42	F	36	F
11	36	C	50	F	37	F
12	34	F	46	F	33	F
13	29	F	39	F	34	F
14	32	F	41	F	35	F
15	38	F	52	F	41	F
16	36	F	47	F	43	F
17	36	C	39	C	35	C
18	34	S	32	S	30	S
19	30	C	40	F	34	F
20	38	F	54	F	42	F
21	37	C	42	F	34	F
22	33	C	40	C	37	C
23	37	C	42	C	37	C
24	40	F	60	C	44	F
25	30	F	43	F	35	F
26	35	F	44	F	38	F
27	32	F	37	C	31	C
28	30	C	33	C	31	C
29	31	S	35	S	32	S
30	33	F	43	C	34	F
31	31	F	42	F	31	F
M.	31.90		41.26		34.22	
H.	40.		60.		44.	
L.	15.		31.		22.	

Mean of the Month, . . 35.79

APRIL, 1838.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	30	F	42	F	34	F
2	29	F	42	F	34	F
3	34	F	44	F	36	F
4	36	F	50	F	42	F
5	35	F	56	F	43	F
6	42	F	67	F	51	F
7	40	F	44	F	40	F
8	38	F	42	C	40	C
9	49	C	58	F	42	F
10	42	C	47	F	38	F
11	34	F	39	C	36	R
12	37	C	46	F	37	F
13	40	C	54	F	42	R
14	36	S	34	C	32	F
15	26	F	46	F	36	F
16	24	F	34	F	28	F
17	26	F	50	C	35	C
18	39	C	57	C	54	R
19	47	C	54	R	46	R
20	32	F	44	F	32	F
21	27	F	45	F	38	F
22	40	F	67	F	53	F
23	33	F	46	F	37	F
24	31	F	39	F	31	F
25	28	F	51	F	39	F
26	41	C	42	C	41	C
27	42	C	61	F	47	F
28	47	F	58	C	45	F
29	46	C	53	F	43	F
30	41	F	51	F	42	F
M.	36.40		48.77		39.80	
H.	49.		67.		54.	
L.	24.		34.		28.	

Mean of the Month, . . 41.66

MAY, 1838.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	39	F	60	F	48	F
2	46	F	57	F	50	F
3	45	R	43	C	40	F
4	45	F	46	C	42	C
5	39	R	41	R	44	R
6	49	F	60	C	48	F
7	46	F	62	F	50	C
8	48	C	52	C	47	C
9	48	C	49	R	48	F
10	47	R	50	C	44	C
11	43	F	60	C	44	F
12	46	F	66	F	54	F
13	50	F	65	F	53	F
14	46	F	53	F	49	F
15	49	F	68	F	58	F
16	54	F	74	F	62	F
17	62	F	76	F	60	F
18	47	R	44	C	44	C
19	43	F	68	F	48	F
20	50	F	75	F	59	F
21	56	F	74	F	61	F
22	58	R	73	C	62	F
23	61	F	74	C	63	R
24	64	F	76	C	61	F
25	59	C	56	C	54	R
26	49	F	65	F	50	F
27	51	F	61	F	53	F
28	57	F	71	F	56	F
29	53	F	64	C	56	F
30	53	F	64	C	54	C
31	56	F	71	F	61	F
M.	50.29		61.87		52.35	
H.	64.		76.		63.	
L.	39.		41.		40.	

Mean of the Month, . . 54.84

JUNE, 1838.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	62	F	61	F	58	F
2	56	C	74	F	58	F
3	59	F	75	F	62	F
4	63	F	77	C	63	C
5	58	R	62	C	58	C
6	60	F	70	F	63	F
7	61	C	72	F	58	F
8	60	F	77	F	65	F
9	61	F	82	F	67	F
10	68	F	93	F	78	F
11	73	F	94	F	80	F
12	74	F	93	R	72	R
13	74	F	92	R	73	R
14	73	F	72	C	69	C
15	68	F	92	F	74	F
16	72	F	87	F	72	F
17	71	F	89	R	70	C
18	64	C	63	F	56	F
19	58	F	62	F	54	F
20	53	F	76	F	60	F
21	58	F	78	F	64	F
22	68	F	73	F	60	F
23	64	F	69	F	61	F
24	68	F	81	F	70	F
25	59	C	65	F	59	R
26	64	F	80	F	68	F
27	59	F	81	F	66	F
28	65	C	72	R	67	C
29	69	F	88	F	69	F
30	66	F	65	C	60	C
M.	64.27		77.16		65.13	
H.	74.		94.		80.	
L.	53.		61.		54.	

Mean of the Month, . . 68.86

JULY, 1838.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	65	C	67	C	62	C
2	66	C	74	C	68	F
3	70	F	88	F	75	F
4	71	F	88	F	77	F
5	76	F	93	F	79	R
6	68	F	83	F	74	F
7	65	F	84	F	74	F
8	68	F	76	F	70	F
9	73	F	92	F	80	F
10	78	F	79	F	75	F
11	76	F	95	F	83	F
12	77	F	89	F	75	F
13	70	R	74	C	64	F
14	63	F	84	F	73	F
15	70	F	90	F	75	F
16	71	F	79	C	72	C
17	69	F	75	F	65	F
18	61	F	85	R	68	C
19	68	F	85	F	72	F
20	68	F	78	C	69	R
21	66	C	69	F	65	F
22	61	F	70	F	62	F
23	58	F	76	F	64	F
24	65	F	79	C	66	C
25	66	C	79	F	70	R
26	66	F	83	F	71	F
27	68	F	74	F	68	F
28	70	F	93	F	80	F
29	78	F	90	F	80	F
30	77	F	94	F	75	F
31	61	F	85	F	72	F
M.	68.68		82.26		71.71	
H.	78.		95.		83.	
L.	58.		67.		62.	

Mean of the Month, . . 74.22

AUGUST, 1838.

Day of Month	7 A. M.		2½ P. M.		9 P. M.	
1	69	F	90	F	74	F
2	66	F	78	F	67	F
3	62	F	71	F	66	F
4	66	F	87	F	74	F
5	70	F	96	F	77	F
6	74	F	67	C	66	R
7	66	C	74	F	71	F
8	68	F	76	F	71	F
9	65	F	80	C	68	R
10	69	C	70	C	64	C
11	64	F	74	C	68	F
12	72	F	82	F	69	F
13	64	F	83	F	69	F
14	58	F	67	F	60	F
15	55	F	78	F	65	F
16	64	C	66	C	63	R
17	67	F	78	F	66	F
18	61	F	77	F	68	F
19	59	F	72	F	63	F
20	55	F	69	F	61	F
21	63	F	84	F	69	F
22	68	F	74	F	68	F
23	67	F	87	F	73	F
24	69	F	91	F	79	F
25	70	F	82	R	69	R
26	68	F	72	F	56	F
27	52	F	70	C	56	R
28	62	F	77	F	63	F
29	55	F	65	F	60	F
30	62	F	70	R	62	F
31	54	F	74	F	60	F
M.	64.00		76.80		66.61	
H.	74.		96.		79.	
L.	52.		65.		56.	

Mean of the Month, . . 69.14

SEPTEMBER, 1838.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	62	R	74	F	63	R
2	56	F	66	F	54	F
3	47	F	60	F	52	F
4	48	F	66	F	54	F
5	52	F	81	F	67	F
6	59	F	71	F	62	F
7	60	F	83	F	71	F
8	62	F	60	F	55	F
9	58	F	72	C	57	C
10	59	F	80	F	64	F
11	66	F	74	C	63	C
12	54	R	53	R	54	R
13	57	R	67	C	57	F
14	54	F	69	F	60	F
15	55	F	71	F	60	F
16	54	F	62	F	51	F
17	54	C	60	C	56	C
18	57	C	70	C	59	C
19	60	F	68	F	55	F
20	50	F	70	F	57	F
21	58	F	67	C	65	R
22	68	F	76	C	67	F
23	69	F	61	C	51	F
24	45	F	64	F	52	F
25	50	F	73	F	58	F
26	55	C	58	R	53	R
27	57	C	60	C	56	C
28	57	C	71	C	61	C
29	61	R	64	C	59	C
30	56	F	71	F	58	F
M.	56 67		68 06		58.36	
H.	69.		83.		71.	
L.	45.		53.		51.	

Mean of the Month, . . 61.03

OCTOBER, 1838.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	56	F	75	F	61	F
2	56	F	76	F	60	F
3	60	F	62	C	50	C
4	43	F	59	F	50	F
5	55	F	70	F	57	F
6	57	F	75	F	60	F
7	49	R	55	C	43	F
8	38	F	49	F	41	F
9	35	F	50	F	45	F
10	46	F	52	C	46	R
11	52	C	58	C	48	C
12	42	C	58	R	49	R
13	42	F	50	F	41	F
14	39	C	61	F	50	C
15	51	C	61	R	49	C
16	43	F	54	F	43	F
17	39	F	52	F	41	F
18	37	F	52	C	47	C
19	44	C	46	R	47	R
20	45	F	54	F	43	F
21	40	F	52	C	45	C
22	42	F	52	C	40	F
23	36	F	53	F	44	F
24	44	R	45	R	43	R
25	42	F	54	C	43	F
26	36	F	50	F	40	F
27	38	C	49	R	40	F
28	36	C	43	R	35	S
29	36	F	44	F	34	F
30	31	F	44	F	36	F
31	35	S	36	C	29	F
M.	43.39		54.54		45.16	
H.	60.		76.		61.	
L.	31.		36.		29.	

Mean of the Month, . . 47.70

NOVEMBER, 1838.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	20	F	32	F	32	F
2	34	F	47	F	38	F
3	35	F	50	F	44	F
4	52	C	56	R	53	R
5	54	R	52	R	50	R
6	48	F	45	F	35	F
7	31	F	43	F	42	F
8	49	C	65	R	65	R
9	45	F	45	F	31	F
10	24	F	34	F	27	F
11	23	F	35	F	32	F
12	28	F	44	F	35	F
13	38	C	52	C	52	C
14	50	F	58	F	44	F
15	42	R	44	R	45	R
16	44	C	58	C	40	F
17	32	F	40	F	31	F
18	26	C	38	S	35	S
19	31	F	34	F	27	F
20	22	F	36	F	32	F
21	27	F	35	F	32	F
22	36	F	43	C	32	C
23	31	F	40	F	32	F
24	23	F	22	F	10	F
25	6	F	19	F	14	F
26	8	F	21	F	16	F
27	18	C	32	C	32	C
28	30	F	38	F	24	F
29	12	F	29	F	27	F
30	24	F	39	F	31	F
M.	31.43		40.87		34.66	
H.	54.		65.		65.	
L.	6.		19.		10.	

Mean of the Month, . . 35 65

DECEMBER, 1838.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	24	F	43	C	41	C
2	35	F	44	F	36	F
3	29	F	34	F	24	F
4	16	F	32	C	33	C
5	35	C	45	C	46	C
6	34	F	32	F	24	F
7	20	F	39	F	33	F
8	35	F	37	C	30	F
9	20	F	22	F	17	F
10	14	F	26	F	20	F
11	20	F	32	C	34	C
12	32	F	37	F	19	F
13	7	F	22	F	22	F
14	28	F	43	C	39	C
15	32	F	44	F	37	F
16	21	F	21	F	14	F
17	8	F	28	C	27	C
18	30	F	41	F	34	F
19	29	C	32	C	22	C
20	21	F	27	F	18	F
21	26	F	34	C	26	F
22	27	C	37	C	33	C
23	31	C	34	C	22	F
24	13	F	13	F	10	F
25	13	F	30	F	30	F
26	29	C	32	F	19	F
27	11	F	24	F	20	F
28	9	F	22	F	19	F
29	32	S	37	C	25	F
30	10	F	19	F	11	F
31	8	F	24	F	14	F
M.	22.55		31 84		25.77	
H.	35.		45.		46.	
L.	7.		13.		10.	

Mean of the Month, . . 26.72

JANUARY, 1839.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	4	F	24	F	21	F
2	17	C	26	C	26	C
3	26	C	36	C	31	C
4	31	C	34	C	29	C
5	29	C	34	C	27	C
6	25	C	34	F	30	F
7	28	C	38	R	37	R
8	36	F	37	F	27	F
9	17	F	28	F	25	F
10	34	F	43	F	37	F
11	38	F	48	F	43	F
12	42	C	52	F	38	F
13	29	F	34	F	33	F
14	34	C	34	F	22	F
15	12	F	22	F	16	F
16	12	F	30	F	24	F
17	20	F	36	F	31	F
18	30	C	40	F	36	F
19	32	F	42	F	15	F
20	5	F	24	F	21	F
21	23	F	32	C	22	C
22	8	F	26	C	23	C
23	22	C	18	F	— 3	F
24	—10	F	16	C	14	C
25	16	F	40	C	35	C
26	37	C	41	R	44	R
27	33	F	38	F	22	F
28	13	C	24	S	19	S
29	18	F	26	F	21	F
30	16	C	32	C	27	F
31	15	F	27	F	21	F
M.	22.32		32.77		26.26	
H.	42.		52.		43.	
L.	—10.		16.		—3.	

Mean of the Month, . . 27.12

FEBRUARY, 1839.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	14	C	28	S	20	S
2	14	C	28	F	16	F
3	15	F	32	F	27	F
4	26	C	31	F	20	F
5	6	F	21	F	12	F
6	6	F	19	F	13	F
7	0	F	25	F	23	F
8	28	F	49	F	42	F
9	34	S	26	C	16	C
10	3	F	24	F	22	F
11	19	C	30	F	23	F
12	19	F	27	F	22	F
13	18	F	39	F	29	F
14	31	C	36	C	34	C
15	34	C	40	F	34	C
16	33	C	36	C	34	C
17	34	C	36	R	33	S
18	29	C	37	C	30	F
19	20	F	36	F	31	F
20	32	F	46	F	34	F
21	32	F	40	F	36	F
22	34	C	37	C	35	R
23	35	S	38	R	34	C
24	33	C	43	F	33	F
25	35	R	40	C	34	F
26	32	F	41	F	36	R
27	35	C	43	C	37	C
28	30	C	46	F	36	F
M.	24.32		34.78		28.43	
H.	35.		49.		42.	
L.	0.		19.		12.	

Mean of the Month, . . 29.18

MARCH, 1839.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	32	F	42	F	32	F
2	31	F	52	F	44	F
3	26	S	20	C	10	F
4	5	F	26	F	20	F
5	15	F	34	F	25	F
6	24	F	45	F	34	F
7	33	F	51	F	37	F
8	33	F	44	C	37	R
9	34	F	46	F	37	F
10	30	F	32	F	27	F
11	21	F	36	F	29	F
12	25	F	46	F	34	F
13	28	F	42	F	36	F
14	44	R	43	C	33	F
15	27	F	40	F	31	F
16	30	F	48	F	40	F
17	35	F	49	F	40	F
18	38	C	43	C	37	C
19	35	C	37	C	34	C
20	30	C	32	C	30	C
21	30	S	36	R	35	R
22	35	C	46	F	36	F
23	37	F	50	F	41	F
24	31	F	46	F	36	F
25	35	C	42	F	31	F
26	26	F	49	F	38	F
27	45	F	61	F	51	F
28	41	F	46	F	39	F
29	38	C	42	C	37	C
30	41	C	39	F	30	F
31	27	F	39	F	34	F
M.	31.03		42.06		34.04	
H.	45.		61.		51.	
L.	5.		20.		10.	

Mean of the Month, . . 35.71

APRIL, 1839.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	31	F	56	F	44	F
2	43	F	44	F	37	F
3	32	F	47	F	39	F
4	36	F	59	F	50	F
5	44	F	47	C	38	C
6	40	C	64	F	49	F
7	54	F	74	F	55	F
8	36	F	52	F	40	F
9	34	F	49	F	40	F
10	39	F	61	F	46	F
11	51	F	70	F	54	F
12	54	R	43	R	41	R
13	38	R	39	C	36	R
14	35	S	37	S	36	R
15	37	C	43	R	41	R
16	39	F	54	F	40	F
17	40	C	40	R	36	S
18	37	F	49	C	40	F
19	42	F	66	F	53	F
20	48	F	56	F	40	F
21	32	F	46	F	38	F
22	38	F	65	F	50	F
23	45	F	66	F	49	F
24	51	F	69	F	53	F
25	53	F	70	R	52	F
26	47	F	63	F	52	F
27	50	F	75	F	60	F
28	50	F	50	C	45	C
29	46	C	48	C	45	C
30	44	C	56	C	50	R
M.	42.20		55.27		44.96	
H.	54.		75.		60.	
L.	31.		37.		36.	

Mean of the Month, . . 47.48

MAY, 1839.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	48	C	52	C	46	R
2	47	R	60	C	52	F
3	59	R	63	F	45	F
4	40	F	49	F	43	F
5	42	F	56	C	49	F
6	45	F	64	F	53	F
7	41	F	58	F	44	F
8	39	F	58	C	50	F
9	60	C	71	F	53	F
10	45	F	58	F	47	F
11	43	F	51	F	47	F
12	45	F	69	F	52	F
13	52	F	70	F	55	F
14	56	R	60	R	54	C
15	54	F	66	F	60	F
16	62	F	63	C	57	S
17	58	F	70	F	58	F
18	54	F	60	F	54	F
19	54	F	76	F	63	F
20	63	F	80	F	56	F
21	52	F	72	F	55	F
22	51	R	53	C	48	F
23	49	F	56	F	48	F
24	49	R	53	C	50	C
25	52	R	62	C	53	F
26	60	F	77	F	60	F
27	62	F	74	F	61	R
28	64	F	76	C	62	F
29	62	R	71	F	59	C
30	59	F	70	F	56	F
31	53	F	68	F	54	F
M.	52.26		64.06		53.03	
H.	64.		80.		63.	
L.	39.		49.		43.	

Mean of the Month, . . 56 45

JUNE, 1839.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	52	C	49	R	48	C
2	50	C	57	F	50	C
3	52	F	67	C	53	F
4	53	F	61	F	52	F
5	51	R	50	R	48	R
6	52	C	61	C	54	C
7	55	F	78	F	58	F
8	59	F	80	F	63	F
9	65	C	82	C	68	C
10	65	F	80	F	68	F
11	67	F	76	C	63	C
12	52	F	70	F	56	F
13	54	F	56	C	50	R
14	50	F	69	F	60	F
15	60	F	73	F	57	F
16	56	R	66	C	54	F
17	55	F	75	F	63	F
18	64	F	75	C	64	R
19	60	F	68	F	56	F
20	59	F	76	F	66	F
21	65	F	88	F	59	F
22	56	C	59	C	58	R
23	63	F	70	C	62	F
24	56	F	72	F	61	C
25	60	C	80	F	65	F
26	60	F	82	F	66	F
27	63	F	74	C	66	F
28	63	R	58	R	58	R
29	61	F	77	F	70	F
30	63	F	78	F	65	F
M.	58.03		70.23		59.37	
H.	67.		88.		70.	
L.	50.		49.		48.	

Mean of the Month, . . 62.54

JULY, 1839.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	61	F	84	F	67	F
2	66	F	82	F	72	R
3	69	R	75	F	68	F
4	69	F	80	F	67	F
5	63	C	75	F	61	C
6	64	C	62	R	59	R
7	65	F	71	F	62	F
8	62	F	82	F	68	R
9	66	F	74	C	68	F
10	66	F	90	F	72	F
11	73	F	80	R	70	C
12	70	F	81	F	66	F
13	63	F	81	F	69	F
14	66	F	78	R	65	C
15	66	F	74	C	66	C
16	63	F	77	F	66	F
17	65	F	81	F	71	F
18	67	F	89	F	73	F
19	71	F	94	F	76	F
20	72	F	83	C	76	F
21	73	R	87	F	73	C
22	73	F	79	C	69	R
23	71	F	86	F	71	F
24	69	F	76	F	67	F
25	68	F	82	C	70	F
26	70	F	81	F	74	F
27	68	F	82	F	67	F
28	66	F	77	F	70	F
29	71	F	91	F	74	F
30	72	F	90	F	73	F
31	71	C	77	R	72	F
M.	67.71		80.67		69.10	
H.	73.		94.		76.	
L.	61.		62.		59.	

Mean of the Month, . . 72.49

AUGUST, 1839.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	68	F	81	F	66	F
2	63	F	82	C	66	F
3	63	F	90	F	68	F
4	62	F	74	F	65	F
5	65	F	78	F	69	F
6	64	F	86	F	70	F
7	70	F	88	F	70	F
8	65	F	72	F	66	F
9	68	C	80	F	66	F
10	60	F	76	F	64	F
11	59	F	80	F	66	F
12	68	C	69	R	69	R
13	63	C	72	F	64	F
14	63	F	69	F	59	F
15	60	F	72	F	58	F
16	60	C	64	R	58	R
17	59	C	67	C	60	C
18	62	C	67	F	58	C
19	60	F	76	F	68	F
20	65	F	83	F	70	F
21	68	F	86	F	74	F
22	71	F	92	F	72	F
23	70	F	90	F	75	F
24	73	F	78	C	71	C
25	73	F	88	F	72	F
26	66	F	78	F	70	F
27	73	F	91	F	76	F
28	69	C	78	F	63	F
29	53	C	61	C	55	C
30	58	C	53	R	51	R
31	53	C	63	F	54	C
M.	64.32		76.90		65.58	
H.	73.		92.		76.	
L.	53.		53.		51.	

Mean of the Month, . . 68.93

SEPTEMBER, 1839.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	50	F	66	F	57	F
2	54	F	76	F	63	F
3	60	F	78	F	65	F
4	59	F	72	F	65	F
5	65	C	78	F	65	C
6	63	F	83	F	68	F
7	67	F	69	C	59	C
8	60	C	63	R	62	R
9	69	R	82	C	70	F
10	68	F	78	F	63	F
11	55	F	70	F	57	F
12	52	F	70	F	58	F
13	52	C	61	C	54	F
14	47	F	65	F	53	F
15	53	F	72	F	60	F
16	61	F	79	F	68	F
17	65	F	72	F	61	F
18	61	R	72	C	64	F
19	62	F	75	F	62	F
20	63	F	75	F	62	F
21	59	F	77	F	64	F
22	61	F	82	F	64	F
23	64	F	74	F	57	F
24	49	F	69	F	59	F
25	54	F	68	C	58	C
26	56	C	56	R	48	F
27	43	F	64	C	60	C
28	42	F	55	F	45	F
29	43	F	56	F	48	F
30	47	C	50	R	48	R
M.	56.80		70.23		59.57	
H.	69.		83.		70.	
L.	42.		50.		45.	

Mean of the Month, . . 62.20

OCTOBER, 1839.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	39	F	54	F	47	F
2	44	F	64	F	53	F
3	53	F	69	F	60	F
4	52	F	58	F	44	F
5	36	F	48	F	40	F
6	33	F	52	F	43	F
7	40	C	62	C	51	C
8	46	F	61	F	52	F
9	55	F	57	F	52	F
10	56	F	67	C	58	C
11	45	F	57	C	48	C
12	50	F	54	C	51	C
13	58	C	68	F	55	C
14	55	R	52	R	51	R
15	50	R	51	R	50	R
16	44	F	58	F	50	F
17	46	F	70	F	54	F
18	52	F	71	F	56	F
19	60	R	66	C	62	C
20	40	C	45	F	35	F
21	29	F	44	F	35	F
22	29	F	51	F	41	F
23	39	F	53	F	49	F
24	53	F	70	F	58	F
25	44	F	53	F	44	F
26	41	F	60	F	49	F
27	50	F	68	F	56	F
28	54	F	66	F	55	F
29	45	F	58	F	48	F
30	41	F	54	F	48	F
31	46	F	51	C	47	F
M.	45.97		58.45		49.74	
H.	60.		71.		62.	
L.	29.		44.		35.	

Mean of the Month, . . 51.39

NOVEMBER, 1839.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	40	C	46	C	42	C
2	38	C	45	C	40	C
3	38	C	43	C	40	C
4	30	F	42	F	33	F
5	26	F	43	C	45	C
6	46	C	56	F	43	F
7	36	F	50	F	40	F
8	35	F	45	F	39	F
9	34	F	42	F	31	F
10	29	F	38	C	33	C
11	27	F	44	F	33	F
12	26	F	43	F	32	F
13	33	F	46	C	41	C
14	40	C	48	C	51	R
15	56	F	62	C	58	F
16	42	F	49	F	41	F
17	36	F	48	C	44	C
18	40	F	44	F	38	F
19	39	F	46	F	35	F
20	30	F	36	F	30	F
21	24	C	27	F	22	C
22	21	F	32	F	22	F
23	17	F	35	F	28	F
24	32	C	41	R	45	R
25	54	R	53	R	36	F
26	17	F	24	F	22	F
27	25	F	34	F	32	F
28	29	F	41	F	32	F
29	25	F	44	F	34	F
30	33	F	44	F	35	F
M.	33.27		43.03		36.56	
H.	56.		62.		58.	
L.	17.		24.		22.	

Mean of the Month, . . 37.62

DECEMBER, 1839.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	37	C	44	C	42	C
2	41	C	41	C	41	C
3	42	C	41	C	41	C
4	40	C	45	F	44	F
5	37	F	47	F	44	F
6	36	F	45	F	36	F
7	38	C	44	C	42	C
8	43	C	44	R	44	R
9	42	C	43	R	49	R
10	35	F	44	F	35	F
11	29	F	42	F	36	F
12	43	R	50	F	38	F
13	35	F	38	F	33	F
14	28	F	37	F	30	F
15	34	S	33	R	36	R
16	30	S	32	S	29	S
17	26	F	30	F	20	F
18	15	F	29	F	17	F
19	9	F	21	F	10	F
20	9	F	19	F	16	F
21	14	F	27	F	20	F
22	19	F	33	C	34	C
23	33	S	28	S	28	S
24	29	C	36	C	30	C
25	26	F	32	F	23	F
26	18	F	31	F	26	F
27	22	F	34	C	37	C
28	38	C	41	R	35	F
29	28	F	31	F	24	F
30	15	F	18	F	14	F
31	10	F	20	F	13	F
M.	29.06		35.45		31.19	
H.	43.		50.		49.	
L.	9.		18.		10.	

Mean of the Month, . . 31.90

JANUARY, 1840.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	4	F	13	F	6	F
2	0	F	15	F	11	F
3	6	F	18	F	12	F
4	12	F	22	F	15	F
5	14	F	28	F	23	F
6	24	F	31	F	19	F
7	12	F	28	F	20	F
8	14	F	28	F	21	F
9	14	F	32	F	28	F
10	23	F	36	F	30	F
11	32	S	29	S	23	S
12	15	C	20	C	14	C
13	17	C	29	F	19	F
14	19	F	32	C	29	S
15	25	F	24	C	10	C
16	— 4	F	8	F	3	F
17	— 4	F	12	F	5	F
18	— 3	F	10	F	4	F
19	7	F	24	F	22	F
20	22	F	37	F	28	F
21	30	F	39	F	24	F
22	14	C	26	S	30	S
23	35	R	27	C	23	F
24	11	F	19	F	13	F
25	6	F	20	F	14	F
26	7	F	17	F	11	F
27	11	C	23	F	14	F
28	12	S	27	S	25	S
29	25	C	32	C	33	C
30	33	C	38	R	40	C
31	27	F	30	F	24	F
M.	14.84		24.97		19.12	
H.	35.		39.		40.	
L.	—4.		8.		3.	

Mean of the Month, . . 19.64

FEBRUARY, 1840.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	23	S	23	S	20	S
2	7	F	26	F	19	F
3	11	F	29	F	19	F
4	2	F	9	F	2	F
5	— 4	F	23	F	20	F
6	21	F	40	F	34	F
7	44	C	44	F	33	F
8	33	R	38	C	36	C
9	34	C	40	F	35	R
10	36	C	40	C	37	R
11	32	C	36	F	26	F
12	19	F	35	F	33	F
13	33	C	44	F	33	F
14	32	C	35	C	37	R
15	36	F	35	F	24	F
16	15	F	27	F	26	F
17	30	F	44	F	34	F
18	34	C	39	C	37	C
19	36	C	50	C	45	C
20	46	F	61	F	54	F
21	44	F	48	F	37	F
22	32	F	45	C	46	C
23	53	F	62	F	49	F
24	41	F	43	C	33	C
25	26	C	37	F	29	F
26	27	C	47	C	40	C
27	36	C	37	C	35	C
28	34	C	44	C	41	C
29	36	F	43	F	41	F
M.	29.27		38.75		32.93	
H.	53.		62.		54.	
L.	— 4.		9.		2.	

Mean of the Month, . . 33.65

MARCH, 1840.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	35	C	39	C	38	C
2	36	F	58	F	45	F
3	36	F	52	C	47	R
4	46	C	64	F	49	F
5	44	R	37	S	33	F
6	29	F	48	F	42	F
7	31	F	37	F	16	F
8	7	F	31	F	27	F
9	32	C	45	F	36	F
10	34	C	48	C	28	C
11	18	F	26	F	22	F
12	19	F	34	C	30	F
13	24	F	36	C	32	F
14	26	F	37	F	26	F
15	23	F	37	C	35	C
16	28	F	45	F	35	F
17	35	C	33	S	33	S
18	29	F	46	F	39	F
19	31	F	42	F	39	F
20	35	R	43	S	40	C
21	40	F	46	F	33	F
22	22	F	32	F	28	F
23	25	F	36	F	32	F
24	33	C	32	S	28	S
25	26	C	37	F	28	F
26	24	F	34	F	29	F
27	31	F	53	F	42	F
28	45	C	51	C	48	C
29	50	C	56	C	50	C
30	47	C	56	R	55	R
31	40	F	46	F	40	F
M.	31.64		42.48		35.65	
H.	50.		64.		55.	
L.	7.		26.		16.	

Mean of the Month, . . 36.59

APRIL, 1840.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	36	F	40	C	36	R
2	34	F	42	F	35	F
3	34	F	56	F	45	F
4	49	F	52	C	43	F
5	38	F	50	F	40	F
6	32	F	47	F	39	F
7	30	F	42	F	34	F
8	29	F	44	F	36	F
9	30	F	44	F	36	F
10	44	F	64	F	52	F
11	50	F	66	C	56	F
12	56	C	61	R	57	R
13	45	F	53	F	44	F
14	37	F	48	F	45	F
15	47	C	58	F	46	F
16	42	F	47	F	46	F
17	47	F	64	F	50	F
18	54	F	73	F	60	F
19	50	C	52	C	43	F
20	41	F	60	F	47	F
21	36	F	46	F	41	F
22	40	F	53	R	53	R
23	56	C	78	F	64	F
24	62	F	75	F	62	F
25	52	F	66	F	59	F
26	60	F	78	F	64	R
27	52	F	51	F	43	F
28	38	F	54	F	44	F
29	47	R	48	R	46	R
30	48	F	67	F	56	F
M.	43.86		55.97		47.40	
H.	62.		78.		64.	
L.	29.		40.		34.	

Mean of the Month, . . 49 08

MAY, 1840.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	57	F	61	R	46	F
2	43	F	62	F	53	F
3	56	F	78	F	57	F
4	51	R	49	C	43	R
5	43	R	43	R	39	R
6	44	F	57	F	43	F
7	43	C	60	F	49	C
8	47	F	52	C	45	F
9	43	C	40	R	42	C
10	41	C	49	R	47	C
11	47	C	49	F	46	F
12	43	F	54	F	46	F
13	44	F	58	F	53	F
14	51	F	72	F	55	F
15	58	F	75	R	57	R
16	52	F	71	F	57	F
17	60	F	80	F	68	F
18	70	F	90	F	75	F
19	56	F	57	C	51	F
20	53	C	56	C	51	C
21	52	C	54	R	49	R
22	53	C	61	F	52	F
23	55	F	59	F	50	F
24	54	F	61	F	53	F
25	53	F	68	F	55	F
26	53	F	78	F	59	F
27	59	F	88	F	70	F
28	65	F	89	F	73	F
29	65	F	68	F	59	F
30	53	F	67	F	58	F
31	60	F	67	F	59	F
M.	52.58		63.64		53.55	
H.	70.		90.		75.	
L.	41.		40.		39.	

Mean of the Month, . . 56.52

JUNE, 1840.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	56	C	58	C	51	C
2	49	F	58	F	54	F
3	58	C	61	C	62	C
4	65	R	71	C	65	R
5	62	R	78	F	67	F
6	61	F	71	F	66	F
7	69	F	79	C	57	R
8	54	C	69	C	61	C
9	58	F	74	F	63	F
10	62	F	88	F	69	F
11	67	F	88	F	71	F
12	68	F	88	F	76	F
13	67	C	73	F	57	C
14	59	F	74	F	64	F
15	60	C	73	F	60	F
16	54	F	68	F	61	F
17	59	F	78	F	63	F
18	62	F	77	C	64	C
19	63	R	75	C	58	F
20	56	C	62	F	58	F
21	60	F	75	F	64	F
22	65	F	87	F	71	F
23	66	F	73	F	66	F
24	64	F	89	F	74	F
25	70	F	71	F	62	F
26	63	F	70	F	60	F
27	64	C	67	C	63	C
28	69	C	72	C	66	F
29	69	F	91	F	73	F
30	72	F	91	F	72	F
M.	62.37		74.96		63.93	
H.	72.		91.		76.	
L.	49.		58.		51.	

Mean of the Month, . . 67.09

JULY, 1840.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	70	F	83	F	70	F
2	60	F	71	F	66	F
3	62	C	69	C	60	C
4	61	R	68	F	62	F
5	62	F	76	F	63	F
6	64	C	69	F	61	F
7	64	C	68	C	62	C
8	66	F	76	C	68	F
9	69	F	86	C	67	F
9	68	F	84	F	71	F
11	63	F	85	F	71	F
12	68	F	72	F	66	F
13	68	F	85	F	72	F
14	75	F	90	F	76	F
15	70	F	92	F	77	F
16	73	F	94	F	78	F
17	75	F	97	F	77	F
18	78	F	82	C	75	C
19	76	F	90	C	69	R
20	59	F	74	F	63	F
21	61	F	83	F	68	F
22	63	F	76	F	70	F
23	66	F	85	F	71	F
24	69	R	73	F	68	C
25	67	F	74	F	67	F
26	66	F	81	F	73	F
27	70	F	72	F	64	F
28	66	F	84	F	71	F
29	72	F	86	F	72	F
30	65	F	86	F	71	F
31	66	F	85	F	71	F
M.	67.16		80.52		69.03	
H.	78.		97.		78.	
L.	59.		68.		60.	

Mean of the Month, . . 72.24

AUGUST, 1840.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	67	R	68	R	66	C
2	70	C	72	C	70	C
3	71	F	83	F	73	R
4	69	F	88	F	73	F
5	73	F	84	F	71	F
6	64	F	84	F	69	R
7	64	F	80	F	64	F
8	61	F	74	F	66	F
9	62	F	80	F	67	F
10	58	F	78	F	66	F
11	61	F	82	F	71	F
12	67	F	82	F	73	F
13	70	C	77	R	71	C
14	73	C	83	F	70	F
15	66	F	81	F	66	F
16	64	F	69	F	61	F
17	59	F	73	F	62	F
18	65	F	74	F	66	F
19	64	F	86	F	74	F
20	69	F	80	F	73	F
21	70	F	81	F	74	F
22	70	F	91	F	74	F
23	74	F	91	F	72	R
24	70	F	83	F	70	F
25	66	F	78	R	62	R
26	59	F	74	F	65	F
27	62	F	72	F	65	F
28	63	C	70	F	62	F
29	65	C	70	F	63	F
30	62	F	70	F	68	F
31	70	C	82	C	71	C
M.	66.06		78.71		68.32	
H.	74.		91.		74.	
L.	58.		69.		61.	

Mean of the Month, . . 71.03

SEPTEMBER, 1840.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	60	F	76	F	64	F
2	63	C	75	C	68	C
3	61	F	73	F	60	F
4	52	F	69	F	60	F
5	58	C	55	R	55	C
6	57	C	65	F	60	C
7	56	F	79	F	62	F
8	57	F	83	F	65	F
9	65	F	78	F	68	F
10	67	F	77	R	63	C
11	58	F	68	C	56	C
12	53	F	62	C	52	F
13	46	F	66	F	54	F
14	47	F	66	F	53	F
15	53	F	74	F	59	F
16	53	F	73	F	61	F
17	60	C	72	F	58	F
18	63	C	76	F	64	C
19	63	R	69	C	55	F
20	51	F	72	C	60	C
21	54	F	61	C	46	C
22	42	F	54	F	46	F
23	45	F	67	F	58	F
24	52	F	56	C	47	F
25	44	F	58	F	50	F
26	47	F	70	F	53	F
27	56	F	73	C	58	R
28	49	F	61	F	49	F
29	44	F	68	F	54	F
30	52	F	72	F	59	F
M.	54.27		68.93		57.23	
H.	67.		83.		68.	
L.	42.		54.		46.	

Mean of the Month, . . 60.14

OCTOBER, 1840.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	57	R	56	C	52	C
2	54	R	62	C	57	C
3	63	R	71	C	55	R
4	44	F	63	F	52	F
5	49	F	70	F	54	F
6	52	F	74	F	59	F
7	54	F	58	F	52	F
8	44	F	58	F	52	F
9	53	C	52	C	46	C
10	38	F	50	F	42	F
11	48	C	56	R	58	R
12	55	F	59	F	45	F
13	38	F	52	F	43	F
14	46	F	70	F	54	F
15	42	F	54	F	42	F
16	33	F	48	F	41	F
17	32	F	47	F	43	F
18	44	C	54	C	48	C
19	50	C	59	C	58	C
20	62	C	66	R	58	C
21	54	C	53	R	51	R
22	49	C	50	R	41	F
23	40	F	60	F	52	F
24	43	F	51	F	45	F
25	45	C	43	C	40	C
26	32	S	43	F	37	C
27	31	F	43	F	32	F
28	37	C	50	C	48	C
29	50	R	53	R	61	R
30	62	R	65	C	55	F
31	46	C	50	C	45	C
M.	46.68		56.12		48.97	
H.	63.		74.		61.	
L.	31.		43.		32.	

Mean of the Month, . . 50.59

NOVEMBER, 1840.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	35	F	49	F	40	F
2	34	F	46	F	40	F
3	32	F	49	F	43	F
4	43	C	47	C	43	C
5	40	C	47	C	44	C
6	42	C	53	C	47	C
7	44	C	45	C	46	C
8	46	C	47	C	47	C
9	49	R	50	R	48	R
10	40	C	48	F	45	C
11	41	C	45	C	43	C
12	44	C	45	R	44	R
13	43	C	49	F	40	F
14	36	F	45	F	40	F
15	42	R	50	C	45	F
16	31	F	41	F	35	F
17	30	F	41	F	36	F
18	33	C	38	C	31	C
19	29	C	35	F	27	F
20	28	F	34	F	26	F
21	23	F	34	F	30	F
22	28	C	34	S	38	R
23	32	C	33	R	34	C
24	31	F	38	C	34	F
25	37	C	40	R	37	R
26	33	C	36	F	36	F
27	29	F	30	F	24	F
28	26	F	38	C	35	C
29	32	F	48	F	43	F
30	44	F	56	F	37	F
M.	35.90		43.03		38.43	
H.	49.		56.		48.	
L.	23.		30.		24.	

Mean of the Month, . . 39.12

DECEMBER, 1840.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	21	F	28	F	24	F
2	18	F	38	F	31	F
3	31	F	43	F	34	F
4	18	F	26	C	22	C
5	19	C	21	C	20	C
6	17	C	28	S	34	R
7	24	F	34	C	31	C
8	29	F	38	F	31	F
9	28	F	41	F	34	F
10	37	F	45	F	37	F
11	30	F	34	F	27	F
12	21	F	38	C	38	C
13	43	R	50	C	40	F
14	35	F	43	F	36	F
15	32	F	46	F	43	F
16	41	F	45	C	33	S
17	27	F	32	F	24	F
18	15	F	24	F	16	F
19	12	F	31	F	24	F
20	18	F	30	F	25	F
21	22	F	26	F	17	F
22	16	S	33	C	30	C
23	14	F	21	F	22	F
24	29	F	26	F	15	F
25	3	F	13	F	9	F
26	9	C	30	S	32	S
27	22	C	24	C	25	C
28	14	F	27	F	22	F
29	19	F	32	F	31	F
30	30	F	35	C	33	F
31	32	C	38	C	35	C
M.	23.42		32.90		28.22	
H.	43.		50.		43.	
L.	3.		13.		9.	

Mean of the Month, . . 28.18

JANUARY, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	19	F	32	C	39	S
2	25	F	28	F	21	F
3	12	F	19	F	10	F
4	2	F	15	F	8	F
5	1	F	20	F	21	F
6	33	C	39	R	43	C
7	48	C	56	R	55	F
8	52	F	52	F	40	F
9	38	C	41	F	38	F
10	32	C	35	C	34	C
11	32	C	39	R	40	R
12	39	F	40	F	32	F
13	32	C	34	C	32	S
14	23	F	31	C	32	F
15	23	F	36	C	31	F
16	27	F	40	F	37	F
17	38	R	53	R	50	R
18	30	F	27	F	16	F
19	10	F	22	F	22	F
20	18	F	26	F	30	F
21	34	R	35	R	34	R
22	32	F	34	F	27	F
23	20	F	37	C	31	C
24	30	F	37	C	36	S
25	30	F	42	C	36	F
26	29	F	40	F	37	F
27	38	R	43	C	36	C
28	34	F	44	F	33	F
29	29	C	33	S	34	S
30	27	F	39	F	29	F
31	22	F	40	F	33	F
M.	27.71		35.77		31.84	
H.	52.		56.		55.	
L.	1.		15.		8.	

Mean of the Month, . . 31.77

FEBRUARY, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	30	F	34	C	22	S
2	18	C	29	F	21	F
3	32	F	31	F	19	F
4	15	F	29	F	21	F
5	18	F	33	F	28	F
6	23	F	38	F	28	F
7	24	F	35	F	25	F
8	23	F	33	F	24	F
9	20	F	38	C	34	C
10	29	F	36	F	23	F
11	11	F	23	F	14	F
12	5	F	18	F	9	F
13	2	F	20	F	19	F
14	10	F	22	F	14	F
15	10	F	19	F	13	F
16	17	F	32	F	24	F
17	26	S	29	S	23	C
18	11	F	27	F	22	F
19	27	C	40	F	31	C
20	18	F	33	F	29	F
21	32	F	46	F	37	F
22	27	C	35	C	28	F
23	40	F	41	F	16	F
24	7	F	24	F	19	F
25	10	F	34	F	29	F
26	33	F	45	F	35	F
27	35	R	38	C	33	F
28	31	F	45	F	35	F
M.	20.85		32.39		24.11	
H.	40.		46.		37.	
L.	2.		18.		9.	

Mean of the Month, . . 25.78

MARCH, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	38	F	49	F	38	F
2	34	F	42	F	35	F
3	32	F	43	F	36	F
4	25	F	31	F	21	F
5	10	F	24	F	21	F
6	20	C	36	S	32	S
7	40	C	42	F	36	F
8	33	C	38	C	30	C
9	27	F	41	F	31	F
10	29	C	39	C	34	C
11	32	F	37	F	27	F
12	20	F	34	F	29	F
13	30	S	39	C	27	C
14	19	F	34	F	31	F
15	18	F	28	F	21	F
16	20	S	28	S	20	F
17	17	F	30	F	23	F
18	24	C	39	F	34	F
19	32	F	55	F	43	F
20	40	F	62	F	46	F
21	41	F	46	F	34	F
22	29	F	40	F	35	F
23	38	C	57	F	52	R
24	36	F	54	F	42	F
25	39	F	50	F	45	F
26	42	F	63	F	51	F
27	52	F	52	C	45	F
28	44	C	52	C	45	C
29	38	C	36	S	35	R
30	34	C	30	F	25	F
31	20	F	42	F	32	F
M.	30.74		41.71		34.06	
H.	52.		63.		52.	
L.	10.		24.		20.	

Mean of the Month, . . 35.50

APRIL, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	36	R	50	F	41	F
2	40	F	56	C	52	R
3	35	F	43	F	37	F
4	35	F	55	C	42	R
5	50	F	53	F	45	F
6	40	F	49	F	38	F
7	37	F	53	C	43	R
8	38	F	49	F	41	F
9	41	R	44	C	38	C
10	35	C	39	C	34	C
11	27	F	36	F	30	F
12	29	C	40	C	34	C
13	29	S	32	S	31	S
14	29	F	44	F	35	F
15	31	F	43	F	35	F
16	33	F	53	F	40	F
17	43	F	49	C	48	C
18	51	R	56	F	38	F
19	31	F	49	F	40	F
20	42	F	45	C	42	C
21	44	R	44	R	41	R
22	42	C	41	R	40	R
23	40	R	44	C	42	C
24	46	C	53	R	45	C
25	41	R	43	C	41	C
26	43	R	50	C	46	C
27	50	C	52	R	44	F
28	40	F	58	F	49	F
29	48	F	71	F	52	F
30	42	R	45	R	41	C
M.	38.93		47.97		40.83	
H.	51.		71.		52.	
L.	27.		32.		30.	

Mean of the Month, . . 42.58

MAY, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	44	C	50	C	46	C
2	45	F	57	C	40	R
3	34	S	43	C	38	F
4	36	F	53	F	43	F
5	43	F	50	F	45	F
6	45	R	46	C	44	C
7	43	F	61	F	52	F
8	46	R	52	C	46	F
9	46	F	68	F	52	F
10	50	R	47	R	45	R
11	47	C	59	F	51	F
12	46	F	60	C	49	C
13	46	F	51	C	46	F
14	47	F	55	C	49	F
15	45	F	52	F	48	F
16	44	F	65	F	51	F
17	51	C	61	C	48	F
18	47	C	55	F	48	C
19	45	C	52	F	46	C
20	44	F	70	F	60	F
21	60	F	70	F	61	F
22	61	F	62	C	58	C
23	60	R	76	C	66	F
24	63	F	86	F	64	F
25	63	F	83	F	67	F
26	63	C	72	F	62	F
27	62	F	75	C	62	C
28	64	F	79	F	66	F
29	67	F	63	C	50	R
30	52	C	57	F	50	F
31	51	F	58	F	45	F
M.	50.32		60.90		51.55	
H.	67.		86.		67.	
L.	34.		43.		38.	

Mean of the Month, . . 54 26

JUNE, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	51	F	55	C	54	F
2	58	F	86	F	63	F
3	58	F	70	F	58	F
4	55	F	80	F	65	F
5	68	F	82	F	57	F
6	57	F	66	F	57	F
7	61	F	89	F	72	F
8	75	F	95	F	73	F
9	61	C	63	C	60	C
10	59	C	89	F	73	C
11	72	F	90	F	73	F
12	64	F	68	C	63	F
13	62	F	75	F	63	F
14	60	F	73	F	65	F
15	63	F	78	C	64	F
16	62	F	84	F	64	F
17	62	F	75	F	68	F
18	67	C	69	C	60	R
19	62	C	72	C	59	R
20	59	F	69	F	56	F
21	56	F	73	F	65	F
22	62	F	81	F	66	F
23	69	F	83	F	73	F
24	69	C	72	C	64	C
25	63	C	66	C	61	C
26	66	C	84	R	71	F
27	74	F	89	F	72	F
28	72	F	86	F	72	F
29	71	F	92	F	80	F
30	79	F	96	R	73	R
M.	63.90		78.33		65.47	
H.	79.		96.		80.	
L.	51.		55.		54.	

Mean of the Month, . . 69.23

JULY, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	74	F	85	C	70	F
2	66	F	80	F	63	F
3	57	F	74	F	61	F
4	59	F	74	F	65	F
5	63	F	76	F	67	R
6	67	F	87	F	71	F
7	68	F	86	F	72	F
8	63	F	80	C	68	F
9	62	F	82	F	67	F
10	69	C	78	F	63	F
11	59	F	73	F	62	F
12	59	F	77	F	67	F
13	61	F	84	F	68	F
14	71	F	85	F	72	C
15	72	F	90	F	77	F
16	73	F	71	F	69	F
17	63	F	71	F	63	F
18	62	F	74	F	64	F
19	63	F	87	C	72	F
20	69	F	72	F	68	F
21	67	F	92	F	74	F
22	68	F	91	F	78	F
23	74	F	72	C	64	F
24	64	C	68	F	63	C
25	72	F	90	F	74	R
26	72	F	79	F	66	F
27	61	F	81	F	69	F
28	66	R	77	F	61	F
29	54	F	69	F	63	F
30	61	F	82	F	67	F
31	65	C	66	R	60	R
M.	65.29		79.13		67.35	
H.	74.		92.		78.	
L.	54.		66.		60.	

Mean of the Month, . . 70.59

AUGUST, 1841.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	61	C	62	R	58	F
2	57	F	78	F	69	F
3	65	F	88	F	71	F
4	67	F	88	F	75	F
5	72	F	80	C	71	C
6	68	F	72	C	65	C
7	64	C	70	F	68	F
8	63	C	74	F	68	F
9	69	C	72	R	72	F
10	70	F	87	C	74	C
11	69	R	66	R	62	C
12	65	C	80	F	71	F
13	67	C	83	F	70	F
14	64	F	70	F	62	F
15	61	F	70	F	61	F
16	57	F	68	F	64	F
17	64	F	88	F	71	F
18	67	F	87	F	69	F
19	69	F	87	F	73	F
20	70	F	77	F	70	F
21	69	F	80	F	74	F
22	73	C	70	C	68	C
23	62	F	70	F	62	F
24	57	F	70	F	61	F
25	56	F	73	F	62	F
26	58	F	81	F	62	F
27	64	C	68	C	64	C
28	65	R	70	C	65	C
29	65	C	67	R	63	C
30	65	R	65	R	63	R
31	64	C	73	R	62	F
M.	64.74		75.29		66.77	
H.	73.		88.		75.	
L.	56.		62.		58.	

Mean of the Month, . . 68.94

SEPTEMBER, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	61	F	71	C	63	F
2	60	F	75	C	68	F
3	66	F	82	F	73	F
4	72	F	83	C	70	C
5	64	C	67	C	63	C
6	61	C	64	C	61	C
7	63	C	67	F	61	F
8	60	F	66	F	60	F
9	54	F	65	F	60	F
10	61	C	68	C	61	C
11	62	C	73	F	63	F
12	65	C	69	F	63	C
13	64	C	64	R	60	C
14	57	F	69	F	60	F
15	56	F	68	F	58	F
16	54	F	65	F	56	F
17	57	C	65	C	60	C
18	59	F	68	F	60	F
19	60	F	63	C	57	F
20	52	F	66	F	61	F
21	58	F	66	C	59	F
22	58	C	66	C	59	C
23	62	C	68	F	64	C
24	64	C	69	R	68	C
25	69	C	73	R	62	C
26	58	F	71	F	61	F
27	53	F	67	F	57	F
28	56	F	73	F	64	F
29	66	C	70	R	57	C
30	52	C	57	C	51	C
M.	60.13		68.60		61.33	
H.	72.		83.		73.	
L.	52.		57.		51.	

Mean of the Month, . . 63.35

OCTOBER, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	42	F	56	F	47	F
2	41	F	54	C	49	C
3	52	R	45	R	42	R
4	37	S	43	R	44	R
5	43	C	47	R	45	R
6	45	C	50	R	48	C
7	41	F	52	F	48	F
8	50	C	53	R	52	R
9	49	R	57	F	50	F
10	42	F	57	F	47	F
11	41	F	60	C	54	C
12	56	C	64	C	53	C
13	43	F	54	F	45	F
14	37	F	53	F	43	F
15	39	C	49	C	48	C
16	43	F	52	C	45	C
17	41	F	48	F	43	F
18	37	F	52	C	40	C
19	36	F	50	F	43	F
20	41	R	47	R	44	R
21	37	F	48	C	41	F
22	39	F	52	C	45	F
23	39	C	49	C	43	C
24	43	F	54	F	41	F
25	33	F	40	F	32	F
26	26	F	48	F	44	F
27	39	F	50	F	37	F
28	28	F	42	F	36	F
29	38	C	52	F	46	F
30	49	F	65	F	55	F
31	51	F	69	F	55	F
M.	41.22		52.00		45.32	
H.	56.		69.		55.	
L.	26.		40.		32.	

Mean of the Month, . . 46.18

NOVEMBER, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	56	F	71	F	57	F
2	57	F	61	C	52	C
3	47	F	56	F	48	F
4	41	C	50	C	48	C
5	46	R	48	C	44	C
6	41	C	47	C	43	F
7	36	F	43	F	35	F
8	33	C	38	R	35	C
9	37	C	42	C	34	C
10	34	C	37	F	32	F
11	24	F	48	F	35	F
12	34	C	40	R	36	R
13	37	F	44	C	40	C
14	34	F	47	F	44	F
15	39	C	45	F	39	C
16	32	C	36	C	31	C
17	33	F	38	C	34	F
18	24	F	40	F	30	F
19	25	C	40	C	41	R
20	40	R	42	C	36	C
21	30	F	44	F	36	F
22	38	R	46	R	56	R
23	48	F	52	F	43	F
24	34	F	45	F	38	F
25	33	F	43	C	36	R
26	42	R	37	C	34	C
27	26	F	30	F	24	F
28	21	F	30	C	25	C
29	25	S	25	S	25	S
30	20	F	30	F	24	F
M.	35.56		43.16		37.83	
H.	57.		71.		57.	
L.	20.		25.		24.	

Mean of the Month, . . 38.85

DECEMBER, 1841.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	20	F	35	F	33	F
2	33	F	41	F	36	F
3	34	C	43	R	43	R
4	48	F	47	F	43	F
5	35	C	40	F	39	C
6	38	F	36	F	30	F
7	25	F	33	F	27	F
8	22	F	38	F	32	F
9	40	F	46	F	43	F
10	35	F	46	C	43	R
11	47	C	53	C	43	C
12	39	F	44	F	35	F
13	29	F	42	F	36	F
14	40	C	44	R	46	C
15	36	F	46	F	43	F
16	40	C	44	C	40	R
17	34	R	35	R	29	R
18	25	S	24	C	19	C
19	15	F	27	C	26	F
20	25	F	32	C	28	F
21	19	S	23	C	14	F
22	9	F	20	F	14	F
23	14	C	26	C	32	C
24	46	R	40	C	30	F
25	29	F	33	C	23	C
26	13	F	27	F	23	F
27	18	F	31	F	28	F
28	29	C	35	F	32	F
29	27	F	38	F	30	F
30	27	C	38	S	34	S
31	25	F	38	F	32	F
M.	29.54		36.93		32.45	
H.	48.		53.		46.	
L.	9.		20.		14.	

Mean of the Month, . . 32.97

JANUARY, 1842.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	15	F	31	C	36	C
2	33	F	41	F	37	F
3	9	F	15	F	15	F
4	18	S	27	F	23	F
5	22	F	23	F	14	F
6	4	F	25	C	30	S
7	42	C	43	C	36	C
8	21	F	43	F	36	F
9	33	F	44	F	36	F
10	34	C	36	C	33	C
11	27	C	35	C	32	C
12	27	F	36	C	31	F
13	9	F	13	F	8	F
14	11	F	41	C	38	C
15	30	F	38	F	25	F
16	14	F	27	F	20	F
17	18	F	38	C	35	C
18	31	F	45	F	37	F
19	34	F	51	F	40	F
20	37	F	54	F	44	F
21	51	C	50	R	38	F
22	28	F	32	F	22	F
23	13	F	20	F	14	F
24	1	F	18	F	16	F
25	22	F	40	F	33	C
26	26	F	44	F	34	F
27	30	C	34	C	25	F
28	16	F	36	F	25	F
29	40	F	52	F	41	F
30	43	F	46	F	40	F
31	36	C	52	R	50	R
M.	25.00		36.45		30.45	
H.	51.		54.		50.	
L.	1.		13.		8.	

Mean of the Month, . . 30.63

FEBRUARY, 1842.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	31	F	37	F	32	F
2	24	F	44	F	41	F
3	48	R	57	C	57	C
4	60	R	52	C	46	C
5	42	R	48	F	37	C
6	27	F	44	F	42	F
7	41	F	50	C	45	R
8	34	F	42	C	31	C
9	7	F	21	F	23	F
10	25	F	40	F	34	F
11	25	F	48	F	40	F
12	44	C	50	F	36	F
13	27	C	44	C	42	C
14	38	F	46	F	28	F
15	9	F	22	F	20	F
16	24	C	40	R	43	R
17	21	C	26	C	20	F
18	17	F	36	F	40	F
19	48	R	50	R	30	F
20	18	F	31	F	29	F
21	18	F	36	F	30	F
22	19	F	40	F	28	F
23	20	F	40	F	32	F
24	31	F	47	F	36	F
25	22	F	31	C	29	C
26	30	C	36	S	37	R
27	29	C	39	S	38	F
28	30	F	43	F	35	F
M.	28.89		40.71		35.04	
H.	60.		57.		57.	
L.	7.		21.		20.	

Mean of the Month, . . 34.88

MARCH, 1842.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	32	F	51	F	43	F
2	40	C	52	C	50	C
3	44	F	61	F	51	F
4	49	F	70	F	57	F
5	57	R	42	C	39	C
6	33	S	37	R	40	C
7	36	C	43	C	36	C
8	28	F	43	F	37	F
9	37	C	48	C	44	C
10	41	F	61	F	47	F
11	40	S	39	C	26	F
12	14	F	30	F	27	F
13	26	C	38	C	36	F
14	30	F	46	C	37	C
15	31	F	44	F	39	F
16	33	F	44	F	40	F
17	43	F	56	C	52	C
18	42	F	51	F	44	F
19	39	F	62	F	53	F
20	43	F	60	F	46	F
21	30	F	44	C	39	C
22	38	C	37	S	32	S
23	25	F	34	C	29	F
24	24	F	40	F	34	F
25	36	C	36	S	36	R
26	35	F	41	C	38	F
27	35	F	52	F	47	F
28	43	F	46	C	36	C
29	32	F	44	F	41	F
30	41	C	55	R	46	C
31	38	F	38	C	28	R
M.	35.97		46.61		40.32	
H.	57.		70.		57.	
L.	14.		30.		26.	

Mean of the Month, . . 40.97

APRIL, 1842.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	22	F	34	F	33	F
2	36	C	56	F	51	F
3	56	C	66	F	52	C
4	42	C	42	C	39	C
5	38	R	41	C	39	C
6	40	F	58	F	49	F
7	49	C	47	R	44	R
8	44	C	44	R	41	C
9	41	C	42	C	40	C
10	38	C	47	F	42	F
11	47	F	62	F	50	F
12	40	F	55	F	43	F
13	38	F	47	F	43	F
14	43	R	45	C	42	F
15	41	F	60	F	47	F
16	41	F	52	F	45	F
17	42	F	49	F	44	F
18	43	R	41	R	41	R
19	41	R	45	R	43	R
20	46	R	60	F	50	F
21	44	F	58	F	50	F
22	54	F	82	F	65	F
23	58	F	53	F	49	F
24	44	F	53	F	50	F
25	50	R	53	C	47	C
26	47	C	47	R	46	R
27	46	R	62	F	48	F
28	46	F	56	F	46	F
29	45	F	56	F	49	F
30	43	F	64	F	53	F
M.	43.50		52.57		46.03	
H.	58.		82.		65.	
L.	22.		34.		33.	

Mean of the Month, . . 47.37

MAY, 1842.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	49	F	66	C	54	R
2	52	F	59	C	51	C
3	51	C	51	C	49	C
4	46	R	53	F	48	C
5	47	F	64	F	54	F
6	53	F	74	F	61	F
7	44	F	54	F	49	F
8	48	F	62	F	48	R
9	49	R	53	F	43	C
10	45	F	52	C	49	C
11	52	F	58	F	51	F
12	52	F	62	F	53	F
13	49	F	66	F	57	F
14	49	F	61	F	53	F
15	50	F	66	C	52	C
16	48	F	72	F	57	F
17	58	F	63	F	58	F
18	58	F	71	F	58	F
19	61	F	80	R	55	R
20	46	R	46	F	43	F
21	45	F	60	F	53	F
22	54	F	60	C	56	C
23	55	C	56	F	50	F
24	51	F	60	C	54	R
25	56	R	68	C	57	F
26	58	F	72	F	60	F
27	58	C	58	R	52	R
28	57	F	72	F	61	F
29	62	F	59	C	52	R
30	54	C	57	R	56	R
31	54	F	66	F	57	F
M.	51.97		61.96		53.26	
H.	62.		80.		61.	
L.	44.		46.		43.	

Mean of the Month, . . 55.73

JUNE, 1842.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	55	F	71	F	60	F
2	55	F	69	F	60	F
3	57	F	68	F	57	F
4	57	F	64	F	63	F
5	68	F	85	F	68	F
6	65	F	72	F	55	F
7	50	F	64	F	53	F
8	55	F	62	C	53	C
9	58	R	62	C	63	C
10	68	C	75	R	63	F
11	51	R	46	C	46	C
12	49	F	68	F	53	F
13	59	F	72	F	63	F
14	68	C	78	F	67	F
15	68	C	80	R	70	R
16	65	C	80	R	66	F
17	74	C	88	F	73	F
18	76	F	79	C	70	R
19	66	C	83	F	72	R
20	75	F	83	F	67	F
21	61	F	78	F	66	F
22	64	F	85	F	74	F
23	62	R	61	C	58	C
24	60	F	75	F	64	F
25	63	F	68	C	64	C
26	68	C	84	F	70	F
27	63	F	63	C	57	F
28	60	C	68	C	60	F
29	67	F	80	F	68	F
30	66	F	85	F	70	F
M.	62.43		73.20		63.10	
H.	76.		88.		74.	
L.	49.		46.		46.	

Mean of the Month, . . 66.24

JULY, 1842.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	75	F	88	F	74	F
2	75	F	88	F	74	F
3	76	F	89	F	74	R
4	73	C	86	F	72	F
5	74	C	81	C	70	C
6	72	C	78	C	68	R
7	64	F	68	F	62	F
8	67	C	68	C	66	C
9	75	F	84	R	73	C
10	68	F	70	F	62	F
11	62	F	74	F	68	F
12	66	F	88	F	73	F
13	71	F	94	F	78	F
14	74	F	92	F	75	F
15	78	F	79	R	72	C
16	72	F	75	F	68	F
17	69	F	88	F	77	F
18	75	F	92	F	74	F
19	73	F	91	F	76	F
20	78	F	84	C	70	F
21	62	F	77	F	67	F
22	63	F	84	F	67	F
23	66	F	89	F	75	F
24	77	F	93	R	70	C
25	60	F	74	F	67	F
26	67	F	88	F	76	F
27	75	F	95	F	75	F
28	73	F	81	F	72	F
29	72	C	84	F	74	F
30	77	F	94	F	82	F
31	73	F	64	C	61	R
M.	71.03		83.22		71.36	
H.	78.		95.		82.	
L.	60.		64.		61.	

Mean of the Month, . . 75.20

AUGUST, 1842.

Day of Month	7 A. M.		2½ P. M.		9 P. M.	
1	58	F	73	F	61	F
2	56	F	70	F	63	F
3	60	F	77	F	65	F
4	65	C	73	C	61	C
5	62	C	68	R	68	C
6	66	C	70	C	68	F
7	69	C	75	R	66	C
8	70	R	74	C	68	F
9	70	F	75	F	69	F
10	73	F	74	C	68	C
11	69	C	80	F	70	F
12	71	C	70	R	66	C
13	64	C	72	R	61	C
14	66	C	76	F	64	C
15	67	C	77	C	68	C
16	67	C	73	F	65	C
17	63	C	75	F	69	F
18	71	R	77	C	72	C
19	74	C	86	F	73	F
20	69	F	83	F	72	F
21	67	F	73	F	65	F
22	63	F	80	F	68	F
23	64	F	78	F	68	F
24	62	F	74	F	66	F
25	68	C	68	R	70	R
26	71	R	76	F	74	C
27	74	C	72	R	70	C
28	72	C	72	R	68	R
29	68	F	83	F	63	F
30	58	F	69	F	61	F
31	62	F	78	F	64	F
M.	66.42		74.87		66.90	
H.	74.		86.		74.	
L.	56.		68.		61.	

Mean of the Month, . . 69.39

SEPTEMBER, 1842.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	67	F	80	C	66	F
2	67	F	88	F	72	F
3	71	F	86	F	73	R
4	63	F	67	F	62	F
5	66	R	75	F	66	F
6	58	F	70	F	60	F
7	58	F	75	F	63	F
8	62	F	68	F	62	F
9	58	R	56	R	55	R
10	53	F	60	F	56	F
11	56	C	65	C	64	F
12	72	F	85	F	68	F
13	68	F	65	C	60	R
14	60	F	62	C	58	C
15	60	C	57	R	55	R
16	58	C	61	R	58	C
17	59	F	70	F	58	F
18	53	F	66	C	58	C
19	57	F	64	C	53	R
20	51	F	64	F	52	F
21	48	F	64	C	52	F
22	45	F	53	C	45	F
23	44	F	54	F	43	F
24	38	F	60	F	51	F
25	43	F	64	F	54	F
26	46	F	66	F	54	F
27	49	F	71	F	58	F
28	61	F	74	F	61	F
29	56	F	62	F	52	F
30	52	F	61	C	57	C
M.	56.63		67.10		58.27	
H.	72.		88.		73.	
L.	38.		53.		43.	

Mean of the Month, . . 60.67

OCTOBER, 1842.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	50	F	70	F	57	F
2	60	F	72	F	54	F
3	50	F	62	F	51	F
4	46	F	58	F	48	F
5	42	F	52	F	45	F
6	41	F	53	F	47	F
7	44	F	64	F	51	F
8	50	F	69	F	58	F
9	59	F	69	C	63	F
10	50	F	61	F	52	F
11	47	F	64	F	53	F
12	53	F	61	F	53	F
13	44	F	60	F	50	F
14	40	F	60	F	52	F
15	60	C	63	F	51	C
16	46	F	59	F	52	F
17	54	F	61	F	50	F
18	50	F	64	C	61	C
19	49	F	53	F	42	F
20	38	F	49	C	43	F
21	35	F	47	F	43	F
22	42	F	59	C	53	C
23	50	R	53	F	44	F
24	41	F	62	C	52	F
25	57	C	65	R	61	R
26	48	C	55	F	43	F
27	37	F	52	F	42	F
28	36	F	48	F	44	F
29	38	F	54	F	46	F
30	38	F	46	F	42	F
31	32	F	47	F	42	F
M.	46.03		58.45		49.84	
H.	60.		72.		63.	
L.	32.		46.		42.	

Mean of the Month, . . 51.44

NOVEMBER, 1842.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	39	F	57	F	49	F
2	46	F	56	F	42	F
3	30	F	48	F	37	F
4	31	F	50	F	40	F
5	38	F	52	C	46	C
6	44	F	60	F	53	F
7	47	F	55	C	48	C
8	49	R	45	R	38	R
9	41	C	45	C	47	R
10	40	F	49	F	38	F
11	40	F	49	F	39	F
12	34	F	46	C	43	R
13	43	C	42	R	40	C
14	39	C	45	C	44	R
15	41	F	45	F	37	F
16	37	C	42	C	37	C
17	31	F	42	C	41	R
18	52	R	50	C	34	F
19	28	F	37	F	32	F
20	30	F	38	F	32	F
21	28	F	38	F	30	F
22	26	F	37	F	29	F
23	24	F	39	F	36	F
24	44	R	36	S	35	F
25	31	F	40	F	36	F
26	32	F	39	F	32	F
27	36	C	34	F	24	F
28	18	F	26	F	22	F
29	18	F	25	F	23	F
30	24	C	30	S	34	R
M.	35.36		43.23		37.26	
H.	52.		60.		53.	
L.	18.		25.		22.	

Mean of the Month, . . 38.62

DECEMBER, 1842.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	38	C	33	C	29	C
2	24	F	29	F	24	F
3	35	F	42	C	38	F
4	33	F	46	C	40	F
5	41	C	44	C	35	R
6	27	F	28	F	22	F
7	24	C	34	F	28	F
8	29	C	34	S	34	R
9	36	C	28	C	26	F
10	28	F	29	C	27	C
11	25	C	32	C	30	C
12	27	F	30	C	24	C
13	25	C	33	S	33	S
14	26	C	34	F	24	F
15	22	F	31	F	25	F
16	24	F	34	C	26	C
17	22	F	26	F	24	F
18	26	C	25	F	17	F
19	12	C	28	C	27	F
20	20	F	33	F	30	F
21	32	R	36	R	43	R
22	38	R	43	F	29	C
23	20	F	23	F	18	F
24	4	F	15	F	15	F
25	16	C	30	C	28	C
26	25	F	35	F	32	F
27	30	C	36	F	33	C
28	25	F	26	F	20	F
29	15	F	23	C	29	R
30	36	R	37	C	29	F
31	28	F	28	F	19	F
M.	26.22		31.77		27.68	
H.	41.		46.		43.	
L.	4.		15.		15.	

Mean of the Month, . . 28.56

JANUARY, 1843.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	16	F	27	F	20	F
2	13	S	21	S	16	C
3	18	C	24	F	14	F
4	7	F	22	F	15	F
5	22	F	38	C	28	C
6	29	C	36	C	36	C
7	34	C	36	C	36	C
8	37	C	56	C	54	C
9	51	C	54	C	45	C
10	43	C	48	R	52	F
11	52	C	50	F	44	R
12	42	R	44	C	42	R
13	41	R	43	R	41	C
14	34	F	37	C	32	C
15	32	F	40	F	32	F
16	25	F	30	F	24	F
17	20	F	28	F	26	F
18	24	F	44	F	36	F
19	34	F	47	C	42	F
20	42	F	50	F	40	F
21	39	F	51	C	44	F
22	42	F	48	F	40	F
23	34	F	42	F	35	F
24	36	F	44	F	35	F
25	25	F	33	F	23	F
26	20	F	32	F	23	F
27	20	F	35	C	34	F
28	32	S	33	C	30	C
29	17	F	29	F	23	F
30	21	F	36	F	31	F
31	35	C	43	F	50	R
M.	30.22		38.74		33.64	
H.	52.		56.		54.	
L.	7.		21.		14.	

Mean of the Month, . . 34.20

FEBRUARY, 1843.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	41	R	36	S	36	S
2	19	F	15	F	10	F
3	6	F	21	F	22	F
4	20	F	33	F	29	F
5	22	C	33	S	33	S
6	29	C	29	F	19	C
7	13	F	19	F	14	F
8	11	F	22	F	16	F
9	7	F	19	F	12	F
10	1	F	22	C	22	C
11	34	R	43	C	30	F
12	25	C	30	F	20	F
13	19	C	26	C	23	C
14	19	S	24	S	26	S
15	14	S	20	C	19	F
16	11	F	21	F	14	F
17	6	F	20	F	17	F
18	7	F	22	F	18	F
19	17	C	25	C	23	C
20	27	C	39	F	30	F
21	24	C	28	F	22	F
22	22	F	40	C	30	C
23	14	F	21	F	17	F
24	9	F	25	F	19	F
25	13	F	32	F	26	F
26	28	F	34	F	28	F
27	24	F	34	F	24	F
28	18	F	36	F	29	F
M.	17.85		27.47		22.43	
H.	41.		43.		36.	
L.	1.		15.		10.	

Mean of the Month, . . 22.58

MARCH, 1843.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	25	F	33	C	24	F
2	15	F	25	F	18	F
3	12	F	21	F	17	F
4	13	F	23	F	19	F
5	15	F	26	F	20	F
6	16	F	24	F	21	F
7	16	F	26	F	20	F
8	16	F	36	F	30	F
9	24	F	42	F	32	F
10	25	F	36	C	32	R
11	36	C	40	F	34	F
12	28	F	38	F	34	F
13	35	C	33	S	34	R
14	27	F	29	F	23	F
15	28	F	42	C	27	F
16	26	F	36	C	33	C
17	36	C	34	S	32	C
18	26	F	36	F	28	F
19	22	F	36	F	30	F
20	22	F	35	F	28	F
21	29	F	35	F	29	F
22	22	F	36	F	30	F
23	30	F	33	C	18	F
24	18	F	37	C	27	F
25	24	F	40	C	30	F
26	24	F	33	F	26	F
27	23	F	39	C	33	C
28	37	R	47	R	49	R
29	34	F	40	F	33	F
30	30	F	40	F	32	F
31	31	C	33	C	29	S
M.	24.68		34.32		28.13	
H.	37.		47.		49.	
L.	12.		21.		17.	

Mean of the Month, . . 29.04

APRIL, 1843.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	35	R	36	S	32	S
2	26	F	35	F	31	F
3	28	F	38	F	30	F
4	26	F	38	F	34	F
5	36	S	38	C	35	R
6	36	S	44	F	36	F
7	36	F	44	F	37	F
8	43	F	56	C	44	F
9	44	C	50	F	40	F
10	38	F	43	C	47	C
11	39	F	48	F	41	F
12	40	F	59	F	46	F
13	44	F	59	F	50	F
14	51	C	51	C	46	C
15	51	C	60	R	54	C
16	53	C	60	F	48	F
17	53	R	44	C	43	R
18	44	C	39	R	40	C
19	42	S	44	C	41	C
20	44	C	50	F	43	C
21	44	F	60	F	52	F
22	53	F	54	F	46	F
23	50	R	53	R	55	R
24	54	R	62	C	54	F
25	52	C	54	C	50	C
26	51	C	56	F	58	C
27	58	R	56	C	51	C
28	48	F	66	F	58	F
29	50	F	47	C	46	C
30	46	C	47	F	45	R
M.	43.83		49.70		44.43	
H.	58.		66.		58.	
L.	26.		35.		30.	

Mean of the Month, . . 45.99

MAY, 1843.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	50	R	61	F	53	F
2	48	F	58	F	49	F
3	46	F	50	C	47	C
4	46	F	52	F	47	F
5	48	R	46	F	47	F
6	50	C	53	F	47	F
7	52	R	61	C	56	C
8	60	C	72	F	58	F
9	51	F	66	C	48	C
10	47	F	60	F	52	F
11	53	C	57	C	52	C
12	49	F	58	F	49	F
13	52	F	56	F	56	F
14	56	F	69	F	64	F
15	63	F	71	F	64	F
16	64	F	80	F	67	F
17	62	F	70	C	53	F
18	50	F	64	F	53	F
19	51	F	69	F	56	F
20	59	C	61	C	54	C
21	58	F	72	F	56	F
22	56	F	70	F	62	F
23	60	R	74	F	60	F
24	56	F	70	F	54	F
25	55	F	61	F	54	F
26	56	F	56	F	50	F
27	54	R	51	C	49	C
28	54	C	66	F	55	F
29	54	C	56	C	51	C
30	55	F	59	F	52	F
31	55	C	59	C	48	F
M.	53.87		62.19		53.65	
H.	64.		80.		67.	
L.	46.		46.		47.	

Mean of the Month, . . 56.57

JUNE, 1843.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	48	C	53	C	46	C
2	46	F	64	F	52	F
3	58	F	68	C	59	R
4	56	F	58	C	57	F
5	65	F	60	C	53	R
6	55	C	53	R	52	C
7	52	F	69	F	61	F
8	64	F	68	C	59	C
9	56	R	68	C	53	C
10	58	C	84	F	70	R
11	64	F	61	R	56	C
12	58	F	76	F	64	F
13	61	F	73	F	61	F
14	67	F	86	F	69	F
15	64	F	73	F	63	F
16	64	C	56	R	55	C
17	57	F	66	F	62	F
18	60	F	75	F	63	F
19	62	F	76	F	66	F
20	67	F	83	F	66	F
21	66	F	87	F	70	F
22	72	F	90	F	77	F
23	74	F	72	F	62	F
24	70	F	91	F	72	R
25	70	F	82	F	74	F
26	71	F	76	F	68	F
27	71	F	91	F	78	F
28	76	F	93	C	77	C
29	76	F	91	R	76	F
30	77	F	77	F	75	F
M.	63.50		74.00		63.87	
H.	77.		93.		78.	
L.	46.		53.		46.	

Mean of the Month, . . 67.12

JULY, 1843.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	78	F	77	F	75	F
2	76	F	89	F	74	F
3	65	F	70	F	60	F
4	60	F	78	F	65	F
5	67	C	65	R	60	F
6	60	F	76	F	64	F
7	65	F	76	C	68	F
8	67	F	82	F	71	F
9	64	F	85	F	72	F
10	70	F	86	C	71	C
11	71	F	73	F	64	F
12	63	F	71	F	65	F
13	62	F	70	F	66	F
14	66	F	84	F	66	F
15	66	F	70	F	63	F
16	65	F	72	F	63	F
17	65	C	75	F	65	F
18	74	R	90	F	73	F
19	75	F	89	F	72	F
20	61	F	81	F	60	F
21	61	F	86	F	68	F
22	64	F	90	F	72	F
23	73	F	94	F	80	F
24	71	F	94	C	72	C
25	62	F	81	F	63	F
26	62	F	87	F	74	F
27	74	F	77	F	70	F
28	71	F	80	C	72	F
29	77	F	86	C	75	F
30	68	C	61	R	59	R
31	62	R	73	C	64	F
M.	67.26		79.61		67.93	
H.	78.		94.		80.	
L.	60.		61.		59.	

Mean of the Month, . . 71.60

AUGUST, 1843.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	65	F	72	F	62	F
2	62	C	68	F	64	C
3	65	F	72	F	65	F
4	65	F	84	F	68	F
5	66	F	72	C	64	C
6	61	R	61	C	60	C
7	63	F	70	F	66	F
8	70	C	77	F	71	C
9	69	F	78	C	70	R
10	69	C	71	R	64	R
11	64	R	69	C	66	R
12	66	F	78	C	68	F
13	66	F	80	F	70	F
14	68	F	86	F	71	F
15	71	R	85	F	72	F
16	64	F	82	F	67	F
17	63	F	86	F	68	F
18	69	F	86	F	74	F
19	71	C	76	F	70	R
20	68	R	74	C	70	C
21	68	C	70	F	64	R
22	64	C	71	R	66	R
23	70	R	84	F	73	R
24	70	C	75	C	70	C
25	65	F	75	F	67	F
26	67	F	87	F	71	F
27	69	F	84	R	73	C
28	71	C	71	R	64	C
29	66	C	71	F	63	F
30	67	F	86	F	74	F
31	69	F	88	F	70	F
M.	66.80		77.06		67.90	
H.	71.		88.		74.	
L.	61.		61.		60.	

Mean of the Month, . . 70.59

SEPTEMBER, 1843.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	64	C	67	C	61	C
2	60	C	82	F	73	F
3	69	F	76	F	69	F
4	71	F	89	F	78	F
5	67	F	73	F	65	F
6	62	F	69	F	64	F
7	64	C	68	C	62	C
8	64	F	68	C	64	C
9	59	F	66	F	56	F
10	49	F	64	F	53	F
11	51	F	61	F	53	F
12	49	F	59	F	51	F
13	44	F	59	F	52	F
14	48	F	61	F	57	F
15	59	R	70	R	72	C
16	68	F	82	F	66	F
17	60	F	81	F	68	F
18	69	F	87	F	77	F
19	69	F	73	F	64	F
20	60	F	64	C	60	C
21	64	F	85	F	76	F
22	54	F	67	F	56	F
23	55	F	72	F	62	F
24	69	F	87	F	68	F
25	58	C	58	C	58	R
26	57	F	64	C	54	C
27	46	F	54	F	43	F
28	38	F	60	F	49	F
29	42	F	64	F	52	F
30	45	F	62	F	54	F
M.	57.80		69.73		61.23	
H.	71.		89.		78.	
L.	38.		54.		43.	

Mean of the Month, . . 62.92

OCTOBER, 1843.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	54	R	55	R	54	R
2	59	C	70	F	59	F
3	51	F	65	F	50	F
4	48	F	57	F	48	F
5	44	F	55	F	48	F
6	43	F	60	F	57	F
7	54	C	54	R	52	R
8	52	R	55	R	60	R
9	46	F	61	F	49	F
10	44	F	59	F	49	F
11	44	F	61	F	51	F
12	44	F	56	F	54	F
13	46	F	60	F	52	F
14	41	F	52	F	42	F
15	38	C	52	C	47	C
16	49	R	59	C	52	C
17	41	F	54	F	45	F
18	37	F	56	C	50	C
19	45	R	51	F	42	F
20	38	F	60	F	55	F
21	57	F	70	F	60	F
22	55	C	54	C	44	C
23	42	R	44	C	40	F
24	35	F	53	F	41	F
25	39	C	53	C	48	C
26	42	C	47	C	44	C
27	42	R	49	C	47	R
28	42	R	47	C	42	C
29	39	C	48	C	41	F
30	37	F	54	C	46	F
31	33	F	44	F	34	F
M.	44.55		55.32		48.48	
H.	59.		70.		60.	
L.	33.		44.		34.	

Mean of the Month, . . 49.45

NOVEMBER, 1843.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	27	F	43	C	42	C
2	48	R	54	R	42	F
3	39	F	46	F	35	F
4	29	F	39	F	30	F
5	26	F	37	F	30	F
6	27	F	41	F	32	F
7	25	F	41	C	35	S
8	29	C	37	C	32	F
9	27	F	38	F	32	F
10	35	R	43	C	39	C
11	35	C	42	R	39	R
12	35	F	34	C	29	C
13	23	F	39	C	34	C
14	27	F	37	F	29	F
15	23	F	41	C	36	C
16	39	R	52	C	44	C
17	42	C	49	F	44	F
18	56	R	62	F	50	F
19	40	F	48	F	42	F
20	36	F	47	F	41	F
21	42	R	46	C	44	C
22	38	F	42	C	38	F
23	35	F	47	F	44	F
24	45	R	50	C	46	C
25	38	F	44	F	35	F
26	29	F	47	C	41	C
27	22	F	30	F	24	F
28	23	F	41	F	34	F
29	29	F	38	C	34	C
30	25	F	28	C	22	F
M.	33.13		42.77		36.63	
H.	56.		62.		50.	
L.	22.		28.		22.	

Mean of the Month, . . 37.51

DECEMBER, 1843.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	21	S	28	C	27	C
2	26	C	36	F	29	C
3	22	F	37	F	30	F
4	24	F	42	F	39	F
5	32	F	42	C	23	F
6	15	F	29	C	30	C
7	30	S	32	S	27	S
8	26	F	35	F	33	F
9	31	S	34	C	27	F
10	22	F	36	C	26	F
11	28	F	41	C	37	C
12	26	F	38	C	20	F
13	8	F	19	F	16	F
14	10	F	34	F	33	F
15	31	F	41	F	34	F
16	35	R	37	S	28	R
17	36	R	28	C	26	C
18	25	C	31	S	26	C
19	21	F	32	C	27	C
20	29	F	38	F	37	F
21	32	F	40	F	34	F
22	34	C	44	C	38	C
23	36	C	36	C	35	C
24	30	C	39	C	37	C
25	35	F	42	C	39	C
26	34	C	38	C	36	C
27	33	S	37	C	34	C
28	32	C	38	C	35	C
29	31	C	36	F	27	F
30	21	F	26	C	23	C
31	24	F	34	C	28	F
M.	27.09		35.80		30.36	
H.	36.		44.		39.	
L.	8.		19.		16.	

Mean of the Month, . . 31.08

JANUARY, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	26	F	35	F	28	F
2	22	F	40	F	33	F
3	32	S	36	S	40	R
4	33	F	36	C	30	F
5	18	F	20	F	16	F
6	15	F	26	F	20	F
7	18	C	38	C	35	F
8	23	F	21	F	15	F
9	3	F	14	C	13	S
10	13	F	29	F	23	F
11	8	F	18	F	13	F
12	5	F	30	C	32	C
13	42	F	42	R	30	C
14	20	F	26	F	20	F
15	13	F	29	F	26	F
16	32	S	37	R	41	R
17	35	R	49	C	40	C
18	27	F	34	F	28	F
19	19	F	22	F	14	F
20	3	F	13	F	7	F
21	—1	F	16	F	11	F
22	9	F	22	F	18	F
23	20	C	38	R	40	F
24	30	F	40	F	34	F
25	20	F	16	F	7	F
26	0	F	8	F	3	F
27	—2	F	11	F	6	F
28	—3	F	14	F	12	F
29	3	F	8	F	2	F
30	—3	F	15	C	11	C
31	1	F	7	F	5	F
M.	15.51		25.48		21.09	
H.	42.		49.		41.	
L.	—3.		7.		2.	

Mean of the Month, . . 20.69

FEBRUARY, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	8	F	26	F	22	F
2	24	C	33	C	30	S
3	25	C	34	F	26	F
4	15	F	30	F	23	F
5	25	C	33	C	32	C
6	28	C	38	C	33	C
7	25	F	41	F	32	F
8	28	C	36	C	26	C
9	20	F	29	F	12	F
10	4	F	19	F	19	F
11	9	F	26	F	20	F
12	8	F	30	F	24	F
13	17	F	40	F	35	F
14	28	F	39	F	28	F
15	16	F	35	C	30	C
16	31	F	40	F	31	F
17	22	F	42	C	27	F
18	11	F	17	F	14	F
19	17	F	40	F	33	F
20	26	F	47	F	42	F
21	33	F	42	C	36	C
22	34	F	44	F	38	F
23	30	C	38	C	35	C
24	25	C	23	F	20	F
25	14	F	30	F	25	F
26	19	F	42	F	32	F
27	32	C	40	R	31	S
28	32	C	34	F	30	F
29	25	F	42	C	36	C
M.	21.76		34.82		28.34	
H.	34.		47.		42.	
L.	4.		17.		12.	

Mean of the Month, . . 28.31

MARCH, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	36	F	55	C	42	C
2	39	C	48	C	43	C
3	39	C	47	F	36	F
4	33	S	33	S	22	F
5	10	F	27	F	24	F
6	23	F	40	F	32	F
7	24	F	46	F	36	F
8	32	F	47	C	45	C
9	44	C	51	C	40	C
10	32	F	40	F	34	F
11	31	F	49	F	42	F
12	38	F	51	C	40	C
13	42	F	51	C	49	R
14	41	F	51	C	43	C
15	32	C	35	C	33	C
16	34	R	38	C	36	C
17	35	R	43	S	38	F
18	39	C	45	F	38	C
19	21	F	32	F	28	F
20	33	F	50	C	46	R
21	34	C	37	C	32	C
22	28	C	34	S	32	S
23	26	C	37	C	31	F
24	21	F	41	F	37	F
25	40	F	57	F	42	F
26	35	F	54	F	45	F
27	39	F	33	C	30	C
28	34	C	38	C	37	C
29	36	F	46	C	39	C
30	31	S	30	C	24	S
31	24	F	32	F	28	F
M.	32.45		42.51		36.26	
H.	44.		57.		49.	
L.	10.		27.		22.	

Mean of the Month, . . 37.07

APRIL, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	25	F	37	C	29	F
2	24	F	38	F	31	F
3	26	F	52	F	42	F
4	45	F	66	F	61	F
5	44	F	56	F	43	F
6	36	F	46	F	43	F
7	40	F	50	F	46	C
8	48	C	64	C	60	C
9	56	C	65	F	50	F
10	42	F	70	F	59	F
11	50	F	50	F	44	F
12	42	F	54	F	48	F
13	46	F	78	F	60	F
14	58	F	78	F	68	F
15	60	C	54	F	46	C
16	44	C	50	F	52	C
17	57	C	67	F	46	F
18	38	F	47	F	36	F
19	36	F	49	F	44	F
20	45	C	55	C	47	C
21	47	C	50	C	45	R
22	50	C	58	F	52	F
23	50	C	50	F	46	F
24	48	C	68	F	58	R
25	51	F	64	F	56	F
26	59	C	60	C	48	C
27	41	F	48	F	43	F
28	43	F	64	F	52	F
29	49	F	64	F	48	F
30	43	F	63	F	52	F
M.	44.77		57.16		48.50	
H.	60.		78.		68.	
L.	24.		37.		29.	

Mean of the Month, . . 50.14

MAY, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	54	C	76	F	63	F
2	63	F	78	F	62	F
3	59	F	80	F	64	R
4	51	C	54	F	48	R
5	53	F	71	F	59	F
6	55	F	78	C	62	R
7	55	F	64	F	56	F
8	55	F	78	C	64	F
9	55	F	65	F	58	F
10	49	F	62	C	54	C
11	52	C	53	C	52	C
12	63	F	70	F	52	F
13	45	F	65	F	57	F
14	53	C	52	R	50	C
15	51	F	65	F	56	F
16	57	C	65	R	59	F
17	54	R	59	C	52	F
18	52	R	55	C	51	F
19	50	F	64	F	57	F
20	53	C	58	C	56	C
21	59	C	64	F	49	F
22	45	F	53	F	48	F
23	49	F	70	F	57	F
24	58	F	78	F	58	F
25	56	F	62	R	49	C
26	48	C	60	C	54	C
27	57	C	60	F	56	C
28	54	C	80	F	66	F
29	60	F	73	F	58	F
30	58	F	60	F	59	F
31	60	R	70	C	64	C
M.	54.29		65.87		56.45	
H.	63.		80.		66.	
L.	45.		52.		48.	

Mean of the Month, . . 58.87

JUNE, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	58	F	74	F	62	F
2	65	F	81	C	67	R
3	59	F	61	F	55	F
4	55	F	64	F	56	F
5	54	F	74	F	58	F
6	59	F	75	F	65	F
7	66	F	68	C	64	R
8	57	F	68	F	59	F
9	60	F	67	C	66	R
10	62	F	74	F	57	F
11	51	F	68	F	55	F
12	51	F	62	F	56	F
13	58	F	74	F	56	F
14	58	F	64	C	56	F
15	53	F	60	F	54	F
16	55	F	81	F	66	F
17	61	F	82	C	68	C
18	69	C	75	F	67	F
19	70	F	92	F	72	F
20	73	F	87	F	74	F
21	68	F	69	C	62	C
22	61	C	61	R	60	C
23	62	F	79	F	67	F
24	65	F	84	F	72	F
25	71	F	90	F	76	F
26	75	F	93	F	76	F
27	73	F	69	C	62	C
28	73	F	90	F	73	F
29	63	F	75	F	65	F
30	60	F	77	F	60	F
M.	62.17		74.60		63.50	
H.	75.		93.		76.	
L.	51.		60.		54.	

Mean of the Month, . . 66.76

JULY, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	63	C	73	C	70	R
2	70	F	86	F	73	F
3	66	R	83	C	68	F
4	55	F	68	F	57	F
5	54	F	77	F	63	F
6	64	C	83	F	73	F
7	65	F	78	F	62	F
8	58	F	78	F	67	F
9	61	F	87	F	72	F
10	72	C	86	F	72	C
11	71	F	73	C	62	R
12	63	C	68	C	59	C
13	63	F	73	F	69	F
14	70	C	77	F	73	C
15	72	F	82	F	74	F
16	63	R	59	C	61	C
17	60	F	85	F	73	F
18	64	F	76	F	68	F
19	67	F	88	C	70	R
20	70	C	70	R	67	F
21	70	F	78	F	71	F
22	66	F	88	F	71	F
23	71	F	89	F	74	F
24	68	F	73	F	63	F
25	62	C	63	R	59	C
26	62	F	68	C	61	F
27	57	F	70	F	61	F
28	58	F	70	F	64	F
29	64	F	85	F	67	F
30	65	F	82	F	66	F
31	66	F	70	C	63	R
M.	64.52		76.96		66.87	
H.	72.		89.		74.	
L.	54.		59.		57.	

Mean of the Month, . . 69.45

AUGUST, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	67	R	81	C	72	F
2	73	F	88	C	70	F
3	67	F	70	C	62	C
4	72	R	74	R	65	F
5	59	F	70	F	64	F
6	62	F	77	C	65	F
7	64	F	77	F	68	F
8	66	C	88	F	70	F
9	68	F	87	F	76	F
10	76	F	84	C	72	C
11	61	F	77	F	64	F
12	59	F	69	F	62	F
13	55	F	74	F	63	F
14	63	F	73	C	65	C
15	60	C	71	F	62	F
16	63	F	70	F	64	F
17	65	F	76	F	74	F
18	66	F	78	F	67	F
19	69	F	83	F	69	C
20	71	F	80	C	72	C
21	63	F	69	F	58	F
22	55	F	64	C	58	R
23	58	R	69	C	61	C
24	58	C	65	C	59	C
25	61	C	60	R	62	C
26	59	F	78	C	64	C
27	63	C	68	C	61	C
28	61	C	67	F	61	F
29	55	F	76	F	63	F
30	58	F	77	F	65	F
31	61	F	72	C	65	C
M.	63.16		74.58		65.26	
H.	76.		88.		76.	
L.	55.		64.		58.	

Mean of the Month, . . 67.67

SEPTEMBER, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	65	C	70	R	63	C
2	65	C	78	F	68	C
3	69	R	75	F	63	F
4	57	F	78	F	62	F
5	53	F	64	F	57	F
6	51	F	66	F	57	F
7	53	F	76	F	62	F
8	56	F	79	F	63	F
9	58	F	80	F	68	F
10	66	F	76	F	65	F
11	63	F	68	C	64	F
12	63	C	71	C	61	C
13	61	F	67	C	59	C
14	59	F	72	F	60	F
15	60	F	75	F	63	F
16	59	F	80	F	69	F
17	64	F	65	F	56	F
18	54	F	71	F	63	F
19	59	F	81	F	64	F
20	61	F	85	F	66	F
21	64	F	81	F	68	F
22	65	C	56	R	54	F
23	45	F	58	F	52	F
24	45	F	61	F	55	F
25	56	F	63	C	55	R
26	51	R	52	C	45	F
27	44	F	58	F	43	F
28	34	F	53	C	50	C
29	47	R	52	F	48	C
30	45	F	63	F	53	F
M.	56.40		69.13		59.20	
H.	69.		85.		69.	
L.	34.		52.		43.	

Mean of the Month, . . 61.58

OCTOBER, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	38	F	54	F	45	F
2	35	F	54	F	47	F
3	48	F	58	C	55	R
4	58	R	64	R	57	F
5	49	F	62	F	52	F
6	46	F	61	F	51	C
7	43	R	52	C	48	C
8	45	F	58	F	46	F
9	48	F	67	F	53	F
10	49	F	70	F	60	F
11	49	F	52	C	46	F
12	40	F	50	F	43	F
13	36	F	53	F	48	F
14	46	C	56	R	52	R
15	54	C	61	R	52	C
16	48	F	58	F	49	F
17	43	F	60	C	53	C
18	59	C	63	R	61	R
19	66	R	57	C	49	F
20	38	F	49	F	40	F
21	34	F	51	C	48	C
22	45	F	53	C	45	F
23	38	F	54	F	47	F
24	37	F	52	F	51	F
25	47	C	60	C	53	F
26	51	F	66	F	55	F
27	54	C	53	C	50	C
28	41	C	43	C	45	R
29	49	R	49	R	49	C
30	37	F	47	C	42	C
31	35	C	46	F	38	F
M.	45.35		55.90		49.36	
H.	66.		70.		61.	
L.	34.		43.		38.	

Mean of the Month, . . 50.20

NOVEMBER, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	33	F	46	F	41	F
2	38	F	56	F	45	F
3	37	F	52	F	49	F
4	48	C	49	R	48	R
5	39	R	47	C	42	F
6	40	C	43	C	39	C
7	33	F	54	F	42	F
8	39	F	54	F	45	F
9	36	F	52	F	44	F
10	33	F	46	F	45	F
11	44	F	49	C	46	C
12	44	C	50	C	50	R
13	56	R	48	C	41	C
14	34	F	43	F	36	F
15	30	F	45	F	41	F
16	36	F	47	F	41	F
17	34	F	49	C	44	C
18	51	C	45	C	35	F
19	26	F	37	F	31	F
20	30	F	43	C	39	F
21	29	F	46	F	42	F
22	42	C	46	R	47	R
23	46	C	49	R	44	R
24	37	F	37	F	31	F
25	25	F	30	F	24	F
26	16	C	29	C	28	C
27	31	F	34	F	21	F
28	16	C	21	S	20	S
29	23	C	31	C	24	F
30	19	F	37	C	38	C
M.	34.83		43.83		38.77	
H.	56.		56.		50.	
L.	16.		21.		20.	

Mean of the Month, . . 39.14

DECEMBER, 1844.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	45	C	36	R	30	F
2	25	F	36	F	31	F
3	30	C	37	C	34	C
4	39	R	38	C	39	C
5	39	F	41	C	38	F
6	36	C	43	C	40	C
7	43	C	54	R	54	F
8	32	F	29	F	24	F
9	20	F	35	F	28	F
10	25	F	38	F	27	F
11	22	C	27	C	24	S
12	23	C	36	F	25	F
13	21	C	34	F	34	R
14	31	F	39	F	33	F
15	29	F	38	F	33	F
16	26	F	34	F	26	F
17	20	F	28	F	21	F
18	21	F	23	F	18	F
19	22	F	31	C	30	C
20	21	F	26	F	18	F
21	12	F	30	C	29	C
22	37	C	42	C	39	C
23	43	C	43	R	41	C
24	29	F	36	F	34	F
25	30	F	43	F	36	F
26	39	F	50	F	42	F
27	41	R	36	S	30	S
28	20	C	26	C	21	F
29	12	F	29	F	25	F
30	24	C	39	C	38	F
31	34	F	36	F	30	F
M.	28.74		35.90		31.36	
H.	45.		54.		54.	
L.	12.		23.		18.	

Mean of the Month, . . 32.00

JANUARY, 1845.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	33	F	44	F	38	F
2	26	F	27	F	21	F
3	14	F	32	C	31	C
4	33	F	41	F	36	F
5	34	F	42	F	39	F
6	30	C	30	C	32	C
7	33	R	38	C	31	C
8	30	F	37	F	28	F
9	25	C	34	C	33	F
10	34	F	37	F	30	F
11	25	F	35	C	32	F
12	27	C	32	F	26	F
13	22	C	24	S	21	S
14	11	F	25	F	17	F
15	18	S	26	C	25	C
16	31	R	33	R	30	C
17	28	R	27	C	27	C
18	26	F	24	F	10	F
19	4	F	18	F	18	F
20	18	C	32	C	26	C
21	28	R	30	C	26	C
22	25	F	30	F	26	F
23	21	F	36	F	28	F
24	27	C	40	R	42	R
25	47	R	50	C	42	R
26	32	F	38	C	33	F
27	26	F	40	F	34	F
28	29	F	40	C	36	C
29	36	F	40	F	31	F
30	27	F	31	C	19	F
31	9	F	17	F	4	F
M.	26.10		33.22		28.13	
H.	47.		50.		42.	
L.	4.		17.		4.	

Mean of the Month, . . 29.15

FEBRUARY, 1845.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	2	F	10	F	7	F
2	—1	F	11	F	7	F
3	1	F	18	F	15	F
4	11	S	24	S	25	S
5	28	F	32	C	23	F
6	15	F	20	F	12	F
7	4	F	17	F	13	F
8	10	F	23	F	15	F
9	11	F	24	F	16	F
10	15	F	26	F	20	F
11	24	S	35	C	30	C
12	37	R	40	C	31	F
13	5	F	13	F	9	F
14	4	C	26	S	28	C
15	27	C	35	C	33	R
16	33	R	42	C	36	F
17	33	F	44	C	37	F
18	31	F	41	F	35	F
19	27	F	45	F	35	F
20	35	C	48	F	40	C
21	37	C	45	F	40	C
22	38	F	50	F	42	F
23	39	C	39	R	39	R
24	36	F	47	F	40	F
25	37	F	53	F	42	F
26	41	F	56	F	40	F
27	31	F	45	F	39	F
28	29	F	37	C	29	F
M.	22.85		33.78		27.78	
H.	41.		56.		42.	
L.	—1.		10.		7.	

Mean of the Month, . . 28.14

MARCH, 1845.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	26	C	43	F	32	F
2	28	C	46	F	42	F
3	52	C	48	F	35	F
4	29	F	45	F	38	F
5	35	R	42	R	40	C
6	37	F	45	F	38	F
7	33	F	43	F	36	F
8	37	C	43	C	39	C
9	42	R	39	C	38	C
10	35	C	40	C	34	C
11	29	S	28	F	24	F
12	16	F	36	F	30	F
13	31	F	49	F	37	F
14	37	S	38	R	38	R
15	34	C	38	F	27	F
16	24	F	33	F	24	F
17	30	F	42	F	35	F
18	29	F	42	F	36	S
19	24	F	34	F	27	F
20	24	F	36	F	34	F
21	30	F	29	F	22	F
22	21	F	41	F	35	F
23	31	F	53	F	44	R
24	38	F	48	F	41	F
25	38	F	40	F	33	F
26	28	F	42	F	38	F
27	43	F	62	F	45	F
28	42	C	50	C	40	C
29	41	C	45	F	37	F
30	45	F	73	F	54	F
31	42	C	47	C	53	F
M.	33.26		43.22		36.32	
H.	52.		73.		54.	
L.	16.		28.		22.	

Mean of the Month, . . 37.60

APRIL, 1845.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	49	C	62	R	48	F
2	40	F	58	C	46	F
3	40	F	44	F	35	F
4	35	C	56	F	43	F
5	35	F	46	F	35	F
6	33	F	45	F	35	F
7	38	C	48	C	40	C
8	37	C	36	C	32	C
9	31	F	43	F	36	F
10	41	C	50	F	48	C
11	40	C	46	F	36	C
12	33	F	43	F	37	F
13	37	C	53	F	44	F
14	42	F	54	F	44	F
15	42	F	60	F	47	F
16	44	C	46	C	40	R
17	39	R	40	C	40	C
18	41	C	43	C	41	C
19	41	C	45	C	41	C
20	41	C	43	C	40	C
21	41	C	53	F	49	C
22	47	F	57	F	48	F
23	46	F	60	F	52	F
24	49	F	74	F	61	F
25	55	F	53	C	48	R
26	43	C	48	F	42	C
27	44	C	64	F	56	F
28	54	F	58	C	52	C
29	56	F	46	C	42	F
30	40	F	53	F	48	F
M.	41.80		50.90		43.53	
H.	56.		74.		61.	
L.	31.		36.		32.	

Mean of the Month, . . 45.41

MAY, 1845.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	50	F	65	C	57	F
2	59	F	63	F	53	F
3	52	F	74	F	58	F
4	59	F	78	F	65	F
5	63	F	65	C	55	F
6	48	F	61	F	52	F
7	51	F	70	F	52	F
8	40	C	54	F	42	C
9	43	F	53	C	44	C
10	42	F	54	F	46	F
11	52	F	85	F	71	F
12	69	F	91	F	59	F
13	57	F	59	F	54	F
14	61	F	80	F	62	F
15	64	C	77	C	50	C
16	46	R	45	C	45	C
17	44	R	44	R	44	R
18	46	C	57	R	52	R
19	55	F	77	F	64	F
20	63	C	72	R	59	C
21	57	F	68	F	58	F
22	53	F	74	C	56	R
23	51	F	63	F	54	F
24	53	F	58	F	48	F
25	42	F	56	C	48	C
26	51	F	66	C	61	F
27	56	F	80	F	65	F
28	61	F	78	F	61	F
29	66	C	67	R	50	C
30	44	F	58	F	47	F
31	46	F	64	F	53	F
M.	53.03		66.32		54.35	
H.	69.		91.		71.	
L.	40.		44.		42.	

Mean of the Month, . . 57.90

JUNE, 1845.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	54	F	69	F	60	F
2	59	F	86	F	66	F
3	64	F	87	F	69	F
4	66	F	90	F	70	F
5	67	F	88	F	67	F
6	61	F	81	F	62	F
7	58	F	76	F	61	F
8	62	R	81	F	72	F
9	78	F	93	F	77	F
10	72	F	91	F	76	F
11	70	R	64	C	60	F
12	62	F	77	F	64	F
13	67	F	87	F	69	F
14	69	R	67	F	64	F
15	59	F	75	F	62	F
16	67	F	87	F	73	F
17	61	F	70	F	58	F
18	56	F	76	F	65	F
19	61	C	75	F	62	F
20	60	F	80	F	63	F
21	66	C	75	F	64	F
22	58	F	75	F	62	F
23	64	C	73	F	66	F
24	67	F	91	R	70	C
25	62	F	74	F	62	F
26	59	F	80	F	67	F
27	62	F	78	F	62	F
28	63	F	82	R	65	F
29	61	F	63	F	55	F
30	58	C	59	F	53	R
M.	63.10		78.33		64.87	
H.	78.		93.		77.	
L.	54.		59.		53.	

Mean of the Month, . . 68.77

JULY, 1845.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	53	C	56	F	55	F
2	59	F	68	C	66	C
3	67	C	70	R	62	R
4	61	F	79	F	66	F
5	62	F	77	F	68	F
6	67	F	86	F	73	F
7	71	F	92	F	79	F
8	73	F	92	F	75	F
9	66	F	80	F	67	F
10	64	F	78	F	70	F
11	67	F	92	F	81	F
12	78	F	98	F	84	F
13	67	F	69	F	65	F
14	68	F	84	R	72	F
15	72	F	95	F	82	F
16	77	F	79	F	72	F
17	76	F	96	F	73	R
18	72	F	89	F	70	F
19	64	F	75	F	65	F
20	68	F	86	F	70	F
21	75	F	98	F	75	F
22	72	C	87	F	67	F
23	68	F	84	F	64	F
24	60	F	82	F	62	F
25	60	F	77	F	65	F
26	63	F	80	F	68	F
27	66	R	64	C	59	F
28	61	F	77	R	66	F
29	62	F	80	F	69	F
30	72	C	82	F	72	C
31	71	F	84	F	67	F
M.	67.16		81.80		69.32	
H.	78.		98.		84.	
L.	53.		56.		55.	

Mean of the Month, . . 72.76

AUGUST, 1845.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	62	F	80	F	68	F
2	66	F	84	F	70	F
3	69	C	76	F	66	F
4	63	F	86	F	73	F
5	68	F	81	F	73	F
6	70	F	78	F	71	F
7	70	C	81	F	71	F
8	70	F	84	F	73	F
9	73	F	84	F	75	F
10	73	F	92	C	73	C
11	74	R	72	C	72	F
12	73	C	82	F	69	F
13	64	F	83	F	72	F
14	72	F	88	F	74	F
15	70	C	77	F	65	F
16	65	C	72	F	62	F
17	64	C	72	F	65	C
18	68	C	70	C	65	C
19	65	C	72	F	68	F
20	67	C	71	F	68	F
21	69	R	86	F	74	C
22	73	R	77	F	72	C
23	72	R	86	C	73	R
24	73	F	85	F	76	F
25	69	F	74	F	68	F
26	70	F	84	F	71	F
27	70	C	67	R	58	C
28	56	F	66	F	56	F
29	52	F	65	F	57	F
30	59	F	73	F	65	F
31	62	F	77	F	63	F
M.	67.45		78.22		68.58	
H.	74.		92.		76.	
L.	52.		65.		56.	

Mean of the Month, . . 71.42

SEPTEMBER, 1845.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	56	F	67	F	63	F
2	68	C	75	F	71	C
3	70	R	81	F	67	F
4	66	F	85	F	71	F
5	60	F	75	F	63	F
6	59	F	72	F	61	F
7	62	C	74	F	65	R
8	54	F	64	F	54	F
9	49	C	62	C	56	C
10	55	F	70	F	56	F
11	52	F	67	F	56	F
12	50	F	62	F	53	F
13	45	F	61	F	53	F
14	55	C	60	R	61	C
15	60	F	73	F	63	F
16	54	F	66	F	56	F
17	47	F	66	C	58	F
18	62	F	80	F	68	R
19	64	F	71	F	60	F
20	61	C	76	R	68	F
21	65	R	59	R	51	F
22	44	F	60	F	50	F
23	43	F	61	F	54	R
24	50	C	54	C	52	C
25	48	F	63	F	52	F
26	51	C	60	F	53	C
27	54	F	63	F	53	F
28	53	F	69	F	56	F
29	57	F	71	F	58	F
30	59	F	74	F	61	F
M.	55.77		68.03		58.77	
H.	70.		85.		71.	
L.	43.		54.		50.	

Mean of the Month, . . 60.86

OCTOBER, 1845.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	66	R	72	F	59	F
2	54	F	67	F	55	F
3	54	F	72	F	60	F
4	58	C	60	C	58	R
5	60	C	66	R	58	R
6	60	C	54	C	53	C
7	51	C	57	C	52	C
8	53	F	67	F	58	F
9	59	C	63	R	60	C
10	60	R	62	C	55	C
11	58	C	62	F	60	R
12	67	F	73	R	69	R
13	55	F	61	F	50	F
14	45	F	60	F	50	F
15	49	F	57	F	43	F
16	35	F	47	F	41	F
17	35	F	53	F	44	F
18	40	F	57	F	48	F
19	48	F	69	F	58	F
20	52	C	50	C	46	C
21	39	C	41	F	30	F
22	26	F	42	F	34	F
23	27	F	46	F	39	F
24	34	F	54	F	44	F
25	39	C	46	F	39	F
26	40	C	56	F	46	F
27	49	F	64	F	54	F
28	49	F	65	F	56	F
29	53	F	70	F	54	F
30	57	F	68	F	52	F
31	51	C	54	C	52	C
M.	49.13		59.19		50.87	
H.	67.		73.		69.	
L.	26.		41.		30.	

Mean of the Month, . . 53.06

NOVEMBER, 1845.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	58	C	68	F	57	F
2	58	R	54	R	53	R
3	58	R	58	C	57	R
4	59	C	62	F	57	R
5	46	F	54	F	45	F
6	39	F	54	C	46	F
7	38	F	53	F	45	F
8	42	F	49	C	49	R
9	52	R	56	C	49	R
10	38	C	46	F	40	F
11	37	F	51	F	47	F
12	42	C	44	F	34	F
13	30	F	48	F	43	F
14	44	F	56	F	47	F
15	39	F	43	F	35	F
16	35	F	52	F	45	F
17	40	F	53	F	48	C
18	50	R	56	C	51	F
19	53	C	58	F	46	F
20	44	F	59	C	48	F
21	53	C	50	F	40	F
22	35	F	43	F	40	F
23	45	C	57	R	39	F
24	33	F	36	F	28	F
25	23	F	39	F	37	F
26	35	F	44	F	41	F
27	49	R	60	R	48	C
28	27	F	30	F	23	F
29	18	F	28	F	27	F
30	25	C	39	S	37	R
M.	41.50		50.00		43.40	
H.	59.		68.		57.	
L.	18.		28.		23.	

Mean of the Month, . . 44.97

DECEMBER, 1845.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	43	R	43	R	52	R
2	25	F	29	F	21	F
3	14	F	22	C	20	S
4	25	S	40	R	29	R
5	33	F	33	F	26	F
6	24	F	28	F	21	F
7	17	F	23	F	20	F
8	24	C	35	C	33	C
9	35	R	36	C	32	F
10	32	F	30	F	22	F
11	19	F	18	F	12	F
12	6	F	15	F	11	F
13	8	F	22	F	21	F
14	25	C	37	R	40	R
15	42	R	40	R	37	R
16	34	C	30	C	24	F
17	23	F	37	F	33	F
18	36	C	45	C	42	C
19	37	C	41	C	29	C
20	22	C	27	S	23	C
21	20	F	24	F	18	F
22	14	F	27	F	21	F
23	14	F	30	F	22	F
24	14	F	30	C	28	C
25	34	S	36	S	27	S
26	25	S	28	S	26	S
27	16	F	28	F	24	F
28	27	F	36	C	34	C
29	31	F	41	C	32	F
30	30	F	41	F	36	F
31	17	F	23	F	16	F
M.	24.71		31.45		26.84	
H.	43.		45.		52.	
L.	6.		15.		11.	

Mean of the Month, . . 27.66

JANUARY, 1846.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	9	F	27	C	30	S
2	36	R	48	C	44	C
3	37	F	38	F	33	F
4	29	F	37	F	33	F
5	23	F	38	F	31	F
6	24	F	38	F	38	F
7	35	R	38	R	38	R
8	35	C	42	F	39	C
9	34	F	37	F	33	F
10	26	F	34	F	33	F
11	32	C	39	F	31	F
12	29	C	39	F	33	F
13	28	F	33	F	25	F
14	18	F	36	C	31	F
15	26	F	43	F	38	C
16	38	C	42	C	37	C
17	32	S	37	S	23	S
18	9	F	10	F	7	F
19	1	F	15	F	13	F
20	6	F	22	F	18	C
21	18	F	34	C	27	C
22	8	F	11	F	19	F
23	13	F	27	F	21	F
24	14	F	32	F	32	F
25	31	F	45	F	36	F
26	35	C	41	C	37	C
27	28	C	33	F	25	F
28	19	F	37	C	29	F
29	18	F	36	C	31	C
30	36	C	49	C	47	C
31	47	F	40	C	28	S
M.	24.97		34.78		30.32	
H.	47.		49.		47.	
L.	1.		10.		7.	

Mean of the Month, . . 30.02

FEBRUARY, 1846.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	15	C	19	C	20	C
2	22	C	35	C	30	C
3	33	C	40	C	37	C
4	37	F	40	F	35	F
5	34	C	47	F	38	F
6	28	F	40	F	34	F
7	30	C	41	C	37	S
8	34	C	25	F	16	F
9	8	F	32	F	13	F
10	5	F	25	F	21	F
11	24	S	28	S	30	S
12	11	F	24	F	14	F
13	7	F	28	F	20	F
14	12	F	31	F	25	F
15	28	S	27	S	17	S
16	21	F	31	F	28	F
17	17	F	33	C	28	F
18	17	F	27	F	18	F
19	6	F	26	F	20	F
20	27	C	30	S	35	C
21	24	F	39	F	30	F
22	27	F	37	F	26	F
23	21	F	36	F	28	F
24	18	F	31	F	22	F
25	16	F	30	F	21	F
26	7	F	15	F	7	F
27	—2	F	14	F	14	F
28	9	C	24	C	18	C
M.	19.14		30.54		24.35	
H.	37.		47.		38.	
L.	—2.		14.		7.	

Mean of the Month, . . 24.68

MARCH, 1846.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	9	F	26	F	18	F
2	19	C	27	C	17	C
3	13	F	33	F	25	F
4	20	F	44	F	35	F
5	34	F	46	F	38	F
6	27	C	44	C	31	F
7	17	F	36	F	33	F
8	31	S	44	C	38	F
9	32	F	41	F	36	F
10	30	F	41	F	33	F
11	26	F	47	F	37	F
12	32	F	53	F	44	F
13	42	F	61	C	53	C
14	53	R	53	C	45	R
15	37	F	52	F	43	F
16	37	C	38	S	36	R
17	33	C	40	F	33	C
18	29	F	44	F	35	F
19	36	F	52	F	44	F
20	42	F	60	F	50	F
21	46	C	52	C	41	C
22	34	F	47	F	37	F
23	32	F	46	F	41	F
24	40	C	45	C	39	C
25	40	C	45	R	43	R
26	42	C	47	R	43	C
27	44	C	53	F	47	F
28	40	F	56	F	46	F
29	37	F	52	F	45	F
30	41	F	49	F	42	F
31	35	F	50	F	41	F
M.	33.22		45.93		38.36	
H.	53.		61.		53.	
L.	9.		26.		17.	

Mean of the Month, . . 39.17

APRIL, 1846.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	33	F	48	F	37	F
2	31	F	48	F	39	F
3	34	F	46	F	38	F
4	33	F	43	F	38	F
5	35	F	62	F	48	F
6	43	C	66	F	48	F
7	48	F	65	F	49	F
8	54	C	58	C	48	C
9	38	F	47	F	48	F
10	37	F	58	F	49	F
11	53	C	68	C	56	C
12	49	C	52	C	46	C
13	35	C	50	C	39	C
14	33	F	50	F	41	F
15	41	R	48	F	37	C
16	35	F	47	F	40	F
17	40	F	65	F	51	F
18	50	F	74	F	58	F
19	56	F	68	F	53	F
20	45	F	68	F	56	F
21	56	F	83	F	68	F
22	52	F	54	F	49	F
23	51	F	75	F	51	F
24	58	C	80	F	64	F
25	39	F	44	F	41	F
26	39	F	61	F	52	F
27	47	F	59	F	51	F
28	47	F	56	F	54	F
29	52	F	63	C	52	F
30	49	R	53	C	50	C
M.	43.77		58.63		48.36	
H.	58.		83.		68.	
L.	31.		43.		37.	

Mean of the Month, . . 50.25

MAY, 1846.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	53	F	53	C	49	R
2	48	C	58	F	52	F
3	54	C	60	C	52	F
4	48	F	60	F	56	F
5	52	F	79	F	63	F
6	52	C	49	C	46	C
7	44	F	53	F	48	F
8	51	C	58	F	50	C
9	51	C	53	C	51	C
10	56	R	72	C	58	F
11	48	C	54	C	44	C
12	44	F	61	F	52	F
13	47	F	70	F	56	F
14	62	F	76	F	61	F
15	64	F	76	C	62	F
16	64	C	74	C	65	C
17	65	R	77	C	66	F
18	69	C	78	R	54	C
19	43	F	56	F	49	F
20	46	F	68	C	54	C
21	46	F	57	F	51	F
22	47	F	61	F	54	F
23	54	F	60	C	58	R
24	57	C	59	F	54	F
25	55	C	62	F	53	C
26	57	C	62	F	52	C
27	54	C	53	C	51	C
28	56	C	55	C	51	C
29	51	C	53	C	51	C
30	52	C	53	C	50	C
31	53	R	55	C	53	C
M.	53.00		61.78		53.74	
H.	69.		79.		66.	
L.	43.		49.		44.	

Mean of the Month, . . 56.17

JUNE, 1846.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	58	C	61	F	58	F
2	66	C	82	F	67	C
3	68	F	82	F	65	F
4	69	F	88	F	69	F
5	72	C	83	F	71	F
6	67	C	75	F	61	F
7	57	F	78	F	61	F
8	61	F	70	F	61	F
9	58	F	70	F	57	F
10	62	F	79	F	64	F
11	64	F	76	F	65	C
12	60	F	61	C	54	F
13	54	F	63	F	58	F
14	59	F	78	F	68	F
15	70	F	81	R	69	R
16	67	F	64	C	58	F
17	63	F	68	F	62	F
18	61	F	86	F	67	F
19	66	R	77	F	61	R
20	59	C	61	R	54	C
21	56	C	62	R	55	F
22	56	C	57	R	54	C
23	54	C	57	C	54	C
24	56	F	66	C	58	F
25	57	F	62	F	56	F
26	60	R	59	C	54	C
27	54	C	64	F	59	C
28	62	F	81	F	67	F
29	69	F	82	F	69	F
30	67	C	75	F	67	F
M.	61.73		71.60		61.43	
H.	72.		88.		71.	
L.	54.		57.		54.	

Mean of the Month, . . 64.92

JULY, 1846.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	67	C	62	C	61	C
2	69	R	83	F	70	C
3	67	F	71	F	62	F
4	64	F	72	F	68	F
5	69	C	77	F	72	R
6	72	F	89	F	75	F
7	71	F	81	F	70	F
8	66	F	87	R	68	F
9	66	F	87	F	73	F
10	74	F	96	F	83	F
11	84	F	96	F	77	R
12	78	F	77	R	75	C
13	69	F	85	F	72	F
14	71	C	76	F	66	F
15	60	F	74	F	62	F
16	57	F	68	F	61	F
17	63	C	69	C	60	C
18	62	C	66	R	62	C
19	63	R	67	C	62	C
20	66	C	73	F	68	F
21	71	C	80	F	72	F
22	73	F	78	C	70	C
23	69	R	78	F	70	R
24	69	F	89	F	74	F
25	69	R	60	C	58	C
26	61	C	68	F	60	F
27	64	F	71	F	62	F
28	63	F	84	F	68	F
29	65	F	83	F	70	F
30	74	F	90	F	75	F
31	75	F	91	F	75	R
M.	68.10		78.32		68.42	
H.	84.		96.		83.	
L.	57.		60.		58.	

Mean of the Month, . . 71.61

AUGUST, 1846.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	71	F	76	C	66	F
2	67	F	79	F	64	F
3	67	F	79	F	70	F
4	67	F	90	F	75	F
5	73	F	93	F	81	F
6	73	C	93	F	81	F
7	68	F	85	F	74	F
8	69	F	80	C	71	C
9	69	F	77	C	70	C
10	69	C	75	F	66	R
11	65	F	72	F	64	F
12	63	F	85	F	68	F
13	69	F	91	F	77	F
14	73	F	91	R	73	C
15	72	C	77	C	72	C
16	72	F	92	F	77	F
17	75	F	89	F	75	F
18	68	C	68	F	61	F
19	58	F	69	F	60	F
20	60	F	69	C	61	C
21	59	C	62	C	60	C
22	59	F	80	C	67	C
23	67	R	74	C	67	F
24	61	F	69	F	58	F
25	59	F	70	C	59	R
26	55	R	58	R	58	C
27	61	C	74	F	66	F
28	63	F	72	F	66	F
29	68	C	84	F	71	C
30	73	F	87	F	69	F
31	67	F	86	F	74	F
M.	66.45		78.90		68.42	
H.	75.		93.		81.	
L.	55.		58.		58.	

Mean of the Month, . . 71.26

SEPTEMBER, 1846.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	69	F	90	F	76	F
2	71	F	78	F	67	F
3	69	C	88	F	74	C
4	74	F	88	F	75	F
5	78	F	92	F	79	F
6	77	F	94	F	81	F
7	77	F	94	F	79	F
8	75	F	96	R	70	R
9	60	F	60	F	54	F
10	54	F	62	F	56	F
11	57	F	68	F	66	F
12	69	F	84	F	74	F
13	69	F	79	F	68	F
14	65	F	80	F	73	F
15	74	F	68	F	56	F
16	51	F	64	F	54	F
17	51	F	71	C	56	C
18	59	F	68	C	60	C
19	54	F	68	F	63	F
20	57	F	79	F	63	F
21	62	C	71	R	61	C
22	56	C	60	F	53	F
23	50	F	73	F	58	F
24	58	F	79	F	64	F
25	62	C	58	C	59	C
26	67	F	69	R	56	C
27	47	F	65	F	54	R
28	48	F	60	F	51	F
29	48	F	70	F	60	F
30	57	F	77	F	63	F
M.	62.16		75.10		64.10	
H.	78.		96.		81.	
L.	47.		58.		51.	

Mean of the Month, . . 67.12

OCTOBER, 1846.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	59	F	76	F	56	F
2	51	C	54	C	53	C
3	48	F	58	F	48	F
4	40	F	55	F	50	F
5	51	C	60	F	51	F
6	48	F	68	F	55	F
7	53	F	74	F	61	F
8	61	F	80	F	59	F
9	57	F	78	F	65	F
10	45	F	54	F	43	F
11	35	F	50	F	44	F
12	40	F	60	F	52	F
13	55	C	64	R	64	R
14	56	F	64	C	54	R
15	44	F	59	F	50	F
16	44	F	61	F	55	F
17	58	F	70	C	54	C
18	43	R	43	R	42	C
19	39	F	49	C	40	F
20	30	F	49	C	45	C
21	42	F	55	F	44	F
22	35	F	53	C	42	C
23	26	F	41	F	40	F
24	44	F	54	F	43	F
25	33	F	50	F	41	F
26	32	F	51	F	48	F
27	56	C	66	C	59	C
28	50	C	47	R	40	R
29	36	F	48	F	40	F
30	40	C	43	C	40	R
31	38	C	47	C	44	C
M.	44.80		57.45		49.10	
H.	61.		80.		65.	
L.	26.		41.		40.	

Mean of the Month, . . 50.45

NOVEMBER, 1846.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	44	F	48	C	46	C
2	47	C	52	C	49	C
3	52	C	64	F	60	F
4	60	C	59	R	52	C
5	40	F	53	F	46	F
6	41	F	54	F	44	F
7	40	F	56	C	46	F
8	41	C	55	F	48	C
9	49	C	48	R	50	R
10	50	C	51	R	49	R
11	49	C	53	C	51	C
12	49	R	48	C	47	R
13	44	C	45	C	45	C
14	44	F	48	C	46	F
15	47	C	49	C	46	C
16	46	C	49	R	47	C
17	38	F	50	F	41	F
18	33	F	48	F	43	F
19	46	C	56	C	56	R
20	45	F	45	C	41	C
21	35	F	49	F	41	F
22	34	F	54	C	46	F
23	40	R	44	F	36	F
24	29	F	43	F	35	F
25	35	S	36	S	35	S
26	21	F	30	F	26	F
27	27	F	33	F	30	F
28	33	F	44	F	38	F
29	37	C	42	F	37	C
30	33	F	35	F	30	F
M.	40.97		48.03		43.56	
H.	60.		64.		60.	
L.	21.		30.		26.	

Mean of the Month, . . 44.19

DECEMBER, 1846.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	23	F	33	F	26	F
2	21	C	34	C	36	C
3	37	R	48	F	39	C
4	33	F	39	F	36	F
5	26	F	33	F	28	F
6	21	F	29	F	23	F
7	15	F	36	F	36	C
8	40	C	42	C	40	C
9	35	S	42	F	32	C
10	23	F	38	C	36	C
11	33	S	36	C	27	F
12	18	F	25	F	21	F
13	17	F	27	F	22	F
14	17	F	23	F	20	F
15	14	F	20	F	15	F
16	11	F	26	F	20	F
17	15	C	30	S	34	R
18	33	C	35	C	35	C
19	25	F	36	F	33	F
20	27	F	35	F	28	F
21	22	C	32	F	26	F
22	19	F	31	C	28	C
23	20	F	27	F	21	F
24	14	F	28	F	28	F
25	31	F	42	C	36	R
26	19	F	25	F	23	F
27	35	C	42	C	42	C
28	42	C	46	C	41	F
29	22	F	27	F	22	F
30	30	R	41	C	34	F
31	36	F	46	C	42	R
M.	25.00		34.00		30.00	
H.	42.		48.		42.	
L.	11.		20.		15.	

Mean of the Month, . . 29.66

JANUARY, 1847.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	45	F	54	C	42	C
2	38	C	39	C	38	C
3	36	C	42	F	34	F
4	27	C	39	C	36	R
5	53	F	48	F	41	F
6	34	F	48	F	38	F
7	34	C	45	R	44	R
8	21	F	30	F	21	F
9	14	F	28	C	25	F
10	24	C	32	C	27	S
11	23	S	23	S	23	S
12	15	F	23	F	19	F
13	13	F	32	C	28	C
14	26	C	40	C	38	C
15	36	C	40	C	42	C
16	42	C	49	F	37	F
17	15	F	20	F	15	F
18	19	C	34	C	42	S
19	36	F	35	F	19	F
20	15	F	23	F	20	F
21	14	F	28	F	18	F
22	5	F	21	F	17	F
23	17	F	36	F	28	F
24	25	F	41	F	33	F
25	19	F	31	F	25	F
26	24	C	36	C	39	C
27	34	C	26	F	16	F
28	8	F	23	F	20	F
29	22	C	39	C	35	R
30	32	S	29	C	21	F
31	11	F	20	F	16	F
M.	25.06		34.00		28.93	
H.	53.		54.		44.	
L.	5.		20.		15.	

Mean of the Month, . . 29.33

FEBRUARY, 1847.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	8	F	26	C	23	S
2	23	C	41	C	36	C
3	39	C	45	R	50	R
4	29	F	30	F	19	F
5	13	F	26	C	24	C
6	23	C	38	F	33	C
7	24	F	42	F	33	F
8	33	F	42	F	35	F
9	39	F	49	C	40	F
10	34	S	37	C	35	C
11	29	F	42	F	27	F
12	21	F	32	F	26	F
13	19	F	32	F	24	F
14	23	F	33	C	30	F
15	33	C	45	F	26	C
16	15	C	24	C	27	C
17	23	C	40	F	33	F
18	24	F	38	F	34	F
19	28	C	38	C	31	C
20	30	C	32	C	27	C
21	25	S	29	S	20	S
22	18	C	26	S	19	S
23	17	F	23	F	16	F
24	5	F	28	F	20	F
25	19	C	31	F	23	C
26	10	F	32	F	27	F
27	26	C	33	S	37	R
28	34	F	37	C	32	F
M.	23.71		34.68		28.82	
H.	39.		49.		50.	
L.	5.		23.		16.	

Mean of the Month, . . 29.07

MARCH, 1847.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	24	F	28	F	25	F
2	24	F	29	F	24	F
3	18	F	37	F	32	F
4	32	F	39	C	31	F
5	25	F	36	F	33	F
6	25	F	40	F	34	F
7	28	F	42	C	40	C
8	43	F	51	F	40	F
9	29	F	33	C	32	C
10	31	C	40	R	35	F
11	25	F	30	F	27	F
12	17	F	30	F	26	F
13	19	C	30	F	25	F
14	18	F	34	F	28	F
15	22	F	40	F	30	F
16	18	F	32	F	23	F
17	19	F	34	F	28	F
18	26	F	43	C	34	C
19	33	F	44	C	36	F
20	30	F	44	C	40	C
21	48	C	51	R	41	R
22	33	R	35	R	33	R
23	30	C	36	C	36	C
24	35	R	44	F	36	F
25	32	F	50	F	44	F
26	41	F	45	C	43	R
27	40	R	40	C	30	F
28	24	F	35	F	29	F
29	26	C	32	S	32	C
30	21	F	35	F	30	F
31	28	S	34	C	27	F
M.	27.87		37.84		32.39	
H.	48.		51.		44.	
L.	17.		28.		23.	

Mean of the Month, . . 32.70

APRIL, 1847.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	17	F	34	F	29	F
2	30	S	37	S	36	C
3	33	F	47	F	37	F
4	39	C	40	R	36	C
5	33	F	48	F	40	F
6	38	F	47	C	46	R
7	39	F	53	C	46	F
8	41	F	53	F	48	F
9	48	F	52	F	41	F
10	38	F	57	C	44	F
11	33	F	42	F	35	F
12	35	C	53	F	46	F
13	43	C	48	F	40	F
14	36	F	56	F	43	F
15	43	C	60	C	40	C
16	31	F	45	F	39	F
17	42	C	53	F	44	R
18	34	F	40	F	32	F
19	28	F	50	F	41	F
20	39	F	53	F	48	F
21	47	R	72	C	61	F
22	59	F	83	R	50	C
23	41	R	38	C	38	R
24	34	F	42	F	36	F
25	34	F	53	F	38	F
26	41	F	64	C	54	F
27	51	F	62	C	40	F
28	33	F	52	F	48	F
29	49	C	54	R	46	R
30	43	F	63	C	45	C
M.	38.40		51.70		42.23	
H.	59.		83.		61.	
L.	17.		34.		29.	

Mean of the Month, . . 44.11

MAY, 1847.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	37	F	54	F	45	F
2	44	C	45	R	39	R
3	39	C	58	F	48	C
4	43	F	62	F	50	F
5	46	F	55	F	51	F
6	46	F	61	F	51	F
7	45	F	56	C	48	R
8	45	R	52	C	51	C
9	57	F	68	F	59	F
10	57	F	61	F	59	F
11	59	C	66	F	51	F
12	49	C	53	C	46	C
13	46	F	48	C	46	F
14	41	C	50	F	45	F
15	44	F	51	F	45	F
16	45	F	54	F	47	F
17	48	F	55	F	49	F
18	51	C	54	C	52	C
19	51	F	63	C	57	C
20	49	F	56	F	50	F
21	49	F	56	F	50	F
22	47	C	63	F	56	F
23	58	F	81	F	61	C
24	60	F	69	C	58	R
25	61	F	69	C	55	F
26	54	C	70	F	58	C
27	52	F	66	F	56	F
28	55	F	72	F	66	F
29	57	F	58	C	52	R
30	46	R	53	C	48	F
31	47	F	62	C	53	C
M.	49.29		59.39		51.68	
H.	61.		81.		66.	
L.	37.		45.		39.	

Mean of the Month, . . 53.45

JUNE, 1847.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	54	R	61	C	55	C
2	53	R	71	C	60	F
3	57	F	64	C	62	C
4	59	R	73	C	62	F
5	54	F	72	F	58	F
6	53	F	76	F	61	F
7	56	F	71	F	62	F
8	59	F	82	F	63	F
9	62	F	67	C	61	C
10	63	F	82	F	68	F
11	67	F	80	C	66	R
12	65	F	73	F	60	F
13	55	F	80	F	64	R
14	65	F	73	C	61	R
15	49	F	61	C	50	F
16	53	F	76	F	62	F
17	57	F	71	F	61	F
18	58	F	61	F	60	F
19	59	F	70	C	58	C
20	58	C	61	C	53	R
21	53	R	60	F	56	C
22	55	C	60	R	57	R
23	59	C	78	F	66	F
24	62	F	83	F	70	F
25	67	F	91	F	76	F
26	73	F	92	F	77	F
27	72	F	92	F	76	F
28	72	F	83	F	76	F
29	70	F	69	C	64	R
30	62	R	69	C	61	F
M.	60.03		73.40		62.87	
H.	73.		92.		77.	
L.	49.		60.		50.	

Mean of the Month, . . 65.43

JULY, 1847.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	61	F	69	F	59	F
2	62	F	66	C	64	F
3	59	F	72	F	65	F
4	64	F	89	F	73	F
5	69	F	90	F	76	F
6	71	F	84	F	72	F
7	71	F	89	F	77	F
8	72	F	86	F	74	F
9	70	F	94	F	76	F
10	67	F	91	F	75	F
11	74	C	87	F	73	F
12	74	F	78	C	72	C
13	73	F	72	F	71	R
14	66	F	72	F	62	F
15	62	F	80	F	63	F
16	63	F	88	F	72	F
17	66	F	90	F	75	F
18	74	F	75	F	65	F
19	68	F	80	F	78	F
20	76	F	96	F	77	F
21	73	F	94	F	78	F
22	75	F	95	F	73	R
23	70	F	80	F	71	F
24	65	F	76	F	71	F
25	68	F	85	C	72	R
26	74	F	92	R	61	R
27	55	F	64	F	56	F
28	54	F	69	F	59	F
29	56	F	72	F	60	F
30	55	F	63	C	60	C
31	67	R	85	C	72	F
M.	66.90		81.38		69.42	
H.	76.		96.		78.	
L.	54.		63.		56.	

Mean of the Month, . . 72.57

AUGUST, 1847.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	70	F	81	C	71	R
2	69	C	81	F	69	F
3	72	F	78	F	70	F
4	66	F	78	F	72	F
5	68	F	77	F	67	C
6	59	R	71	R	65	C
7	65	R	62	R	60	R
8	60	C	71	R	61	R
9	60	C	73	C	62	C
10	65	C	79	F	72	F
11	73	F	92	F	72	F
12	73	F	91	F	74	F
13	69	F	84	F	70	F
14	69	F	73	F	64	F
15	64	F	70	F	64	F
16	63	F	74	F	58	F
17	59	F	75	F	66	F
18	70	C	81	F	67	R
19	58	F	77	F	60	F
20	54	F	75	F	63	F
21	60	F	82	F	68	F
22	61	F	82	F	68	F
23	58	F	76	F	62	F
24	55	F	68	F	61	F
25	57	F	74	F	62	F
26	59	C	71	F	61	C
27	57	F	80	F	68	F
28	67	C	77	C	68	C
29	67	F	76	C	64	F
30	59	F	68	F	66	F
31	65	C	86	F	70	F
M.	63.58		76.87		65.97	
H.	73.		92.		74.	
L.	54.		62.		58.	

Mean of the Month, . . 68.81

SEPTEMBER, 1847.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	62	F	67	C	63	C
2	68	C	71	F	64	F
3	69	F	85	C	70	F
4	71	F	83	C	71	F
5	69	F	84	F	73	F
6	71	R	84	R	67	F
7	59	F	66	F	59	F
8	63	C	68	C	64	C
9	71	C	83	F	65	R
10	60	R	61	R	59	R
11	55	C	59	R	58	C
12	57	C	62	R	59	C
13	58	R	64	R	61	R
14	55	F	77	F	56	F
15	47	F	67	F	52	F
16	45	F	68	F	54	F
17	47	F	64	F	55	F
18	57	F	62	F	56	F
19	53	F	63	C	57	C
20	54	C	58	R	53	R
21	51	C	68	F	58	C
22	53	F	72	F	56	F
23	49	F	76	F	61	F
24	56	C	62	C	56	C
25	54	C	56	R	53	R
26	51	R	54	C	52	C
27	51	C	56	R	54	C
28	55	C	70	C	60	C
29	48	F	67	F	56	F
30	51	C	64	F	53	F
M.	57.00		68.03		59.17	
H.	71.		85.		73.	
L.	45.		54.		52.	

Mean of the Month, . . . 61.40

OCTOBER, 1847.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	47	C	65	F	51	C
2	42	F	61	F	51	F
3	43	F	60	F	50	F
4	42	F	60	F	53	F
5	45	F	65	C	59	F
6	51	F	72	F	58	F
7	52	F	58	C	54	F
8	53	C	60	C	58	R
9	54	C	58	F	49	F
10	51	F	62	F	51	F
11	43	F	58	F	44	F
12	38	F	57	C	51	C
13	60	R	55	R	49	C
14	38	F	57	F	46	F
15	37	F	51	C	42	F
16	31	F	54	F	48	F
17	45	F	63	F	52	F
18	45	F	62	F	53	F
19	53	F	73	F	59	F
20	49	F	55	F	47	F
21	37	F	60	F	52	F
22	49	C	64	F	58	F
23	51	R	54	C	45	F
24	37	C	52	C	49	C
25	60	C	65	F	52	F
26	38	F	43	F	32	F
27	22	F	38	F	33	F
28	24	F	41	F	33	F
29	26	F	52	F	39	F
30	32	F	50	F	46	F
31	39	F	52	F	47	F
M.	43.03		57.32		48.74	
H.	60.		73.		59.	
L.	22.		38.		32.	

Mean of the Month, . . 49.70

NOVEMBER, 1847.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	42	C	57	F	55	C
2	45	F	60	F	50	F
3	42	F	61	F	53	F
4	50	F	66	F	53	F
5	51	C	58	F	44	F
6	38	F	49	F	41	F
7	34	F	46	C	43	C
8	45	C	54	C	54	C
9	53	C	67	F	61	C
10	55	F	54	F	45	F
11	37	F	49	C	43	F
12	37	C	49	F	39	F
13	37	F	47	C	43	C
14	43	R	47	C	38	F
15	38	F	45	C	39	F
16	38	F	45	F	38	F
17	40	F	56	C	51	F
18	48	F	62	C	47	C
19	48	R	51	C	41	C
20	32	C	40	F	38	C
21	34	C	47	C	41	C
22	38	F	52	C	49	F
23	46	R	52	C	49	C
24	54	F	66	C	61	R
25	58	C	62	C	54	F
26	43	F	48	F	37	F
27	31	C	35	C	31	C
28	25	F	40	C	34	C
29	23	F	23	F	12	F
30	8	F	24	F	21	F
M.	40.43		50.40		43.50	
H.	58.		67.		61.	
L.	8.		23.		12.	

Mean of the Month, . . 44.78

DECEMBER, 1847.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	22	F	41	C	40	C
2	52	R	58	C	57	R
3	51	C	44	R	41	R
4	31	F	40	F	29	F
5	27	F	43	C	42	R
6	32	F	41	F	31	F
7	25	F	38	F	32	F
8	30	F	47	F	41	F
9	42	F	58	C	52	F
10	55	C	63	C	58	C
11	58	C	62	F	45	F
12	36	F	47	C	45	R
13	46	C	65	F	55	C
14	49	F	57	C	49	R
15	49	C	56	F	45	C
16	30	C	33	C	34	C
17	31	R	40	R	34	S
18	22	F	34	C	25	F
19	26	F	41	F	36	F
20	27	F	33	F	26	F
21	16	F	22	C	23	C
22	14	C	23	C	18	C
23	14	F	30	C	26	C
24	29	F	38	F	26	F
25	26	S	30	C	26	S
26	19	F	22	F	14	F
27	4	F	16	F	16	F
28	22	C	31	C	35	C
29	29	F	46	F	39	F
30	38	F	52	F	43	F
31	47	C	54	R	50	C
M.	32.22		42.10		36.55	
H.	58.		65.		58.	
L.	4.		16.		14.	

Mean of the Month, . . 36.96

JANUARY, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	50	C	59	C	55	C
2	53	C	44	R	39	C
3	34	F	41	F	35	F
4	32	F	46	F	33	F
5	23	C	31	C	41	C
6	23	F	26	F	22	F
7	9	F	19	F	13	F
8	16	F	29	C	34	C
9	37	R	41	C	21	F
10	6	F	9	F	4	F
11	—5	F	14	F	18	F
12	17	F	30	F	22	F
13	14	C	32	C	32	C
14	33	C	41	C	39	C
15	39	C	52	R	48	C
16	43	F	45	F	35	F
17	36	F	43	F	36	F
18	26	F	42	C	25	F
19	9	F	18	F	14	F
20	15	F	36	F	32	F
21	30	F	48	C	41	C
22	28	F	32	F	32	F
23	26	C	32	F	24	F
24	15	F	33	F	28	F
25	31	C	44	F	40	F
26	37	F	44	C	39	C
27	38	R	41	R	41	R
28	35	F	48	F	38	F
29	38	C	35	C	36	C
30	30	F	40	F	32	F
31	26	F	38	F	36	F
M.	27.22		36.55		31.77	
H.	53.		59.		55.	
L.	—5.		9.		4.	

Mean of the Month, . . 31.85

FEBRUARY, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	32	S	33	F	28	F
2	24	F	34	F	26	F
3	19	F	40	F	34	F
4	31	C	38	R	33	S
5	29	C	34	C	31	C
6	27	C	32	C	26	C
7	23	F	30	F	23	F
8	20	F	29	F	18	F
9	15	F	30	F	22	F
10	26	F	36	F	17	F
11	1	F	16	F	13	F
12	8	F	36	F	20	F
13	18	C	32	F	20	F
14	15	F	35	F	25	F
15	19	F	34	F	23	F
16	20	F	35	F	26	F
17	21	F	36	F	27	F
18	20	F	37	F	29	F
19	23	F	44	F	36	F
20	36	C	38	R	36	R
21	37	F	44	F	36	F
22	36	C	41	C	35	C
23	36	F	46	F	38	F
24	30	F	41	C	27	F
25	13	F	22	F	17	F
26	10	F	31	F	24	F
27	23	F	39	C	27	F
28	14	F	32	C	31	S
29	35	F	42	F	28	F
M.	22.80		35.06		26.76	
H.	37.		46.		38.	
L.	1.		16.		13.	

Mean of the Month, . . 28.21

MARCH, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	18	F	27	F	22	F
2	14	F	28	C	26	C
3	27	S	37	S	29	C
4	20	F	31	F	27	F
5	27	F	30	F	21	F
6	17	C	32	F	28	C
7	24	F	45	F	37	F
8	36	F	53	F	45	F
9	46	R	44	R	37	R
10	35	R	35	C	31	C
11	21	F	34	F	28	F
12	21	F	39	C	39	R
13	42	F	49	F	33	F
14	20	F	27	F	18	F
15	8	F	19	F	12	F
16	8	F	26	F	17	F
17	11	F	36	C	23	C
18	23	C	40	C	31	C
19	26	F	41	C	38	R
20	35	F	55	C	46	C
21	43	F	59	F	44	F
22	36	F	50	F	42	F
23	36	S	35	C	32	C
24	25	F	38	F	32	F
25	28	F	45	F	36	F
26	38	F	47	F	47	F
27	45	C	51	C	43	C
28	39	C	43	R	41	R
29	40	C	58	F	46	F
30	40	F	62	F	48	F
31	43	F	66	C	54	C
M.	28.77		41.35		33.97	
H.	46.		66.		54.	
L.	8.		19.		12.	

Mean of the Month, . . 34.70

APRIL, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	55	C	48	R	42	F
2	35	F	46	F	38	F
3	30	F	41	F	38	F
4	38	F	47	C	46	C
5	48	F	57	F	42	F
6	33	F	50	F	43	F
7	36	F	48	F	40	F
8	34	F	57	F	49	F
9	39	F	57	F	53	F
10	41	F	72	F	56	F
11	44	F	49	F	44	F
12	41	C	49	C	45	C
13	39	F	49	C	44	R
14	37	F	47	C	42	C
15	38	F	65	F	49	F
16	42	F	53	F	43	F
17	40	F	57	F	45	F
18	37	F	47	C	43	C
19	32	S	37	C	32	F
20	30	F	48	F	42	F
21	38	F	63	F	52	F
22	48	F	74	F	58	F
23	47	F	56	F	51	F
24	52	F	57	F	44	F
25	38	F	60	F	46	F
26	45	F	60	C	45	F
27	47	F	50	F	45	F
28	42	C	60	F	47	F
29	47	C	63	F	51	F
30	44	F	60	F	52	F
M.	40.57		54.23		45.56	
H.	55.		74.		58.	
L.	30.		37.		32.	

Mean of the Month, . . 46.79

MAY, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	45	F	68	F	54	F
2	52	C	57	C	49	R
3	46	R	57	C	52	F
4	51	F	64	F	58	F
5	57	C	62	C	55	C
6	50	R	57	C	53	C
7	54	C	64	F	63	R
8	55	F	73	F	62	F
9	55	C	60	F	52	F
10	52	F	68	C	54	C
11	46	R	50	F	46	F
12	47	F	65	F	54	F
13	51	F	56	C	53	R
14	50	F	60	C	52	C
15	49	F	67	F	57	F
16	54	C	68	C	61	C
17	58	C	70	F	59	F
18	60	F	82	F	68	F
19	64	F	87	F	73	F
20	69	F	88	C	69	C
21	63	C	64	F	54	R
22	51	C	51	R	51	C
23	54	C	57	F	50	C
24	51	C	53	C	50	R
25	51	F	64	F	62	F
26	65	F	70	C	56	C
27	53	C	57	F	50	C
28	54	C	65	F	58	F
29	59	C	68	F	59	F
30	66	C	66	R	62	R
31	58	F	64	F	50	F
M.	54.51		64.58		56.32	
H.	69.		88.		73.	
L.	45.		50.		46.	

Mean of the Month, . . 58.47

JUNE, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	43	F	61	F	50	F
2	50	F	73	F	61	F
3	61	F	87	C	73	C
4	55	F	60	F	54	F
5	53	C	55	R	51	C
6	51	R	56	C	54	C
7	54	C	56	R	51	C
8	53	R	58	C	57	C
9	57	C	61	F	54	C
10	59	F	74	F	60	F
11	63	F	80	F	65	F
12	50	F	62	F	52	F
13	46	F	61	F	57	F
14	56	F	77	F	62	F
15	58	F	76	F	66	F
16	65	F	86	F	76	F
17	64	F	68	F	69	F
18	67	F	90	F	74	F
19	73	F	87	C	72	C
20	69	C	81	R	70	R
21	70	F	87	F	73	F
22	65	F	83	F	70	F
23	68	F	84	F	73	R
24	66	F	82	F	68	F
25	61	F	81	F	66	F
26	61	F	79	F	66	F
27	63	F	82	F	66	F
28	69	F	91	F	77	F
29	73	F	77	F	63	F
30	59	R	63	C	61	C
M.	60.07		73.93		63.70	
H.	73.		91.		77.	
L.	43.		55.		50.	

Mean of the Month, . . 65.90

JULY, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	59	C	64	C	59	C
2	58	C	63	C	58	C
3	59	R	70	C	65	F
4	60	F	76	F	62	F
5	59	F	80	F	64	F
6	58	F	64	F	60	F
7	57	C	62	C	56	C
8	54	F	65	F	59	F
9	57	F	69	F	63	R
10	62	C	68	F	66	F
11	66	F	76	F	74	F
12	72	R	86	C	73	C
13	73	F	80	F	70	F
14	70	R	73	C	73	F
15	68	F	81	F	70	F
16	59	F	80	F	62	F
17	58	F	80	F	68	F
18	62	F	81	F	74	F
19	66	F	89	F	75	F
20	68	F	89	F	72	F
21	69	F	93	F	72	F
22	72	C	88	F	76	F
23	76	C	89	F	71	C
24	69	C	87	F	72	F
25	68	F	79	C	72	C
26	71	F	81	F	75	F
27	74	F	89	F	77	R
28	71	C	82	F	68	F
29	66	C	78	F	68	C
30	62	F	74	F	64	F
31	62	C	69	C	66	C
M.	64.68		77.58		67.87	
H.	76.		93.		77.	
L.	54.		62.		56.	

Mean of the Month, . . 70.04

AUGUST, 1848.

Day of Month	7 A. M.		2½ P. M.		9 P. M.	
1	68	F	84	F	69	F
2	61	F	74	F	67	F
3	63	F	73	F	66	F
4	65	C	70	F	67	F
5	67	R	87	C	73	F
6	65	F	82	F	70	F
7	64	F	86	F	73	F
8	65	F	91	F	75	F
9	66	F	91	F	75	F
10	65	F	92	F	74	F
11	66	F	90	F	76	F
12	72	F	84	F	73	F
13	69	C	74	F	69	C
14	69	R	82	F	73	F
15	71	F	88	F	75	F
16	73	F	88	F	75	F
17	73	F	89	F	76	F
18	74	R	67	R	63	C
19	62	C	70	F	63	C
20	58	F	68	F	64	F
21	54	F	67	C	62	C
22	57	F	64	F	58	F
23	60	C	65	F	57	F
24	55	F	68	F	57	F
25	50	F	67	F	60	F
26	53	F	68	F	61	F
27	58	C	68	F	60	F
28	58	C	67	C	66	R
29	68	C	80	F	67	F
30	60	F	88	F	71	F
31	61	F	79	F	68	F
M.	63.55		77.77		67.84	
H.	74.		92.		76.	
L.	50.		64.		57.	

Mean of the Month, . . 69.72

SEPTEMBER, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	66	F	78	C	68	R
2	60	F	76	F	69	F
3	61	F	78	F	66	F
4	62	F	82	F	67	F
5	63	F	75	F	68	F
6	68	F	79	F	65	F
7	54	F	69	F	58	F
8	51	F	72	F	60	F
9	56	F	78	R	65	F
10	59	F	67	F	60	F
11	60	F	81	F	67	F
12	64	R	63	C	54	F
13	43	F	58	F	52	F
14	43	C	59	C	54	C
15	63	R	71	C	54	F
16	45	F	61	C	53	C
17	42	F	60	F	55	F
18	54	R	64	C	56	F
19	52	F	72	F	59	F
20	59	F	75	C	69	C
21	57	C	70	F	59	F
22	49	R	55	F	46	F
23	41	F	54	C	47	F
24	48	F	64	F	54	F
25	50	C	63	C	59	F
26	49	F	59	F	44	F
27	36	F	52	C	46	C
28	38	F	63	F	50	F
29	49	C	66	C	63	C
30	63	C	78	F	68	F
M.	53.50		68.07		58.50	
H.	68.		82.		69.	
L.	36.		52.		44.	

Mean of the Month, . . 60.02

OCTOBER, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	63	C	69	C	61	R
2	52	R	48	R	48	R
3	49	R	51	R	52	R
4	52	C	56	R	53	C
5	52	C	66	F	55	F
6	47	F	55	F	52	F
7	43	F	67	F	55	F
8	54	R	58	C	44	F
9	36	F	57	F	46	F
10	48	C	59	C	46	F
11	35	F	50	F	43	F
12	40	F	62	F	50	F
13	35	F	47	F	40	F
14	34	F	49	F	43	F
15	41	F	61	F	50	F
16	43	F	68	F	60	F
17	61	F	71	C	61	F
18	58	C	57	R	57	R
19	56	C	57	C	52	C
20	48	F	55	C	45	F
21	38	C	51	C	46	C
22	36	F	51	F	42	F
23	36	F	52	F	43	F
24	40	C	52	C	50	C
25	46	F	54	F	45	F
26	40	C	52	C	45	C
27	38	F	50	C	43	F
28	35	F	53	F	45	F
29	50	C	62	C	60	C
30	57	C	58	C	56	C
31	56	C	60	C	57	C
M.	45.77		56.71		49.84	
H.	63.		71.		61.	
L.	34.		47.		40.	

Mean of the Month, . . 50.77

NOVEMBER, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	43	C	52	F	44	F
2	36	F	51	F	41	F
3	39	F	49	F	40	F
4	33	F	49	C	47	C
5	48	C	56	R	44	F
6	35	F	49	F	41	F
7	36	F	47	F	36	F
8	29	F	43	F	36	F
9	34	S	43	C	30	F
10	21	F	31	F	22	F
11	15	F	31	F	30	F
12	30	S	39	C	40	R
13	33	C	37	F	30	F
14	22	F	40	F	32	F
15	36	F	48	C	39	F
16	33	F	48	F	42	F
17	42	F	47	F	40	F
18	35	F	42	F	32	F
19	28	C	37	C	36	C
20	30	R	34	C	32	S
21	28	F	39	F	33	F
22	28	F	41	F	35	F
23	30	F	41	C	36	F
24	29	C	42	C	46	R
25	53	F	53	F	42	F
26	34	F	46	F	36	F
27	33	F	36	F	29	F
28	24	F	36	F	31	F
29	34	F	48	F	41	F
30	45	F	56	F	43	F
M.	33.20		43.70		36.87	
H.	53.		56.		47.	
L.	15.		31.		22.	

Mean of the Month, . . 37.92

DECEMBER, 1848.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	32	F	43	F	37	F
2	43	C	58	R	50	F
3	38	F	46	F	38	F
4	40	C	51	C	45	C
5	41	C	43	C	42	R
6	39	C	39	C	34	R
7	35	R	37	R	33	R
8	34	C	56	F	53	C
9	41	F	47	F	40	F
10	42	C	45	R	45	R
11	40	F	46	F	36	F
12	31	C	38	C	32	C
13	33	C	43	C	41	C
14	41	C	47	C	45	C
15	46	R	49	C	38	F
16	29	F	43	C	44	C
17	42	F	49	F	41	F
18	40	F	48	F	41	F
19	43	F	57	F	52	F
20	42	C	43	C	39	C
21	36	C	29	C	21	S
22	19	S	25	S	13	S
23	13	F	17	F	12	F
24	9	C	23	C	36	C
25	39	C	40	R	43	R
26	31	F	32	F	24	F
27	14	C	21	S	32	S
28	29	F	32	F	25	F
29	24	S	29	S	34	S
30	28	S	33	C	29	F
31	30	F	37	F	28	F
M.	33.68		40.19		36.22	
H.	46.		58.		53.	
L.	9.		17.		12.	

Mean of the Month, . . 36.70

JANUARY, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	20	F	29	F	26	F
2	10	F	10	F	5	F
3	—1	F	17	F	14	F
4	13	F	22	F	18	F
5	15	C	16	C	18	F
6	19	F	27	F	19	F
7	13	F	23	C	14	F
8	11	F	30	C	29	C
9	28	F	31	C	25	C
10	8	F	13	F	7	F
11	—1	F	9	F	6	F
12	5	F	21	F	16	F
13	23	C	37	C	37	C
14	42	C	47	F	41	C
15	35	C	37	R	36	F
16	28	F	31	F	26	F
17	31	C	42	F	33	F
18	12	F	13	F	10	F
19	2	F	11	F	10	F
20	11	F	32	F	34	F
21	29	F	38	F	32	F
22	12	F	19	F	17	F
23	22	F	34	F	26	F
24	26	F	44	F	40	F
25	42	C	43	C	41	R
26	44	C	52	R	41	F
27	23	F	29	F	21	F
28	18	F	26	C	28	C
29	35	C	42	C	42	C
30	41	C	35	F	20	C
31	11	F	17	F	11	F
M.	20.22		28.29		23.97	
H.	44.		52.		42.	
L.	—1.		9.		5.	

Mean of the Month, . . 24.16

FEBRUARY, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	17	S	27	C	26	C
2	32	C	37	C	35	F
3	28	F	27	F	19	F
4	17	F	35	F	27	F
5	31	S	27	C	28	C
6	13	F	29	C	20	S
7	11	F	28	F	11	F
8	6	F	23	C	24	S
9	26	F	27	F	17	F
10	7	F	17	F	18	F
11	31	C	25	C	20	C
12	13	S	9	S	8	S
13	6	F	19	F	12	F
14	11	F	24	F	17	F
15	5	F	16	F	9	F
16	3	F	16	F	13	F
17	9	C	18	C	14	C
18	13	C	20	F	12	F
19	4	F	14	F	6	F
20	2	F	21	C	15	C
21	14	F	31	C	27	C
22	26	C	32	C	30	C
23	27	C	37	C	32	F
24	26	F	40	F	36	F
25	34	C	38	C	35	C
26	34	C	35	C	33	C
27	33	C	35	C	33	C
28	31	C	37	C	34	C
M.	18.21		26.57		21.82	
H.	34.		40.		36.	
L.	2.		14.		6.	

Mean of the Month, . . 22.20

MARCH, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	36	C	46	F	38	F
2	27	F	33	C	29	C
3	25	F	33	C	26	F
4	21	F	32	F	26	F
5	19	F	34	F	29	F
6	27	F	36	C	32	F
7	33	C	35	R	34	S
8	31	F	39	F	34	F
9	29	F	36	F	29	F
10	24	F	34	F	30	F
11	24	F	38	F	31	F
12	25	F	43	F	38	F
13	31	F	48	F	39	F
14	35	C	36	C	34	C
15	37	C	40	R	37	R
16	36	C	41	F	36	F
17	35	F	53	C	45	F
18	34	F	46	F	35	F
19	28	F	37	F	33	F
20	37	F	51	C	48	C
21	52	R	56	R	53	R
22	34	F	41	F	31	F
23	26	F	38	F	34	F
24	36	F	54	C	44	F
25	40	C	44	C	46	R
26	38	R	40	R	35	R
27	34	C	43	C	40	C
28	37	R	43	C	40	R
29	42	C	47	R	44	R
30	41	C	45	R	43	R
31	44	C	59	F	52	C
M.	32.84		41.96		36.93	
H.	52.		59.		53.	
L.	19.		32.		26.	

Mean of the Month, . . 37.24

APRIL, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	37	F	44	F	34	F
2	31	F	43	F	36	F
3	33	F	59	F	52	F
4	48	F	63	F	50	F
5	50	C	54	C	46	C
6	38	F	54	F	44	F
7	42	F	57	C	48	F
8	52	F	59	F	46	F
9	38	F	57	F	46	F
10	41	F	48	C	44	R
11	42	F	54	C	40	F
12	33	F	54	F	44	F
13	43	F	50	C	52	C
14	40	F	42	C	28	F
15	23	F	36	F	29	F
16	27	F	38	C	34	C
17	35	F	52	F	42	F
18	40	F	45	C	41	C
19	38	F	44	C	41	C
20	38	F	57	C	42	C
21	34	F	48	F	42	F
22	38	C	43	C	41	C
23	38	C	43	F	42	C
24	49	C	60	F	47	F
25	42	F	58	F	48	F
26	48	F	49	F	43	F
27	42	F	47	F	40	F
28	44	F	49	C	50	C
29	48	F	60	F	49	F
30	44	F	52	F	45	F
M.	39.87		50.63		42.86	
H.	52.		63.		52.	
L.	23.		36.		28.	

Mean of the Month, . . 44.45

MAY, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	56	F	77	F	59	F
2	44	F	57	F	48	F
3	42	F	54	C	49	C
4	51	F	71	C	64	F
5	46	R	49	C	46	C
6	44	C	48	C	45	C
7	45	F	52	C	48	C
8	50	C	56	C	49	C
9	46	C	50	R	46	C
10	49	F	52	F	46	F
11	44	F	51	F	44	F
12	46	F	54	F	49	F
13	51	C	54	R	54	R
14	53	F	65	C	53	C
15	48	F	56	C	51	F
16	47	F	56	F	51	F
17	48	F	58	F	51	F
18	51	F	57	F	50	F
19	50	F	71	F	59	F
20	55	F	78	F	63	F
21	61	F	84	C	50	C
22	50	C	56	F	50	C
23	60	F	82	C	65	F
24	47	C	49	C	46	C
25	44	R	48	C	45	C
26	47	F	57	F	52	F
27	51	F	70	F	58	F
28	55	F	59	F	51	F
29	53	C	58	C	53	C
30	52	R	53	R	51	R
31	51	C	53	R	50	R
M.	49.58		59.19		51.48	
H.	61.		84.		65.	
L.	42.		48.		44.	

Mean of the Month, . . 53.42

JUNE, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	55	C	58	F	54	C
2	54	F	66	F	64	F
3	66	F	76	C	68	F
4	68	F	84	R	68	R
5	57	F	70	F	63	F
6	56	F	73	F	63	F
7	59	F	71	F	64	F
8	61	C	54	C	52	C
9	51	F	62	F	60	F
10	61	F	63	C	55	F
11	51	F	61	F	55	F
12	54	F	62	F	56	F
13	52	F	66	F	60	F
14	57	F	69	F	63	F
15	61	F	81	F	68	F
16	68	F	88	F	72	F
17	65	F	75	F	67	F
18	63	F	83	F	75	F
19	69	F	91	F	78	F
20	75	F	86	F	78	F
21	76	F	91	F	83	F
22	76	F	97	F	84	F
23	79	F	91	F	80	F
24	68	F	78	F	72	R
25	68	F	84	F	74	F
26	67	F	85	F	71	F
27	61	F	83	F	73	F
28	63	C	64	C	61	C
29	58	R	59	R	57	C
30	58	F	80	F	70	F
M.	62.56		75.03		66.83	
H.	79.		97.		84.	
L.	51.		54.		52.	

Mean of the Month, . . 68.14

JULY, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	64	F	73	F	63	F
2	59	F	64	C	58	C
3	54	F	62	C	59	F
4	57	F	67	F	60	F
5	57	C	64	C	60	C
6	62	F	79	F	68	F
7	68	F	80	F	70	F
8	70	F	80	F	74	F
9	69	F	72	F	68	F
10	69	F	86	F	72	F
11	71	F	93	F	82	F
12	75	F	95	F	85	F
13	78	F	98	F	86	F
14	79	F	76	C	74	F
15	56	F	74	F	64	F
16	58	F	75	F	68	F
17	62	F	84	F	71	F
18	64	F	87	F	70	F
19	69	F	89	F	74	F
20	69	F	92	F	74	F
21	72	R	79	C	71	F
22	67	F	84	F	72	F
23	65	F	73	F	65	F
24	62	F	69	F	64	F
25	63	C	69	F	63	F
26	67	C	81	F	74	C
27	69	F	87	F	72	F
28	62	F	78	C	68	F
29	60	F	81	F	71	F
30	64	F	82	F	72	F
31	74	C	91	F	74	R
M.	65.64		79.48		69.55	
H.	79.		98.		86.	
L.	54.		62.		58.	

Mean of the Month, . . 71.56

AUGUST, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	62	C	69	R	62	F
2	59	F	72	F	65	F
3	61	F	78	F	68	F
4	61	F	76	F	70	R
5	63	F	72	F	66	F
6	66	C	72	C	70	R
7	64	C	87	F	72	F
8	63	F	80	F	71	F
9	65	C	74	C	67	C
10	69	C	75	R	67	R
11	67	C	74	R	67	R
12	67	C	69	R	66	R
13	67	C	77	F	69	C
14	64	C	68	F	66	R
15	63	F	75	F	65	F
16	59	F	77	F	69	F
17	62	F	80	F	70	F
18	65	C	77	F	69	F
19	64	C	73	F	68	C
20	66	C	73	F	66	F
21	63	C	80	F	70	C
22	69	F	81	F	73	F
23	66	C	67	R	63	R
24	61	F	72	F	64	F
25	61	F	82	F	71	F
26	65	F	87	F	73	F
27	66	F	84	F	70	F
28	69	F	84	C	72	C
29	70	C	82	F	71	C
30	68	F	75	F	68	F
31	69	F	82	C	72	R
M.	64.64		76.58		68.39	
H.	70.		87.		73.	
L.	59.		67.		62.	

Mean of the Month, . . 69.87

SEPTEMBER, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	55	R	67	C	60	F
2	52	F	66	F	58	F
3	50	F	68	F	59	F
4	53	F	71	F	62	F
5	63	F	73	C	66	F
6	64	F	72	F	67	F
7	67	C	85	F	63	C
8	53	F	64	F	58	F
9	51	F	68	F	60	F
10	51	F	66	F	60	F
11	55	F	68	F	61	F
12	56	F	76	F	62	F
13	57	F	79	F	68	F
14	62	C	68	F	62	C
15	60	C	70	F	62	F
16	61	C	72	F	66	C
17	67	C	77	C	71	C
18	60	F	71	F	58	F
19	46	F	61	F	52	F
20	49	C	60	F	55	F
21	52	F	62	F	55	F
22	52	F	64	C	60	C
23	60	C	66	R	58	C
24	50	F	63	F	54	F
25	51	F	72	F	61	F
26	59	F	78	C	61	R
27	50	F	60	F	51	F
28	50	F	72	F	61	F
29	56	F	66	C	59	C
30	51	C	57	C	55	C
M.	55.43		68.73		60.17	
H.	67.		85.		71.	
L.	46.		57.		51.	

Mean of the Month, . . . 61.44

OCTOBER, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	52	R	50	R	45	R
2	39	F	56	F	49	F
3	46	C	55	F	49	C
4	51	R	54	R	52	R
5	49	C	54	C	49	C
6	46	C	54	F	50	R
7	46	R	48	R	42	C
8	42	C	52	C	49	C
9	41	F	54	F	49	F
10	47	C	52	R	52	R
11	53	R	52	C	47	C
12	46	F	57	F	52	F
13	43	F	56	F	47	F
14	37	F	50	F	44	F
15	35	F	55	F	47	F
16	46	F	64	F	54	F
17	53	F	67	F	60	F
18	57	F	60	C	51	F
19	47	F	54	C	50	F
20	39	F	52	F	46	F
21	40	F	54	C	51	F
22	53	C	58	R	59	F
23	49	F	65	F	55	F
24	47	F	50	C	44	C
25	39	F	56	F	50	F
26	41	F	51	F	47	F
27	46	F	62	F	54	F
28	46	F	56	C	53	C
29	55	C	67	C	64	R
30	50	F	53	F	46	F
31	39	F	44	F	35	F
M.	45.80		55.22		49.74	
H.	57.		67.		64.	
L.	35.		44.		35.	

Mean of the Month, . . 50.26

NOVEMBER, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	28	F	41	F	36	F
2	31	F	47	F	38	F
3	33	F	52	F	50	F
4	49	F	61	F	52	F
5	48	C	52	R	51	R
6	50	C	52	C	52	C
7	51	C	58	C	58	C
8	53	C	56	C	54	C
9	54	R	54	R	54	C
10	53	C	54	R	51	C
11	47	C	52	F	47	C
12	43	F	54	F	46	F
13	41	F	54	F	48	F
14	44	F	61	F	50	F
15	39	F	48	F	39	F
16	33	F	49	F	42	F
17	34	F	52	F	46	F
18	40	F	52	C	46	C
19	46	C	49	R	46	R
20	39	C	46	R	44	C
21	41	C	51	F	45	F
22	38	F	48	F	45	F
23	45	C	53	C	49	C
24	44	C	54	F	51	C
25	49	C	55	C	57	C
26	58	F	60	F	53	C
27	39	F	48	F	40	F
28	33	F	44	F	36	F
29	32	F	42	F	35	F
30	35	F	44	F	38	F
M.	42.33		51.43		46.63	
H.	58.		61.		58.	
L.	28.		41.		35.	

Mean of the Month, . . 46.80

DECEMBER, 1849.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	38	F	49	F	26	F
2	14	F	30	C	29	C
3	34	S	40	R	35	R
4	32	C	36	C	36	C
5	33	C	39	F	36	F
6	34	C	41	F	34	F
7	25	F	31	F	24	F
8	21	F	29	C	24	F
9	19	C	30	C	31	C
10	34	C	39	C	36	C
11	31	F	29	F	20	F
12	16	F	28	F	22	F
13	21	C	35	C	33	C
14	32	F	36	C	34	C
15	27	F	38	C	34	C
16	38	C	43	R	46	C
17	40	F	46	F	36	F
18	23	F	31	F	26	F
19	18	F	33	C	30	S
20	40	C	47	F	47	R
21	36	F	40	F	30	F
22	29	C	39	R	48	R
23	27	F	36	F	35	F
24	34	R	37	C	30	S
25	28	F	19	F	10	F
26	4	F	18	C	20	C
27	23	F	33	F	29	F
28	27	F	31	F	27	F
29	30	S	37	S	31	R
30	26	F	31	F	28	F
31	23	S	22	F	22	F
M.	27.64		34.61		30.61	
H.	40.		49.		48.	
L.	4.		18.		10.	

Mean of the Month, . . 30 95

JANUARY, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	13	F	28	C	22	F
2	20	F	31	C	28	C
3	26	C	27	C	27	S
4	29	F	35	F	31	F
5	20	F	29	F	24	F
6	18	F	29	F	21	F
7	21	F	32	C	36	R
8	30	C	32	C	31	C
9	24	C	30	C	32	F
10	30	F	27	F	23	F
11	26	C	37	R	45	R
12	36	C	44	F	40	F
13	28	F	32	F	23	F
14	17	C	24	F	22	F
15	20	F	34	F	29	F
16	31	F	37	F	29	F
17	23	F	34	C	34	C
18	36	C	37	S	34	S
19	25	F	34	F	28	F
20	22	F	32	F	28	F
21	26	C	34	C	37	R
22	40	R	36	C	38	F
23	30	F	40	F	33	F
24	25	F	37	C	36	C
25	36	R	41	C	41	F
26	37	F	45	F	41	F
27	40	C	46	C	40	F
28	32	F	39	C	34	S
29	28	F	31	F	25	F
30	17	F	29	F	22	F
31	13	F	35	F	32	F
M.	26.42		34.13		31.16	
H.	40.		46.		45.	
L.	13.		24.		21.	

Mean of the Month, . . 30.57

FEBRUARY, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	31	F	42	F	33	F
2	30	C	35	C	31	C
3	38	R	39	F	21	F
4	12	F	22	F	19	F
5	10	F	12	F	6	F
6	1	F	15	F	16	F
7	19	S	30	C	26	F
8	21	C	36	C	35	C
9	40	C	49	R	45	R
10	51	C	50	C	38	F
11	32	F	42	F	36	F
12	33	F	39	F	30	F
13	25	F	38	F	34	F
14	29	F	39	C	41	R
15	36	F	40	C	31	F
16	18	F	30	F	28	F
17	24	F	44	F	36	F
18	33	F	49	F	40	F
19	35	C	42	C	33	F
20	24	F	39	F	38	F
21	40	F	46	F	39	F
22	24	F	28	F	24	F
23	15	F	31	F	27	F
24	24	F	37	F	34	F
25	37	C	46	F	40	F
26	34	F	54	F	45	F
27	37	F	45	F	34	F
28	22	F	34	C	34	C
M.	27.68		37.61		31.92	
H.	51.		54.		45.	
L.	1.		12.		6.	

Mean of the Month, . . 32.40

MARCH, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	40	R	44	C	39	F
2	30	F	39	F	36	F
3	28	C	21	C	16	F
4	12	F	25	F	23	F
5	21	F	34	F	31	F
6	28	F	43	C	36	R
7	39	R	37	C	36	C
8	33	C	37	F	31	F
9	25	F	41	F	37	F
10	35	C	38	F	34	C
11	25	F	34	F	31	F
12	31	S	36	C	32	F
13	32	F	51	F	50	R
14	53	R	59	F	55	R
15	38	F	50	F	40	F
16	36	F	41	C	38	C
17	37	C	41	C	36	C
18	38	S	35	S	34	S
19	30	F	37	F	26	F
20	15	F	26	F	21	F
21	20	F	35	F	31	F
22	27	F	42	F	36	F
23	35	S	34	S	28	S
24	25	F	37	F	30	F
25	25	F	34	F	28	F
26	25	F	36	F	31	F
27	29	C	38	C	34	C
28	32	S	34	S	30	F
29	27	F	42	F	35	F
30	32	F	46	F	39	F
31	34	F	45	F	38	F
M.	30.22		38.45		33.61	
H.	53.		59.		55.	
L.	12.		21.		16.	

Mean of the Month, . . 34.09

APRIL, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	35	F	51	F	44	F
2	40	F	52	F	50	F
3	48	F	63	F	53	F
4	46	R	39	S	33	S
5	33	S	36	C	34	C
6	31	S	34	S	33	F
7	29	F	49	F	44	F
8	39	F	58	C	42	F
9	24	F	34	F	32	F
10	28	F	43	F	35	F
11	29	F	42	F	38	F
12	36	C	42	F	38	C
13	37	C	40	R	36	C
14	32	C	36	F	31	C
15	30	F	38	F	33	F
16	30	F	35	F	30	F
17	26	F	40	F	30	F
18	26	F	47	F	41	F
19	39	F	50	C	42	F
20	38	F	44	F	40	F
21	38	F	46	F	42	F
22	40	C	48	R	49	C
23	53	C	54	F	43	F
24	35	F	51	F	46	F
25	46	F	68	F	56	F
26	53	F	67	F	55	F
27	55	C	60	F	53	F
28	53	F	66	F	52	F
29	48	R	61	R	52	F
30	48	F	65	F	55	F
M.	38.17		48.63		42.06	
H.	55.		68.		56.	
L.	24.		34.		31.	

Mean of the Month, . . 42.95

MAY, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	56	F	51	C	46	F
2	40	F	51	F	46	F
3	42	F	61	F	54	F
4	51	F	49	C	46	R
5	43	R	43	C	46	R
6	52	R	65	C	54	C
7	48	F	62	F	54	F
8	51	F	66	F	54	F
9	52	R	55	C	49	F
10	44	F	52	C	47	F
11	48	F	57	C	47	C
12	42	F	56	F	50	F
13	54	F	71	F	61	F
14	50	F	53	F	47	F
15	49	R	50	R	49	R
16	50	C	58	R	53	F
17	53	F	67	C	58	C
18	46	F	54	F	48	F
19	44	F	62	F	52	F
20	50	F	58	C	49	R
21	49	R	52	C	49	C
22	44	F	56	F	50	F
23	51	C	52	F	47	C
24	48	F	56	F	50	F
25	52	C	51	C	48	C
26	49	C	51	R	47	R
27	49	R	56	R	55	C
28	58	F	53	C	50	C
29	47	R	55	C	52	F
30	50	C	52	C	47	C
31	50	F	54	C	48	F
M.	48.77		55.77		50.10	
H.	58.		71.		61.	
L.	40.		43.		46.	

Mean of the Month, . . 51.55

JUNE, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	48	C	56	F	48	F
2	49	F	62	C	56	F
3	55	F	66	F	60	F
4	58	F	62	F	58	F
5	58	F	71	F	66	F
6	63	F	86	F	65	F
7	63	F	86	F	65	F
8	63	F	84	F	65	F
9	66	F	78	F	70	F
10	64	R	72	F	51	C
11	51	C	63	F	58	F
12	57	F	77	F	64	F
13	64	F	83	F	70	F
14	67	F	83	F	73	F
15	68	F	64	F	60	F
16	57	F	63	F	60	F
17	57	F	80	F	62	F
18	63	F	87	F	72	F
19	69	F	91	F	79	F
20	77	F	91	R	73	F
21	72	F	82	F	68	F
22	65	F	79	C	65	C
23	58	R	63	C	59	C
24	60	C	78	F	70	F
25	61	F	72	F	64	F
26	60	F	78	F	68	F
27	67	F	83	F	69	F
28	66	C	72	F	62	C
29	64	R	68	F	64	C
30	71	F	85	F	75	F
M.	62.03		75.50		64.63	
H.	77.		91.		79.	
L.	48.		56.		48.	

Mean of the Month, . . 67.39

JULY, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	71	F	74	C	62	C
2	62	C	68	R	60	C
3	62	C	61	R	62	C
4	64	C	76	F	71	R
5	78	F	92	F	85	F
6	78	F	88	F	72	F
7	64	F	76	F	68	F
8	68	F	79	F	70	F
9	62	F	71	F	64	F
10	61	F	75	F	66	F
11	61	C	70	F	62	F
12	60	F	82	F	66	F
13	66	F	82	F	66	F
14	68	F	79	C	72	F
15	74	F	88	F	76	F
16	74	F	88	F	76	F
17	77	F	88	F	76	F
18	75	F	88	F	75	F
19	68	R	70	R	70	R
20	70	F	75	C	70	F
21	68	F	79	F	72	F
22	68	F	81	F	74	F
23	72	F	79	F	70	F
24	68	F	90	F	76	F
25	78	F	83	C	70	F
26	59	F	74	F	66	F
27	56	F	72	F	66	F
28	62	R	74	C	72	F
29	78	R	86	C	77	F
30	77	F	74	C	68	R
31	68	C	76	F	70	F
M.	67.48		78.55		70.00	
H.	77.		92.		85.	
L.	56.		61.		60.	

Mean of the Month, . . 72.01

AUGUST, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	78	R	76	C	70	F
2	65	R	72	F	68	C
3	68	C	74	F	69	C
4	71	R	76	C	74	F
5	78	C	74	C	68	C
6	70	C	78	F	72	R
7	69	F	78	F	72	F
8	65	F	72	F	64	F
9	63	C	71	F	70	R
10	68	F	78	F	64	F
11	58	F	78	F	66	F
12	58	F	78	F	68	F
13	68	F	79	C	67	R
14	61	C	70	F	64	F
15	62	F	66	C	62	C
16	58	F	74	F	61	F
17	58	F	68	F	58	F
18	52	F	68	F	60	F
19	54	F	66	F	60	F
20	55	F	64	C	60	C
21	59	F	74	F	66	F
22	59	F	76	F	65	F
23	59	C	79	F	68	F
24	65	F	80	F	72	F
25	68	C	65	R	65	R
26	65	F	80	R	65	F
27	60	F	71	F	62	F
28	50	F	75	F	64	F
29	58	F	80	F	69	F
30	64	F	83	C	69	C
31	67	C	80	F	66	F
M.	62.51		74.13		66.06	
H.	78.		83.		74.	
L.	50.		64.		58.	

Mean of the Month, . . 67.57

SEPTEMBER, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	68	F	83	F	72	F
2	68	C	78	F	73	C
3	74	C	70	R	68	C
4	61	F	75	F	67	C
5	64	F	77	F	68	F
6	69	F	80	C	71	F
7	71	C	66	R	65	R
8	65	R	69	C	65	C
9	56	F	73	C	64	F
10	59	F	75	F	62	F
11	60	F	77	C	61	F
12	58	F	61	C	52	F
13	48	F	61	F	52	F
14	47	F	65	F	57	F
15	47	F	61	F	56	F
16	48	F	62	F	55	F
17	47	F	62	F	54	F
18	50	F	63	C	58	F
19	56	C	61	C	60	C
20	56	C	71	C	58	F
21	51	F	68	F	58	F
22	52	F	73	F	56	F
23	56	F	77	F	61	F
24	61	F	77	C	68	F
25	60	F	67	C	58	F
26	54	C	57	R	54	C
27	58	R	55	R	54	R
28	60	R	71	F	58	F
29	48	F	56	F	45	F
30	40	F	60	F	52	F
M.	56.73		68.20		60.13	
H.	74.		83.		73.	
L.	40.		55.		45.	

Mean of the Month, . . 61.69

OCTOBER, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	48	F	66	F	53	F
2	52	C	62	R	52	R
3	47	F	53	F	46	F
4	45	F	65	F	52	F
5	48	F	72	F	57	F
6	58	F	63	F	47	F
7	57	F	52	F	40	F
8	53	F	51	F	48	F
9	46	F	63	F	54	F
10	46	F	61	F	51	F
11	52	C	59	C	57	C
12	58	C	66	F	56	C
13	45	F	55	F	45	F
14	39	F	60	F	48	F
15	38	F	62	F	49	F
16	48	F	66	F	55	F
17	49	C	60	F	55	F
18	55	C	60	R	63	R
19	61	F	70	F	54	F
20	43	F	54	C	47	F
21	41	F	54	F	46	F
22	41	F	64	F	54	F
23	58	F	67	F	58	F
24	62	F	68	F	60	C
25	56	C	59	C	56	C
26	57	C	60	C	61	R
27	56	F	55	C	45	R
28	37	F	53	F	50	F
29	38	F	46	F	35	F
30	29	F	54	F	44	F
31	37	F	54	F	47	F
M.	46.74		59.87		51.13	
H.	62.		72.		63.	
L.	29.		46.		35.	

Mean of the Month, . . 52.58

NOVEMBER, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	46	F	63	F	55	F
2	51	C	59	C	54	C
3	49	C	53	C	49	C
4	50	C	54	F	50	C
5	50	C	55	F	55	C
6	34	F	60	F	53	F
7	44	F	48	F	39	F
8	31	F	50	C	42	C
9	39	F	50	F	39	F
10	35	F	53	F	44	F
11	37	F	59	F	48	F
12	39	C	55	C	46	C
13	38	C	46	F	37	F
14	30	F	44	F	38	F
15	31	F	47	F	41	F
16	43	C	49	C	47	R
17	46	C	51	F	41	C
18	36	F	47	F	39	F
19	34	F	47	F	39	F
20	32	F	47	F	41	F
21	34	C	42	F	34	F
22	28	C	39	F	31	C
23	24	C	37	F	31	C
24	27	C	34	F	28	F
25	27	F	41	F	34	F
26	35	S	37	R	35	C
27	37	C	44	R	50	C
28	45	R	38	C	39	R
29	36	R	41	C	41	F
30	40	C	44	F	40	F
M.	38.26		47.80		42.07	
H.	54.		63.		55.	
L.	24.		34.		28.	

Mean of the Month, . . 42.71

DECEMBER, 1850.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	32	F	30	F	41	F
2	32	C	39	C	37	C
3	35	C	41	C	43	R
4	38	F	30	F	46	F
5	40	R	42	F	39	F
6	33	F	38	C	32	S
7	33	S	38	S	32	R
8	28	F	28	F	26	F
9	21	F	34	F	33	C
10	31	F	37	C	25	C
11	21	F	27	C	29	C
12	28	F	38	C	37	C
13	18	F	18	F	12	F
14	10	F	25	F	28	F
15	30	C	37	F	31	F
16	34	C	39	F	37	R
17	40	R	37	C	26	F
18	17	F	24	F	19	F
19	14	S	22	S	34	F
20	22	F	38	S	22	F
21	16	F	38	C	31	F
22	33	C	30	C	32	S
23	34	R	18	S	12	F
24	7	F	12	F	9	F
25	12	F	25	C	26	S
26	25	F	34	F	28	F
27	24	F	34	F	29	F
28	24	F	34	C	34	S
29	14	S	21	C	22	C
30	11	F	16	F	9	C
31	7	F	18	C	19	C
M.	24.64		31.35		28.13	
H.	40.		50.		46.	
L.	7.		12.		9.	

Mean of the Month, . . 28.04

JANUARY, 1851.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	16	F	30	F	28	F
2	8	F	17	F	18	F
3	27	F	24	F	14	F
4	15	S	15	C	10	C
5	4	F	20	C	23	C
6	30	F	30	C	25	C
7	25	C	28	C	19	F
8	13	F	25	F	17	F
9	23	C	32	C	34	R
10	39	F	42	F	38	F
11	34	F	41	F	33	F
12	31	F	42	F	36	F
13	32	F	40	F	32	F
14	28	F	38	F	38	F
15	38	F	48	F	40	F
16	40	F	40	C	38	C
17	38	C	45	F	34	C
18	23	F	25	F	17	F
19	12	F	20	F	21	F
20	31	R	34	C	36	C
21	30	F	34	F	29	F
22	30	C	34	C	29	C
23	34	C	42	F	35	F
24	29	F	44	F	40	F
25	33	F	39	F	34	F
26	38	F	52	F	38	F
27	31	C	28	F	23	F
28	20	C	31	C	34	R
29	49	R	34	C	13	F
30	6	F	6	F	1	F
31	1	F	5	F	4	F
M.	26.06		31.78		26.80	
H.	49.		52.		40.	
L.	1.		5.		1.	

Mean of the Month, . . 28.21

FEBRUARY, 1851.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	3	F	19	C	19	C
2	25	S	30	C	26	F
3	27	F	38	F	32	F
4	27	F	39	C	34	F
5	32	F	39	C	35	F
6	28	C	22	F	10	F
7	4	F	17	F	14	F
8	5	F	6	C	7	C
9	13	C	17	C	20	S
10	29	C	53	R	54	R
11	50	R	46	C	29	F
12	16	F	26	F	22	F
13	20	F	38	F	32	C
14	36	C	51	C	46	C
15	48	R	54	R	52	C
16	38	C	37	F	28	F
17	22	F	30	F	28	F
18	30	F	42	F	32	F
19	23	F	34	F	30	F
20	30	C	44	C	43	R
21	43	R	37	R	36	R
22	34	C	44	F	40	F
23	34	F	50	F	38	F
24	36	C	42	R	36	R
25	36	F	39	F	32	F
26	28	F	39	F	34	F
27	33	F	42	F	40	F
28	42	C	42	R	38	C
M.	28.28		36.32		31.70	
H.	50.		54.		54.	
L.	3.		6.		7.	

Mean of the Month, . . 32.10

MARCH, 1851.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	23	F	39	F	31	F
2	30	C	39	C	34	C
3	34	F	32	F	26	F
4	23	F	39	C	37	F
5	40	F	38	F	38	F
6	40	C	58	F	38	C
7	33	C	37	C	35	C
8	30	S	33	S	28	S
9	25	F	36	C	32	F
10	29	C	36	S	34	C
11	27	F	45	C	40	C
12	34	F	31	F	23	F
13	22	C	34	S	22	C
14	15	F	28	F	27	F
15	37	F	57	F	48	F
16	37	C	32	C	32	C
17	33	C	35	C	32	S
18	32	S	31	S	28	S
19	29	C	39	C	35	C
20	33	C	39	C	33	C
21	35	F	44	F	35	F
22	35	F	48	F	41	F
23	35	F	47	F	40	F
24	36	C	46	C	44	F
25	35	F	42	F	33	F
26	28	F	50	F	40	F
27	43	F	63	C	59	C
28	52	F	58	F	42	F
29	36	F	45	F	40	F
30	35	F	64	F	54	F
31	54	F	72	F	60	F
M.	33.22		43.13		36.80	
H.	54.		72.		60.	
L.	15.		28.		22.	

Mean of the Month, . . 37.72

APRIL, 1851.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	41	F	50	F	45	F
2	38	F	48	C	44	R
3	41	R	57	F	49	F
4	40	F	59	F	51	F
5	46	F	54	F	46	F
6	51	F	59	C	56	R
7	45	F	59	F	50	F
8	45	F	61	C	57	R
9	42	F	52	F	46	F
10	45	F	63	F	53	F
11	40	F	44	F	39	F
12	36	F	39	F	33	F
13	28	F	48	F	39	F
14	33	F	43	F	41	F
15	39	R	40	R	40	R
16	37	R	39	R	38	R
17	37	R	37	R	36	C
18	35	C	39	C	37	C
19	40	F	43	F	38	F
20	37	R	34	S	35	S
21	41	C	48	R	40	R
22	43	F	59	F	52	F
23	46	F	62	F	54	F
24	47	F	55	F	52	F
25	44	F	61	F	52	F
26	42	F	63	F	50	F
27	48	F	53	C	47	C
28	46	C	47	C	43	C
29	42	F	57	F	50	F
30	44	F	57	C	46	R
M.	41.30		51.00		45.30	
H.	51.		63.		57.	
L.	28.		34.		33.	

Mean of the Month, . . 45.87

MAY, 1851.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	48	C	57	F	49	C
2	40	F	55	F	47	F
3	40	F	59	F	49	F
4	50	C	62	F	53	R
5	38	R	41	R	40	R
6	41	F	51	C	46	F
7	41	F	51	C	47	F
8	42	F	53	C	50	C
9	47	F	53	C	50	F
10	50	F	62	F	55	F
11	49	R	50	C	48	R
12	49	C	56	C	55	C
13	59	F	84	F	71	R
14	63	F	75	C	59	F
15	51	F	59	F	53	F
16	50	F	71	F	54	F
17	55	F	66	C	61	F
18	58	C	55	C	52	C
19	52	F	57	F	57	F
20	53	C	74	C	65	C
21	66	F	76	F	63	F
22	55	F	70	C	61	R
23	62	C	81	F	58	F
24	48	F	67	F	59	F
25	52	F	72	F	55	F
26	49	F	75	F	63	F
27	61	F	80	F	68	F
28	64	F	80	F	69	F
29	54	C	49	R	47	R
30	47	C	48	C	47	C
31	49	F	59	F	53	F
M.	51.06		62.84		54.97	
H.	66.		84.		71.	
L.	38.		41.		40.	

Mean of the Month, . . 56.29

JUNE, 1851.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	53	F	60	C	53	C
2	56	C	72	F	63	F
3	55	F	68	F	58	F
4	56	F	72	F	58	F
5	55	F	70	F	61	F
6	53	F	77	F	65	F
7	59	R	51	C	48	C
8	49	F	55	C	50	R
9	49	R	57	C	52	C
10	53	F	70	F	62½	F
11	61½	F	78	F	66	F
12	60½	F	75	F	63½	F
13	56½	F	71½	F	62½	F
14	57	F	73	F	61	F
15	56½	F	76½	F	56½	F
16	49½	R	58½	C	52½	F
17	48½	F	64½	F	56½	F
18	55	F	78½	F	64	F
19	58	F	77½	F	60½	F
20	62	F	81½	C	71	C
21	68	F	74	C	74	C
22	67	C	84	F	75	F
23	68	C	72	R	65	C
24	54	C	60	C	65	C
25	62	F	81	F	72	F
26	68	F	87	F	74	R
27	69	C	86	F	74	F
28	67½	F	81½	F	72½	F
29	69½	F	89	F	77½	F
30	74½	F	89	F	80	F
M.	59.00		73.00		63.80	
H.	74.50		89.		80.	
L.	48.50		51.		48.	

Mean of the Month, . . 65.27

JULY, 1851.

Day of Month	7 A. M.	2½ P. M.	9 P. M.
1	70 C	73½ F	69 R
2	68 F	79½ F	73 F
3	67 F	73½ C	68 C
4	63½ C	62½ F	62½ R
5	61½ F	76½ F	66 F
6	64½ F	83 F	67½ F
7	69 C	73 C	65½ F
8	59½ F	73 F	65 F
9	61½ C	72 C	70 C
10	71½ F	83 C	71 R
11	68½ F	83 F	70½ F
12	64½ F	81 F	69 F
13	65½ F	76 R	60½ F
14	60½ F	71½ F	67 F
15	62½ F	84 F	72 F
16	70 C	78½ C	70 F
17	72 F	91½ F	78½ F
18	72½ F	89 F	77 F
19	73½ C	72 R	72 R
20	70½ F	81 F	71 F
21	67½ F	83 F	72½ F
22	65 F	87 F	72 F
23	71½ F	88 F	76 F
24	71 F	76 C	73½ C
25	74 F	85 F	78½ R
26	69½ F	87 F	73 F
27	68½ F	77 C	66½ R
28	66½ F	68½ C	64 C
29	60½ R	59 C	57½ R
30	58 F	65½ C	57½ F
31	56 F	69½ C	61½ C
M.	66.58	77.50	68.95
H.	73.50	91.50	78.50
L.	56.	59.	57.50

Mean of the Month, . . 71.01

AUGUST, 1851.

Day of Month	7 A. M.	2½ P. M.	9 P. M.
1	60½ C	67 F	61½ F
2	59 F	78 F	68 F
3	63½ F	84½ F	69½ F
4	65½ F	69 C	61 R
5	60 C	79 F	71 F
6	65½ F	80½ F	69 F
7	67½ F	84½ C	69 R
8	70 F	84½ F	77 F
9	68½ R	83 C	68 F
10	64 F	77 F	66½ F
11	60½ F	77½ F	69 F
12	67½ F	84 F	70 F
13	67 F	87 R	70 R
14	72 C	75½ F	65 F
15	59½ F	73 F	66 F
16	60 F	76 F	65½ F
17	59 C	63½ C	58½ C
18	59 F	70½ F	62½ F
19	57½ F	74½ F	66 F
20	58½ F	69 C	66½ C
21	61 C	69 F	63½ F
22	64½ C	78½ C	75½ C
23	71½ F	85 F	72½ F
24	65½ F	82 F	71½ F
25	68 F	86½ F	75 F
26	58½ C	67 F	58 F
27	54 F	70½ F	61 F
28	54½ F	77 F	62 F
29	57 F	81 F	68 F
30	62 F	85 F	65 F
31	63½ F	84 F	74 F
M.	62.72	77.51	67.28
H.	72.	87.	77.
L.	54.	67.	58.

Mean of the Month, . . 69.17

SEPTEMBER, 1851.

Day of Month	7 A. M.	2½ P. M.	9 P. M.
1	63 F	69 F	61½ F
2	57 C	62 R	59 R
3	56½ R	57 C	57½ C
4	55 F	67 F	60 F
5	56½ F	80½ F	67½ F
6	63½ F	85½ F	73½ F
7	68 F	85½ F	76½ F
8	71½ F	82½ C	77 C
9	73 F	74 F	67 F
10	65 F	87 F	72½ F
11	73½ F	85½ C	73 F
12	70 C	79 F	78½ F
13	73 F	85 C	60 C
14	51½ F	63½ F	51½ F
15	44½ F	61½ F	51 F
16	45½ F	68½ F	57 F
17	49½ F	65 F	53½ F
18	46 F	71½ F	58½ F
19	53 F	77 F	63½ F
20	58 F	81 F	64 F
21	62½ F	78 C	53 R
22	47½ C	53 F	49 C
23	47 C	57 R	60½ R
24	51½ F	56½ F	45 F
25	39 F	55½ F	47½ F
26	41 F	57½ C	55½ F
27	56½ R	62½ C	59 R
28	56 C	61 C	57½ C
29	58 R	61 C	58 F
30	51 F	64 C	55 F
M.	56.78	69.78	60.75
H.	73.	87.	78.50
L.	39.	53.	45.

Mean of the Month, . . . 62.44

OCTOBER, 1851.

Day of Month	7 A. M.	2½ P. M.	9 P. M.
1	52 F	60½ C	52 F
2	44 F	61 F	52½ F
3	45 C	59 F	52 C
4	46½ F	62 C	56 F
5	52 F	58 C	50 F
6	43½ F	60½ F	53 F
7	47 F	67½ F	56 F
8	51½ F	76½ F	62 F
9	53½ C	67 F	60 F
10	52½ F	69 F	60 F
11	54 F	67 F	65 F
12	61½ C	63 R	63 C
13	69 C	71½ R	62 F
14	52 F	66½ C	56 C
15	50½ F	57½ F	47½ F
16	40½ F	55 F	45½ F
17	35 F	57 F	47½ F
18	45 C	60 F	56 F
19	49 R	51½ C	48½ F
20	48½ F	63 F	53 F
21	50½ C	70½ F	63 F
22	56 R	53½ R	51 R
23	41 F	51 F	42½ F
24	40 F	57 F	48½ F
25	48½ F	62 C	55 R
26	51 C	51 R	43 R
27	33 S	39 C	33 F
28	34 C	52½ F	49½ C
29	42 C	62½ F	57½ C
30	59 C	67 F	62 R
31	58½ F	59½ C	49½ F
M.	48.58	60.60	53.29
H.	69.	76.50	65.
L.	33.	39.	33.

Mean of the Month, . . 54.16

NOVEMBER, 1851.

Day of Month	7 A. M.	2½ P. M.	9 P. M.
1	45 F	54½ F	46 F
2	47½ C	56½ R	55½ C
3	47 C	53 C	46 C
4	38½ C	40½ C	37½ C
5	33½ F	43 F	36 F
6	30 F	38 C	33½ C
7	28½ F	40 F	32½ F
8	30½ F	51 F	44½ C
9	43½ F	51½ C	43 C
10	42 C	40 R	32½ F
11	24½ F	31 F	24 F
12	20 F	36½ F	30 F
13	31 C	34½ F	27½ F
14	25 C	39 C	33½ C
15	39 R	43½ C	39 F
16	36 F	40 C	30½ F
17	31½ C	41½ R	33½ F
18	31 F	38½ F	32 F
19	27½ F	37 F	32 F
20	26½ C	38½ F	37 C
21	38½ R	49 R	48 R
22	40 F	45 C	39 C
23	33½ F	45 F	38 F
24	35½ F	41 F	35 F
25	29½ C	33 S	35 R
26	30 C	35 F	29 F
27	26½ F	39½ F	32 F
28	35 R	40½ R	38½ R
29	35½ F	39½ C	33 F
30	27½ F	37 F	29 F
M.	33.65	41.75	36.08
H.	47.50	56.50	55.50
L.	20.	31.	24.

Mean of the Month, . . 37.16

DECEMBER, 1851.

Day of Month	7 A. M.	2½ P. M.	9 P. M.
1	24 F	30½ F	28 F
2	22½ F	30½ F	24 F
3	21 F	31 F	24½ F
4	26½ F	33 C	25 C
5	26½ C	27 F	20 C
6	16 F	27 F	23 F
7	26 C	29 S	29½ C
8	31½ C	42 R	42 F
9	32½ F	35 F	28 F
10	25 F	37½ F	35 F
11	16½ F	18½ F	16 F
12	14 C	23 C	28 C
13	24½ F	36½ C	24 F
14	12 F	21½ C	22 C
15	32 S	32 C	24½ C
16	24 F	20½ F	12½ F
17	½ F	12½ F	6½ F
18	1½ F	15 F	13 F
19	13 F	26½ F	18 F
20	25½ F	32 F	22½ F
21	14½ F	23½ C	17 F
22	12 C	22 C	19½ C
23	16½ S	19 F	13½ F
24	9½ F	23½ C	24 C
25	25½ F	16 F	5½ F
26	0 F	9 F	3½ F
27	1 F	18½ C	20½ C
28	29½ C	44 R	47 R
29	42 F	48 F	39½ F
30	33½ F	41 C	43½ F
31	43½ F	45½ C	41½ R
M.	20.73	28.08	23.90
H.	43.50	48.	47.
L.	0.	9.	3.50

Mean of the Month, . . 24 24

JANUARY, 1852.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	37	R	40⅓	C	33	F
2	25½	F	31½	F	26½	F
3	22	S	30	S	26½	S
4	32	S	32	S	30	S
5	32	S	32½	C	32½	F
6	32	C	32	S	31	S
7	28	S	23	F	15	F
8	11½	F	23½	F	17	F
9	13	C	32	S	33	C
10	26⅓	C	34	F	32	C
11	30⅓	S	34	C	26½	C
12	26½	C	26½	F	18½	C
13	14½	F	22	F	15	F
14	10	F	24½	C	23	C
15	26½	C	34½	F	19	C
16	—2	F	10½	C	11½	C
17	16	F	18	F	10½	F
18	8	C	9	S	7	S
19	2½	S	5	C	—0½	F
20	—3	F	8½	F	2½	F
21	10	C	20⅓	C	11	F
22	1½	F	14½	F	7½	F
23	4	F	19	F	12⅓	F
24	8	F	28½	F	24½	F
25	21	F	42	F	31	F
26	35	F	40½	C	30	F
27	14½	F	25½	F	17½	F
28	21	F	35½	C	35	C
29	35	C	43½	F	33½	F
30	28	C	31	C	28½	C
31	26	C	23½	S	25	S
M.	19.13		26.69		21.47	
H.	37.		43.50		35.	
L.	—3.		5.		—0.50	

Mean of the Month, . . 22.43

FEBRUARY, 1852.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	29½	S	22	S	19½	S
2	21½	C	29½	F	20	F
3	15	F	31½	F	21	F
4	22	C	39½	F	33	C
5	32	F	44⅓	F	37	F
6	33⅓	F	43½	C	35	C
7	37½	F	40	F	33	F
8	23	F	30	F	24	F
9	23	F	38½	F	33	F
10	31	F	46½	F	38	F
11	44	R	51	C	43½	C
12	36½	C	35	F	23	C
13	18	F	29	C	24½	S
14	24	S	25	C	18	F
15	10½	F	27½	C	23½	C
16	31	S	32	C	21	F
17	13½	F	25	F	16	F
18	16	F	25	F	11½	F
19	5⅓	F	19	C	10½	F
20	4½	F	20½	F	13	F
21	6	F	29½	C	25½	C
22	28	S	35	C	30½	F
23	36	C	42	F	36	F
24	33	F	44½	C	36½	F
25	39⅓	F	46½	C	38	F
26	27⅓	F	34	F	26	F
27	17½	C	31½	F	28	F
28	27	S	31	S	34½	R
29	26	F	27	F	19	F
M.	24.55		33.63		26.62	
H.	44.		51.		43.50	
L.	4.50		19.		10.50	

Mean of the Month, . . 28.27

MARCH, 1852.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	21	C	24	C	23½	C
2	27½	C	18	S	15	F
3	9	F	20⅓	F	15½	F
4	10⅓	F	27½	F	24	F
5	25½	C	30⅓	C	26	C
6	23	F	32½	C	29	C
7	23½	F	36	F	28⅓	F
8	24	C	36	F	34⅓	C
9	37	R	54	C	47½	F
10	38	F	43⅓	F	31½	F
11	27½	F	38	F	32	F
12	34⅓	C	52⅓	F	48½	C
13	47	C	57⅓	C	50	C
14	40	R	38⅓	C	35	R
15	35	C	45⅓	C	40	R
16	34½	F	48½	F	38½	F
17	34	C	37	C	35	C
18	32½	R	33½	R	32	R
19	29	F	36	F	28	F
20	21½	F	29⅓	F	22½	F
21	17½	F	33⅓	C	28	S
22	28	C	37	F	32	C
23	34	S	40	C	35	F
24	31	C	39½	F	33	C
25	32	S	38½	F	32½	F
26	30⅓	C	48	F	38½	F
27	35⅓	F	44	C	40	C
28	37	F	46	F	36½	F
29	36	C	36⅓	C	35	C
30	31⅓	F	37⅓	C	32	C
31	34½	C	36½	S	34½	R
M.	29.74		37.94		32.69	
H.	47.		57.50		50.	
L.	9.		18.		15.	

Mean of the Month, . . 33 46

APRIL, 1852.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	33½	F	51	F	41½	F
2	36	F	53	C	35	R
3	30	F	38	F	32	F
4	29	F	43	F	36½	F
5	34	C	39½	C	36	C
6	30½	S	29½	C	28½	C
7	31	C	44	F	36½	F
8	32½	F	48	F	39⅓	F
9	36	C	41½	C	35½	C
10	38½	F	49	F	41½	F
11	36	F	54	F	44	F
12	41½	C	40½	C	36	C
13	32	S	32	S	34	S
14	33⅓	F	41½	C	36½	C
15	36½	R	36	R	40⅓	R
16	35⅓	S	45	C	38½	F
17	36⅓	F	50	F	42	F
18	38⅓	C	39	C	36½	R
19	36½	R	37	R	37	R
20	37	R	38	R	38	R
21	43	C	43½	R	41½	C
22	42	C	47½	R	44	F
23	42⅓	F	52	C	42½	C
24	39⅓	C	51	C	40	C
25	35⅓	F	56	F	47½	F
26	47	C	61	F	46	C
27	44	C	56½	F	43	F
28	40	F	47½	C	42½	F
29	41	F	59	F	50	F
30	46	F	63	F	51½	F
M.	37.17		46.22		39.80	
H.	47.		63.		51.50	
L.	29.		29.50		28.50	

Mean of the Month, . . 41.06

MAY, 1852.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	46	C	50	C	42	R
2	43	C	57½	F	50⅓	C
3	47⅓	F	58⅓	F	42⅓	F
4	39½	F	53½	F	48½	F
5	46	F	72	F	61	F
6	54	F	81½	F	66	F
7	58½	F	86	F	66	F
8	56½	F	82	F	59	F
9	56½	F	77½	F	63	F
10	59⅓	C	67	F	56½	F
11	53⅓	F	59	F	53	F
12	52⅓	C	49⅓	R	47	R
13	47⅓	R	45½	R	45	R
14	43⅓	C	45⅓	C	44	C
15	46½	C	50½	F	46½	C
16	48	C	60½	F	57	F
17	53½	C	70	F	59½	C
18	51	F	66½	F	56½	F
19	51	F	62	F	52	F
20	51½	C	67	F	50	F
21	46⅓	F	68	F	57½	F
22	55⅓	F	77½	F	63	F
23	60⅓	F	76⅓	F	62½	F
24	54	F	57½	C	49⅓	C
25	61½	F	70	F	59½	F
26	51	F	59	F	55⅓	F
27	51⅓	C	58	R	53⅓	C
28	52½	F	63	F	56½	F
29	54	F	74½	F	61	F
30	67⅓	F	74½	F	56½	F
31	52	F	69	F	61	F
M.	52.00		64.80		54.89	
H.	67.50		86.		66.	
L.	39.50		45.50		42.	

Mean of the Month, . . 57.23

JUNE, 1852.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	55	F	76	F	61⅓	F
2	60	F	81	C	67½	F
3	69	F	69⅓	R	69	F
4	60⅓	C	62½	C	56	C
5	49½	F	65	F	56	F
6	52	F	73	F	59	F
7	59½	F	71½	F	62	F
8	63½	C	71	R	64	R
9	66	C	75½	F	64	F
10	60	F	77	F	61	F
11	50	F	68	C	59	C
12	53	C	66	F	58	C
13	58	F	78	F	67	F
14	63	F	67	F	70	F
15	70	C	86	R	72	F
16	77	F	95	F	80	F
17	75	F	85	C	68	F
18	62	C	69	C	64	C
19	65	F	77	F	69	F
20	65½	F	74	F	68½	F
21	65	F	79½	F	70½	F
22	68½	F	79	C	64	R
23	59	F	75	F	66½	F
24	59½	F	73½	F	66	F
25	61½	F	66	C	59	F
26	59	F	79	F	67	F
27	64½	F	80½	F	68½	F
28	67⅓	F	76	F	71	F
29	67½	F	85½	F	71	F
30	68	F	89	R	70	F
M.	62.45		75.66		65.63	
H.	77.		95.		80.	
L.	49.50		62.50		56.	

Mean of the Month, . . 67.91

JULY, 1852.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	68	R	79	F	68	C
2	70	C	76½	F	65	C
3	60½	F	74	F	64	F
4	62⅔	F	82	F	70½	F
5	67⅓	F	86	F	74	F
6	68⅓	F	76½	F	66	F
7	62⅔	C	79½	F	67	F
8	67	F	90	F	74	F
9	72	F	95½	F	79½	F
10	71⅓	F	93	F	76	F
11	72½	F	88½	F	75	F
12	75	F	90	F	80½	F
13	77	C	87½	F	73½	F
14	75	F	73½	C	70	R
15	68	F	79	F	68½	F
16	63½	F	81	F	69½	F
17	66	C	64½	R	59	C
18	58½	F	71	F	64	F
19	59	F	73½	F	66½	F
20	65½	F	88½	F	76	F
21	70½	F	91½	F	81	F
22	75½	F	92½	F	80½	F
23	74	F	87	F	74	F
24	64	F	75	F	68½	F
25	61⅓	F	78½	F	68½	F
26	67½	C	64⅔	R	62⅔	C
27	64	F	78	F	70½	F
28	61½	F	81	F	68½	F
29	67	F	87	F	74	F
30	70⅓	F	85	C	73	C
31	66⅔	F	78½	F	67	F
M.	67.50		81.53		70.79	
H.	77.		95.50		81.	
L.	58.50		64.50		59.	

Mean of the Month, . . 73.27

AUGUST, 1852.

Day of Month	7 A. M.		2½ P. M.		9 P. M.	
1	64	C	75	F	64	F
2	59½	C	72	C	67	C
3	62	F	70	C	67	C
4	64	F	75	C	65	R
5	62	R	70	F	65	F
6	59	C	70	F	61	C
7	62½	F	73	C	61½	R
8	60½	F	78	F	69	F
9	65	F	70½	R	69	F
10	64½	F	75½	F	67	F
11	63	R	71	C	62	F
12	57½	F	74½	F	65	F
13	61	F	82⅓	F	70½	F
14	65	F	85⅓	F	69½	F
15	66	F	86½	F	72	F
16	59	F	75	F	64	F
17	61	F	74	F	63½	F
18	59½	F	78½	F	66	F
19	65	F	87⅓	F	77	F
20	65	C	64½	R	62½	C
21	62	C	72	F	63	F
22	57	F	71	F	61½	F
23	57½	F	76	F	64	F
24	62	F	82½	F	69	F
25	69½	C	76½	C	67½	R
26	66⅔	R	72	C	67	C
27	68	C	69½	F	66	R
28	66	F	76⅓	C	70	R
29	63	R	61	R	59½	R
30	60	R	59⅓	R	58	R
31	59	C	65⅓	F	63	C
M.	62.43		73.89		65.68	
H.	69.50		87.50		77.	
L.	57.		59.50		58.	

Mean of the Month, . . 67.33

SEPTEMBER, 1852.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	61½	F	81	F	72	F
2	68	F	85½	F	74	F
3	67½	F	86⅔	F	73½	F
4	65½	F	75	F	68⅔	F
5	57½	F	73	F	63½	F
6	57½	F	80½	F	65	F
7	60½	F	84½	F	71	F
8	67	F	83	F	73½	F
9	68	F	83	F	74½	F
10	65	F	80	C	67⅓	C
11	67	C	67½	R	66	C
12	68½	R	72	C	67⅓	C
13	61⅓	C	67½	F	54⅓	F
14	48½	F	66⅓	F	58½	F
15	59	R	60½	R	58	R
16	49	F	63	F	51	F
17	45	F	65⅓	F	56	F
18	49½	F	65½	F	55	F
19	51½	F	64	C	59	C
20	56½	F	72	C	64½	C
21	62	C	76	F	66	F
22	65	F	72½	F	59	F
23	52	F	65⅓	F	52	F
24	53½	F	59½	C	53	C
25	51⅓	C	59	C	55½	C
26	53½	R	64½	C	54	F
27	47½	F	60	F	50	F
28	52	C	69½	F	60	F
29	53⅓	C	61	F	47	C
30	40½	F	54	F	47½	F
M.	57.50		70 58		61.23	
H.	68.50		86.50		74.50	
L.	40.50		54.		47.	

Mean of the Month, . . 63.10

OCTOBER, 1852.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	40⅓	F	56	C	52⅓	F
2	49⅓	F	67	F	60½	F
3	51⅓	F	58½	F	51	F
4	52½	C	59⅓	R	60	C
5	49	F	61	F	49	F
6	43½	C	61⅓	F	54½	F
7	52	F	69½	C	60	C
8	57½	C	67	C	56	C
9	51	C	55½	F	54	C
10	56	C	64⅓	C	59	R
11	57½	F	66⅓	F	57	F
12	48	C	68½	F	59	F
13	54	C	55	C	51	C
14	45⅓	C	52	C	48	R
15	40½	R	48	S	44	C
16	37	F	43	C	36⅓	C
17	31½	F	49	C	43½	R
18	43	C	54	F	57	C
19	56	C	58	F	47⅓	C
20	41⅓	C	44	C	45½	C
21	42½	C	49⅓	F	46	F
22	46	F	55⅓	C	50	F
23	44	F	58⅓	F	48	F
24	45	F	65⅓	F	52	F
25	50	F	63	F	51	F
26	39	F	47⅓	F	36	F
27	31⅓	F	48½	C	45	C
28	47½	C	61	F	55½	F
29	53	F	56⅓	C	52	C
30	47½	R	50	R	52	R
31	44	R	46½	C	45½	C
M.	46 69		56.77		50.92	
H.	57.50		69.50		60.50	
L.	31.50		43.		36.	

Mean of the Month, . . . 51.46

NOVEMBER, 1852.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	44	R	47	C	47	R
2	48	R	55	C	54	C
3	49	F	57	F	47	F
4	42	F	49½	C	41⅓	F
5	39½	C	45	C	38⅓	F
6	31⅓	F	42½	C	40	R
7	44	R	47	C	42½	F
8	38	F	50½	F	42	F
9	37½	C	43⅓	F	39½	C
10	35⅓	C	46⅓	F	39	C
11	33	F	46½	F	39	F
12	41⅓	C	49	R	41	F
13	35	F	40½	C	38	C
14	35	C	36½	C	33	C
15	28	F	37	C	32⅓	F
16	34½	F	43½	F	35⅓	F
17	32	F	44	F	37⅓	F
18	37	C	42½	C	36⅓	C
19	35½	C	38½	C	35½	C
20	34	C	37½	C	35	F
21	26	F	36	F	28½	F
22	24	F	35	C	35	C
23	34⅓	R	37	C	36	C
24	21	F	27⅓	F	24⅓	F
25	25½	F	38⅓	C	37½	C
26	36	C	41½	R	47	R
27	58	R	49	C	38⅓	F
28	35	F	42½	F	34½	F
29	33½	C	45	C	42	F
30	33	F	41	F	33	F
M.	36.03		43.07		38.33	
H.	58.		57.		54.	
L.	21.		27.50		24.50	

Mean of the Month, . . 39.14

DECEMBER, 1852.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	36	F	45	F	35	F
2	33	F	49	F	40½	F
3	36⅓	F	50½	F	43½	F
4	44⅓	R	46	R	46	R
5	43	C	46⅓	R	46½	F
6	42⅓	F	51½	F	44	F
7	46⅓	C	60	F	51	F
8	55	F	55	F	45	F
9	37	F	46½	C	46	C
10	44	C	50	C	46½	C
11	39	R	38	C	35	R
12	34	F	38	F	33½	F
13	29	F	34	C	34	C
14	25½	F	29	F	20⅓	F
15	14½	F	24	C	20⅓	F
16	15	F	31	C	31½	C
17	35	R	39	C	35⅓	C
18	28½	F	31½	F	28⅓	F
19	23	F	31	C	31⅓	F
20	39½	C	43	C	35½	C
21	29	C	27	C	21	F
22	9½	F	17	F	15	F
23	16	C	29	S	33	R
24	38½	C	50	F	48	C
25	42	C	43	C	33½	C
26	37	R	42	C	36	F
27	29½	F	38½	C	33	S
28	38⅓	C	56⅓	C	40	F
29	33½	F	38	F	33½	F
30	32	C	37⅓	C	39½	C
31	32	C	28⅓	R	27	R
M.	33.50		40.18		35.79	
H.	55.		60.		51.	
L.	9.50		17.		15.	

Mean of the Month, . . 36.49

JANUARY, 1853.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	25	C	32	R	33	R
2	22	F	32	C	31	C
3	32	C	35½	C	31½	C
4	28	C	24½	S	20½	S
5	21	F	29	F	20	F
6	15½	F	33½	F	29	F
7	27½	F	43½	F	38	F
8	33½	F	45½	F	35	F
9	35	C	48½	F	41½	F
10	34	F	43½	F	37	F
11	37	C	48	F	35	F
12	26½	C	30	C	28	C
13	29	S	19	S	20	S
14	25	C	28½	C	29½	C
15	28½	F	36	F	28½	F
16	24½	F	13	C	7½	F
17	8	F	23	F	17	F
18	20½	C	29½	S	26½	C
19	21	F	30	C	21	F
20	21½	F	30½	F	26½	F
21	21	F	35	F	27	F
22	21	F	39	F	32	F
23	33½	C	38½	R	38	C
24	36	C	41	F	34½	C
25	29½	F	33	F	29	C
26	12½	F	18½	F	7½	F
27	4	F	23½	F	16½	F
28	12	F	28½	F	21	F
29	16	F	34½	F	27½	F
30	30	F	40	C	32½	F
31	20½	F	28½	C	22	F
M.	24.22		32.74		27.21	
H.	37.		48.50		41.50	
L.	4.		13.		7.50	

Mean of the Month, . . 28.06

FEBRUARY, 1853.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	15	F	31	F	24½	F
2	28½	C	40	F	38	C
3	41½	C	43½	C	40	C
4	35	C	41½	C	40	R
5	40	R	47	C	46½	C
6	49	C	58	F	52	R
7	37	C	37	R	36½	F
8	28½	F	37	C	29½	F
9	24	F	31½	F	21	F
10	16½	F	29	C	31	C
11	33	F	41	C	36½	F
12	35	F	33	F	22	F
13	27	S	31½	C	18	F
14	16	F	23	F	16½	F
15	8	F	23½	F	24½	F
16	32	C	37	R	43½	R
17	32	F	32½	F	24½	F
18	17½	F	26½	C	23½	C
19	18	C	20½	C	16½	C
20	7½	F	25½	F	23	F
21	18	F	30½	F	25	F
22	25½	F	42	C	41	C
23	42½	R	50	R	40	F
24	28	F	33	F	21	F
25	21	F	31½	F	25	F
26	18	F	31½	F	24	F
27	18½	F	38	F	30½	F
28	30	C	32	S	33	R
M.	26.52		34.93		30.25	
H.	49.		58.		52.	
L.	7.50		20.50		16.50	

Mean of the Month, . . 30.57

MARCH, 1853.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	27	C	32	R	33½	R
2	28	F	42	F	37	F
3	34½	F	38	C	33½	F
4	28	F	39½	F	34½	F
5	31	S	32	C	29	F
6	22	F	36	C	30½	F
7	25½	F	40	F	33½	F
8	35	F	46	F	37	C
9	37	C	39½	R	36½	F
10	28	F	40	F	32½	C
11	33½	C	37½	C	34	R
12	33	C	34	C	35	F
13	37	F	45	F	36½	F
14	30½	F	36½	F	20	F
15	10½	F	23	F	16	F
16	12½	F	30	F	23½	F
17	22½	F	43	C	37	C
18	40½	R	44½	C	40½	F
19	34½	F	38½	F	32	F
20	30	F	50	F	45	F
21	45	F	62	F	50½	F
22	43	F	56½	F	41½	F
23	35	F	49½	C	41	C
24	33	F	41	C	36	F
25	33	F	45	C	40	C
26	40	C	48	F	38½	R
27	37	F	45½	C	36	F
28	34½	F	41½	C	38½	C
29	35½	F	50½	F	43	F
30	42	C	58½	F	49	F
31	40	F	55	C	47½	C
M.	32.21		42.58		36.08	
H.	45.		62.		50.50	
L.	10.50		23.		16.	

Mean of the Month, . . 36.96

APRIL, 1853.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	39	R	41	C	39	F
2	33½	F	44	F	36	F
3	34	F	53½	C	39⅓	C
4	36½	C	41	R	40	R
5	42½	R	43½	C	41	F
6	38	F	50½	C	42½	R
7	35	F	50	F	39	F
8	38	F	54	F	46	F
9	47½	C	64	F	51	C
10	41	F	50	F	39½	F
11	33	F	50½	F	40½	F
12	38	F	49½	C	44	R
13	47	R	56½	F	50	R
14	42½	R	38	C	36½	R
15	33½	F	48½	F	40½	F
16	34½	F	48½	C	42	C
17	38½	R	38	C	38	C
18	37½	F	45	F	42	F
19	36	F	60	F	45½	F
20	47	R	46	C	45½	C
21	46½	C	52½	F	46½	F
22	43½	F	52½	F	51	R
23	49½	F	55½	F	43½	F
24	37	F	50	C	43½	C
25	42	C	43	C	37½	R
26	37	F	48½	C	44	F
27	41	F	66	F	51½	F
28	46½	F	76	F	54	F
29	50½	F	74	F	58	F
30	50½	F	61½	F	53½	F
M.	40.55		51.72		44.03	
H.	50.50		76.		58.	
L.	33.		38.		36.	

Mean of the Month, . . 45.43

MAY, 1853.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	42	F	53½	F	41	F
2	39	F	59	F	51½	F
3	46½	C	52	F	49	F
4	46	F	52	F	46	F
5	44½	C	46½	C	43	R
6	41½	C	49½	C	47½	F
7	42	F	59½	F	49	F
8	45½	C	54½	C	45½	R
9	44	F	63½	F	55½	F
10	48½	F	70½	F	56½	F
11	51	C	59	R	52	F
12	49	F	68½	C	56	C
13	50½	F	57	C	52½	F
14	46½	F	70	F	60	F
15	54	F	77½	F	59	F
16	59½	F	82½	F	67	F
17	68	F	85	F	72½	F
18	62½	F	52½	C	50	C
19	48½	R	49	R	46½	R
20	46½	F	59½	F	52	F
21	47½	F	70½	F	60	F
22	58	F	78½	F	61	F
23	58	F	75	F	61½	F
24	62½	C	68	F	59	C
25	54	C	62	R	53½	C
26	54½	R	58½	R	52	R
27	56	C	76½	F	67½	C
28	61½	F	79	F	70½	F
29	63½	F	79	F	66½	F
30	64	F	76½	C	65	C
31	52	F	62	C	53½	F
M.	51.84		66.34		55.54	
H.	68.		85.		72.50	
L.	39.		46.50		41.	

Mean of the Month, . . 57.91

JUNE, 1853.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	51½	F	63	F	54½	F
2	50	F	63	F	57½	F
3	59	C	76	F	65	C
4	66½	F	55½	C	55	R
5	56	F	66½	F	59½	F
6	55	F	75	F	59	F
7	57½	F	77½	C	66	F
8	63	C	68	C	60	F
9	55½	F	67	F	58½	F
10	55	F	67	F	63	F
11	60	C	73½	F	60	C
12	60½	F	65½	C	58½	F
13	56	F	74	C	65½	F
14	67	F	77	F	67	F
15	66	F	85½	F	70	F
16	66	F	90	F	74	F
17	69	F	84	C	70	F
18	70	C	84	F	75	C
19	68	F	86	F	74	F
20	69	C	92	F	84	F
21	79	F	95	F	72½	F
22	68½	F	74	C	65½	F
23	65	C	73	F	70	F
24	72½	C	78½	F	66½	F
25	61	F	74½	F	62	F
26	55	F	71	C	58½	F
27	60½	C	64½	R	58	R
28	59	F	69½	F	64	F
29	63½	F	72½	C	67½	C
30	66½	C	85½	F	76	F
M.	62.37		74.93		65.22	
H.	79.		95.		84.	
L.	50.		55.50		54.50	

Mean of the Month, . . 67.51

JULY, 1853.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	72	C	83	F	73½	C
2	66½	F	79½	F	70	F
3	62½	F	79	C	71	C
4	70	R	85½	C	75	F
5	71½	F	84	F	74½	F
6	66½	F	82	F	71½	F
7	64	F	79½	F	69½	F
8	63	F	83	C	73½	F
9	69½	F	86½	C	73	R
10	70½	F	80	C	74	C
11	67	F	78½	F	72	F
12	65½	C	73½	F	66	C
13	63½	F	75	F	68	F
14	63½	F	77	F	69	F
15	63½	F	79½	F	71	F
16	69½	C	77	C	70½	C
17	68	F	81	F	68	F
18	61	F	74	F	68	F
19	66	F	75	C	69	C
20	65	R	74	C	65	F
21	62	F	73	C	67	F
22	65	F	80½	F	71	F
23	67½	C	69½	R	63½	R
24	65	F	78½	F	71	F
25	68	F	85½	F	73	F
26	74	C	75	R	70	C
27	62½	R	63	C	61½	R
28	61½	F	77	F	68	F
29	64	F	79½	C	68½	F
30	65½	F	83	F	74	F
31	73	C	80½	F	71	R
M.	66.34		78.43		70.02	
H.	74.		86.50		75.	
L.	61.		63.		61.50	

Mean of the Month, . . 71.60

AUGUST, 1853.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	69	F	75	C	70	C
2	65½	R	66½	C	61½	C
3	62	F	76	C	67½	C
4	64½	R	66½	R	65½	F
5	65	F	76	F	70	F
6	67	C	70	R	65½	R
7	64½	R	65½	C	63½	C
8	63½	C	73	F	69½	C
9	65½	F	85	F	75½	F
10	71½	F	80	F	73	F
11	71½	F	89½	F	78	F
12	74½	F	92½	F	83	F
13	76½	F	77½	C	74	R
14	74	F	91	R	74½	R
15	66	C	73½	F	66	F
16	66½	F	74	F	67	F
17	63½	C	64	R	63½	R
18	66	R	68	R	69	C
19	60½	C	70½	F	61	F
20	55½	F	74½	F	63½	F
21	58½	F	77	F	66	F
22	63	F	78½	C	67	F
23	56½	F	70	F	64	F
24	57½	F	69	C	66	C
25	69	F	80½	C	69	F
26	60	F	68	F	63	F
27	62½	C	76	C	67	R
28	60	F	70½	F	59	F
29	53½	F	74	F	64½	F
30	58½	F	76½	F	65½	F
31	66	F	79½	C	73½	F
M.	64.44		75.10		67.92	
H.	76.50		92.50		83.	
L.	53.		64.		59.	

Mean of the Month, . . 69.15

SEPTEMBER, 1853.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	65½	F	73½	C	68	F
2	64½	F	82½	F	70	F
3	69	F	83	C	73	F
4	70½	F	85½	F	75½	F
5	72½	F	71½	F	67	C
6	67	C	87½	C	77½	F
7	73	F	86½	F	70½	F
8	64½	F	72½	F	63½	F
9	56½	F	68	C	63	C
10	61½	C	67	C	61	F
11	51½	F	68	F	55	F
12	47½	F	68	F	57½	F
13	51	F	72½	F	62	F
14	59	F	71½	C	65½	R
15	64	R	73½	C	63	R
16	61	F	72	F	63	F
17	57½	C	61	C	59	R
18	60½	R	69½	C	66½	C
19	67½	C	80½	F	68½	F
20	68½	F	78½	F	70½	C
21	65	R	65½	R	64	C
22	61	C	68½	F	63	C
23	56½	F	66	C	60	C
24	54	F	72½	F	64½	F
25	49	F	62½	F	53	F
26	46	F	62½	F	55½	F
27	47½	C	52½	C	53	R
28	54½	R	52	R	45	R
29	46	C	53	F	43	F
30	37	F	58½	F	49	F
M.	58.97		70.20		62.32	
H.	73.		87.50		77.50	
L.	37.		52.		43.	

Mean of the Month, . . . 63.83

OCTOBER, 1853.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	41	F	60	C	55½	C
2	53½	C	63½	F	50½	F
3	43	F	52	C	44½	C
4	39	F	61	F	51	F
5	50½	F	65	C	59	C
6	54	F	54½	C	43½	F
7	37	F	53	F	43½	F
8	38½	F	63½	F	50½	F
9	52	F	67½	F	57	F
10	56½	R	60½	F	49	R
11	40	F	49½	F	41	F
12	38	F	51½	F	45	F
13	40½	F	57	F	49	F
14	42½	F	59	F	48	F
15	48½	F	58	F	48	F
16	45	F	66	F	53½	F
17	43½	F	67	F	53½	F
18	50½	F	54½	F	47	F
19	42	F	67½	F	55	F
20	49½	F	73	F	58½	F
21	51	F	66	F	62	F
22	58½	F	67	C	62½	R
23	62	C	71½	F	57½	F
24	50	C	47½	R	63	R
25	40	C	48	F	40	F
26	36½	F	52½	F	47½	F
27	53	C	60	C	56	C
28	50	R	50	R	45	R
29	36½	F	49	F	39	F
30	31½	F	43	C	40	C
31	35½	F	49	F	40½	F
M.	45.47		58.29		50.18	
H.	62.		73.		63.	
L.	31.50		43.		39.	

Mean of the Month, . . 51.31

NOVEMBER, 1853.

Day of Month	7 A. M.		2½ P. M.		9 P. M.	
1	38½	F	56½	F	45	F
2	43	F	60½	F	48	F
3	45	F	60½	C	51	C
4	37½	F	48½	F	37	F
5	32½	F	43	C	38½	F
6	42	R	45½	F	35½	F
7	29½	F	38½	F	29	F
8	27½	C	36½	R	41	R
9	55½	C	62	F	40½	R
10	34	F	36	F	31½	F
11	28	F	43½	C	41½	C
12	41½	C	55½	F	51½	C
13	51	C	53	R	59½	R
14	48½	C	51½	F	42½	F
15	39½	F	54½	F	46	F
16	39½	C	43	C	39½	C
17	42	C	44½	C	45	R
18	41	C	43½	C	42½	C
19	48	F	62½	F	55	F
20	53	F	47	C	44	R
21	42	R	44	R	41½	R
22	41	F	53	C	50½	F
23	51	F	58	C	45½	F
24	45	C	36½	F	21½	F
25	15	F	27½	F	23½	F
26	23	C	39	F	32	F
27	27	F	31	C	29	F
28	24	C	31	C	31	C
29	33	C	46	F	41	C
30	44	C	55½	C	43½	F
M.	38.73		46.91		40.77	
H.	55.50		62.50		59.50	
L.	15.		27.50		21.50	

Mean of the Month, . . 42.14

DECEMBER, 1853.

Day of Month.	7 A. M.		2½ P. M.		9 P. M.	
1	38	C	38	C	34	C
2	31	C	35	F	29½	F
3	26½	C	31½	C	34½	C
4	23½	F	27	F	21	F
5	16½	F	26	C	23	F
6	25	C	40½	C	46½	C
7	35½	F	36	F	26½	F
8	18½	F	35½	F	29	F
9	22½	F	42	F	32½	F
10	27½	F	42½	F	33	F
11	28½	F	40½	F	33	F
12	34	C	34	C	33	C
13	31½	C	35½	F	31½	F
14	29	C	36	C	32	F
15	27	F	39½	F	33	F
16	28	F	38	F	35	F
17	35½	C	43½	C	42	R
18	49	C	43½	F	27	F
19	19½	F	25	F	18½	F
20	14	F	20	F	15½	F
21	15½	F	28	C	24½	C
22	23½	C	34	F	28½	F
23	32½	R	43	R	32½	S
24	21½	F	26½	F	22	F
25	22½	F	35	C	32	F
26	26	C	33½	C	29½	S
27	28	F	25½	F	19	F
28	10	F	30½	F	30½	C
29	20	S	14	S	8	S
30	5	F	17½	F	19	S
31	18	C	28	C	27½	C
M.	25.26		33.06		28.48	
H.	49.		43.50		46.50	
L.	5.		14.		8.	

Mean of the Month, . . 28.93

JANUARY, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	30	S	32	C	31½	F
2	19	F	27½	F	18½	F
3	9½	F	25	C	19	F
4	31	F	42½	F	38½	F
5	37	F	44½	C	39	C
6	39	C	42	F	29½	C
7	13	F	22½	F	16½	F
8	16	C	27	F	19½	F
9	8	F	16½	F	13½	F
10	13	C	31	C	32	C
11	19	C	26½	C	27	C
12	33	C	51½	R	52	C
13	39½	F	44½	F	40	F
14	35	F	32½	F	27½	F
15	23	F	30½	C	28	C
16	31	C	37	C	40	C
17	37½	C	38	F	32½	F
18	23½	C	26	S	21½	S
19	19½	C	29	F	27½	C
20	32	S	29	C	23½	R
21	35	C	44	F	22	F
22	13½	F	20	F	15½	F
23	19½	C	20½	F	10½	F
24	5½	F	23½	F	19	F
25	— 1	F	6½	F	5½	F
26	20	S	15½	C	34	C
27	34	C	31½	F	27	F
28	12½	F	12	F	3	F
29	— 6	F	8½	F	4½	F
30	— 5½	F	17½	C	18	S
31	23	C	40½	F	33½	F
M.	21.26		28.87		24.82	
H.	39.50		51.50		52.	
L.	—6.		6.50		3.	

Mean of the Month, . . 24.98

FEBRUARY, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	38½	C	42½	C	38½	C
2	39	C	45	F	33½	F
3	18½	S	15½	C	7	F
4	4	F	14	F	6½	F
5	— 2	F	16	C	21½	S
6	10½	C	14½	F	6	F
7	— 1	F	24	C	20½	C
8	21½	S	32½	R	43½	R
9	40½	F	41	F	34	F
10	33½	F	38	C	24	F
11	11	F	16½	F	10½	F
12	9	F	26½	F	24½	F
13	25½	C	34	R	33	R
14	32½	C	35	R	34½	C
15	32½	R	34½	C	33½	R
16	35½	C	33	S	28	F
17	20½	F	27	F	19½	F
18	16	F	38	F	34	F
19	33	C	30½	F	17	F
20	9	F	24	C	25½	C
21	16½	S	24	C	19	F
22	16½	F	39½	F	35	F
23	28	C	12	F	8½	F
24	7	C	22	F	23½	C
25	10	F	19	F	19½	F
26	25½	C	35½	R	45½	R
27	41½	F	32	C	23	F
28	18½	F	34½	F	28	F
M.	21.11		28.59		24.89	
H.	41.50		45.		45.50	
L.	—2.		12.		6.	

Mean of the Month, . . 24.86

MARCH, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	28	F	43	F	35	F
2	31½	F	44½	F	36½	F
3	34½	S	36	R	34	R
4	32½	C	39	C	35½	C
5	34	F	36	C	31½	F
6	28½	F	36½	F	30	F
7	27	F	41	C	39	R
8	35	R	36	R	34	R
9	33½	C	39	C	36	R
10	36	R	37½	C	34½	R
11	35	F	44½	F	36	F
12	31½	F	50½	F	40½	F
13	37	F	61	F	51½	F
14	39	F	40½	C	36	C
15	31½	C	51½	F	44½	C
16	44½	F	66	C	53	R
17	37½	F	50½	C	44	R
18	24½	F	27½	C	22½	F
19	18½	F	31	F	25	F
20	23	C	28½	F	19	F
21	15½	F	30	F	23	F
22	17	F	34½	F	31	C
23	33½	S	37	R	37	R
24	33½	F	36½	F	23½	F
25	19½	F	30	F	22½	F
26	21	F	31½	F	24	F
27	21½	F	34	F	25	F
28	18	F	24½	C	18½	F
29	18½	F	34	F	24½	F
30	19½	F	34	F	31½	F
31	32½	C	36	C	34½	C
M.	28.79		38.77		32.68	
H.	44.50		66.		53.	
L.	15.50		24.50		18.50	

Mean of the Month, . . 33.41

APRIL, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	37	R	53½	C	41½	R
2	33½	F	40½	F	31	F
3	24½	F	36	F	29½	F
4	27½	F	44	C	38	C
5	34½	F	51	F	43½	F
6	41½	F	70	F	56	F
7	54	F	55	F	39	F
8	33½	F	44½	C	40	C
9	41½	C	45	F	38	R
10	38½	R	43½	C	37½	R
11	36	C	45	F	37½	F
12	33	F	51½	F	43½	F
13	38	F	48½	F	41½	F
14	28	F	39	F	34½	F
15	30	S	33	S	33	C
16	32	C	37½	F	35½	C
17	32	S	32	S	32	S
18	32	S	39	C	36½	F
19	35½	F	53½	F	45½	F
20	42	F	58	C	43½	F
21	39½	F	57	C	50	F
22	44	C	53	R	43	R
23	40½	R	51½	C	41½	F
24	39½	F	51	F	49	F
25	44	F	63	F	52½	F
26	54	C	60½	F	51	R
27	56	F	53	C	46½	R
28	40	C	40	R	39	R
29	38½	R	41	C	43	C
30	47½	C	49½	C	49	R
M.	38.27		47.98		41.38	
H.	56.		70.		56.	
L.	24.50		32.		29.50	

Mean of the Month, . . 42.54

MAY, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	49½	F	61	C	52	F
2	48	F	72½	F	61	F
3	55	R	58	C	47½	R
4	45	R	43	R	42½	C
5	45	F	57½	C	53	F
6	41	F	43	C	31½	F
7	33½	F	51½	C	46	F
8	41½	F	60½	F	54	F
9	48½	F	71½	F	61½	F
10	56	F	73	C	58	F
11	59½	C	71½	F	61½	C
12	57½	F	74½	F	64½	F
13	55½	F	78½	F	66	F
14	54½	C	64	F	63½	R
15	63	R	77½	C	68½	F
16	64½	F	75	C	62	F
17	56	F	61½	F	61½	F
18	65	F	75½	C	66½	R
19	61½	C	77	F	64½	F
20	59	F	78	F	66	F
21	62	C	64	F	57	C
22	59	F	72½	C	61½	F
23	54½	F	67½	F	58	F
24	54	F	63	F	60	F
25	58	F	61½	C	57½	R
26	59½	F	64½	C	58	R
27	54	C	64½	F	59	F
28	58	F	71	F	66½	F
29	60½	F	64	F	59	F
30	58½	C	64½	C	64½	C
31	48	F	57½	F	52	F
M.	54.36		65.77		58.21	
H.	65.		78.50		68.50	
L.	33.50		43.		31.50	

Mean of the Month, . . 59.45

JUNE, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	49	F	67	F	57½	F
2	54	F	74	F	65½	F
3	61	F	74½	F	54	F
4	52	C	81½	F	66½	F
5	63½	F	86	F	71	F
6	65	F	68	F	58½	C
7	57	R	71½	C	63	C
8	63½	R	61½	R	64½	C
9	62½	C	77	F	64	F
10	61½	F	69½	C	63½	F
11	62	C	68	C	65½	C
12	62½	F	71½	F	68	F
13	64	F	79	F	67½	F
14	65½	F	79	C	69	F
15	67	F	75	C	67	F
16	64	F	69½	C	61½	F
17	54½	C	73½	F	62	F
18	61	F	79½	F	72	F
19	69½	F	86	R	71½	C
20	69	F	84½	F	71	F
21	59	C	69	C	59½	C
22	59	C	61½	C	56½	R
23	56	R	58½	C	57½	C
24	61½	C	78	F	69	F
25	64½	F	71	C	58½	F
26	57½	F	72	F	65	F
27	64½	F	70	F	64	F
28	63½	C	81½	F	72	R
29	66½	F	73½	C	66	C
30	64½	C	66½	C	64	C
M.	61.48		73.25		64.50	
H.	69.50		86.		72.	
L.	49.		58.50		54.	

Mean of the Month, . . 66.41

JULY, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	64 F	74½ F	69½ F
2	63½ F	81 F	72½ F
3	69 F	91 F	83½ F
4	78 F	95½ F	85 F
5	81½ F	92½ F	81 F
6	71½ F	81 F	71½ F
7	71½ F	84½ F	75 F
8	72½ F	84½ F	74 F
9	74 F	87 F	77½ F
10	72½ C	68½ C	66 F
11	63½ F	73½ F	67 F
12	65 C	73½ C	68 C
13	65½ F	73½ F	66½ F
14	60 R	59½ C	57 R
15	57 C	64½ C	61 C
16	59½ C	67½ F	62 C
17	62 C	67½ F	72 F
18	69 F	77 F	72 F
19	66 F	85 F	76½ F
20	73½ F	86½ F	75½ F
21	73 F	87 F	78½ F
22	73½ F	77 C	76 F
23	76 C	88 F	77½ F
24	76½ F	77 R	73½ C
25	73 R	80 C	75 F
26	75½ C	87½ F	78 F
27	71½ C	81 F	70 F
28	62½ F	82½ F	71½ F
29	70 C	82 F	73½ F
30	74 F	86 F	73 F
31	67 F	85 F	76 F
M.	69.40	80.03	72.76
H.	81.50	95.50	85.
L.	57.	59.50	57.

Mean of the Month, . . 74.06

AUGUST, 1854.

Day of Month	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	69 F	87 F	75½ F
2	77 F	89 F	77 F
3	65½ F	82½ F	71½ F
4	68½ C	69½ R	66 C
5	65 F	78 F	72 F
6	69½ F	85 F	74 F
7	63 F	76½ F	68 F
8	61½ F	77 F	67½ F
9	60 F	73½ F	66½ F
10	60½ C	71½ F	65 C
11	64 C	72 F	65½ F
12	65 F	81½ F	72 F
13	72 C	87 R	75 C
14	66½ F	79 F	68½ F
15	58 C	73½ C	69 C
16	62 F	81 F	70 F
17	64½ C	78½ F	68 C
18	59½ F	76 F	66 F
19	61½ F	80 F	67 F
20	65½ F	85 F	71 F
21	64½ F	74½ F	66 F
22	70 F	87½ F	69 F
23	59½ F	72½ F	64 F
24	63 F	84½ F	76 F
25	71½ F	84½ F	74½ F
26	66 C	71 F	61 R
27	59 C	66 F	59½ F
28	55½ F	68½ F	62 F
29	52 F	65 F	59½ F
30	53½ C	78 F	64½ F
31	67½ F	72½ C	65 C
M.	63.87	77.66	68.42
H.	77.	89.	77.
L.	52.	65.	59.50

Mean of the Month, . . 69.98

SEPTEMBER, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	63 C	61 R	59 C
2	61 R	63½ C	61 C
3	62½ C	80½ F	69½ F
4	65½ F	71 F	64½ F
5	65½ C	85 F	75½ F
6	74 F	91½ F	77 C
7	71½ C	84 F	73 F
8	65½ F	76½ F	67 R
9	74 C	64 R	60 R
10	54 R	52½ C	52 R
11	46½ F	62½ F	55 F
12	55 F	69½ C	65 F
13	58 F	65 F	56 F
14	50 F	63½ C	60½ R
15	62½ R	71½ F	58 C
16	49½ F	65 F	56 F
17	47½ F	64 F	54 F
18	52 F	70 F	59 F
19	64 C	79 F	70 F
20	63½ F	65½ F	50 F
21	41 F	57 F	46 F
22	41 F	60 F	50 F
23	47½ F	68 F	55½ F
24	52½ F	74 F	62½ F
25	59 F	75 F	62½ F
26	61½ F	81 F	67 F
27	62½ F	80½ F	68½ F
28	67 F	72½ F	64 F
29	54 F	60 C	50½ F
30	40 F	58 F	50 F
M.	57.70	69.70	60.62
H.	74.	91.50	77.
L.	40.	52.50	46.

Mean of the Month, . . 62.67

OCTOBER, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	44½ C	58 C	56½ C
2	57 F	65½ F	55½ F
3	50 F	64 C	66½ R
4	67 R	59 C	55 F
5	46 F	56 F	47 F
6	40 F	63½ F	53½ F
7	51½ F	75 F	66 F
8	60½ F	63½ C	59½ C
9	60 F	77 C	68 C
10	52½ F	61 F	49 F
11	49 F	66½ F	60 F
12	62 F	75 F	65 F
13	63½ R	57½ C	53 C
14	53 C	57 R	53½ R
15	48½ R	43½ R	39½ R
16	40 C	54 F	48 F
17	47 F	50 C	43 C
18	37½ F	52½ C	42½ C
19	37 F	47½ C	41 F
20	34 F	50 F	43 F
21	36½ F	51½ F	45½ F
22	37 F	53½ F	45 F
23	44 F	50 C	45 F
24	44 C	50 F	44 F
25	40 F	59 F	50½ F
26	46 F	57½ F	52 F
27	48 F	71½ F	56½ F
28	48½ F	65½ F	59½ F
29	56 C	65½ F	63½ C
30	58½ C	61 C	58 R
31	56½ C	66 R	62 C
M.	48 89	59.58	53.11
H.	67.	77.	68.
L.	34.	43.50	39.50

Mean of the Month, . . . 53.86

NOVEMBER, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	55 F	66½ C	55 C
2	46½ F	55½ F	47½ F
3	51 F	59½ C	51 F
4	39 C	43½ F	30½ C
5	19½ F	32½ F	26½ F
6	19½ F	40 C	38½ C
7	43½ C	47½ R	39½ F
8	35½ F	41½ C	33½ F
9	28 F	41 F	33 F
10	29 F	53½ C	48 F
11	55 C	58½ R	62½ R
12	60 C	55 R	55 R
13	62½ R	64½ R	62 R
14	48 F	48 F	39 F
15	35½ F	37 C	35 S
16	37 R	41 C	39 C
17	34½ F	43½ C	43 C
18	44 C	47½ C	45 C
19	40½ C	44½ F	38 F
20	31½ F	38 F	30½ F
21	28½ F	40½ F	35½ F
22	39½ R	43½ R	35 R
23	34½ F	44 F	38½ F
24	42 C	55½ C	55 R
25	54½ R	59½ F	50½ F
26	49 F	46 F	39 F
27	37 F	42½ F	36 F
28	30 F	44 F	35½ F
29	35 R	34½ R	36 S
30	32 F	37½ F	30 F
M.	39.90	46.87	41.43
H.	62.50	66.50	62.50
L.	19.50	32.50	26.50

Mean of the Month, . . 42.73

DECEMBER, 1854.

Day of Month.	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	23 F	29 F	26 F
2	30 C	31 F	23 F
3	18 F	33 C	36 R
4	36 F	32½ C	23½ C
5	16 F	17½ F	14½ F
6	20 F	30 C	26½ C
7	27 C	35 C	27 C
8	19½ F	22 F	14 F
9	10½ F	25½ F	22½ F
10	31 F	45 C	43 C
11	38 R	38 S	33½ F
12	24 F	27½ F	23½ F
13	19 C	33 C	34½ F
14	34 F	41½ C	39 C
15	33½ F	46½ C	42 R
16	39 C	43½ F	37 C
17	22½ F	28 C	27 C
18	19 C	23½ C	15 F
19	5½ F	13½ F	7 F
20	4½ F	15 F	6 F
21	5½ C	25½ C	20½ F
22	6½ F	8½ C	5½ S
23	6 C	16 C	13½ C
24	19 S	32 R	32 C
25	32 F	39½ C	37 C
26	33½ F	43 F	36½ F
27	36½ R	38½ C	36 F
28	35 R	39½ C	36 C
29	35 C	34½ C	23 S
30	14½ C	21 C	16 F
31	16 F	29 F	22½ F
M.	22.89	30.24	25.77
H.	39.	46.50	43.
L.	4.50	8.50	5.50

Mean of the Month, . . 26.30

JANUARY, 1855.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	19½	F	30	F	21	F
2	17	C	21	C	23	C
3	23	C	34	C	34½	C
4	34½	C	39½	C	39½	C
5	38½	F	40½	F	34	F
6	25	C	26	C	27	C
7	30	C	54	F	51	C
8	38	F	38½	F	32	F
9	29	C	36½	C	33½	F
10	32	F	26	F	17	F
11	13	F	29	C	31	C
12	30½	C	37	F	34	F
13	36½	C	50	C	37	F
14	18	F	16½	F	11	F
15	12	F	29	C	30½	C
16	28	C	29	S	23½	S
17	20	C	26	C	25½	S
18	35	R	39	R	33½	R
19	32	S	28½	S	29	S
20	26½	F	32½	F	29½	F
21	25½	F	32	C	36	R
22	50	R	46	F	32	F
23	24	F	30½	F	23½	F
24	18½	F	30	C	26½	C
25	19	F	29	C	23	F
26	24	S	32	R	37	R
27	22½	F	27	F	22	F
28	20	C	30½	C	35½	R
29	47	R	51	C	39	F
30	26	F	34½	F	28½	F
31	22	F	32½	F	29	F
M.	26.98		33.47		29.97	
H.	50.		54.		51.	
L.	12.		16.50		11.	

Mean of the Month, . . 30.14

FEBRUARY, 1855.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	21½	F	23½	C	21	F
2	16	F	26½	C	27	C
3	26	F	26	C	18	F
4	11	F	16	C	9½	C
5	14	S	15½	F	10½	F
6	— 6	F	— 5	F	—11½	F
7	—16	F	8	C	5	C
8	9	C	28½	S	20	S
9	15	S	17½	S	14½	C
10	10	F	23½	F	14	F
11	3	F	24	C	21½	C
12	10	F	27½	F	20½	F
13	13½	F	32½	F	27½	F
14	20½	F	35½	C	34	R
15	36½	C	38½	R	37½	R
16	35	C	38½	C	36½	C
17	33½	C	35½	C	34	F
18	30	F	40	C	33	F
19	32	F	37½	F	31½	F
20	29	C	37	F	30½	C
21	31½	F	40½	F	32½	F
22	28	F	40½	C	34½	C
23	32	C	23	F	13½	F
24	5	F	17	F	12	F
25	8½	F	17	F	11½	F
26	10	C	21	C	18	C
27	13½	F	25½	F	20	F
28	14½	F	30½	F	22	F
M.	17.37		26.48		21.37	
H.	36.50		40.50		37.50	
L.	—16.		— 5.		—11.50	

Mean of the Month, . . 21.74

MARCH, 1855.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	13½	F	34	F	26½	F
2	19½	F	38½	F	29½	F
3	26	F	44½	C	36½	C
4	34	F	38½	C	31½	F
5	35	F	52	C	42	F
6	44½	F	43	F	34	F
7	22½	F	33½	C	28	C
8	25	F	37½	F	28½	F
9	25½	C	43	F	37	R
10	28½	C	29½	C	26½	C
11	25	C	41½	F	33½	F
12	32½	C	33	C	31½	F
13	25½	F	36	C	32	S
14	32	C	28½	S	24½	F
15	31½	S	34½	R	34	C
16	36	C	41½	F	34½	F
17	33	C	35½	S	34½	R
18	34½	C	41½	F	35	C
19	29	F	39	F	32½	F
20	33½	C	37	F	29½	F
21	24½	F	39	F	33	F
22	27	F	36	F	30	F
23	25	F	37	C	35	F
24	37	F	35	C	22	F
25	19	F	34	F	30	F
26	28	F	38	C	34	C
27	33	F	39	F	29	F
28	26	F	37	F	27	F
29	28	F	42	F	37	F
30	35	F	56	F	47	F
31	40	F	63	F	47	F
M.	29.32		39.29		32.66	
H.	44.50		63.		47.	
L.	13.50		28.50		22.	

Mean of the Month, . . 33.76

APRIL, 1855.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	42	R	41	C	27	F
2	19	F	26½	C	27	F
3	26	F	38½	F	32½	F
4	27½	F	52	F	39½	F
5	34½	F	51½	C	39½	R
6	38½	C	57	F	49½	C
7	35½	F	43½	F	34	F
8	30½	F	45	F	37	F
9	36½	F	48½	C	41½	R
10	35	F	50½	C	44	R
11	35½	R	37	S	36	R
12	36½	C	44½	F	40	F
13	35½	F	51½	F	41½	F
14	40	C	47	R	45	F
15	46	C	50	C	44½	F
16	39½	F	66	F	53½	F
17	47	F	68½	F	50½	F
18	50½	F	59	C	51½	C
19	50½	C	54½	F	43	C
20	41	R	38	R	36½	R
21	38	F	61½	F	51	F
22	41½	F	60½	C	55	F
23	46	F	52	F	46½	F
24	46	F	71½	F	58	F
25	58	R	53½	F	45	C
26	45½	C	46½	C	45½	R
27	40½	F	55½	F	43½	F
28	37½	F	52½	F	44½	F
29	42	C	44	C	41½	C
30	41	C	45	C	45½	C
M.	39.43		50.42		42.98	
H.	58.		71.50		58.	
L.	19.		26.50		27.	

Mean of the Month, . . 44.28

MAY, 1855.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	43½	C	55	R	43	C
2	41	C	61½	F	45½	F
3	41	F	55½	F	48	F
4	47½	F	57	C	47	R
5	51	F	60½	C	56½	F
6	51½	F	68	F	55	F
7	43½	F	56½	F	47½	F
8	46½	C	43½	R	41½	R
9	42½	C	43½	R	42½	C
10	44	F	53½	F	46	F
11	46½	F	55	F	50½	F
12	47½	F	65	F	57½	F
13	46½	F	53½	F	54	F
14	52½	F	65	C	60½	F
15	55½	F	79½	F	64	F
16	65	F	81½	F	65	R
17	56½	F	66½	F	56	F
18	51	F	66	F	56	F
19	53	F	62	C	52	R
20	49	R	50½	R	50½	R
21	47½	F	51	C	46½	C
22	44½	C	47½	C	45	F
23	50	F	53	C	48	F
24	49	C	76	F	66	F
25	62	F	68½	F	61½	F
26	47	F	62½	F	52½	F
27	49½	F	68	F	58	F
28	51½	F	60½	F	55	F
29	50½	F	66	F	57	F
30	55½	F	76½	F	66	F
31	63½	F	79½	F	65	F
M.	49.85		61.55		53.52	
H.	65.		81.50		66.	
L.	41.		43.50		41.50	

Mean of the Month, . . 54.97

JUNE, 1855.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	64	C	75	F	64	C
2	64	C	70½	C	66	C
3	66½	C	66	C	63	R
4	62	C	74	F	62½	F
5	53	F	66½	F	58	F
6	56	F	74	F	64	F
7	60½	R	56	C	62½	R
8	58½	F	69	F	60	F
9	56	F	70	F	63½	F
10	59	C	75½	F	65½	F
11	65½	R	73	C	61	F
12	57½	R	64	C	58	F
13	51	C	64½	F	59	F
14	55½	F	72	C	60	R
15	55	C	68	F	63	F
16	60	F	74	F	67	C
17	60	F	74	F	67	F
18	59	F	67	F	61	F
19	58	C	65½	F	57	R
20	58	C	67	R	62	F
21	62	F	77	F	70	F
22	68	F	80½	F	69	R
23	68	F	74	F	68	F
24	69	F	72	R	63	R
25	63	C	65	R	61	F
26	66½	C	77½	F	70	C
27	67	F	84	F	76	F
28	73	F	75½	C	72	R
29	70½	F	88½	F	81	F
30	78½	F	87	F	79½	F
M.	62.15		72.22		65.11	
H.	78.50		88.50		81.	
L.	51.		56.		58.	

Mean of the Month, . . 66.50

JULY, 1855.

Day of Month	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	78 F	88½ F	81½ F
2	76½ F	91½ F	78½ F
3	72½ F	83 F	75 F
4	71 F	86 F	74½ F
5	71½ R	83 C	76 F
6	71 F	75½ C	72 R
7	69 C	66½ R	64 R
8	60½ C	68½ F	62½ F
9	59½ F	73 F	65 F
10	63½ F	79 F	68 F
11	67 R	74 F	71 C
12	69½ C	83½ F	73½ F
13	68 F	85½ F	75½ F
14	68 F	78½ F	70½ F
15	66 F	76½ F	69½ F
16	65½ F	82½ F	72½ F
17	74 F	91½ F	83 F
18	76½ F	84½ F	80 F
19	79 F	93½ F	82½ F
20	73½ C	70½ R	68 C
21	63½ R	68½ C	63 C
22	61 F	72½ F	65½ F
23	65 C	68½ C	66 C
24	66½ C	69½ C	67½ C
25	73 F	83½ F	77½ F
26	74 F	83 R	73½ R
27	73½ C	73 C	68½ C
28	67 F	75 C	69½ F
29	68 C	71½ C	68½ C
30	68 C	77½ F	74 C
31	71½ R	77 C	70½ F
M.	69.39	78.53	71.84
H.	79.	93.50	83.
L.	59.50	66.50	62.50

Mean of the Month, . . 73.25

AUGUST, 1855.

Day of Month	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	68½ C	78 F	72 F
2	68 C	78½ F	70½ F
3	63½ C	82½ F	69 F
4	65½ F	85½ R	71½ R
5	66½ F	74 C	68½ F
6	65½ F	78 F	70½ F
7	62½ F	77½ F	63 R
8	55½ F	67½ C	62 F
9	62½ R	80½ F	73½ C
10	66½ F	78 F	66½ F
11	59 F	71½ F	64½ F
12	61 C	70½ F	64 F
13	62½ F	77 C	73½ F
14	67 F	78½ F	72 F
15	65 F	77 F	69 F
16	69½ F	85 F	75 F
17	76 C	81 C	75 C
18	59 F	69 F	64 F
19	58 F	72 F	63 F
20	61 F	76 F	64 F
21	61 F	81 F	67½ F
22	64 F	80½ F	71½ F
23	70 C	79½ C	74½ C
24	70 F	85 F	75 F
25	66½ F	74 F	66 F
26	61½ C	68 R	68 C
27	59½ C	64½ F	59 F
28	52 F	66 F	60 F
29	51½ F	70 F	61½ F
30	63 F	69 F	57½ F
31	50 F	68½ F	60 F
M.	62.95	75.59	67.47
H.	76.	85.50	75.
L.	50.	64.50	57.50

Mean of the Month, . . 68.67

SEPTEMBER, 1855.

Day of Month.	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	59 F	74½ C	72 F
2	73 F	82½ C	65½ F
3	56½ F	61½ C	59 C
4	53 F	67 F	58 F
5	51½ F	74½ F	63 F
6	55 F	73½ F	65 F
7	56 F	77½ F	66 F
8	65½ F	83½ F	75½ F
9	71 F	86 F	73½ F
10	63½ F	79½ F	68 F
11	59½ F	83 F	71½ F
12	68 F	88 F	79½ F
13	77 F	73½ C	63 F
14	53½ F	66 F	58½ F
15	53½ F	67 F	61 F
16	60½ F	68½ C	66 F
17	63 C	81½ F	72½ F
18	69½ F	81½ R	53½ C
19	45½ F	58 F	46 F
20	40½ F	62 F	53 F
21	46½ F	65 F	60 F
22	58 F	64 C	58½ C
23	53½ R	57½ C	52½ F
24	45½ F	60½ F	52 F
25	48½ F	64½ F	55 F
26	58 F	74 F	63½ F
27	64½ R	64½ C	56 F
28	49½ F	63½ F	52½ F
29	43½ F	61½ F	53½ F
30	48½ F	62½ C	58 F
M.	57.02	70 88	61.71
H.	77.	88.	79.50
L.	40.50	57.50	46.

Mean of the Month, . . . 63.20

OCTOBER, 1855.

Day of Month.	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	59½ C	64 C	61 C
2	61½ R	67 C	62½ C
3	62½ C	68½ F	64½ C
4	61½ R	67½ F	58½ R
5	59 F	74½ F	66½ F
6	62 F	70½ C	67½ R
7	49 F	59½ F	48½ F
8	41½ F	56½ F	49 F
9	46½ F	61½ F	54 F
10	51½ F	63½ F	54 F
11	44½ F	60½ F	56 F
12	57 F	61 C	55 C
13	57½ R	59 C	47 F
14	44 F	54½ C	50 R
15	42½ F	57 F	49½ F
16	48 F	62 F	48 F
17	40½ F	54½ F	44½ F
18	38½ F	60 F	51½ F
19	45½ F	60 F	55 F
20	54 F	58½ C	58 R
21	57 R	57 C	56 C
22	56½ C	63½ C	56 C
23	43½ F	54½ F	51 F
24	46 R	51 R	54 R
25	49½ C	49 F	40½ C
26	35½ F	47½ F	41 F
27	44½ F	54 C	41½ F
28	41½ R	43½ C	40½ C
29	36½ F	49½ F	41½ F
30	48½ F	54½ C	47 R
31	38½ F	51 F	44 F
M.	49.16	58.55	52.05
H.	62.50	74.50	67.50
L.	35.50	43.50	40 50

Mean of the Month, . . 53.25

NOVEMBER, 1855.

Day of Month	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	46 F	61 C	54 C
2	52 C	51 C	48 C
3	46 C	47½ R	46 R
4	44½ R	44½ C	42 C
5	38 C	46 C	45½ C
6	44 C	50½ C	48 C
7	46 C	50½ C	49 C
8	49 C	55½ R	48½ F
9	41 F	54 F	42½ F
10	39 F	51½ F	47 F
11	45 C	53½ F	49½ F
12	49½ C	51½ R	49 R
13	43½ C	51 F	46½ F
14	41 F	56½ F	47 F
15	42½ F	55½ F	50 F
16	52 F	65½ C	50½ F
17	30 F	35½ C	31½ S
18	36 R	39½ C	34 F
19	32 F	38 C	32 C
20	23½ F	30½ F	26½ F
21	27 S	34½ R	35½ R
22	30 F	28½ F	22½ F
23	19½ C	36 C	43 C
24	39½ F	27½ F	23 F
25	21½ F	39 C	45 R
26	44½ F	50 C	39½ C
27	32 F	41½ F	37½ F
28	38½ F	49 F	41½ F
29	34½ C	27½ F	23½ F
30	22½ F	37½ F	31½ F
M.	38.33	45.33	40.98
H.	52.	65.50	54.
L.	19.50	27.50	22.50

Mean of the Month, . . 41.55

DECEMBER, 1855.

Day of Month.	Thermometer and Weather. 7 A. M.	2½ P. M.	9 P. M.
1	33 F	50½ F	40 F
2	38 F	48 C	48 C
3	39 F	47 F	38½ F
4	32 F	43 F	35½ F
5	34 F	47 F	36½ F
6	30½ F	47 F	38½ F
7	34½ F	42½ C	33½ F
8	27½ F	38½ F	30 F
9	31½ R	41½ R	55 R
10	40 F	39½ C	33 C
11	29 C	27½ F	23½ F
12	18½ F	28 F	22 F
13	24 S	29 C	26½ S
14	19½ F	33½ F	29 F
15	31 S	37½ R	41 R
16	35 C	37 R	38½ C
17	39 F	44 F	37½ F
18	32 F	33½ F	29 F
19	25 F	33 F	29 F
20	22½ F	32 F	25 F
21	20 F	37½ C	37 C
22	39½ C	41½ R	43½ R
23	47 F	49½ F	41 F
24	41½ C	39½ C	31 C
25	32½ S	21 R	29½ R
26	31½ C	23½ F	19½ F
27	15½ F	20½ F	17½ F
28	19 S	26½ C	22½ F
29	8 F	15½ C	24 S
30	32½ S	27½ F	18½ F
31	13½ F	27½ F	18 F
M.	29.55	35.79	31.98
H.	47.	50.50	55.
L.	8.	15.50	17.50

Mean of the Month, . . 32.44

JANUARY, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	13½	F	27½	F	20½	F
2	8½	F	27	C	24½	C
3	31	R	30	C	30	F
4	18	F	19½	F	8½	F
5	6	C	12½	S	8	S
6	11	S	20	F	12½	F
7	3½	F	21	F	22	F
8	24½	F	28½	F	8	F
9	— 5½	F	2	F	— 5	F
10	— 4½	F	15	F	15½	F
11	16	F	26	F	19½	F
12	10½	F	22½	C	20½	C
13	32	S	35	R	31½	C
14	25½	C	28	C	22½	C
15	17	F	26½	F	19	F
16	16½	F	30½	F	24	F
17	24½	C	33	F	29	C
18	29½	F	36½	F	28½	F
19	23	F	30	C	9	F
20	6½	F	17½	C	13½	F
21	10½	F	19½	F	15½	F
22	6½	F	22½	F	15	F
23	13	F	28½	F	23	F
24	15½	F	32½	F	25½	F
25	8	F	6½	F	3	F
26	4½	F	22½	F	17	F
27	10	F	25½	C	24½	C
28	29	S	18½	S	12½	S
29	17½	C	30½	C	27½	C
30	25	S	28	C	19	F
31	14	F	22	F	15	F
M.	14.85		24.03		18.03	
H.	32.		36.50		31.50	
L.	—5.50		2.		— 5.	

Mean of the Month, . . 18.97

FEBRUARY, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	13	C	22½	F	22	C
2	25	F	23½	F	11	F
3	1½	F	13½	F	8	F
4	5	F	16	F	9½	F
5	9½	F	19½	F	14½	F
6	10	F	24½	F	16½	F
7	19½	S	33	R	30½	C
8	28½	F	32	F	24	F
9	20	C	22	C	19½	F
10	7	F	23½	F	20½	F
11	23	F	41	C	36½	R
12	38	F	34½	C	8½	F
13	1½	F	8	F	2½	F
14	— 2½	F	14½	F	8½	F
15	8	C	21½	C	22½	C
16	29½	C	33½	S	28½	F
17	32	C	21	S	12½	C
18	9	F	14½	F	12	C
19	13½	F	25½	F	18	F
20	19½	C	29½	C	26	C
21	29	F	39	C	31	F
22	25	F	40½	F	33½	F
23	30	F	40	C	33½	C
24	27½	F	31	F	23½	F
25	20½	F	32	F	25	F
26	19	F	33½	F	25½	F
27	20	F	34½	F	29	F
28	18½	F	33½	F	27	F
29	20½	F	33	F	26½	F
M.	17.95		27.26		20.89	
H.	38.		41.		36 50	
L.	— 2.50		8.		2.50	

Mean of the Month, . . 22.03

MARCH, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	23½	F	36	F	31	F
2	31½	R	35½	C	31½	F
3	23	F	29½	F	23	F
4	16½	F	33½	C	37½	R
5	21½	F	31	F	21½	F
6	24½	C	39½	F	28	C
7	18½	F	26	F	18½	F
8	27	C	38	F	15½	F
9	4	F	15½	F	10	F
10	½	F	11½	F	6½	F
11	8	F	23½	F	18½	F
12	11	F	21	F	16½	F
13	14	F	31	F	26	F
14	20½	F	37½	F	31	F
15	27	F	40	F	30½	F
16	25	F	36	F	30	F
17	24½	F	37½	F	32½	F
18	27½	F	40½	F	33½	F
19	29	F	38	C	32	S
20	30½	C	37½	C	33½	F
21	33	C	37½	C	35½	C
22	32½	F	40½	F	35	F
23	30½	F	40½	F	33½	F
24	30	F	42½	C	35½	F
25	32	C	43½	F	35	C
26	31½	F	42½	F	34½	F
27	30½	F	40½	F	31	F
28	24	F	26	C	22½	C
29	20½	F	32	F	26½	F
30	25	F	36½	F	28½	F
31	20	F	35½	F	29½	F
M.	23.13		34.06		27.55	
H.	33.		43.50		37.50	
L.	.50		11.50		6.50	

Mean of the Month, . . 28.25

APRIL, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	23½	F	42	F	33	F
2	27½	F	51	F	36½	F
3	45½	R	49½	C	45½	C
4	39	C	43½	R	39½	C
5	38	F	47½	F	40	F
6	36½	F	45½	C	40	C
7	37	F	58½	F	49½	F
8	41	F	62	F	51½	F
9	44½	F	71	F	53	F
10	52	F	54½	F	40½	F
11	35	F	55½	F	44½	F
12	46	F	62	C	57	R
13	28½	F	43½	F	37	F
14	33	F	50½	C	46	F
15	42½	F	49½	C	46	F
16	41½	F	43	C	41½	C
17	42½	F	60½	C	51½	R
18	48	F	63	C	51½	F
19	43½	F	54½	C	50½	C
20	45½	R	40	R	38½	R
21	38½	C	37½	R	39½	R
22	41½	C	45½	C	41	R
23	40½	F	64½	F	56	F
24	50½	C	52	C	49	R
25	50	C	54½	F	46	F
26	41½	F	52½	F	43	F
27	42	F	71½	F	56	F
28	56	F	56½	C	44½	C
29	43	C	53	F	44	F
30	43½	C	45	F	43	C
M.	41.25		52.65		45.17	
H.	56.		71.50		57.	
L.	23.50		37.50		33.	

Mean of the Month, . . 46.36

MAY, 1856.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	42½	F	62½	F	49½	F
2	45	R	46	R	42	R
3	41	R	42	R	39½	R
4	40	F	52	C	41	C
5	38½	F	49½	C	49	F
6	43	F	58½	F	53	F
7	46½	F	53	F	45½	F
8	44½	C	46	R	45½	R
9	42½	R	38½	R	41	R
10	41½	R	43	R	41	C
11	41	R	44½	R	44½	C
12	43½	F	75½	F	65	F
13	48½	F	49½	C	49	C
14	49	F	58	F	51	F
15	49	C	74½	F	57	F
16	61½	F	63	C	60	F
17	58½	R	60½	C	54	C
18	50	C	60	F	52	F
19	49	C	60	F	60½	C
20	57½	F	76½	C	61	F
21	52½	F	66½	F	56	F
22	52½	F	69	F	61½	F
23	58	F	82	F	70½	F
24	69½	F	88½	R	62	R
25	50½	F	60½	C	46½	F
26	42	R	50	C	46½	F
27	48	F	72½	F	59½	F
28	59½	R	60	C	59	R
29	55	F	66	F	55½	R
30	45½	F	58½	F	46½	C
31	46½	F	52½	F	48	F
M.	48.68		59.32		52.02	
H.	69.50		88.50		70.50	
L.	38.50		38.50		39.50	

Mean of the Month, . . 53.34

JUNE, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	50½	F	70	C	58½	F
2	54	F	70½	F	68	F
3	65½	F	79½	F	66	R
4	62½	C	64	F	60½	F
5	55½	C	58½	C	53	C
6	52½	F	51½	C	48	R
7	49	R	54½	C	55	C
8	56	C	60½	C	54½	C
9	55	R	70½	C	62	F
10	60½	F	79	F	70	F
11	65½	F	79½	F	68½	F
12	63½	F	82	F	67½	F
13	61	C	67½	F	61½	C
14	65	C	79	F	69	R
15	64	F	75	F	64½	F
16	58	F	73½	F	67½	F
17	62	F	73	F	67½	F
18	63	F	69½	C	64½	R
19	61½	R	62½	C	58½	C
20	61½	C	77	F	76½	F
21	74	F	92½	F	82½	F
22	77½	F	90	C	81½	F
23	69	F	69½	F	64½	F
24	59½	F	71½	F	64	F
25	63½	C	71	F	67½	F
26	68½	F	87	F	77½	F
27	71	F	81½	F	70	F
28	62½	F	81½	F	73½	F
29	76½	F	93½	F	86	F
30	80	F	92	F	79	F
M.	62.93		74.23		66.90	
H.	80.		93.50		86.	
L.	49.		51.50		48.	

Mean of the Month, . . 68.02

JULY, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	65	F	78	F	68	F
2	61½	F	78	F	66½	F
3	67	C	84	F	72½	F
4	70	R	63½	F	63	R
5	59½	F	73½	F	67½	F
6	66	F	84½	R	70	C
7	60½	F	68½	C	63½	F
8	63	C	70	F	63	F
9	57	R	57	C	55½	C
10	60½	C	70½	F	65½	F
11	64½	F	83½	F	68	F
12	61½	R	75	C	70	F
13	72	C	81	R	72½	F
14	72½	F	87	F	79	F
15	75½	F	80½	R	76½	F
16	69½	F	88½	F	77	F
17	74½	F	90½	C	84½	F
18	79	F	97½	F	84½	F
19	71	F	77	F	69½	F
20	65	F	70	C	67½	F
21	63	F	80	F	68½	F
22	64	F	75½	F	71	F
23	67½	F	87	F	76	F
24	70	F	90	F	80½	F
25	75	F	94½	F	83	F
26	75½	F	94	F	84	F
27	76½	F	95½	F	84	F
28	75½	F	73½	R	78½	F
29	75	F	86	R	75	F
30	72	C	82	F	74	F
31	73½	C	78½	C	75	C
M.	68.47		80.47		72.69	
H.	79.		97.50		84.50	
L.	57.		57.		55.50	

Mean of the Month, . . 73.88

AUGUST, 1856.

Day of Month	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	74	C	80½	F	72½	C
2	70	C	76½	F	72	C
3	71	C	76	F	71½	C
4	68½	C	77½	F	71½	C
5	70	C	75½	C	71	C
6	70½	R	80	C	70½	F
7	66	F	78	F	73	F
8	71½	F	70	C	68	R
9	67½	R	73	C	70½	F
10	66½	F	76½	F	71½	F
11	68	F	83	F	73½	F
12	68½	F	81	C	72½	C
13	66	F	79	F	70	F
14	64½	F	79½	F	72	F
15	66½	F	80½	R	67½	F
16	61½	F	77½	F	68½	F
17	62	F	72½	C	66	C
18	65½	C	72	F	64½	C
19	63½	F	72½	C	66½	C
20	64½	R	65	R	61½	R
21	59½	R	58½	R	57	R
22	58½	F	73	F	64	F
23	60	F	77½	F	69	F
24	67½	C	74	F	65	R
25	59½	F	65	C	60	C
26	50½	F	68½	F	59	F
27	52	F	71	F	64	F
28	59	F	75	C	64½	F
29	66	C	68½	R	66½	R
30	57½	F	71½	F	62	F
31	54½	F	73	F	64½	F
M.	64.21		74.24		67.42	
H.	74.		83.		73.50	
L.	50.50		58.50		57.	

Mean of the Month, . . 68.62

SEPTEMBER, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	54	F	66½	F	58½	F
2	55	F	68½	F	61	F
3	54½	F	72	F	63	F
4	58	F	79	F	68½	F
5	62	F	83	F	70½	F
6	62	F	81	F	69½	F
7	68½	F	67½	C	64½	C
8	62½	R	71	C	68½	C
9	59½	F	81	F	71	F
10	65	F	83½	F	71	F
11	71	C	84½	F	69½	R
12	61½	F	76	C	66½	C
13	60½	F	78	C	61½	R
14	57½	F	72	F	63½	F
15	57	F	76½	F	62½	F
16	59⅓	F	71⅓	F	58½	F
17	52½	F	71½	F	64	F
18	58	F	68⅓	C	63½	C
19	63½	F	77½	F	68½	F
20	63	F	70	C	64	R
21	63	C	69½	F	63	F
22	61	R	64½	C	60½	R
23	60⅓	C	65	R	61⅓	R
24	57½	F	65	F	53½	F
25	47	F	63½	F	53	F
26	53	F	70½	F	59½	F
27	57½	F	70½	F	61½	F
28	51	F	65	F	58	F
29	54	F	66	F	61	F
30	61	C	63½	R	64	R
M.	59.02		72.07		63.45	
H.	71.		84.50		71.	
L.	47.		63.50		53.	

Mean of the Month, . . 64.84

OCTOBER, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	61	F	67⅓	F	53½	F
2	41	F	60½	F	51	F
3	49⅓	F	64⅓	F	53	F
4	46½	F	62½	F	52½	F
5	43	F	63½	F	56	F
6	58½	F	73⅓	C	64½	F
7	51½	F	61⅓	F	53	F
8	46	F	66⅓	F	55	F
9	51	F	75	F	65	F
10	59	F	76⅓	F	66½	F
11	57	F	77	F	66	F
12	50⅓	F	60½	F	54½	F
13	53⅓	C	68	C	60⅓	R
14	42⅓	C	46	C	37	C
15	31½	F	48⅓	F	38⅓	F
16	34	F	58	F	47½	F
17	42½	F	55⅓	F	50	F
18	52	R	62½	C	53	F
19	47½	F	63	F	55	F
20	49	F	59½	F	53	F
21	47½	F	69⅓	F	59½	F
22	53	C	56½	C	53	C
23	56	C	57½	F	39⅓	C
24	33½	F	41	F	34½	F
25	32⅓	F	51	F	41½	F
26	34½	F	58	F	46	F
27	38⅓	C	55	F	51	C
28	55⅓	R	55	C	47⅓	F
29	42	F	50½	C	43	F
30	44	F	63½	F	54	F
31	42	F	44	C	37	F
M.	46.65		60.37		51.34	
H.	61.		77.		66.50	
L.	31.50		41.		34.50	

Mean of the Month, . . . 52.78

NOVEMBER, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	33	F	50½	F	51½	F
2	47½	F	66⅓	F	56	F
3	50	F	60½	C	58	R
4	55⅓	C	55	C	64	C
5	42½	F	40½	C	33	F
6	27	F	41	F	34⅓	F
7	37½	F	55⅓	C	50⅓	C
8	50	C	63½	F	58½	R
9	41	R	42⅓	C	36	C
10	30	F	38½	F	29½	F
11	23⅓	F	41½	F	34	F
12	32⅓	C	44	C	41	C
13	35⅓	F	46⅓	C	42⅓	C
14	35½	F	43½	C	41½	C
15	30½	S	32⅓	C	28	F
16	24	F	43⅓	C	45	C
17	39	C	42⅓	F	34	F
18	30½	C	38⅓	F	34	C
19	29	F	41	F	30⅓	F
20	24	F	40½	F	33⅓	F
21	27⅓	F	45½	F	39½	F
22	43½	R	53⅓	F	43	F
23	35	F	47⅓	F	40⅓	C
24	41½	F	53⅓	C	46½	F
25	38	C	42½	C	42	R
26	43½	C	53½	F	44	F
27	36	F	44	C	39	C
28	34½	F	42½	F	30⅓	F
29	27	C	32	S	24½	S
30	23	F	36	F	31	F
M.	35.58		45.95		40.53	
H.	55.50		66.50		64.	
L.	23.		32.		24.50	

Mean of the Month, . . 40.69

DECEMBER, 1856.

Day of Month.	Thermometer and Weather. 7 A. M.		2½ P. M.		9 P. M.	
1	23	F	31½	F	29	F
2	24⅓	F	38	F	31⅓	F
3	33⅓	R	38	R	35½	R
4	30	F	31⅓	F	24	F
5	24½	F	31½	F	25½	F
6	23	F	32	F	25	F
7	23½	F	29	F	22	F
8	15	F	23	F	17½	F
9	18⅓	F	26	F	21	F
10	17	F	30½	F	23	F
11	22⅓	C	38	C	46	R
12	39½	F	43⅓	F	38	F
13	33½	F	42½	F	35⅓	F
14	36	R	42	R	50½	R
15	34	F	32½	F	26	F
16	19⅓	F	24	F	18½	F
17	16½	F	16½	F	8½	F
18	— 5½	F	2	F	— 1½	F
19	— 2	F	17	F	15	F
20	24	C	37	R	49⅓	R
21	32	C	28⅓	C	26	C
22	21⅓	C	22½	C	24½	C
23	25½	C	23½	S	27	S
24	21	C	23	C	15⅓	C
25	13½	C	18½	C	19½	F
26	18	F	22½	C	14⅓	F
27	12⅓	F	24	F	19⅓	F
28	16½	F	31	C	29½	C
29	25	C	37	C	32	C
30	29½	F	35	F	27½	F
31	27½	C	29½	C	27⅓	C
M.	22.35		29.06		26.00	
H.	39.50		43.50		50.50	
L.	— 5.50		2.		— 1.50	

Mean of the Month, . . 25.80

Mean Heat of each Month and Year, for Thirty-six Years.

Year.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Mean of Year.
1821	20.58	32.53	34.03	43.58	56.03	66.52	68.22	71.50	63.24	50.24	40.64	29.26	48.03
1822	23.28	28.30	38.70	45.15	61.37	66.72	72.92	68.16	66.47	52.23	44.25	30.27	49.82
1823	26.72	22.71	33.57	46.68	53.76	65.09	70.87	70.45	58.85	50.17	36.41	32.54	47.32
1824	30.30	29.31	35.76	47.76	55.12	64.94	71.26	67.20	62.91	51.79	39.83	34.73	49.24
1825	28.70	31.31	40.04	48.77	56.98	69.82	77.61	69.44	60.18	53.11	39.76	32.54	50.69
1826	29.02	30.92	36.60	43.56	63.59	67.96	72.92	69.87	64.56	51.87	40.62	32.28	50.31
1827	22.64	28.95	37.38	50.33	56.90	66.01	71.76	68.97	62.54	52.99	34.99	32.01	48.79
1828	31.91	37.51	37.69	44.19	56.90	70.10	73.58	74.09	64.32	51.05	43.67	36.29	51.78
1829	26.23	23.11	32.33	46.40	59.88	66.50	69.64	68.96	58.26	49.97	40.78	37.40	48.29
1830	25.73	25.94	37.55	48.07	57.08	66.67	72.04	69.95	59.27	52.70	46.68	35.22	49.74
1831	23.38	24.86	41.34	48.51	59.31	71.47	73.09	72.39	63.08	53.76	40.82	19.14	49.26
1832	27.38	28.73	36.98	41.99	53.15	64.48	68.04	69.85	61.24	52.15	41.78	31.35	48.09
1833	31.16	25.45	33.03	48.74	58.91	63.23	72.06	67.04	62.28	50.56	38.30	31.84	48.55
1834	24.85	34.23	37.53	46.88	53.44	63.84	74.03	68.28	62.86	49.03	38.52	28.55	48.50
1835	27.26	25.46	32.80	43.84	55.26	65.42	71.75	68.75	57.90	53.54	40.22	23.43	47.14
1836	26.94	20.95	31.84	43.73	55.44	58.91	69.19	65.12	60.46	45.22	36.77	29.52	45.34
1837	21.74	25.70	31.86	44.72	52.97	63.75	68.45	65.32	59.00	48.03	39.26	28.93	45.81
1838	33.28	19.27	35.79	41.66	54.84	68.86	74.22	69.14	61.03	47.70	35.65	26.72	47.35
1839	27.12	29.18	35.71	47.48	56.45	62.54	72.49	68.93	62.20	51.39	37.62	31.90	48.58
1840	19.64	33.65	36.59	49.08	56.52	67.09	72.24	71.03	60.14	50.59	39.12	28.18	48.66
1841	31.77	25.78	35.50	42.58	54.26	69.23	70.59	68.94	63.35	46.18	38.85	32.97	48.33
1842	30.63	34.88	40.97	47.37	55.73	66.24	75.20	69.39	60.67	51.44	38.62	28.56	49.97
1843	34.20	22.58	29.04	45.99	56.57	67.12	71.60	70.59	62.92	49.45	37.51	31.08	48.22
1844	20.69	28.31	37.07	50.14	58.87	66.76	69.45	67.67	61.58	50.20	39.14	32.00	48.49
1845	29.15	28.14	37.60	45.41	57.90	68.77	72.76	71.42	60.86	53.06	44.97	27.66	49.81
1846	30.02	24.68	39.17	50.25	56.17	64.92	71.61	71.26	67.12	50.45	44.19	29.66	49.96
1847	29.33	29.07	32.70	44.11	53.45	65.43	72.57	68.81	61.40	49.70	44.78	36.96	49.03
1848	31.85	28.21	34.70	46.79	58.47	65.90	70.04	69.72	60.02	50.77	37.92	36.70	49.26
1849	24.16	22.20	37.24	44.45	53.42	68.14	71.56	69.87	61.44	50.26	46.80	30.95	48.37
1850	30.57	32.40	34.09	42.95	51.55	67.39	72.01	67.57	61.69	52.58	42.71	28.04	48.63
1851	28.21	32.10	37.72	45.87	56.29	65.27	71.01	69.17	62.44	54.16	37.16	24.24	48.64
1852	22.43	28.27	33.46	41.06	57.23	67.91	73.27	67.33	63.10	51.46	39.14	36.49	48.43
1853	28.06	30.57	36.96	45.43	57.91	67.51	71.60	69.15	63.83	51.31	42.14	28.93	49.45
1854	24.98	24.86	33.41	42.54	59.45	66.41	74.06	69.98	62.67	53.86	42.73	26.30	48.44
1855	30.14	21.74	33.76	44.28	54.97	66.50	73.25	68.67	63.20	53.25	41.55	32.44	48.65
1856	18.97	22.03	28.25	46.36	53.34	68.02	73.88	68.62	64.84	52.78	40.69	25.80	46.97
Mean,	27.03	27.61	35.52	45.74	56.37	66.43	71.97	69.24	62.00	51.08	40.40	30.58	48.66

Tabular View of the Means of the Thermometer

	JANUARY.			FEBRUARY.			MARCH.			APRIL.			MAY.			JUNE.		
Year.	7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.
1821	15.48	26.67	19.61	29.10	37.75	30.75	29.67	40.25	32.19	37.76	51.60	41.40	51.41	63.77	52.93	61.20	75.43	62.93
1822	19.70	28.70	21.45	22.10	35.75	27.07	33.96	45.83	36.29	41.50	51.16	42.80	55.16	70.96	58.00	61.76	75.40	63.00
1823	22.61	31.74	25.80	17.21	29.40	21.53	29.42	39.19	32.10	42.00	53.53	44.53	49.00	61.16	51.13	59.13	73.73	62.40
1824	27.06	34.90	28.93	24.93	34.10	28.90	31.26	41.83	34.20	42.26	55.26	45.77	49.45	64.03	51.87	60.07	72.23	62.53
1825	25.00	34.06	27.03	26.93	36.67	30.35	35.71	45.97	38.45	43.60	56.20	46.50	51.74	65.20	54.00	66.00	77.40	66.06
1826	25.61	33.45	28.00	26.32	36.28	30.14	32.55	42.06	35.20	38.70	50.77	41.20	58.00	72.87	59.88	63.50	76.27	64.10
1827	18.06	28.26	21.58	23.14	35.85	27.86	32.06	44.42	35.68	46.03	57.20	47.77	53.32	63.90	53.48	61.87	73.80	62.36
1828	28.03	36.45	31.26	33.10	43.14	36.27	32.39	44.45	36.23	39.90	50.57	42.10	53.84	63.32	53.55	67.10	77.10	66.10
1829	21.93	31.87	24.90	16.32	30.04	22.96	27.00	39.10	30.90	42.23	52.83	44.14	55.84	67.58	56.22	62.40	73.60	63.50
1830	21.71	30.45	25.03	20.90	32.14	24.78	32.61	44.32	35.71	44.10	54.23	45.87	53.22	64.06	53.97	62.20	74.70	63.10
1831	18.84	29.19	22.10	19.35	31.86	23.36	36.84	48.55	38.64	44.57	54.20	46.77	55.29	66.32	56.32	67.70	79.23	67.47
1832	20.16	34.71	27.26	24.03	34.69	27.48	31.58	44.32	35.03	37.60	48.87	39.50	49.77	58.84	50.84	59.33	73.27	60.83
1833	27.80	35.77	29.90	20.14	31.96	24.25	27.00	40.51	31.58	43.57	56.23	46.43	55.29	65.93	55.52	58.53	71.27	59.90
1834	20.35	30.39	23.80	28.36	40.82	33.50	32.00	44.84	35.74	42.33	53.63	44.67	49.32	60.39	50.61	59.83	71.13	60.57
1835	22.71	33.03	26.03	20.71	31.21	24.45	27.48	39.61	31.32	39.00	50.20	42.33	50.71	62.48	52.58	60.40	74.67	61.20
1836	23.26	31.64	25.93	14.31	28.90	19.65	26.29	39.09	30.13	38.97	50.56	41.66	51.29	63.13	51.90	56.00	64.53	56.20
1837	16.19	27.45	21.58	20.75	31.28	25.07	27.00	37.84	30.74	39.37	52.66	42.13	48.93	59.71	50.26	59.70	71.00	60.56
1838	29.48	38.20	32.16	12.71	25.93	19.17	31.90	41.26	34.22	36.40	48.77	39.80	50.29	61.87	52.35	64.27	77.16	65.13
1839	22.32	32.77	26.26	24.32	34.78	28.43	31.03	42.06	34.04	42.20	55.27	44.96	52.26	64.06	53.03	58.03	70.23	59.37
1840	14.84	24.97	19.12	29.27	38.75	32.93	31.64	42.48	35.65	43.86	55.97	47.40	52.38	63.64	53.55	62.37	74.96	63.93
1841	27.71	35.77	31.84	20.85	32.39	24.11	30.74	41.71	34.06	38.93	47.97	40.83	50.32	60.90	51.55	63.90	78.33	65.47
1842	25.00	36.45	30.45	28.89	40.71	35.04	35.97	46.61	40.32	43.50	52.57	46.03	51.97	61.96	53.26	62.43	73.20	63.10
1843	30.22	38.74	33.64	17.85	27.47	22.43	24.68	34.32	28.13	43.83	49.70	44.43	53.87	62.19	53.65	63.50	74.00	63.87
1844	15.51	25.48	21.09	21.76	34.82	28.34	32.45	42.51	36.26	44.77	57.16	48.50	54.29	65.87	56.45	62.17	74.60	63.50
1845	26.10	33.22	28.13	22.85	33.78	27.78	33.26	43.22	36.32	41.80	50.90	43.53	53.03	66.32	54.35	63.10	78.33	64.87
1846	24.97	34.78	30.32	19.14	30.54	24.35	33.22	45.93	38.36	43.77	58.63	48.36	53.00	61.78	53.74	61.73	71.60	61.43
1847	25.06	34.00	28.93	23.71	34.68	28.82	27.87	37.84	32.39	38.40	51.70	42.23	49.29	59.39	51.68	60.03	73.40	62.87
1848	27.22	36.55	31.77	22.80	35.06	26.76	28.77	41.35	33.97	40.57	54.23	45.56	54.51	64.58	56.32	60.07	73.93	63.70
1849	20.22	28.29	23.97	18.21	26.57	21.82	32.84	41.96	36.93	39.87	50.63	42.86	49.58	59.19	51.48	62.56	75.03	66.83
1850	26.42	34.13	31.16	27.68	37.61	31.92	30.22	38.45	33.61	38.17	48.63	42.06	48.77	55.77	50.10	62.03	75.50	64.63
1851	26.06	31.78	26.80	28.28	36.32	31.70	33.22	43.13	36.80	41.30	51.00	45.30	51.06	62.84	54.97	59.00	73.00	63.80
1852	19.13	26.69	21.47	24.55	33.63	26.62	29.74	37.94	32.69	37.17	46.22	39.80	52.00	64.80	54.89	62.45	75.66	65.63
1853	24.22	32.74	27.21	26.52	34.93	30.25	32.21	42.58	36.08	40.55	51.72	44.03	51.84	66.34	55.51	62.37	74.93	65.22
1854	21.26	28.87	24.82	21.11	28.59	24.89	28.79	38.77	32.68	38.27	47.98	41.38	54.36	65.77	58.21	61.48	73.25	64.50
1855	26.98	33.47	29.97	17.37	26.48	21.37	29.32	39.29	32.66	39.43	50.42	42.98	49.85	61.55	53.52	62.15	72.22	65.11
1856	14.85	24.03	18.03	17.95	27.26	20.89	23.13	34.06	27.55	41.25	52.65	45.17	48.68	59.32	52.02	62.93	74.23	66.90
Mean,	22.84	31.93	26.31	22.60	33.39	26.83	30.72	41.60	34.25	41.04	52.27	43.91	52.03	63.38	53.71	61.76	74.12	63.41

for Thirty-six Years, at 7 A. M., 2½ P. M., and 9 P. M.

JULY.			AUGUST.			SEPTEMBER.			OCTOBER.			NOVEMBER.			DECEMBER.			
7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.	7 A.M.	2½ P.M.	9 P.M.	Year.
62.93	76.80	64.93	66.54	79.77	68.19	58.06	70.60	61.06	44.61	58.06	48.06	37.96	45.36	38.60	26.03	33.96	27.80	1821
67.22	81.87	69.67	62.09	76.77	65.64	59.96	75.56	63.90	47.58	58.51	50.61	39.86	49.56	43.33	27.58	34.83	28.41	1822
65.41	79.35	67.84	64.48	79.13	67.74	53.80	66.00	56.76	45.58	57.16	47.77	32.73	42.10	34.40	28.77	37.13	31.71	1823
65.74	79.45	68.58	61.26	75.16	65.19	58.66	69.86	60.20	46.71	59.55	49.12	36.16	44.33	39.00	31.51	39.29	33.39	1824
71.71	87.45	73.68	65.09	76.71	66.51	55.27	68.33	56.93	48.80	59.45	51.06	35.17	46.26	37.83	29.03	37.13	31.45	1825
68.13	81.22	69.42	67.13	74.90	67.58	60.43	71.50	61.73	48.13	58.58	48.90	36.30	46.10	39.47	27.42	37.61	31.80	1826
67.13	79.58	68.58	64.42	76.45	66.03	58.47	69.50	59.66	49.16	59.20	50.61	31.47	39.66	33.83	28.51	35.90	31.61	1827
68.51	81.97	70.26	68.32	83.90	70.03	60.27	71.13	61.57	45.29	58.55	49.32	40.47	48.20	42.33	31.84	42.19	34.84	1828
65.22	76.71	67.00	64.29	76.74	65.84	52.43	66.64	55.70	44.93	56.81	48.16	37.53	45.50	39.33	33.64	42.39	36.16	1829
68.48	77.92	69.71	65.32	77.94	66.58	55.30	65.93	56.57	48.20	59.16	50.74	45.17	49.56	45.30	32.03	39.23	34.39	1830
68.30	81.64	69.32	68.16	80.29	68.71	58.60	70.50	60.13	49.20	60.13	51.96	36.73	46.70	39.03	14.10	25.20	18.12	1831
63.42	75.83	64.87	65.10	77.80	66.64	56.50	69.30	57.93	47.16	59.16	50.13	37.60	47.60	40.13	27.84	35.22	31.00	1832
65.64	82.52	68.03	61.74	74.77	64.61	56.50	70.90	59.43	46.45	56.48	48.74	33.47	44.23	37.20	28.87	35.48	31.16	1833
68.68	82.67	70.74	63.45	75.94	65.45	58.57	70.20	59.80	43.74	55.87	47.49	34.33	44.00	37.23	24.74	33.52	27.39	1834
65.39	81.52	68.35	63.32	78.26	64.68	52.20	66.43	55.07	48.58	60.55	51.48	35.73	45.90	39.03	19.20	28.32	22.77	1835
65.42	76.03	66.13	59.26	74.06	62.03	56.86	66.67	57.86	40.00	52.22	43.45	32.43	42.10	35.77	25.45	35.32	27.81	1836
63.00	76.84	65.52	61.10	72.61	62.26	53.70	67.27	56.03	43.13	54.39	46.58	35.20	44.76	37.83	24.58	34.48	27.74	1837
68.68	82.26	71.71	64.00	76.80	66.61	56.67	68.06	58.36	43.39	54.54	45.16	31.43	40.87	34.66	22.55	31.84	25.77	1838
67.71	80.67	69.10	64.32	76.90	65.58	56.80	70.23	59.57	45.97	58.45	49.74	33.27	43.03	36.56	29.06	35.45	31.19	1839
67.16	80.52	69.03	66.06	78.71	68.32	54.27	68.93	57.23	46.68	56.12	48.97	35.90	43.03	38.43	23.42	32.90	28.22	1840
65.29	79.13	67.35	64.74	75.29	66.77	60.13	68.60	61.33	41.22	52.00	45.32	35.56	43.16	37.83	29.54	36.93	32.45	1841
71.03	83.22	71.36	66.42	74.87	66.90	56.63	67.10	58.27	46.03	58.45	49.84	35.36	43.23	37.26	26.22	31.77	27.68	1842
67.26	79.61	67.93	66.80	77.06	67.90	57.80	69.73	61.23	44.55	55.32	48.48	33.13	42.77	36.63	27.09	35.80	30.36	1843
64.52	76.96	66.87	63.16	74.58	65.26	56.40	69.13	59.20	45.35	55.90	49.36	34.83	43.83	38.77	28.74	35.90	31.36	1844
67.16	81.80	69.32	67.45	78.22	68.58	55.77	68.03	58.77	49.13	59.19	50.87	41.50	50.00	43.40	24.71	31.45	26.84	1845
68.10	78.32	68.42	66.45	78.90	68.42	62.16	75.10	64.10	44.80	57.45	49.10	40.97	48.03	43.56	25.00	34.00	30.00	1846
66.90	81.38	69.42	63.58	76.87	65.97	57.00	68.03	59.17	43.03	57.32	48.74	40.43	50.40	43.50	32.22	42.10	36.55	1847
64.68	77.58	67.87	63.55	77.77	67.84	53.50	68.07	58.50	45.77	56.71	49.84	33.20	43.70	36.87	33.68	40.19	36.22	1848
65.64	79.48	69.55	64.64	76.58	68.39	55.43	68.73	60.17	45.80	55.22	49.74	42.33	51.43	46.63	27.64	34.61	30.61	1849
67.48	78.55	70.00	62.51	74.13	66.06	56.73	68.20	60.13	46.74	59.87	51.13	38.26	47.80	42.07	24.64	31.35	28.13	1850
66.58	77.50	68.95	62.72	77.51	67.28	56.78	69.78	60.75	48.58	60.60	53.29	33.65	41.75	36.08	20.73	28.08	23.90	1851
67.50	81.53	70.79	62.43	73.89	65.68	57.50	70.58	61.23	46.69	56.77	50.92	36.03	43.07	38.33	33.50	40.18	35.79	1852
66.34	78.43	70.02	64.44	75.10	67.92	58.97	70.20	62.32	45.47	58.29	50.18	38.73	46.91	40.77	25.26	33.06	28.48	1853
69.40	80.03	72.76	63.87	77.66	68.42	57.70	69.70	60.62	48.89	59.58	53.11	39.90	46.87	41.43	22.89	30.24	25.77	1854
69.39	78.53	71.84	62.95	75.59	67.47	57.02	70.88	61.71	49.16	58.55	52.05	38.33	45.33	40.98	29.55	35.79	31.98	1855
68.47	80.47	72.69	64.21	74.24	67.42	59.02	72.07	63.45	46.65	60.37	51.34	35.58	45.95	40.53	22.35	29.06	26.00	1856
66.91	79.87	69.10	64.32	76.72	66.68	57.00	69.37	59.62	46.14	57.63	49.48	36.57	45.36	39.28	26.94	34.94	30.00	Mean.

Quantity of Rain and Melted Snow falling in Boston in Thirty-four Years.

Year.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Whole Quantity in Year.
1823	3.00	4.57	7.72	2.21	6.40	–.93	5.74	1.98	1.95	3.95	1.92	6.93	47.30
1824	3.95	5.99	1.81	4.72	1.43	1.60	–.88	3.68	6.43	1.01	1.72	2.80	36.02
1825	2.79	3.43	4.70	–.37	1.36	4.77	1.24	5.62	2.66	3.21	–.81	4.38	35.34
1826	2.55	1.48	3.81	1.50	–.25	3.85	2.90	12.10	3.03	3.80	2.31	3.56	41.14
1827	3.92	2.97	2.51	4.75	5.34	2.56	2.59	4.88	4.81	5.28	5.71	3.59	48.91
1828	2.15	2.79	1.84	2.00	4.67	1.59	4.58	–.37	3.82	2.79	5.55	–.26	32.41
1829	4.93	5.62	4.30	3.45	2.71	1.64	6.98	4.95	2.62	1.65	5.74	2.26	46.85
1830	2.36	1.63	3.51	1.21	3.93	3.46	4.90	2.64	5.65	2.38	5.32	5.96	42.95
1831	4.44	3.68	3.07	6.97	3.65	4.32	5.53	5.57	3.83	4.42	3.20	2.93	51.61
1832	4.47	3.74	2.65	5.56	7.27	–.50	3.41	6.14	2.07	2.46	3.57	4.85	46.69
1833	2.96	2.53	2.71	2.30	1.03	3.23	2.01	–.82	2.88	6.00	5.53	5.86	37.86
1834	1.39	1.13	–.96	2.93	6.33	3.09	7.71	2.47	3.71	4.62	2.90	2.36	39.60
1835	3.25	1.37	4.27	4.54	2.07	2.74	9.07	2.89	1.31	1.87	2.08	2.40	37.86
1836	8.84	3.57	2.90	1.58	1.85	4.33	2.12	1.53	–.54	4.04	5.43	4.13	40.86
1837	4.10	4.14	3.02	3.07	5.79	2.98	1.80	1.67	–.56	1.58	2.35	2.46	33.52
1838	3.07	2.77	3.09	2.62	3.32	2.55	1.20	4.26	9.87	5.02	3.95	–.80	42.52
1839	–.98	3.11	1.18	7.73	4.27	2.25	3.32	5.70	2.00	2.50	1.71	6.35	41.10
1840	3.12	2.57	4.55	4.60	2.23	2.78	2.93	4.00	2.12	4.48	11.63	4.15	49.16
1841	6.00	1.60	3.50	8.82	1.90	1.95	2.10	4.20	2.86	3.80	4.55	5.77	47.05
1842	–.80	3.20	3.35	3.50	2.90	5.30	1.82	4.44	3.25	–.80	4.45	5.30	39.11
1843	2.20	6.08	6.17	3.88	1.60	4.61	2.15	6.88	–.98	4.82	3.40	3.92	46.69
1844	3.68	2.42	6.00	–.20	2.72	1.40	2.17	2.62	3.53	5.80	3.15	3.85	37.54
1845	4.58	4.25	3.83	1.23	2.82	2.05	3.28	1.82	2.23	4.00	10.25	5.98	46.32
1846	3.12	2.95	2.73	1.23	2.02	2.25	2.51	1.80	1.30	1.35	4.17	4.52	29.95
1847	3.28	4.70	4.77	2.20	2.03	4.09	2.65	6.45	6.64	1.05	5.12	3.95	46.93
1848	2.30	3.90	4.05	1.40	6.30	1.73	1.35	3.10	3.55	5.10	2.25	5.95	40.98
1849	–.35	1.15	7.35	–.90	3.10	1.45	–.85	6.25	1.25	8.10	5.50	4.05	40.30
1850	4.59	2.52	5.32	4.82	6.63	2.77	2.70	5.30	7.15	2.10	3.32	6.76	53.98
1851	1.30	4.20	3.88	9.37	3.31	1.80	3.09	1.27	3.50	4.43	5.51	2.65	44.31
1852	4.85	2.85	4.45	10.18	1.95	2.35	3.28	7.63	1.65	2.19	3.47	3.09	47.94
1853	2.44	5.30	2.27	3.78	5.63	–.30	3.64	9.40	3.80	3.92	4.43	3.95	48.86
1854	2.91	4.87	2.84	6.63	4.33	2.47	3.70	–.58	3.86	2.08	6.80	4.64	45.71
1855	7.22	4.67	1.18	4.28	1.20	3.09	4.15	1.46	1.13	4.61	5.27	5.93	44.19
1856	5.32	–.80	1.33	4.37	7.10	2.90	4.02	11.11	4.90	2.70	3.33	4.28	52.16
Mean,	3.45	3.31	3.58	3.79	3.51	2.64	3.30	4.28	3.28	3.47	4.31	4.14	43.05

VII.

A History of the Fishes of Massachusetts.

By DAVID HUMPHREYS STORER, M. D., A. A. S.

Continued from Vol. V. p. 296.

FAMILY XIII. CYPRINODONTIDÆ (*continued*).

GENUS II. HYDRARGYRA, Lacép.

Upper surface of head flattened; but the jaws are not depressed. Fine card-like teeth upon the jaws. Opening of mouth semicircular. Lower pharyngeal teeth with rounded crowns, the medio-posterior ones the largest. Branchial rays six on either side. Dorsal opposite to anal, as in the genus *Esox*. Caudal posteriorly subtruncated. Upper surface and sides of head covered with scales.

Hydrargyra flavula, *Storer.*

The Basse Fry.

(Plate XXIII. Fig. 5. Male. 6. Female.)

Esox flavulus, New York Gudgeon, Mitch., Trans. Lit. and Phil. Soc. of N. Y., i. p. 439, pl. 4, fig. 8.
Cyprinodon flavulus, Val., in Humboldt and Bonpland, ii. p. 164, pl. 62, fig. 3.
Hydrargyra flavula, The Basse Fry, Storer's Report, p. 95.
" " Ayres, Bost. Journ. Nat. Hist., iv. p. 267.
" " Girard, in Lit.
Hydrargyra formosa, Storer, Proc. Bost. Soc. Nat. Hist., i. p. 76.
Hydrargyra trifasciata, Storer, Bost. Journ. Nat. Hist., i. p. 417.
Fundulus fasciatus, Striped Killifish, Dekay, Report, p. 216, pl. 31, fig. 98.
Hydrargyra vernalis, Cuv. et Val., Hist. Nat. Poiss., xviii. pp. 206, 207.
Hydrargyra flavula, Storer, Mem. Amer. Acad., New Series, ii. p. 432.
" " " Synopsis, p. 180.

Color. Female of a yellowish-green above, lighter upon the sides, and white beneath. Several longitudinal, interrupted black bands, sometimes five in number, may

be distinctly seen, at other times not more than one or two, upon the sides, extending from the gill-covers almost the whole length of the fish. At the base of the caudal fin, just at the termination of the longitudinal bands, are three or more less distinct transverse bands of a similar color.

In the male, the sides and back are of a greenish-black; the sides are crossed by numerous slate-colored, nearly black, transverse bands, varying very much in their number and width in different individuals, — some individuals exhibiting ten or twelve bands only, while in others are observed twenty, or even more. In some specimens these bands are of the same size throughout their whole length; in others, they diminish gradually from the centre to the sides towards the abdomen, upon which they are lost. In some specimens these bands are less than the sixteenth of an inch wide; in others, they are quite the eighth of an inch. The lower portion of the sides, as well as the abdomen, is of a beautiful yellowish-green color. The operculum is marked by a large black spot; the preoperculum is fuliginous, sometimes cupreous. The dorsal fin is violet-colored, with a black spot, circular in some individuals, upon the centre of the posterior three or four rays; anterior to this spot, in some of the larger specimens, are three or four broken, dark-colored blotches. The pectorals are yellowish. The ventrals are the color of the abdomen. The anal fin is almost green. The caudal fin is orange-colored, margined at its extremity with black. In the dead fish, the general color becomes much lighter, but the black spots upon the dorsal fin and operculum remain.

Description. Body elongated, slightly convex on the dorsum over the pectorals in the female, nearly straight in the male. Greatest depth of the body, which is across the pectorals, less than the length of the head. The head, which is equal in length to one fourth of the entire length of the fish, is compressed above. The mouth is protractile, with numerous minute teeth in the jaws. The eyes are circular.

The dorsal fin is situated upon the posterior half of the body. In the female, it is nearly quadrangular; in the male, the last rays are quite as high as the first, and the extremities of the rays project beyond the connecting membrane.

The pectorals are higher than the dorsal, and are rounded when expanded.

The anal fin is higher than long; in the female the rays of this fin gradually diminish in height posteriorly, while in the male the sixth and seventh rays are highest.

The caudal fin is broad and rounded when expanded.

The fin rays, in three specimens examined, were as follows: —

D. 16. P. 16. V. 6. A. 11. C. 19.
D. 15. P. 17. V. 6. A. 11. C. 20.
D. 14. P. 18. V. 6. A. 12. C. 18.

Length, one to four inches.

Remarks. This pretty species, called by Mitchill the "New York Gudgeon," and known by our fishermen as the "Basse-fry," from the resemblance of the markings of the female to those of the "Striped Basse," and called by boys the "Yellow-tail," is common in brackish waters in the vicinity of Boston. The two sexes were formerly considered distinct species.

Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, DEKAY.

FAMILY XIV. ESOCIDÆ.

Body elongated. One dorsal, generally opposite to the anal. Edge of the upper jaw either formed solely by the intermaxillaries, or, if the labials enter at all into its composition, they are destitute of teeth. Intestinal canal short, without cœca. Branchial rays vary from three to eighteen. Mouth large, and without sharp teeth.

GENUS I. ESOX, CUV.

Head depressed, large, oblong, blunt; intermaxillaries small, with small, pointed teeth at the middle of the upper jaw, of which they form two bands. The maxillaries forming the sides have no teeth. The vomer, palatines, tongue, pharyngeals, and branchial arches bristled with card-like teeth. Sides of the lower jaw with a row of long, pointed teeth.

ESOX RETICULATUS, *Lesueur.*

The Pickerel.

(PLATE XXIV. FIG. 1.)

Esox lucius, Pickerel, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 440.
Esox reticulatus, LESUEUR, Journ. Acad. Nat. Sciences, I. p. 414.
" " *Common Pickerel,* STORER, Report, p. 97.
" " *Pike,* KIRTLAND, Report, p. 194.
" " *Common Pickerel,* DEKAY, Report, p. 223, pl. 34, fig. 107.
Esox fasciatus, Varied Pickerel, DEKAY, Report, p. 224, pl. 34, fig. 110.
Esox reticulatus, Pickerel, THOMPSON'S History of Vermont, p. 138.
" " AYRES, Bost. Journ. Nat. Hist., IV. p. 269.
" " *Pickerel, Pike,* KIRTLAND, Bost. Journ. Nat. Hist., IV. p. 233, pl. 10, fig. 2.
Esox tredecem lineatus, Federation Pike, MITCH., Mirror, 1825, p. 361.
Esox tredecem radiatus, Federation Pike, DEKAY, Report, p. 225.
Esox reticulatus, Pickerel, STORER, Mem. Amer. Acad., New Series, II. p. 437.
" " " " Synopsis, p. 185.
Le Brochet reticulé (Esox reticulatus, LESUEUR), CUV. et VAL., XVIII. p. 327.

Color. The color of this species varies considerably in different localities. Most commonly, however, the body is green above; the sides are of a beautiful golden-

yellow, marked over their whole extent with irregularly distributed dark, longitudinal lines, which by their union produce imperfect reticulations. The body beneath is white, the throat is flesh-colored. The pupils are black; the irides greenish, with a golden ring upon their anterior edge. Beneath the eyes, a deep black band passes perpendicularly to the lower edge of the gill-covers. The dorsal fins are of a greenish-black. The pectoral, anal, and ventral fins are flesh-colored.

Description. Body subcylindrical, much flattened upon the back. The scales are very small. The length of the head is one third less than that of the body, and it is flattened above. The snout is obtuse. The mouth is capable of very great distention. The tip of the lower jaw projects beyond the upper. Teeth on the upper maxillary small; teeth on the anterior portion of the lower jaw small, exceedingly sharp, and incurved; a few on the sides of the lower maxillary quite large, with cutting edges; the palatine bones are armed with numerous incurved teeth, the innermost row the largest; strong teeth are also seen upon the maxillary bones; the vomer, the branchial arches, and the base of the tongue, are likewise furnished with minute teeth. The eyes are moderate in size; they are irregularly oval, their longest diameter being from before, backwards. The nostrils, which are situated in a groove, are quite large; the posterior is much the larger.

The dorsal fin, which is subquadrangular, is situated a short distance in front of the tail. Its fourth and fifth rays are higher than the length of the fin; the first three rays are single, and firmer than the others; the first is about one fifth the height of the fourth; the second is as high again as the first; the third, not as high again as the second.

The pectorals commence on a line with the sixteenth branchial ray; their height is equal to the length of the dorsal fin. They are rounded when expanded.

The ventrals are situated on the anterior half of the body, and they likewise are rounded when expanded. Their rays are multifid. These fins are shorter than the pectorals.

The anus is large, and situated just in front of the anal fin.

The anal fin commences opposite the middle of the dorsal, and is of nearly the same form and size as that fin.

The caudal fin is forked.

The fin rays are as follows: — B. 17. D. 18. P. 13. V. 9. A. 17. C. $19\frac{7}{7}$.

Length, one to two feet.

Remarks. This fine species is the common Pickerel of Massachusetts. It is generally diffused throughout the State, and is everywhere valued. Specimens

may be met with in Boston market almost any month in the year, although greater numbers are taken in the spring and autumn, and some years during the winter. The largest specimens I have seen were brought from Brewster, Cape Cod. Individuals from that place weighing seven pounds have been sold in our market, and they are said to be taken there considerably larger even than this. They are generally caught with the hook; considerable quantities, however, are speared, in some cases through the ice; at other times individuals go out in boats in the evening with lights, the pickerel are attracted, and are speared as they collect round the boats.

Maine, Massachusetts, STORER. Connecticut, LINSLEY, AYRES. New York, DEKAY. Ohio, KIRTLAND.

ESOX ORNATUS, *Girard.*

The Smaller Pickerel.

(PLATE XXIV. FIG. 2.)

Esox ornatus, GIRARD, Proc. Bost. Soc. Nat. Hist., v. p. 41. 1854.

Color. A darkish-green, barred transversely and quite regularly with narrow blackish-brown bands, some twenty in number, which hardly reticulate; not at all posteriorly. The black band beneath the eye pointing somewhat obliquely backward. Throat stained with fuliginous.

Description. Very similar in its characters to those of the *reticulatus*. The following differences are observable. Head considerably more than one fourth the whole length of the body; in the *reticulatus* it is one fourth.

The distance of the ventrals before the anal fin is about one quarter of the whole length; in the *reticulatus* it is not one sixth.

The pectorals commence on a line with the sixth branchial ray; in the *reticulatus*, on a line with the sixteenth.

The fin rays are as follows: — D. 11. P. 13. V. 9. A. 11. C. 19.

Length, seven and a half inches.

Remarks. This species is not unfrequently noticed in Boston market, and is so similar to the *reticulatus* that it has heretofore been considered to be the young of that species.

Massachusetts, GIRARD, STORER.

GENUS II. BELONE, Cuv.

Head and body greatly elongated; the latter covered with minute scales. Both jaws very much produced, straight, narrow, and pointed; armed with numerous small teeth, those of the pharynx paved. Scales not very apparent, except a longitudinal range, carinated on each side near the inferior edge.

Belone truncata, *Lesueur.*

The Gar-fish.

(Plate XXIV. Fig. 3.)

Esox Belone, Bill-fish, Mitch., Trans. Lit. and Phil. Soc. of N. Y., i. p. 443.
Esox longirostris, Long-jawed Fresh-water Pike, Mitch., Amer. Month. Mag., ii. p. 322.
Belone truncata, Gar or *Bill-fish,* Lesueur, Journ. Acad. Nat. Sc., ii. p. 126, fig.
" " *Gar-fish,* Storer, Report, p. 98.
" " *Banded Gar-fish,* Dekay, Report, p. 227, pl. 35, fig. 112.
" " Storer, Mem. Amer. Acad., New Series, ii. p. 438.
" " " Synopsis, p. 186.
L'Orphie à caudale tronquée (*Belone truncata,* Lesueur), Cuv. et Val., xviii. p. 422.

Color. After being preserved in salt, this fish is of a light-green above; beneath silvery, including opercles and lower mandible. Just above the base of the pectorals a band of a darker color arises, and passes in a straight line to the origin of the dorsal fin. Minute fuliginous spots upon the upper portion of opercles.

Description. The body is elongated; the scales small and orbicular. The lateral line arises at the inferior angle of the operculum, and, passing gradually up to the inferior base of the pectorals, assumes thence a straight line, which is continued to the base of the caudal rays. Its greatest depth is equal to about one fifteenth its entire length; the length of the head, from the angle of the jaws to the posterior portion of the operculum, is equal to one tenth the length of the body. The jaws are armed with distant, very sharp, conical teeth, between which are numerous others very minute; the lower mandible projects beyond the upper, and is fleshy at its tip. The head is flattened above, and compressed laterally; the eyes are longitudinally oval; the distance between the eyes is equal to their longer diameter. The nostrils are situated in a triangular space just in front of the eyes.

The dorsal fin is situated on the posterior fourth of the body; its anterior rays are highest, and it is emarginated posteriorly.

The pectorals are directly back of the posterior angle of the operculum; their length is equal to one fourth the height of their longest rays.

The ventrals are situated upon the posterior half of the body; their length is equal to one fourth of their height.

The anal fin is of the same form as the dorsal; it commences just in front of that fin, and is coterminal with it; its anterior rays are longer than the corresponding ones of the dorsal fin.

The caudal fin is slightly emarginated.

The fin rays are as follows: — D. 15. P. 12. V. 6. A. 19. C. 19.

Length, one to two feet.

Remarks. The only specimens I have seen of this species were sent to me by Dr. Yale, from Holmes's Hole, where it is called "Gar-fish."

Massachusetts, STORER. Connecticut, LINSLEY, AYRES. New York, LESUEUR, MITCHILL, DEKAY. Pennsylvania, Rhode Island, LESUEUR.

GENUS III. SCOMBERESOX, CUV.

Have the same structure of the jaws as the *Belone;* and are similar, also, in the form of the body and scales, with a keel-like edge to the belly; but the posterior portions of the dorsal and anal fins are divided, forming finlets, as in the Mackerel.

SCOMBERESOX STORERI, *Dekay.*

The Bill-fish.

(PLATE XXIV. FIG. 4.)

Scomberesox equirostrum, LESUEUR, Journ. Acad. Nat. Sc., II. p. 132.
Scomberesox scutellatum, LESUEUR, Journ. Acad. Nat. Sc., II. p. 132.
Scomberesox equirostrum, Bill-fish, STORER, Report, p. 100.
Scomberesox Storeri, Bill-fish, DEKAY, Report, p. 299, pl. 35, fig. 111.
" " STORER, Mem. Amer. Acad., New Series, II. p. 439.
" " " Synopsis, p. 187.
Le Scombrésoce equirostre (*Scomberesox equirostrum*, LESUEUR), CUV. et VAL., XVIII. p. 479.

Color. The dorsum is of an olive-green color; beneath this, a strongly-marked silvery band, half an inch wide, runs the whole length of the body, divided in its centre by a narrow longitudinal line of the same color as the back; the abdomen and gill-covers are satiny. The dorsal fin is greenish, as well as the finlets posterior to it. A dark-green spot is situated at the base of the pectorals, above. After death, the olive-green upon the back becomes a coppery green; the sides lose their splendor, and the fins their transparency.

Description. Body elongated, compressed, gradually lessening in depth back of the anus. Head, including the jaws, equal to one fourth the length of the body; gill-covers large, smooth; the lower jaw the longer; the jaws, at their origin, are armed

with very minute teeth. The eyes are moderate; their diameter is equal to one twelfth the length of the head; the distance between the eyes rather greater than their diameter. Nostrils large.

From the lower edge of the operculum, extending to the fourth anal finlet, forming the lateral boundaries of the abdomen, are two yellowish lines, which are continued series of scales; when raised they resemble serrations, when not erect they look like sinuses. Between these rows of scales are situated the ventrals, the anal, and the anal finlets.

The dorsal fin is small, and situated upon the posterior third of the body. It is longer than high; the first and second rays are simple; the first is about half the height of the second; the first three or four rays are articulated. Posterior to this fin are situated five, and in some specimens six, finlets.

The triangular pectorals are situated at the posterior angle of the operculum; the first ray is longer and broader than the others.

The fan-shaped ventrals are situated just back of the centre of the body.

The anal fin commences about opposite the dorsal, and terminates nearly on a line with it. Back of this fin are five or six finlets.

The caudal fin is deeply forked, the lower lobe projecting slightly beyond the upper; the rays are articulated. In the recent fish the fleshy portion of the tail is continued to the top of the central rays, presenting a large silvery patch.

The fin rays are as follows: — D. 10, v. or vi. P. 14. V. 6. A. 12, v. or vi. C. 20.

Length, ten inches.

Remarks. This is one of our most beautiful species. It usually appears in the month of October, sometimes earlier and sometimes later, however, depending upon the season. Large quantities are yearly thrown upon the shore at Provincetown, and are considered worthless, while by the inhabitants of some of the other towns upon Cape Cod it is taken in immense numbers, and is considered by them very nutritious food.

In the year 1821, Lesueur read to the "Academy of Natural Sciences of Philadelphia" a description of this species; to use his own words, "taken from an individual preserved and dried in the cabinet of the Linnæan Society of Boston, under the name of *Saurus*. It cannot be regarded as sufficiently complete, but may serve to call the attention of others who may have a better opportunity of completing its description." In my "Report on the Fishes of Massachusetts," published in 1839, I had an opportunity of presenting a description drawn up from recent specimens; and under the head of this species, I made the following observations: — "Lesueur's description

shows his specimen to have been an imperfect one. I have seen no specimen in which the jaws were of equal length; the lower jaw was undoubtedly broken in the specimen seen by Lesueur, as is very apt to be the case in dried specimens of this genus, else he could not have called it '*equirostrum*'; still, as some naturalists think a specific name need not point out any particular character, and as I have no desire to detract from the labors of another, I shall merely point out the characters as they exist in the recent specimen, and leave Lesueur's name to be changed, should it ever be thought advisable, by some succeeding ichthyologist." In 1842, Dekay published his "Zoölogy of New York." In his volume on the Ichthyology of that State, while describing this species, he says: "The original notice of this species by Lesueur was made from an imperfect and dried cabinet specimen; and his name, of very dubious Latinity, and drawn from a false character, must be rejected. The name which I have attached to it is due to the distinguished ichthyologist who pointed out distinctly the impropriety of the appellation, and was its first accurate describer." Dr. Dekay having thus agreed with me in the opinion of the "impropriety" of Lesueur's specific name, I did not hesitate to adopt the one he proposed, in my "Synopsis of the Fishes of North America," published in 1846, however much I may have desired that it should be a different one. Valenciennes, in the eighteenth volume of his "Histoire Naturelle des Poissons," insists upon retaining Lesueur's name of "*equirostrum*," — because, having received a specimen of *Scomberesox* from Chili, and compared it with Lesueur's figure, he says "it is impossible to doubt their specific identity." He thinks, if any differences are noticeable in Lesueur's description from the Chilian fish, that they are referable to the fact that that description was made from a dried specimen. Now what are the facts? Lesueur's description was not accompanied by a figure. He himself was aware that his specimen was imperfect, and that his account could "not be regarded as sufficiently complete." Valenciennes seems to have forgotten that the most likely accident to happen to a dried specimen of this species is a fracture of the lower jaw; that it is a rare thing to find a specimen, thus preserved, perfect in this respect; and if he refers to his description of the Southern fish, he will notice the caudal fin contains twenty-seven rays, while in the descriptions of Lesueur, Dekay, and my own, there are uniformly twenty rays in that fin. Unconvinced that Dekay and myself are in error, I cannot yield my convictions to the authority of the justly celebrated French ichthyologist.

Newfoundland, Lesueur. Massachusetts, Storer. New York, Dekay.

FAMILY XV. FISTULARIDÆ.

Characterized by a long tube in the fore part of the cranium, formed by the prolongation of the ethmoid, vomer, preopercula, interopercula, pterygoideals, and tympanals, and at the extremity of which is the mouth, composed, as usual, of the intermaxillaries, maxillaries, and the palatine and mandibulary bones. Their intestine has neither great inequalities nor many folds, and their ribs are short or wanting. Some of them, the Fistulariæ, have a cylindrical body; in others, the Centrisci, it is oval and compressed.

GENUS FISTULARIA, Lacép.

Body elongated, cylindrical. Dorsal opposite to the anal. The intermaxillaries and the lower jaw are armed with small teeth. From between the two lobes of the caudal proceeds a filament which is sometimes as long as the body. The tube of the snout is very long and depressed. The natatory bladder is excessively small, and the scales are invisible.

Fistularia serrata, *Bloch.*

The Tobacco-pipe Fish.

(Plate XXV. Fig. 1.)

Petimbuabo Brazil, Tobacco-pipe Fish, Catesby, Hist. Carol., ii. p. 17.
Fistularia serrata (?), Bloch, variety of *tabacaria.*
" " Shaw, Gen. Zoöl., v. pl. 107, fig. of tube.
" " *Tobacco-pipe Fish,* Storer, Report, p. 80.
" " *American Pipe-fish,* Dekay, Report, p. 232, pl. 35, fig. 113.
" " Storer, Mem. Amer. Acad., New Series, ii. p. 443.
" " " Synopsis, p. 191.

Color. Back a light drab. Abdomen silvery. A narrow brownish-blue band along the sides. Throat white. Irides silvery.

Description. Body to dorsal cylindrical, greatly elongated; between dorsal and caudal, flattened from above. Head of but little less diameter than body. Snout prolonged into a lengthened tube, the distance from the orbit to the tip of the lower jaw being nearly four times that from the orbit to the posterior angle of the operculum. Whole length of head rather more than a third of whole length of body, exclusive of caudal filament; its depth but little less than that of the body, and one ninth its whole length. Snout horny, somewhat broader than deep; strong longitudinal ridges along its top, sides, and base. The lateral ridges extend from the anterior and superior edge of the orbit to the tip of the upper jaw, and are strongly serrated nearly the whole

distance; the lower ridges with small and crowded reticulating striæ, like those of a file. Gape of mouth large in proportion to diameter of tube. Lower jaw the longer, and somewhat curved upwards. A fleshy protuberance at chin. Both jaws with numerous small, sharp, recurved teeth. Nostrils double (Dekay says single), just in front of anterior superior orbital spine, the posterior being the smaller. Orbits elliptical, greatly ridged, with blunt spines anteriorly both above and below, and posteriorly above. Top of head strongly ridged. Opercula with radiating striæ.

Shoulders covered by horny plates extending deep upon the sides, and reaching posteriorly two thirds the distance between the pectoral and ventral fins. Skin slightly roughened, but no scales visible.

The lateral line commences above and a little anterior to the superior angle of the opercle, curves slowly upwards, and again downwards, to the posterior extremity of the humeral plates, just described, then, taking the middle of the side, pursues a straight course to the centre of the caudal, whence it is evidently prolonged as the longer caudal filament; from the humeral plates it gradually becomes furnished with more and more distinct broad longitudinally-flattened spines.

Dorsal small, triangular, the central rays the longer; directed sharply backwards. Situated on posterior sixth of fish. Less than one half as broad as long.

Pectorals also in breadth less than one half their length; quadrangular, and of moderate size; situated just posterior to the opercle.

Ventrals very small, oblong, three eighths of the distance between pectorals and anus.

Anal just beneath dorsal, with which it is identical in size and shape.

Caudal deeply forked. From its central point, and in continuation of the lateral line, arises a delicate jointed filament, in length nearly half that of the body; not far from its extremity this filament seems to have been broken in the specimen described, giving rise to little diverging threads, which were described by Dekay, from the same specimen, as natural bifurcations. Just beneath the long filament, and from its base, arises a second, one sixth its length and much more delicate.

The fin rays are as follows: — D. 14. P. 16. V. 6. A. 14. C. $16\frac{3}{3}$.

Length, exclusive of filament, nineteen inches.

" including filament, twenty-eight inches.

Remarks. The only specimen I have seen of this species was procured at Holmes's Hole by the late Dr. Yale of that place. It belongs to the cabinet of the Boston Society of Natural History. It served for the description contained in my Report. I loaned it to Dr. Dekay, who described and figured it in his Report on the Fishes of New York. I now redescribe it, and Mr. Sonrel furnishes an admirable drawing.

I stated in my Report, that I considered this fish to be the *serrata*, although I had no means of ascertaining what that species was, having no works upon Ichthyology which would assist me. Dr. Dekay, under date of June 7th, 1841, wrote me that I was right in my supposition, as he had compared my specimen "directly with one he had brought from Brazil some years ago."

Massachusetts, STORER. Jamaica, CATESBY.

FAMILY XVI. SALMONIDÆ.

Body scaly. First dorsal with soft rays, the second small and adipose. Numerous cœca, and a natatory bladder. The structure and armature of the jaws vary surprisingly. Almost all of them ascend rivers.

GENUS I. SALMO, LIN.

Head smooth; teeth on the vomer, both palatine bones, and all the maxillary bones; branchiostegous rays varying in number, generally from ten to twelve, but sometimes unequal on the two sides of the head of the same fish.

SALMO SALAR, *Lin.*

The Salmon.

(PLATE XXV. FIG. 2.)

Salmo salar, LIN., Syst. Nat. (12th edit.), p. 509.
" " BLOCH, I. pl. 20 (female); III. p. 98 (male).
" " *Salmon*, PENNANT, Brit. Zoöl., VIII. p. 382.
" " *Common Sea-Salmon*, SHAW, Gen. Zoöl., V. p. 40, fig. 102.
" " *Salmon*, FLEMING, Brit. An., p. 179, sp. 40.
" " " JENYNS, Brit. Vert., p. 421.
" " " GRIFFITH'S CUV., X. p. 416.
" " " FABRICIUS, Fauna Grœnlandica, p. 170.
" " *Common Salmon*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 435.
" " " " DE WITT CLINTON, Trans. Lit. and Phil. Soc. of N. Y., I. pp. 147, 498.
" " " " RICH., Fauna Boreal. Americ., III. p. 145.
" " *Salmon*, STORER, Report, p. 104.
" " *Common Sea-Salmon*, DEKAY, Report, p. 241, pl. 38, fig. 122.
" " *Salmon*, THOMPSON, Hist. of Vermont, p. 140.
" " " STORER, Mem. Amer. Acad., New Series, II. p. 444.
" " " " Synopsis, p. 192.
Salmo, CUV. et VAL., Nat. Hist. des Pois., XXI. p. 169.

Color. This species is of a beautiful, brilliant silver-color above, lighter upon the sides, white beneath; many black blotches are observed upon the sides, which are much

more numerous above the lateral line; frequently these blotches surround the outline of the scales, or occupy only a portion of each scale. Upon the scaleless head these spots are unbroken; they are of a deeper color, and are generally circular. The head is darker-colored above, than the back of this fish; the greater portion of the gill-covers is of a light silver-color. The pupils are black, the irides silvery. The inside of the jaws and the edges of the tongue are dusky. The dorsal fin is rather darker-colored than the back, and has one or two longitudinal rows of black blotches upon its base. The adipose fin is dark brown. The pectorals are dark-colored above, lighter beneath. The ventrals are dusky above, white beneath. The anal fin is white. The caudal fin is of a dark-brown color.

Description. Body elongated. The length of the head is less than one sixth the length of the entire fish; the greatest depth of the fish is equal to three ninths its length; its greatest width is less than one sixth its length. The eyes are small; their diameter is equal to one quarter of the distance between them. The nostrils are situated vertically nearer to the eyes than to the extremity of the snout. The upper jaw is the longer, and receives into a notch at its middle the prominent tip of the lower jaw. The lateral line is nearly straight, and is situated just above the middle of the body.

The dorsal fin arises upon the anterior half of the body; its first rays are nearly equal in height to the length of the fin. The *adipose fin* is situated a short distance in front of the tail; its length is equal to one third of its height.

The pectorals commence in front of the posterior angle of the gill-covers; their length is equal to one fourth their height.

The ventrals begin on a line opposite the posterior portion of the dorsal fin, and have on their sides a large axillary scale.

The anal fin is higher than long. The anus is large, and is edged by the extremities of the surrounding scales.

The fleshy portion of the tail extends considerably further forwards in its middle than on the sides, leaving the rays on the sides much the longer; the length of the central caudal rays being only about one third the length of those upon the sides.

The fin rays are as follows: — D. 12. P. 15. V. 9. A. 10. C. 19.

Length, two to three feet.

Remarks. This excellent fish is almost entirely driven from the waters of our State, by the numerous dams and manufacturing establishments which have been erected within a few years, preventing it from going up the rivers to deposit its spawn. About sixty years since it was very abundant in Merrimack River; so much so, that nine individuals have been taken in an afternoon by one person with a dip-net, and the usual

price was eight cents per pound. Between twenty and thirty years ago, two wagons, each bringing from thirty to forty salmon from the Merrimack River, supplied the Boston market every week during the season of the fish. The few individuals now taken in our rivers are looked upon as rarities, and our market is supplied by the fisheries of the Kennebec River and Nova Scotia. The average weight of the Merrimack salmon was from nine to twelve pounds, and from sixteen to twenty-two pounds. The largest weigh from thirty to forty pounds. They have been caught during every month of the year. The greatest run of salmon up the rivers is about the first of June. The fishermen say the young salmon are never seen on their return.

The price of salmon has varied in Boston market of late years from two dollars to twenty cents per pound. The largest specimen I have heard of being sold in the market here weighed thirty-five pounds; and the greatest price ever received for one individual in the same market was fifty dollars.

Labrador, Canada, Newfoundland, and Nova Scotia, RICHARDSON, DEKAY. Maine, New Hampshire, and Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

SALMO FONTINALIS, *Mitchill.*

The Common Brook-Trout.

(PLATE XXV. FIG. 3.)

Salmo fontinalis, Common Trout, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 435.
Salmo nigrescens, Black Trout, RAF., Ichth. Ohien.; p. 45.
Red-spotted Trout, DOUGHTY, Cabinet of Nat. Hist., I. p. 145, pl. 13.
Salmo fontinalis, RICH., Fauna Boreal. Americ., III. p. 176, pl. 83, fig. 1; pl. 87, fig. 2 (head).
" " *Common Brook-Trout,* STORER, Report, p. 106.
" " *Speckled Trout,* KIRTLAND, Report, pp. 169, 194.
" " *Brook-Trout,* THOMPSON, Hist. of Vermont, p. 141.
" " " DEKAY, Report, p. 235, pl. 37, fig. 120.
Baione fontinalis, Spotted Troutlet, DEKAY, Report, p. 244, pl. 20, fig. 58.
Salmo fontinalis, Brook-Trout, AYRES, Bost. Journ. Nat. Hist., IV. 273.
" " *Common Brook-Trout,* KIRTLAND, Bost. Journ. Nat. Hist., IV. p. 305.
" " " " STORER, Mem. Amer. Acad., New Series, II. p. 444.
" " " " " Synopsis, p. 192.
" " CUV. et VAL., Nat. Hist. des Pois., XXI. p. 266.

Color. The upper part of the body is of a pale-brown color, mottled with darker undulating, reticulated markings; the sides lighter, with a great number of circular yellow spots, varying in their size from a small point to a line or more in diameter, and many of them having in the centre a bright-red spot; sometimes, the yellow color sur-

rounding them having partially disappeared, they seem distinct from the circular spots, or are surrounded by a dull-bluish halo; these red spots differ exceedingly in number in different specimens; in some, three or four only are observable, and these are situated below the lateral line; in others, twenty or more are seen, scattered above and below the lateral line indiscriminately, presenting a beautiful appearance. The body beneath is white, yellowish-white, slightly or dark fuliginous. Head above, darker than the back of the fish. Gill-covers golden, with fuliginous. The dorsal fin is yellow, with irregular tranverse black bands. The first ray of the pectorals and ventrals is white, the second is dark-colored, the remainder red. The first ray of the anal fin is white; the remainder of the fin is generally red. The caudal fin is of a dirty reddish-brown, mottled with black spots.

Description. Body elongated, compressed. The length of the head is equal to about one fifth the whole length of the fish; the top of the head is flattened; the snout is obtuse. The eyes are large and circular. The distance between the eyes is equal to one fifth the length of the head. The jaws are equal in length; the gape of the mouth is large; the teeth are sharp and recurved; the teeth on the tongue are larger than those in the jaws; there are teeth also on the palatines and vomer. The scales are very small; those on the lateral line, which pursues a straight course, are larger than those on the rest of the body.

The quadrangular dorsal fin is situated upon the anterior half of the body; the adipose fin is quite small, and near the tail.

The pectorals arise in front of the posterior angle of the operculum; their length is equal to one quarter of their height.

The fan-shaped ventrals commence opposite the middle of the dorsal fin; when unexpanded, their extremities together form a sharp point.

The anal fin arises in front of the adipose fin, and is higher than long.

The caudal fin is deeply emarginated.

The fin rays are as follows: — D. 11. P. 13. V. 8. A. 11. C. 19.

Length, eight to twenty inches.

Remarks. This is quite a common species in our waters. It is frequently met with in the market, where it is readily sold. It is a delicious fish, and is much valued by epicures. It is taken at Sandwich in considerable quantities, not less than one thousand pounds yearly. It is quite common to find them in the wells in the vicinity of Sandwich, living there for years and attaining a large size.

It varies from a quarter of a pound to a pound and a half. Dr. Dekay speaks of a specimen weighing four and a half pounds; and Mr. Henry Blood, of New Bedford,

informed me that he caught one at Enfield, New Hampshire, which weighed nine pounds.

The following interesting observations upon the habits of this species were sent me by my friend, J. B. Forsyth, M. D., of Chelsea, formerly of Sandwich, and with his consent were published in the fifth volume of the Boston Journal of Natural History.

"The few observations I have to communicate upon the habits and peculiarities of the Salmon-Trout were made during a residence of ten years in Sandwich, Cape Cod, where the facilities for that purpose are abundant.

"It may be well to premise, that the distance, at this point of the Cape, from one bay to the other, varies from five to ten miles, and the land is gradually elevated from each shore till it reaches the centre, and consequently the streams, for the most part arising from springs, are short, terminating in creeks upon the marshes. Many of these are of sufficient magnitude for mill-sites, and are therefore crossed by permanent obstructions; and hence it frequently happens, in the short space of a quarter of a mile, you find specimens of both, as they are familiarly called, the fresh and salt water trout.

"The following varieties in color and appearance have been observed.

"1st. Those having the upper part and sides of a pale-brown, gradually becoming less so till it terminates in white on the under part, having a silvery appearance when first taken from the water, and covered with small, distinct scales, the circular yellow and red spots very indistinct; generally found in the marshy creeks or open streams, where the sun has free access. They are well fed upon minnows and shrimps, have a plump appearance, and are the variety mostly sought after by those who desire the trout, in its highest perfection, for the table. They are taken mostly between the months of January and July. They vary in size from one fourth of a pound to four pounds; but I have never seen one to exceed two and a half.

"2d. Those having the upper part and sides of a dark brown, having a dark-green appearance, terminating in white or orange underneath, and covered more or less with round yellow spots, with a bright-red centre, color varying according to the location, and generally not so plump and well fed as those above mentioned.

"3d. Those having the upper part and sides of either a light or dark brown, with spots more distinctly marked on the dark than the light; underneath, the color uniformly ferruginous or orange.

"Each of these varieties is found both in the streams communicating with the salt marshes, and in those which are entirely cut off from them by permanent obstructions. The first-named variety, however, is nowhere found in so great perfection as in close

approximation to the salt creeks. The difference between the salt and fresh-water trout, in this vicinity, seems to be only in name, so far as I have been able to determine, with ample opportunities in taking them, and with specimens before me. The peculiarity of these varieties seems to depend entirely upon the location, and the nature of the soil at the bottom of the stream they inhabit. The first variety is found in clear water, with light gravelly bottom, and where the banks are not shaded by shrubbery, but where they are almost constantly exposed to the rays of the sun. The second variety inhabits streams which are for the most part shaded by trees, or which take their rise in or pass through peat-bogs. Thus, in one stream, the trout caught at the head of it were always of a very dark brown, almost black, highly marked with yellow and red spots, while those taken near the mouth of the stream were of a light color. One of these streams arises from a deep basin of dark water, thirty feet in diameter and ten feet deep, surrounded by a peat-bog, where the fish taken, so far as I know, have been uniformly of a dark brown. In other streams, having a bottom of iron ore, they are uniformly marked with orange beneath, the color of the upper part and sides appearing to depend upon the amount of exposure to the sun's rays. These observations are made independent of any of the changes of color or markings which take place during the spawning season.

"About the first of January, these fish are found congregated together at high-water mark, and seem to have come down the stream for the purpose of locating themselves in the marshes, where they can obtain food. So uniform are they in this, that for a number of years it was my custom to visit one particular stream during this month; and I was always sure to find them assembled in waiting for me, within a few rods of the same spot, in number I cannot say how many, but I would take of them varying from sixty to seventy-five.

"During the months of February, March, and April they become separated, and are distributed the whole length of the creeks, and about the first of May begin again, in small numbers, to ascend the stream. This they continue to do as the season advances, and their means of sustenance increases (which is principally insects and flies), till about the middle of October, when they are found in great numbers as near up as they can conveniently get to the origin of the stream. This is their spawning season; and having deposited their spawn, they begin to wend their way down the stream, for the most part in a body, till they again reach the marshes.

"These fish were formerly taken in considerable numbers with a kind of net used in the herring fishery; but this method of taking them is, I believe, prohibited by legislation. They are now taken, for the most part, with line and hook, baited with minnow.

shrimp, or earth-worm; or at some seasons of the year, with the artificial fly, more especially in the fresh ponds.

"Two other methods of taking them have been resorted to in the small streams, both of which deserve a passing notice; the first is by titillation, so called, and the second, hooking them up by the caudal extremity, decidedly the meanest way of taking them.

"The method of taking them by titillation is this. About the spawning season they are found, for the most part, in the small and narrow head streams, and seem more sluggish than at any other season of the year, and less inclined to take the bait. Having arrived at the edge of the stream, the hand is carefully and gently passed along under the banks, till it comes in contact with the fish, generally near the tail. The titillation then commences, and the hand is made to approach towards the head, till sufficiently forward to prevent slipping through the fingers, when by a sudden grasp it is landed upon the shore, the fish remaining perfectly quiet during the process. This mode of taking them I have practised in one stream three years in succession, and taken many fine trout.

"The unscientific mode of hooking them up by the caudal extremity is also practised at the spawning season, when they are averse to taking the bait, and when and where the stream is deeper and wider. The manner is as follows. A large-sized hook, made very sharp, is fastened to the end of a long, straight stick or piece of whalebone. The fish is then sought, and generally found beneath the root of an old tree, or under the shadow of a log, with the head and part of the body out of sight; the hook is then carefully introduced near the extremity of the fish, and by a sudden jerk is inserted so as effectually to secure him."

Labrador, H. R. Storer. Maine, Massachusetts, Storer. Connecticut, Linsley, Ayres. Vermont, Thompson. New York, Mitchill, Dekay. Pennsylvania, Dekay. Ohio, Kirtland. Lake Huron, Richardson.

GENUS II. OSMERUS, Artedi.

Body elongated, covered with small scales; two dorsal fins, the first with rays, the second fleshy, without rays; ventral fins in a vertical line under the commencement of the first dorsal fin. Teeth on the jaws and tongue very long, two distinct rows on each palatine bone, none on the vomer, except at the most anterior part. Branchiostegous rays, eight.

Osmerus viridescens, *Lesueur.*

The Smelt.

(Plate XXV. Fig. 4.)

Salmo eperlanus, Smelt, Mitch., Trans. Lit. and Phil. Soc. of N. Y., i. p. 435.
Osmerus viridescens, Lesueur, Journ. Acad. Nat. Sc., i. p. 230.
Salmo (Osmerus) eperlanus, Rich., Fauna Boreal. Americ., iii. p. 183.
Osmerus eperlanus, Smelt, Art., Storer's Report, p. 108.
Osmerus viridescens, American Smelt, Lesueur, Dekay's Report, p. 243, pl. 30, fig. 124.
" " Storer, Mem. Amer. Acad., New Series, ii. p. 449.
" " " Synopsis, p. 197.
" " Cuv. et Val., Hist. Nat. Poiss., xxi. p. 388.

Color. When alive, this species, above the lateral line, is of a yellowish-green color with cupreous reflections, the scales being ornamented with exceedingly minute black dots; the sides, beneath the lateral line, are of a silvery-white; the abdomen, of a milky-white; the upper portion, beneath the lateral line, presents the appearance of a satin band the entire length of the body; the upper edge of this band is of a beautiful violet tint. Opercles golden. The dorsal and caudal fins are of the color of the back; the ventrals and anals are white; the pectorals are yellowish-white.

Description. Body elongated, cylindrical. Its greatest depth is just in front of the dorsal fin; its depth at the base of the caudal fin is less than half the depth of the head across the operculum. The length of the head to the whole length of the fish is as 1 to 5. The head is destitute of scales. The lower jaw is longer than the upper, with several sharp, recurved teeth; the front upper teeth much larger than the others, and very sharp. A single row of sharp teeth on the palatine bones. Three or more teeth on each side of the tongue; a tooth at the tip of the tongue much larger than the others. Labials delicately denticulated throughout the whole extent. Gape of the mouth wide. Nostrils large, double; the posterior the longer. Eyes circular, pupils black, irides silvery. Diameter of the eye equal to three fourths the distance between the eyes.

The lateral line commences at the superior angle of the operculum, and is continued in a straight course to the tail, being more obvious in front of the dorsal fin.

The dorsal fin arises opposite the ventrals. The first ray is one third as high as the second ray; the second ray is one third higher than the length of the fin. The rays are branched at their extremities. The adipose fin, which is quite narrow, is situated over the posterior portion of the anal fin, at a distance greater than the length of the head, back of the first dorsal fin.

The pectorals are situated just beneath the inferior angle of the operculum. Their

first ray is of a dark-brown color; they are of the same height as the first rays of the dorsal fin.

The ventrals commence on a line with the origin of the dorsal fin, and are not quite as high as the pectorals; their rays are multifid.

The anal fin is situated at the same distance back of the ventrals that the ventrals are back of the pectorals; it is longer than high, and its length is equal to the height of the pectorals.

The caudal fin is deeply forked.

The fin rays are as follows: — D. 11. P. 14. V. 9. A. 15. C. 19.

Length, three to ten inches.

Remarks. This beautiful species is brought to Boston market in the spring and autumn in large quantities, and is highly esteemed as an article of food. In the spring it is taken in nets up the rivers, and in winter with the hook beneath the ice. In Watertown alone, about 750,000 dozen are taken annually in scoop-nets, from the first of March to the first of June. The largest specimens I have seen were taken in Milton River in the latter part of December, 1837. Four specimens taken, without regard to size, weighed one pound and a half.

Maine, Massachusetts, Lesueur, Storer. New York, Mitchill, Dekay. "From the waters of Huron to the coast of Labrador," Dekay.

GENUS III. SCOPELUS, Cuv.

Body long, slender; the principal dorsal fin over the interval between the ventral and anal fins; a second dorsal, so small as to be scarcely perceptible. The head short; the mouth and gill-aperture large; small teeth on both jaws; palate and tongue smooth.

Scopelus Humboldtii, *Cuv.*

The Argentine.

(Plate XXV. Fig. 5.)

Argentina sphyræna, *Argentine*, Penn., Brit. Zoöl., iii. p. 286, fig.
Scopelus Humboldtii, Cuv., An. King., Eng. edit., x. p. 432.
" " Yarrell, Brit. Fish., 1st edit., ii. p. 94, fig.; 2d edit., ii. p. 161, fig.
" " *The Argentine*, Storer, Report, p. 110.
" ? " Dekay, Report, p. 246.
" " Storer, Mem. Amer. Acad., New Series, ii. p. 450.
" " " Synopsis, p. 198.
" " Cuv. et Val., Nat. Hist. des Pois., xxii. p. 431.

Color. Back, to depth of a line, dark brownish-green. Sides, opercula, and beneath orbit silvery, as also irides. A row of large circular golden spots on a bluish-metallic

ground, five in number, runs along each side of the throat. A similar row of twelve, somewhat smaller in size, on each side of the belly from before pectorals to ventrals. Above these, on the sides, another row of eight, still smaller ones, between base of pectorals and a point perpendicularly over ventrals; between ventrals and anal, five; above anus, one, breaking the row, which is continued from the anus to base of tail by a series of twenty-four, gradually decreasing in size to a mere speck; about two thirds this distance, a single spot omitted on each side.

Description. Body compressed, elongated. Its depth, which to near the ventrals is equal, is about one fourth the whole length, and about the length of the head, of which the diameter of the large eye is but little less than one third. Nostrils double, situated just anteriorly to upper edge of orbit. Mouth widely cleft, its gape transverse, lower jaw being much the longer when expanded. Lateral line nearly straight for the posterior two thirds, and about midway of the body; in its anterior third, rising to upper third of operculum; almost imperceptible.

Dorsal situated at about the middle of the back, on a line between the ventrals and anal; moderate in size.

The adipose fin about equidistant from dorsal and caudal; hardly perceptible; apparently little more than a membranous ridge.

Pectorals much elongated; their rays gradually increasing in length upwards and outwards.

Ventrals and anal small, and situated very near each other.

Caudal deeply forked.

The fin rays are as follows: — D. 10. P. 17. V. 8. A. 15. C. 19.

Length of specimen of 1856, one inch and six lines; of that of 1837, two inches and one line.

Remarks. In December, 1837, I received from Mr. Jonathan Johnson, of Nahant, a specimen of this fish, which he had just previously found alive on the beach at that place. Although a fisherman from his youth, he had never seen a living specimen before, but he had repeatedly found partially decomposed specimens in the stomachs of haddock.

Several years afterwards, my son, Horatio R. Storer, found a mutilated specimen in the stomach of a cod at Provincetown.

Captain Atwood brought me a specimen in July, 1856, which had been found alive a few days before upon the beach at Provincetown. This specimen has enabled Mr. Sonrel to furnish me with a figure, and allowed me to redescribe the species. Our fish agrees almost precisely with the very thoroughly and carefully drawn description

given by Dr. Clarke, in Yarrell's "British Fishes," from a specimen taken in 1833, in the Frith of Forth, and there can be little doubt of their identity.

Soon after I had received my specimen from Provincetown, Captain Atwood found five other individuals alive on the beach at that place.

FAMILY XVII. CLUPEIDÆ.

No adipose fin. The upper jaw is formed as in the Trout, at the middle by intermaxillaries, without pedicles, and on the sides by the maxillaries. Their body is always very scaly.

GENUS I. CLUPEA, Cuv.

Body compressed; scales large, thin, and deciduous. Head compressed; teeth minute or wanting. A single dorsal fin. Abdominal line forming a sharp, keel-like edge, which in some species is serrated; branchiostegous rays, eight.

Clupea elongata, *Lesueur.*

The Common American Herring.

(Plate XXVI. Fig. 1.)

Clupea harengus, Herring of Commerce, Mitchill, Amer. Month. Mag., ii. p. 323.
Clupea elongata, Lesueur, Journ. Acad. Nat. Sc., i. p. 250.
" " *Common Herring of Massachusetts*, Storer, Report, p. 111.
" " *Common American Herring*, Dekay, Report, p. 250.
" " Storer, Mem. Amer. Acad., New Series, ii. p. 456.
" " " Synopsis, p. 204.
Le Hareng de New York (*Clupea elongata*, Lesueur), Cuv. et Val., xx. p. 247.

Color. Above, of a deep blue tinged with yellow; sides silvery, with metallic reflections; opercles brassy, with metallic reflections; beneath, silvery. Pupils black, irides silvery.

Description. Body elongated, fusiform, compressed. The depth of the fish at the origin of the dorsal fin is equal to one sixth its entire length; its width, at the commencement of the dorsal, is about one twelfth its entire length. The scales are large, silvery, nearly smooth, deciduous. The abdominal ridge is indistinctly serrated. About thirty serrations are seen in front of, and fifteen back of, the ventrals. The length of the head, when the mouth is closed, from the extremity of the chin, is equal to about one sixth of the entire length; head naked, with a depression above, extending from occiput anteriorly, exhibiting numerous mucous pores. Teeth on lower jaw, vomer, and

centre of tongue. Vertical gape of mouth equal to half the length of the head. Eyes large, circular, provided with a nictitating membrane; distance between the eyes less than the diameter of the eye. Nostrils situated in a groove, nearer the snout than the eyes.

The subquadrangular dorsal fin arises on the anterior half of the body.

The fan-shaped pectorals are one third as long as high.

The ventrals are situated opposite the dorsal, and are two thirds as high as that fin.

The anal fin is about as long as the dorsal; its first rays are one third as high as its length.

The caudal fin is deeply forked; scales are continued upon the base of its rays.

The fin rays are as follows: — D. 18. P. 19. V. 9. A. 17. C. 22.

Length, twelve to fifteen inches.

Remarks. This species, incorrectly called by our fishermen "English Herring," is taken in great numbers on some parts of our coast. At Edgartown, it is abundant from March to May; on the south side of that place, sometimes five hundred or six hundred barrels are taken in a single night. These are sold fresh, salted, or smoked. When it first makes its appearance, it is sold to fishing-smacks for $1.50 per hundred for bait; when it is abundant, it does not sell, for the same purpose, for more than twenty-five cents per hundred. When salted, it brings three dollars per barrel.

Until within the last twenty years, this species was exceedingly abundant at Cape Cod. It came into Massachusetts Bay and Provincetown harbor in myriads from about the 20th of March to the 1st of April, and continued there until June, and would then leave the coast and not be seen again until the autumn. Now, it has become so rare that at some seasons it is scarcely seen at all. Within the last few years, it is perhaps slightly increasing. While I was visiting Race Point, Provincetown, June 25th, 1847, the crews of two boats captured with sweep-nets, the one a hundred and fifty barrels, the other thirty-five barrels, of full-sized herring. They had never been known to be taken at that season, but are generally captured there early in May. They would sell for one dollar per barrel for bait, and two dollars per barrel salted. The nets by which they are taken are carried out in boats a short distance from the shore, and when a school of fish make their appearance, they are thrown overboard outside of the fish, and thence drawn towards the shore, forcing the fish forwards into shoal water. The young of this species are called *Spirling*, and serve as excellent bait for codfish. They are taken in nets which are about forty yards long and fifteen feet deep, with meshes an inch and a half across. Within the last few years these young fishes, which in the fall of the year are three or four inches long, have been met

with in increased numbers; they disappear during the unpleasant weather in November. At George's Banks, these immature fishes are not found; there, the herring are full grown.

In different portions of Massachusetts Bay the herring has been taken by "torching"; and it is the opinion of many intelligent fishermen, that this method of capturing them has been one of the means of their being less frequent upon our coast than they were formerly. They are thus taken. A large torch is attached to the bows of the boat, which is rowed very fast; the fish, attracted by the light, follow the boat, and with a dip-net are caught in large numbers.

The *Clupea minima*, PECK, is undoubtedly the young of this fish. They are found from half an inch to over a foot in length. When half grown they are called Spirling, and are much sought for cod-bait, being preferred to anything else by all fish. A man can frequently catch many fish with these when he has not had a bite with clams and mussels.*

Massachusetts, LESUEUR, STORER. New Hampshire, PECK. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

GENUS II. ALOSA, CUV.

Upper jaw with a deep notch in the centre; in other respects like the Clupea.

ALOSA PRÆSTABILIS, *Dekay.*

The American Shad.

(PLATE XXVI. FIG. 2.)

Clupea sapidissima, WILSON, Rees's Encyclopæd. (Amer. edit.); catalogued, but not described.
" " RAF., Amer. Month. Mag., II. p. 205.
Clupea alosa, Shad, BELKNAP, Hist. New Hampshire, III. p. 130.
" " " MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 449.
Clupea indigena, Sprat Herring, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 454 (young).
Alosa vulgaris, Common Shad, STORER, Report, p. 116.
Alosa præstabilis, American Shad, DEKAY, Report, p. 255, pl. 15, fig. 41.
Alosa sapidissima, Shad, LINSLEY, Cat. of Fishes of Connecticut, Silliman's Journal, XLVII.
" " STORER, Mem. Amer. Acad., New Series, II. p. 458.
" " " Synopsis, p. 206.
L'Alose savoureuse, Alausa præstabilis, CUV. et VAL., XX. p. 421.

Color. The upper portion of the sides, including the opercula, cupreous; the lower portion of the sides silvery, with a greenish tinge; the abdomen is pearly; the top of

* Although the young of this species is so acceptable to the cod and haddock, yet they will not touch young alewives, nor in fact any fish that is spawned in fresh water.

the head and back bluish. At the posterior angle of the operculum is a black blotch of considerable size, which in some specimens is very indistinct until the scales are removed, when it is obvious. Pupils black, irides silvery. The dorsal fin is transparent; the tips of its rays are tinged with brown. The pectorals are silvery; their outer rays are fuliginous beneath. The ventrals are of the same color as the abdomen.

Description. Body oblong, compressed. Covered throughout with large deciduous scales, with the exception of the head, which is naked. Head equal in length to one sixth of the entire fish; the greatest depth of the body exceeds the length of the head. The upper jaw is notched in its centre; its lateral edges are slightly crenated. The eyes are large; the diameter of the eye is less than half the distance between the eyes. The nostrils are nearer to the anterior angle of the eye than to the snout. The abdominal ridge is serrated throughout, from the inferior angle of the operculum to the anus; the serrations are more prominent back of the ventrals.

The quadrangular dorsal fin, which shuts into a groove, is situated on the anterior half of the body; the height of the first rays is equal to two thirds the length of the fin. The first rays are simple; the succeeding, multifid; the fourth and fifth rays are longest.

The length of the pectorals is equal to about one third of their height; all the rays except the first, which is simple, are bifid.

The triangular ventrals are situated opposite the middle of the dorsal fin. They have at their base, on each side, a large accessory scale.

The anal fin is low, emarginated above, and, like the dorsal, is partially received into a groove when not erected; its fourth ray, which is highest, is less than one sixth the length of the fin.

The caudal fin is deeply forked; at the base of each lobe is a patch of small scales. At the base of this fin are two membranous appendages, one on each side of its centre.

The fin rays are as follows: — D. 17 to 19. P. 16. V. 9. A. 20 to 22. C. 20.

Length, twenty inches.

Remarks. In my "Synopsis of the Fishes of North America," I adopted Wilson's scientific name of this species. As, however, a name was merely proposed by him, and no description given, I feel that to him belongs the honor who first presented an accurate description at the same time that he considered it a new species. I therefore accept Dr. Dekay's as more appropriate.

In the spring of the year, this excellent fish is brought to Boston market from the mouths of the neighboring rivers in considerable quantities, and meets with a ready sale. At first they sell for fifty cents apiece; as the season advances, for twenty-five

cents, and at last may be bought for about twelve cents. Many of this species are packed and inspected. In the year 1832, 100 barrels were inspected; in 1833, 321; in 1834, 3; in 1835, 310; in 1836, 527; in 1837, 652; in 1838, 390; in 1839, 773; in 1840, 856; in 1841, 3,910; in 1842, 513; in 1843, 903; in 1844, 1,679; in 1845, 1,338; in 1846, 517; in 1847, 474; in 1848, 228¾; in 1849, 415; in 1850, 705; in 1851, 180¾; in 1852, 195; in 1853, 16⅝; in 1854, 225⅜; in 1855, 238½; in 1856, 265; in 1857, 473½.

The quantities taken in Charles River, at Watertown, for the five years preceding 1838, averaged about 6,000 per annum. From 3,000 to 4,000 are yearly caught at Taunton. Sixty years ago this fish was very scarce in the Merrimack River, and remained so for about five years; previous to that time they had been very abundant, and it is said that 10,000 were caught at one haul. After the scarcity they became again abundant, and continued so till about the year 1810, when they were again scarce for two or three years. They then became plentiful, and still continue so. This species goes up the river during the whole of May. Its greatest run is when the apple-trees are in full blossom. The old shad return in August; the young, three or four inches long, in September. It is said that the Concord River water is warmer than that of the Merrimack, and that Concord shad were caught a month earlier than those of the Merrimack above its junction with the Concord. The Concord shad have almost entirely disappeared, their ascent being cut off by dams.

Maine, Connecticut, Linsley. New Hampshire, Belknap. Massachusetts, Storer. New York, Mitchill, Dekay. South Carolina, Virginia, Dekay.

Alosa tyrannus, *Dekay.*

The Alewife.

(Plate XXVI. Fig. 3.)

Clupea serrata, Peck, Belknap's Hist. of New Hampshire, III. p. 133.
Clupea tyrannus, Bay Alewife, Latrobe, Amer. Phil. Soc. Trans., V. p. 77, pl. 1.
Clupea vernalis, Spring Herring or *Alewife*, Mitch., Trans. Lit. and Phil. Soc. of N. Y., I. p. 454.
Alosa vernalis, Spring Herring or *Alewife*, Storer, Report, p. 114.
Alosa tyrannus, American Alewife, Dekay, Report, p. 258, pl. 13, fig. 38.
Alosa vernalis, Linsley, Cat. of Fishes of Connecticut, Silliman's Journal, XLVII.
Alosa tyrannus, Storer, Mem. Amer. Acad., New Series, II. p. 459.
" " " Synopsis, p. 207.
L'Alose tyran, Alosa tyrannus, Cuv. et Val., Hist. Nat. des Pois., XX. p. 419.

Color. Back, bluish purple; sides more or less cupreous; beneath silvery and beautifully iridescent. Four or five, and sometimes even more, indistinct greenish-brown

longitudinal lines extend from the operculum to the tail. These lines are much more clearly seen when the fish is looked at from either extremity, the eye being placed on a line with the fish. The opercula are cupreous, and marked by numerous vessels, which give them a beautiful arborescent appearance.

Description. Body elongated, compressed. The head is about one sixth the whole length of the fish; the depth of the fish at the origin of the dorsal fin is rather less than one fourth its entire length. Eyes large; their diameter equal to one fourth the length of the head. Pupils black, irides silvery. Mouth very large. The upper jaw notched at its centre; the lower jaw slightly the longer; the intermaxillaries very protractile. Jaws edentate. Nostrils large, situated just back of the snout. Back of the posterior angle of the operculum, upon the shoulder, is a deep black blotch. The scales are very large and deciduous, marked with concentric striæ. The entire abdominal edge is strongly serrated with projecting bony spines; these serrations are larger back of the ventrals, between them and the anus.

The dorsal fin is quadrangular, slightly longer than high.

Height of the pectorals a little greater than the length of the dorsal fin.

The ventrals are very small.

The anal fin is low, slightly emarginated, and equal in length to the dorsal fin.

The caudal fin is deeply forked.

The fin rays are as follows: — D. 18. P. 15. V. 9. A. 18. C. 21.

Length, eight to twelve inches. Weight, about half a pound.

Remarks. In several portions of the State, where the alewife was formerly most abundant, the various encroachments of man have sensibly diminished its numbers; it is still, however, in some places taken in immense quantities. In Taunton, the fishermen commence taking it the last of March or the first of April, and continue to take it until the middle or the last of May, at which time it has so much diminished in numbers, and has become so inferior in its quality, that the business is not a lucrative one. The last of the *run* are of a very small size, and are called "Black-bellies."

At Watertown, the average quantity of alewives taken, for the two years preceding 1839, was seven hundred barrels.

They are first pickled, then salted and barrelled, and sent to the West Indies. They sell for from $1.50 to $2 per barrel. At Taunton, which was at one time so celebrated for its fishery, the alewives are gradually lessening. Forty years since, they were taken in such abundance at Taunton that they sold for twenty cents per hundred, and a great business was carried on in barrelling and shipping them to the West Indian market. At the present time, when first taken, they sell for one dollar per hundred;

and, as the season advances, diminish gradually in price to fifty cents. Most of the fish are disposed of at the seines (fresh), and cured by the purchasers. Two or more dams across the "Great River," at Taunton, impede the progress of this species very much; and on the "Little River," where many dams and factories have been erected, and where forty years ago thousands were taken, not one is now to be seen. In the Merrimack River, too, they have been diminishing in numbers for the last twenty years; the fishermen think this is owing to the small ponds emptying into the river having been dammed up. A pond in Manchester and Chester was formerly famous for its alewives. At some seasons, large quantities are taken in Mystic River; thus, fifty thousand were taken at one haul at Medford, in April, 1844.

A larger quantity of alewives is packed than of any other species of this family. In 1832, 1,730 barrels were inspected; in 1833, 2,266; in 1834, 4,320; in 1835, 5,600; in 1836, 5,000; in 1837, 1,182; in 1838, 604; in 1839, 2,769; in 1840, 1,474; in 1841, 2,840; in 1842, 3,580; in 1843, 5,554; in 1844, 6,380; in 1845, 4,714; in 1846, 2,626½; in 1847, 3,843; in 1848, 1,899¼; in 1849, 2,189; in 1850, 1,629; in 1851, 1,358½; in 1852, 1,604; in 1853, 1,580; in 1854, 1,645; in 1855, 2,775; in 1856, 2,740½; in 1857, 2,497.

New Hampshire, Peck. Massachusetts, Storer. Connecticut, Linsley. New York, Mitchill, Dekay. Chesapeake Bay, Mitchill.

Alosa menhaden, *Storer.*

The Menhaden.

(Plate XXVI. Fig. 4.)

Clupea menhaden, Bony-fish, Hard-heads, or *Marsh-bankers* of New York, Mitch., Trans. Lit. and Phil. Soc. of N. Y., i. p. 453, pl. 5, fig. 7.
Alosa menhaden, Menhaden, Hard-head, Storer, Report, p. 117.
" " *Moss-bonker,* Dekay, Report, p. 259, pl. 21, fig. 60.
" " Ayres, Bost. Journ. Nat. Hist., iv. p. 275.
" " Storer, Mem. Amer. Acad., New Series, ii. p. 459.
" " " Synopsis, p. 207.
L'Alose menhaden, Alausa menhaden, Cuv. et Val., Hist. Nat. des Pois., xx. p. 424.

Color. Upper part of body of a greenish-brown, darker upon the top of the head and at the snout; upper part of the sides in the living fish roseous, and mottled with indistinct bluish oscillations, which disappear in death; abdomen silvery; gill-covers cupreous, with a rosy tint; space in front of the eyes translucent; a black spot, more or less distinct, upon the shoulders; whole surface of the fish iridescent.

Description. Body elongated, compressed. Its depth across, at the base of the pectorals, less than one fifth the length of the fish. Length of the head more than one third the length of the fish. Gill-covers very large. Opercula with numerous deeply-marked striæ, which commence just beneath a large green blotch, situated some distance back of the eye and on a line with it, and pass obliquely backwards and downwards to its lower edge; subopercula and interopercula smooth; preopercula presenting an arborescent appearance of vessels upon their surface. Eyes circular, moderate in size, furnished with a nictitating membrane. Gape of mouth very large; lower jaw shorter than the upper; the middle of the upper jaw deeply emarginate. Back slightly arched in front of the dorsal fin.

The dorsal fin commences upon the anterior half of the body; it is nearly as long again as high, and is emarginated above; at its base is a membranous prolongation or sheath, by which it is almost entirely covered when unexpanded. The first three rays of this fin are simple; the first articulated rays are higher than the remainder, the most posterior higher than the eight or nine preceding.

The pectorals are situated just beneath the posterior inferior angle of the operculum; the first three rays are the longest; the first ray is simple. Outside of this fin is an axillary plate, more than two thirds the length of the fin; a broad scaly shield at the base of the pectorals covers a portion of the inferior edge.

The ventrals are very small, and fan-shaped; their rays are multifid; on each side of these fins is an axillary plate.

The anal fin is shorter than the dorsal, low, and slightly emarginated above; its anterior rays are highest; the first ray is simple; it is sheathed at its base, like the dorsal.

The caudal fin is deeply forked; the depth of the fin at its extremities, when expanded, is equal to the height of the outer rays.

The fin rays are as follows: — D. 19. P. 15, 16, or 17. V. 6. A. 20, 21, or 22. C. $20\frac{4}{4}$.

Length, eight to fourteen inches.

Remarks. This valuable species comes into Massachusetts Bay about the middle of May, and leaves it in November; and is taken in immense quantities for the various uses to which it is appropriated, viz. bait for other fishes, manure, oil, and food.

The fishermen who supply Boston market with codfish set their nets about the outer islands in the harbor each night as they come up to the city, and examine them in the morning as they go out for the day's fishing. Large numbers are thus taken, frequently one hundred barrels at a haul, and such as are not used as bait are sold to the poorer classes for food, at about six and a quarter cents per dozen. It is not very pal-

atable, having an oily or muddy taste. It is also considered a very good bait for halibut. At Provincetown, this species is used only for mackerel bait; and for this purpose they are worth from seventy-five cents to four dollars per barrel, in proportion to the demand. In the year 1836, 1,500 barrels were used as bait for other fishes. While I was visiting Race Point, in the latter part of June, 1847, a large number of barrels of this fish were taken by the fishermen in their sweep-nets from the shore. I learn from Captain Atwood, that a much smaller number are taken in the sweep-nets than formerly, as they stay off in deeper water, for the most part out of reach of the nets, and but few are caught in the mackerel nets.

Being a very oily fish, it is valuable as an article of manure. In some places they are taken for this purpose only. At Lynn, in 1836, 1,500 barrels full were thrown upon the land. At Sandwich, where they are very abundant, the inhabitants strew them upon their land by the cart-load, and thus for miles immense quantities enrich the soil. It is computed that a single menhaden, of ordinary size, is equal in richness to a shovelful of barn-yard manure. Upon some portions of Cape Cod, menhaden are sold to the farmers for one dollar per thousand for manure; they average about one pound each, and twenty-five hundred are considered a proper quantity for an acre.

Dekay states, that in the counties of Suffolk, King's, and Queen's, in New York, it is used as an article of manure in the following ways: — "For Indian corn, two or three are thrown on a hill; for wheat, they are thrown broadcast on the field and ploughed under, although it is not uncommon to put them in layers alternately with common mould, and when decomposed to spread it like any other compost. Its effects in renovating old grass-fields, when spread over with these fish at the rate of about two thousand to the acre, are very remarkable."

That the air, however, must be exceedingly deteriorated, if not rendered decidedly unhealthy by them, is shown by the following extract of a letter from my friend, J. B. Forsyth, M. D., formerly of Sandwich, now of Chelsea, dated November 8th, 1837. "For two or three miles below me, on the Barnstable road, the stench from the decomposing fish was a great nuisance to travellers passing along the road, so much so that I feared they might be instrumental in the production of disease; but whether they were so or not, I am not now prepared to say. But certain it is, there have been more cases of autumnal fever and dysentery this season in this district, than in all the rest of the town."

It is also taken for its oil. In the year 1845, four or five hundred barrels of oil were obtained at the Elizabeth Islands, by grinding up these fishes by machinery. This oil is used by the painters, and is considered preferable to linseed oil.

Within a few years numbers have been packed and inspected for exportation as an article of food. In 1832, 300 barrels were inspected; in 1833, 480; in 1834, 1,008; in 1835, 1,443; in 1836, 1,488; in 1837, 461; in 1838, 1,164; in 1839, 1,083; in 1840, 1,427; in 1841, 2,138; in 1842, 566; in 1843, 854; in 1844, 476; in 1845, 272; in 1846, 585; in 1847, 132; in 1848, 137; in 1849, 78; in 1850, 137; in 1851, 0; in 1852, 107; in 1853, 0; in 1854, 0; in 1855, 0; in 1856, 63; in 1857, 203.

This species is much more numerous along our coast in some years than in others; thus, in the year 1845 they might readily be purchased for from twenty to thirty cents per barrel, while in 1847 the fishermen would willingly have offered one dollar per barrel.

Maine, Massachusetts, STORER. Connecticut, AYRES, LINSLEY. New York, MITCHILL, DEKAY.

ALOSA CYANONOTON, *Storer.*

The Blue-back.

(PLATE XXVII. FIG. 1.)

Alosa Cyanonoton, STORER, Proc. Bost. Soc. Nat. Hist., II. p. 242.

Color. Above bluish, cupreous upon the sides and the opercula; silvery beneath. When the large deciduous scales are removed, the entire upper portion of the body is of a deep greenish-blue color. A large, circular black spot exists just back of the posterior angle of the operculum; the opercula present a beautiful arborescent appearance. Pupils black, irides golden.

Description. Body stout, elongated. The abdominal ridge is serrated, the serrations being stronger back of the ventrals. Twenty serrations exist anterior to, and fifteen back of, the ventrals. The length of the head is less than one fifth the length of the body; the greatest depth of the fish is equal to about one fourth the length of the body. The jaws are equal. The eyes are moderate-sized and circular. The nostrils are large, near the snout.

The dorsal fin arises on the anterior half of the body; it is quadrangular, and emarginated above.

The pectorals are falciform, and equal in height to the length of the dorsal, with accessory plates at their base.

The ventrals are fan-shaped, and have accessory plates.

The anal fin is low, and longer than the dorsal.

The caudal is deeply forked, and has at its base two membranous pouches.

The fin rays are as follows: — D. 17. P. 18. V. 10. A. 17. C. 20.

Length, ten inches.

Remarks. This species is called "Blue-back" and "Kiouk," by the fishermen at Provincetown. It is seldom met with more than ten inches in length. A few make their appearance in May; they are then quite small and scattered; they are numerous before the 10th of June. They are occasionally taken, in small numbers, in mackerel-nets; but few only are thus captured, as their size allows them to swim through the meshes of the net. They remain along the coast for only a short time. Some years since, they were found in much larger numbers than at present, and a hundred barrels full of them would be taken at the drag of a net. They are used as bait for mackerel, and are worth about a dollar a barrel for that purpose. Captain Atwood thinks this species is never found in rivers.

This fish is very fat, almost too much so to eat; and, appearing at a season when other favorite species are so common, no use is made of it as an article of food.

Massachusetts, STORER.

ALOSA LINEATA, *Storer.*

The Hickory-Shad.

(PLATE XXVII. FIG. 2.)

Alosa lineata, STORER, Proc. Bost. Soc. Nat. Hist., II. p. 242.

Color. The sides of this fish are silvery, with six or eight indistinct bluish bands running from the head to the tail, which are light-colored after death. The opercula are cupreous; the pectoral and caudal fins are of a dark-brown color, the pectorals being fuliginous beneath; the anal and ventral fins are nearly white.

Description. Body elongated, compressed. The head is equal in length to about one fifth the entire fish; the lower jaw is the longer; the chin is prominent; the eyes are large and circular, their diameter equal to about one sixth the length of the head; the space between the eyes, from the nostrils to the occiput, is translucent. The opercula and preopercula are beautifully striated; the interopercle is but slightly roughened. The abdomen is serrated; about fifteen serrations between the ventral and anal fins, more strongly marked than those anterior to the ventrals. The scales are large and rounded; their concealed portion is covered with concentric striæ, and delicate radiations are seen passing to their circumference upon their exposed portions.

The dorsal fin arises upon the anterior portion of the body; its height is equal to two thirds its length.

The pectorals are rather higher than the length of the dorsal fin; at their base, they have on each side a broad axillary plate, concealing a considerable portion of their extent.

The ventrals arise opposite the anterior portion of the dorsal; they have at their bases, also, axillary plates.

The anterior portion of the anal fin is as high again as the posterior portion; it is rather longer than the dorsal fin.

The caudal fin is deeply falcate; the scales are continued high up on its central rays, which are transparent and exceedingly delicate; the rays are articulated. Caudal pouches.

The fin rays are as follows: — D. 17. P. 16. V. 8. A. 20. C. 20.

Length, fifteen inches.

Remarks. This species, which does not appear in great numbers, is known at Provincetown by the name of "Hickory-Shad." It is taken in nets while fishing for mackerel, in May and June. It is a lean fish, and is not used for food.

Massachusetts, STORER.

GENUS III. ENGRAULIS, CUV.

Body rounded or compressed. Mouth large; snout protruded beyond the lower jaw. Intermaxillaries very small, and hidden under the snout; maxillaries slender, stretching over the cheeks; a few teeth on front of the vomer; palatine and pterygoidian teeth sometimes reduced to mere asperities. Gill-openings very large, and continuous under the throat. Branchiostegal membrane narrow, and hidden under the jaw; its rays being short, and variable in number. Caudal fin forked. Dorsal fin rather small. Insertion of pectorals near the gill-openings. Ventrals very small.

ENGRAULIS VITTATA, *B. and G.*

The American Anchovy.

(PLATE XXVII. FIG. 3.)

Clupea vittata, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 456.
Clupea cærulea, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 457.
Clupea vittata, DEKAY, Report, p. 254.
" " STORER, Mem. Amer. Acad., New Series, II. p. 457.
" " " Synopsis, p. 205.
Clupea cærulea, DEKAY, Report, p. 254.
" " STORER, Mem. Amer. Acad., New Series, II. p. 457.
" " " Synopsis, p. 205.
Engraulis Mitchilli, VAL., CUV. et VAL., Nat. Hist. des Pois., XXI. p. 50.
Engraulis vittata, B. and G., Smithsonian Institution's Ninth Annual Report, p. 33.

Color. Top of the head bluish-slate; back light-green, dotted with fuliginous. A greenish-blue stripe high up on the side, shadowed out on the head from the upper orbit of the eye, more defined above the posterior opercle, and thence extending nearly to the tail. Sides below greenish-silvery, with metallic reflections. Gill-covers and abdomen silvery, with nacreous iridescence.

Description. Outline of the body ascending from the tip of the snout to the origin of the dorsal fin, thence descending in an equal curve; hence, the dorsum is regularly gibbous, while the thoracic and the abdominal plane is nearly straight, or with a slight double curve; convex anteriorly, concave posteriorly. Head elongated, sharp, wedge-shaped; broad above posteriorly, attenuated below. Length of the head one fifth the length of the body, and a third longer than the greatest depth of the body; its greatest width above, one third its length; its width below, a mere line. Eyes large, situated on the anterior third of the head; their diameter is equal to two thirds of the distance between them. Jaws unequal; the upper much the longer, and nearly concealing the lower, which shuts into it as into a groove; jaws armed with very minute teeth. Gill-covers elongated, yet rounded. Scales very large and deciduous.

First dorsal commencing just anterior to the median line; its first ray the longer; subquadrangular.

Pectorals rather small, situated low, and just posterior to the opercula, with an elongated scapular scale at the base; this is nearly its own length.

Ventrals commence a little anterior to a perpendicular from the commencement of the dorsal fin. The basic iliac scale is also elongated, and nearly its own length.

Anal about as far posterior to the ventrals as these were to the pectorals; about twice the length of the dorsal.

Caudal fin deeply forked.

The fin rays are as follows: — D. 8. P. 17. V. 5. A. 14. C. 18.

Length, three and a half inches.

Remarks. A fine specimen of this species was brought to me in November, 1852, from Provincetown, by Dr. Charles Girard, now of Washington, D. C. I have retained the specific name originally given it by Mitchill, and very properly affixed by Girard, although Valenciennes has thought proper to change it.

Mr. Baird, in his "Report to the Secretary of the Smithsonian Institution on the Fishes of the New Jersey Coast, as observed in the Summer of 1854," remarks that "the Anchovy made its appearance early in August, in the shallow waters along the beach, although of very small size. They became subsequently more abundant; and towards the end of the month, while hauling a large net in the surf, many were taken

measuring over six inches in length. As the meshes of the net were very large, the greater portion readily escaped; but with a seine properly constructed, enough could be readily procured to supply the American markets."

Massachusetts, STORER. New York, MITCHILL, VALENCIENNES. New Jersey, BAIRD.

JUGULARES.

Ventrals attached under the pectorals, and the pelvis immediately suspended to the bones of the shoulder.

FAMILY XVIII. GADIDÆ.

Body elongated, but little compressed, covered with soft scales not very voluminous. The head well-proportioned, and without scales. All their fins soft. The jaws and the front of the vomer are armed with pointed, irregular teeth, middling or small-sized, in several rows, forming a sort of currycomb or rasp; their gills are large, with seven rays. Ventrals separate, jugular. Almost all have two or three fins on the back, one or two behind the anus, and a distinct caudal. Their stomach is in the form of a large and strong sac; their cœca are very numerous, and their caudal tolerably long. They have a large air-bladder, with strong parietes, and frequently dentated in the sides.

GENUS I. MORRHUA, CUV.

Three dorsal fins; two anal; ventrals pointed. A barbel at the end of the lower jaw.

MORRHUA AMERICANA, *Storer.*

The American Cod.

(PLATE XXVII. FIG. 4.)

Gadus callarias, Common Cod of New York, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 367.
Morrhua Americana, American Cod, STORER, Report, p. 120.
" " DEKAY, Report, p. 274, pl. 44, fig. 140.
" " STORER, Mem. Amer. Acad., New Series, II. p. 467.
" " " Synopsis, p. 215.

Color. An individual twenty-eight inches in length presents the following appearances. Back ash-colored; sides lighter; back, sides, and part of the head covered with yellowish spots, which are rather larger and more distinct upon the sides; beneath, dusky-

white. Pupils black; irides a beautiful silver. All the dorsal fins are of a greenish-blue color, and spotted, like the body. The ventrals, as well as the anals, are rather darker than the abdomen. The caudal is spotted like the rest of the body.

The color of this species is very variable. In the same stall in our market may frequently be seen specimens with equally obvious spots over their entire surface; or they may be much more perceptible on the sides; or they may be scarcely observed at all, and the entire fish appear of a uniform gray; or, again, of a beautiful bright-red; and I have seen a single specimen which was of a lemon-yellow.

Description. The greatest depth of the body is nearly equal to one fifth its length; the length of the head is equal to one fourth the entire length of the fish; the distance of the extremity of the snout from a line on a plane with the anterior angle of the eye, is nearly equal to one third the length of the head; diameter of the eye equal to one sixth the length of the head; the distance between the eyes is nearly equal to one third the length of the head. Nostrils double, the posterior lower and larger. The upper jaw projects beyond the lower. In the lower jaw are two rows of teeth; those of the larger row, which are in the back part of the jaw, are larger and incurved; while those in the fore part of the jaw are much smaller. In the upper jaw are several rows of card-like teeth, of which the outermost is much the largest. There are teeth on the vomer and pharyngeal bones. A single barbel, about an inch long, upon the chin. The lateral line, arising above the operculum, makes a very gradual slope upwards, and as gradually curves downwards, until, opposite the anterior third of the second dorsal, it commences a straight course, which is continued to the tail; this line, which is lighter-colored throughout its whole extent than the body, is wider and more conspicuous after assuming a straight course.

The first dorsal fin arises just back of the pectorals; the second dorsal is much longer, and the third is but little longer, than the first.

The pectorals are rounded; their length is nearly equal to half their height.

The ventrals are situated in front of the pectorals; their two outer rays are free, the second being the longer.

The first anal fin is about equal in length to the second dorsal; the second anal is much the shorter.

The height of the caudal fin is about twice its length.

The fin rays are as follows: — D. 14, 21, 21. P. 18. V. 6. A. 14, 19. C. 38. In another specimen, — D. 15, 22, 19. P. 19. V. 6. A. 22, 19. C. 40.

Length, two to eight feet.

Remarks. The great value of the cod-fishery to the State of Massachusetts requires

that I should offer here something more than a few cursory observations. Among the earliest enterprises undertaken in New England, it has at all times been zealously prosecuted and liberally encouraged; those engaged in it have always been among our most industrious, respectable citizens, and its existence and prosperity have ever been a subject of State pride. The rise, progress, extent, and value of this fishery are full of interest, and I shall offer no apology for presenting the following valuable article, by Benjamin W. Hale, Esq., of Newbury, from the "Newburyport Herald" of February 12, 1840.

"The commencement of this fishery takes its date prior to the landing of the Pilgrim Fathers, and it is believed to be the first, if not the only business, the prosecution of which they encouraged by a bounty.

"The first fishing company in New England was established at Gloucester in 1624, which continued its operations but two years. It was, however, incorporated as a fishing plantation in 1639, and that the early operations in this branch of business were successful appears evident, as its products are mentioned as forming the first of four articles of export as early as 1655, and in 1668, when the trade of the Colony was represented as being in a very flourishing condition, there being upwards of one hundred and thirty vessels, of all descriptions, owned in the Colony, it was assigned the first place in the list of exports to the West Indies and Europe, and was considered the most lucrative branch of industry carried on in the Colony.

"In a report of the commerce and resources of the Colony, in 1763, the number of vessels of all classes employed in this business is stated to be three hundred sail, and its products still occupy the first place on the list of exports to the West Indies and Europe.

"The principal ports in Europe to which shipments were made, were those in the Bay of Biscay, Cadiz, and Lisbon. This trade was prosecuted for several years, before and after the war of the Revolution, so extensively from Marblehead (their operations being confined to the Grand-Bank Fishery, the products of which were suitable for those markets), that they not only shipped what was cured in that town, suitable for those markets, but purchased from other ports in the State.

"The increase of business was rapid after the peace, from the encouragement of a bounty granted by government; and from the representations of some Nova Scotia fishermen, who settled in this district and prosecuted the salmon-fishery on the coast of Labrador, a vessel was fitted out in 1799 for cod-fishing, which was the first attempt from the United States on that coast. This voyage proving successful, one or two others fitted out the next year; and the success attending these operations encouraged others to engage in the business. Discoveries were extended, and new fishing-grounds explored, so that, in 1807, four vessels from Newburyport (the first from the United

States), took their fares in Esquimaux Bay; and the increase of the business was such, that, the season the attack on the Chesapeake frigate took place, upwards of forty vessels were employed on that coast from this district, and the whole number from the United States was probably seven hundred, giving employment to nearly ten thousand men.

"Large shipments of the products of this business were made to the West Indies, principally to the French ports; eighteen sail of vessels were at one time lying in Point Petre from Newburyport, a large proportion of the eastern cargoes of which were fish, the returns of which, being transshipped to Europe, afforded them profitable results, which were the foundation of the great estates of the merchants of that time, some of whom were then, and had been previously, engaged in this business themselves.

"The shipments to the Mediterranean and other ports in Europe were still more extensive. These, with those to the West Indies and South America, for the five years from 1803 to 1807 inclusive, were but little short of $2,500,000 annually, and in 1804 they exceeded $3,000,00, owing to the products of the Labrador fishery, both in fish and oil, being peculiarly adapted to the markets. Such were the advantages attending the operations of the American fishermen, in consequence of the European war, which in its effects operated to make them fishermen for the world, that an investment in this fishery, with the shipment of its proceeds to these markets, generally gave returns of from fifty to one hundred per cent profit. Aside from accident or mismanagement of the voyage, the annual supply from 1803 to 1808 was probably 700,000 to 800,000 quintals.

"The long embargo, as it has been termed, took place at an inauspicious season of the year for the interests of those engaged in this business. It found them with a year's stock on hand, and, by stopping all exports, the article was reduced to fifty per cent of its former value. But no extensive sale could be made; the holders were compelled to keep them during its continuance, and at its repeal the damage by depreciation in quality, and the glut of all foreign markets in consequence of large shipments at the same time, resulted in great loss, and the ruin of many of those engaged in the business.

"At the commencement of the war with Great Britain, in 1812, nearly all the larger and more valuable class of vessels, as they returned from their voyages, were laid up and dismantled. Some few of the others pursued the business during the first season, with but little interruption; but during the succeeding years, the policy of capturing and destroying all such as were found 'on his Majesty's waters' prevailed; which resulted in the entire abandonment of the business, except by market-boats in the vicinity of ports, which afforded them opportunity to escape on the appearance of British cruisers. The whole amount of bounties paid to fishing-vessels, in 1814, was but $1,312, including the export bounty on pickled fish.

"Since the peace, which was concluded by the negotiations at Ghent, difficulties have attended the pursuit of this business on some parts of the coasts of the British Provinces, in consequence of an abandonment of some of the previous privileges on the western coasts of those Provinces, or an ambiguity in the provisions of the treaty, which has produced feelings of acrimony between the fishermen of the two nations.

"It has been pursued with various degrees of success at different periods. For a few years succeeding the peace, the stock of fish on the Grand Bank, Labrador Coast, and other fishing-grounds, appeared to have been greatly replenished; operations in the business were successful, and its pursuit became generally extended. The tonnage employed in 1815 was about 8,000 tons, and in 1816 about 18,000 tons.

"A laudable spirit of enterprise, and a conviction of the advantages resulting to the laboring classes from its prosecution, determined the citizens of Newburyport and other towns to attempt its further extension. Companies were formed in several of our seaports, with extensive capitals, and managed by agents selected for their experience in the business; but owing to ill-success in some of their voyages, the depressed prices of its products, and their shipment to European and other foreign markets, which derived sufficient supplies from their own fisheries and those of other nations (which, owing to the general peace in Europe, were enabled to resume the business), they all proved unsuccessful, and the results were generally disastrous to the stockholders; — furnishing good evidence that, in a country like our own, individual enterprise offers the surest prospect of success in all branches of business, where the amount of capital or the particular location requisite for its prosecution does not prevent the attainment of its means, and thereby render a resort to combined effort necessary for its accomplishment.

"Of late years, an entire change of markets for the products of this fishery, so far as it respects the large-sized fish, has taken place. Since the opening of the Erie Canal, and the increase of population and means of conveyance consequent thereto, an increasing demand for this article has taken place in that quarter; so that New York and Albany markets, which previously required a few thousand quintals for their annual supply, now afford a demand, for their own markets and those above, for nearly 150,000 quintals; as their annual supplies, and the increasing facilities for transportation by canals and railroads from other Southern and Western cities, create an increasing demand for the supply of those markets.

"The foreign export has diminished in a ratio proportionate to the increase in demand for domestic markets; — from upwards of $2,500,000 from 1803 to 1806, it has been less than $1,000,000 for the last ten years. . . . . The products of this fishery, in Essex County, exceed $600,000 annually.

"The quantity of codfish taken for the last five years is probably as great as that of any preceding five, with the exception of those from 1803 to 1807 inclusive, when the Labrador fishery was carried to its greatest extent. The quantity taken in this State, with those in New Hampshire, Maine, and some in other States, will give an annual amount exceeding 700,000 quintals, and, with its oil and other products, exceeding $2,000,000 in value."

The above has evidently been prepared with care, and is unquestionably accurate. In some portions of the State, this fishery is entirely superseded by the taking of *whales*. Thus, while every town in the county of Barnstable is more or less engaged in this business, and collectively they exhibit an aggregate of two hundred and twelve vessels, but *a single fishing-smack* was licensed in Dukes County in 1836, and *not one* in the county of Nantucket, — the attention of the inhabitants of the last two counties being entirely engaged in whaling. I have ascertained that, in 1836, there were engaged in the cod-fishery, from Gloucester, Marblehead, Provincetown, Wellfleet, Cohasset, Duxbury, Plymouth, Manchester, Salem, and Beverly, being *ten* towns, 561 vessels, having crews of 3,816 men, and that by these vessels there were taken 263,454 quintals of fish. To these may be added the ports of Newburyport, Lynn, Falmouth, Holmes's Hole, and Sandwich (in which I have not been able to learn the number of vessels *exclusively* employed in this fishery), which furnished, in 1836, 16,265 quintals; thus exhibiting 279,718 quintals of codfish taken by the enterprise of the citizens of fifteen towns. When it is mentioned that about 3,500 of the codfish from the Grand Bank (which are generally much larger than those from the Straits of Belleisle) constitute *one hundred quintals*, some conception may be formed of the immense numbers taken. At the usual price of these prepared fish, the above-mentioned number of quintals would sell for $839,154.

According to the returns of the assessors of the several towns, it appears that there were taken, in 1836, 510,554 quintals of codfish, which were valued at $1,569,517. These fish were from the following counties: — Essex, 159,424 quintals, valued at $501,363; Barnstable, 134,758 quintals, valued at $392,930; Suffolk, 127,250 quintals, valued at $408,510; Plymouth, 64,172 quintals, valued at $193,664; Norfolk, 15,950 quintals, valued at $46,050; Middlesex, 9,000 quintals, valued at $27,000.

The statistics, derived from the same sources, for the year ending April 1st, 1845, prepared by the Secretary of State, present us with the following facts. Whole number of quintals taken, 334,901, valued at $746,263. From Essex County, 175,273 quintals, valued at $374,815; Barnstable, 84,503 quintals, valued at $190,267; Plymouth, 61,007 quintals, valued at $146,665; Suffolk, 6,600 quintals, valued at

$15,840; Norfolk, 3,771 quintals, valued at $9,485; Middlesex, 2,100 quintals, valued at $5,040; Bristol, 1,400 quintals, valued at $3,500; Dukes, 247 quintals, valued at $651.

The minutiæ of a fishing-voyage to the Grank Bank are described in an interesting manner, in the following communication, by an anonymous writer, in a number of the "Boston Centinel and Gazette," for September 4, 1839.

"There are about eighty vessels, all schooner-rigged, employed in the Bank fishery, which are built principally of oak, in Massachusetts. They are strong, stanch, and comfortable sea-boats, averaging in burden from sixty to one hundred and ten tons; but the principal part of them are from seventy-five to eighty tons' burden, and cost from $3,500 to $4,000 each. They make two fares in a year; the first fare commencing early in April, at which time they sail for the Bank of Newfoundland, commonly called the 'Grand Bank.' The second fare commences early in September. The duration of each fare depends, of course, on the degree of success attending it; but four months must be passed each season in fishing, in order to secure the bounty offered by the general government for the encouragement of the fisheries, amounting to four dollars per ton on all vessels of ninety tons and under; no allowance being made for any excess of burden. Each vessel takes from one hundred and twenty to one hundred and thirty hogsheads of salt for a fare, at from $3 to $3.25 per hogshead. Cadiz salt is preferred, but occasionally other kinds are used. More salt is now expended in curing the fish than formerly; and one hundred quintals of fish require about thirteen hogsheads of salt. Occasionally, though but seldom, a 'spring fare' is made; when the vessel is expected to return by old 'Election-day.' This fare is called 'Spring-fish,' and usually consumed in the neighborhood, being of superior quality. The word '*fare*' applies as well to the cargo or lading of the fish, as to the voyage.

"The 'shoresman,' as the title implies, and who is generally sole or part owner of the vessel, superintends all operations on shore relative to the fare. In addition to the vessel, he furnishes the salt and bait; the latter article being either salted clams or mackerel, in barrels. He also supplies the knives for splitting the fish, mittens for the crew while splitting and salting, and trousers of oil-cloth or canvas for the 'salter.' This part of the outfit is called the 'great general,' three eighths of which is paid for by the shoresman, and five eighths by the crew (consisting generally of a skipper and five men), at the final settlement of the fare. In contradistinction to the 'great general,' the 'small general' is furnished by the crew, consisting of their sea-stores, the expense of which is entirely defrayed by themselves; and each man provides his own fishing-apparatus.

Barrels are provided by the shoresman to contain their store of fresh water, but all subsequent cooperage is paid for by the crew.

"A fair passage to the Bank is made in a week; and on their arrival there, they generally 'lie-to, and try for fish'; and when they 'strike a school,' as the phrase is, they anchor. The depths at which they fish are various, from thirty to sixty fathoms; but generally from thirty-five to fifty fathoms. When fish are plenty, a fare is made up in about six weeks; that is, when they have *wet*, or expended, all their salt. Fish caught with mackerel-bait are larger than those caught with clams, for the supposed reason that a larger bait of mackerel can be put upon the hook than of clams; and the largest fish take the largest bait. Whatever may be the reason, however, the fact is incontrovertible; and the proportional difference is about thus: fish caught with clam-bait will average about twenty-five quintals to the thousand fish, and those caught with mackerel-bait about forty quintals to the thousand.

"This is a general result; but there are occasional variations from various causes, the principal of which is in the different depths at which the fish are taken, — the largest fish being taken in the deepest water. The flesh of a sea-bird called a 'hag-don' is a fine bait for codfish, and is frequently used.

"The equipment of the fishermen is singular and grotesque. Over their common dress they wear a pair of 'petticoat-trousers,' made very wide, and descending to the calf of the leg; generally they are made with an insertion for each leg, but sometimes like a woman's petticoat, with no intersecting seam, and are of course canvas or oil-cloth. A pair of thick cowhide boots, of a russet color, and with soles an inch or more thick, reach quite to the knees, with tops to turn up and cover the thighs. The barvel, or leather apron, extending from the breast to the knees, and the tarpauling hat, complete the costume, which secures to the occupant perfect immunity from the assaults of the element in which he procures his subsistence. The hands are preserved from the cutting of the fishing-lines by a sort of digitless woollen mittens, called 'nippers.' Each man tends two lines, and they generally fish near the bottom of the sea; but sometimes the codfish will ascend to mid-water, or even much higher, in pursuit of herrings, capelines, and other fishes of that class, which swim in immense shoals near the surface; and in such cases the labors of the fishermen are much lightened, and the fish taken with much greater celerity.

"In the day-time, during the first fare, all hands generally fish; and at night, the crew is divided into watches that fish alternately; but circumstances create variations in this mode; such as the scarcity or abundance of fish, the inclinations of the skipper and crew, &c. During the season of the second fare, the fish feed principally in the

night, at which time most of them are taken; and on the succeeding day they are prepared and secured below. At any time, however, when the decks are full of fish, they proceed to cure them; and this is the process. The operators being placed in juxtaposition before a bench or platform, about mid-height, the 'cut-throat,' wielding a sharp two-edged knife, which bears the same sanguinary and ominous name, seizes the fish, and, separating the connecting integuments between the head and the body, he then passes his knife through from the nape to the vent, and abstracts the viscera. He then passes it to the 'header,' who, by an adroit process, separates the articulation of the spine at the shoulder, and detaches the head from the trunk, which he passes to the 'splitter'; who, commencing at the shoulders, proceeds to lay the fish open to the tail, and detach the sound-bone. The fish, being thus prepared, is thrown into the hold, to the 'salter,' who strews on the salt and stows it neatly away, in compact layers, with the skin down. And in this manner they proceed daily till all the salt is wet, if they are so fortunate as to get a full fare. They are sometimes obliged, however, by the scarcity of fish, by losing their anchors, by sickness or casualty on board, or other causes, to return without wetting all their salt.

"Besides the bodies of the codfish, and the bounty, there are other emoluments accruing to the adventurers; such as the oil extracted from the livers of the cod, of which about fifteen barrels to eight hundred quintals of fish is produced, and is sold at about fifty cents per gallon; and halibut, which was mostly thrown away formerly, but now constitutes a considerable proportion of the profits. It is salted like the codfish, and sold *green* from the vessel, on arrival, at about two dollars per quintal; the subsequent processes of drying and smoking for the market being performed by the purchasers. This article is mostly derived from the second fare; and about fifteen thousand quintals are annually brought into Marblehead, and, with the oil, are divided in the same proportions as are the codfish and the bounty. As regards the proportional proceeds of the fare, on return of the vessel to port, one quarter part is considered to be the property of the shoresman, and the other three quarters of the crew; but the shoresman is allowed one eighth part more on articles that it is his province to prepare for the market, such as drying the codfish, &c. The sounds, or air-bladders, and the tongues of the codfish, with the fins of the halibut, collectively called 'garney,' are the perquisites of the crew, but of which the shoresman is allowed some proportion, according to mutual convention. From twenty to thirty barrels to a fare are saved; the fins selling for about eight dollars per barrel, and the sounds and tongues for from six to seven dollars. When the vessel returns, she is moored, head and stern, at about a cable's length from the shore, and the crew proceeds to 'wash out' the fare; which is done by unlading it into boats,

taking it into about eighteen inches' depth of water, and throwing it out, when it is washed clean, and then transported to 'the fence,' as the enclosure is called where the fish are dried. It is then placed in 'water-horse'; that is, it is staked up in a pile, with the skin up, to drain; thence it is taken to 'the flakes,' to be dried. The flakes are a series of horizontal hurdles, at a convenient height from the earth for the shoresman and his hired men to spread, turn, and take off the fish, — the labors of the vessel's crew ceasing with the 'washing-out.'

"Two good 'fish-days,' with a subsequent airing of a few hours, — when the fish are sold, they being now more heavily salted than formerly, — are sufficient to preserve them, and this process is called 'Albany drying'; it is, however, by this mode now considered sufficiently cured for any market. Last year, the fish thus prepared was sold at from 19 shillings, or $3.16\frac{2}{3}$, to $3.50 per quintal; this year it commands about $3\frac{3}{8}$ per net hundred-weight, and is always sold for cash."

Besides these immense quantities of codfish which are taken at the Grand Bank and salted and dried, large numbers are brought fresh into all the markets along the seaboard, and thence are distributed throughout the interior of the State. At Duxbury, in 1836, there were *ten* market-boats, having forty men on board, which took from 48,000 to 50,000 fish. At Provincetown there were also *ten boats* thus engaged. Boston market is supplied with codfish by about fifteen or twenty small schooners and a large number of boats.

By the kindness of Captain Nathaniel Blanchard, of Lynn, master of one of these smacks, I am enabled to furnish the following facts, by which some idea may be formed of the amount of *fresh codfish* brought to our market. He has presented me the result of his labors with a vessel of twenty-five tons, and a crew of six men, for nearly five months, commencing October 24, 1836, and terminating March 20, 1837. His account exhibits the number of fish taken, and the price obtained for the same, for each day during that period. From this minute statement, I am able to ascertain that the *largest quantity* taken any one day was 7,124 pounds, on the 13th of December, which sold for five shillings per hundred = $59.39. The *smallest quantity* taken any one day was 337 pounds, on January 16th, which sold for twelve shillings = $6.67. The smallest receipts were on March 20th, when 359 pounds were taken, which sold for ten shillings six pence = $5.92. The whole number of pounds taken during the period mentioned was 194,125. The entire receipts for the same were $3,026.14.

My old friend, Captain Nathaniel E. Atwood, has also furnished me with an account of his cod-fishing, with a crew of five men, from December 26, 1846, to May 8, 1847.

Arrival in Boston.	No. of Cod.	Whole Weight.	Price at Wholesale.	Whole Stock.
January 4,	326	3,931	8*s.* 6*d.*	$ 55.20
" 16,	315	3,637	6 9	40.55
February 11,	840	10,823	9 0	162.34*
" 19,	824	10,933	8 0	144.36
March 1,	293	5,395	10 6	94.39
" 8,	591	8,093	8 0	108.12
" 20,	260	2,862	8 3	40.77
April 2,	420	4,651	10 0	75.48
" 12,	130	938	8 0	12.97*
	3,999	51,263		$ 734.18

The above were taken north of Cape Cod.

	No. of Cod.	Weight.	Split Cod.†	Stock.
April 20,	902	620	5,055	$ 81.76
" 27,	299	1,061	1,418	42.06
May 3,	530	1,953	2,038	62.79
" 8,	474	373	3,568	53.82
	2,205	4,007	12,079	$ 240.43

The above were taken south of Cape Cod. On the 18th of April, Captain Atwood himself caught one hundred and seventy-three codfish and two halibut in twenty-nine fathoms of water.

The following extract from a letter of Captain Blanchard will show the success of a single half-day. "This day," November 25, 1846, "eleven fishing-smacks have been out fishing, manned by seventy-five men; they have taken 75,000 or 76,000 pounds of fish, making an average of a little more than a thousand weight to each man. We fished but half of the day, on account of the snow-storm."

Generally speaking, this species "schools" but little, and is met with straggling all along the coast. It is a very voracious fish, eating almost every kind of food it can obtain. The fishermen consider the *herring* the best bait they can use in fishing for it, although they frequently catch them with *young flounders*, *cuttle-fish*, &c. When fishing on a *muddy bottom*, it is some time before the cod begins to take the hook; when, however, they are fished for upon a rocky bottom, they seize the bait at once. The hook should be suspended from three to five feet above the bottom of the sea, else the bait is taken off by skates.

* Two days' fishing.

† The split fish were sold by contract for eight shillings per hundred; none being split which could be sold entire.

As well as the Bank fishers, our shore fishers preserve the livers of this species for their oil. A good-sized cod liver yields half its weight of oil. Three barrels of livers yield one barrel of oil; almost all the remainder of the liver is water. A barrel of *cod oil* is worth from eleven to fourteen dollars. The oil furnished by the *cod upon our coast* is called shore oil, which is inferior to the Labrador or Bank oil. It is the habit of our fishermen to mix the livers of all the fishes which furnish oil together, and sell them for shore oil, — such as those of the pollock and hake, both of which furnish more oil than the liver of the cod, and that of the haddock, which yields but little oil.

Specimens of the cod are occasionally taken which are more or less mutilated; and sometimes, also, suffering from disease. The ventral or pectoral fins are lost. Captain Atwood has seen a cod with an injured spine, causing a distortion of the head to one side. Frequently specimens are caught much scarred, and with large sores upon their surface. Sometimes the sore becomes very hard, the surrounding parts inflame, and the fish emaciates; or the gall-bladder becomes enlarged, and the bile hardened, so that it can scarcely be cut with a knife.

In the month of February, the cod leaves the vicinity of the land, and goes off into deeper water. There are several varieties, differing in their color and markings, probably produced by difference of locality or food, which are known by the names of "Rock-Cod," "Shoal-Cod," &c.

The American cod grows to a very great size. Yarrell states that the largest cod of which he has any record weighed *sixty pounds.* Pennant refers to one weighing *seventy-eight* pounds. Captain Nathaniel Blanchard, of Lynn, has seen a cod weighing *eighty-six* pounds. Mr. Jonathan Johnson, Jr., of Nahant, has seen one taken weighing *eighty-eight* pounds. A cod weighing *one hundred pounds and a half* was taken at Provincetown in the winter of 1846 – 47, by one of the crew of Captain Emery's fishing-smack. The largest specimen of which I have any certain information, Mr. Anthony Holbrook, fishmonger in Boston Market, assures me he saw caught, in the spring of the year 1807, at New Ledge, sixty miles southeast of Portland, Maine; it weighed *one hundred and seven* pounds. Captain Atwood has *heard* of one said to weigh *one hundred and twelve* pounds.

In a Portland paper of September 13th, 1840, is an account, copied from the "Halifax Recorder," of a codfish exhibited in the fish-market at that place, measuring eight feet three inches in length, and forty inches in circumference.

Morrhua æglefinus, *Lin.*

The Haddock, Cuv.

(Plate XXVIII. Fig. 1.)

Gadus æglefinus, Lin., Syst. Nat. (12th edit.), p. 435.
" " *Haddock*, Bloch, II. p. 125, pl. 62.
" " " Shaw, Gen. Zoöl., IV. p. 136.
" " " Pennant, Brit. Zoöl., III. p. 241.
" " " Jenyns, Brit. Vert., p. 441.
" " " Mitch., Trans. Lit. and Phil. Soc. of N. Y., I. p. 570.
Morrhua æglefinus, Haddock, Griffith's Cuv., X. p. 484.
" " " Yarrell, Brit. Fish., 1st edit., II. p. 153, fig.; 2d edit., II. p. 233, fig.
" " " Storer, Report, p. 124.
" " " Dekay, Report, p. 279, pl. 43, fig. 138.
" " " Storer, Mem. Amer. Acad., New Series, II. p. 467.
" " " " Synopsis, p. 215.

Color. This species is of a dark-gray color above the lateral line, and of a beautiful silvery-gray beneath it, with a large circular or oblong blotch on each side, on a line with the middle of the pectorals, and just above them, which at its upper portion generally extends above the lateral line, its larger part being beneath that line. The gill-covers are much lighter-colored than the top of the head and snout, with a purplish tinge after death. The dorsal, pectoral, and caudal fins are bluish; the anal fins are of the color of the abdomen; the ventrals are rather lighter than the anal. The lateral line of a jet-black color. Pupils black, irides bluish.

Description. Stout in front of the first anal fin, gradually diminishing in size posterior to this. Length of the head less than one fourth the length of the body; depth of the body across from the anus less than the length of the head. Neck convex; top of the head between the eyes flattened; snout prominent. The upper jaw projects beyond the lower, and has several rows of sharp, pointed teeth; a single row of teeth are observed in the lower. A very minute barbule is suspended from the chin. The posterior nostril is much larger than the anterior. The eyes are circular; the diameter of the eye is rather more than one sixth the length of the head; the distance between the eyes is equal to about one fourth the length of the head.

The lateral line commences just above the posterior angle of the operculum, and assumes the curve of the body until on a line with about the middle of the second dorsal fin, when it takes a straight course, and terminates at the base of the caudal rays.

All the fin rays are enveloped by a thick fleshy membrane.

The first dorsal fin is high and triangular, and three fifths the length of the second dorsal; it commences on a line above the base of the pectorals.

The second dorsal arises just back of the first, on a line above the posterior extremity of the pectoral fin, and is equal in length to the head; its first rays are equal in height to nearly the length of the fin; its last ray is very minute; this fin terminates just anterior to the third dorsal.

The third dorsal is of the same form as the second, and a little longer than the first.

The pectorals are triangular; in height they are equal to the length of the third dorsal; their rays are multifid.

The ventrals are situated in front of the pectorals; the extremities of their first two rays are free; the second ray is the longest.

The first anal fin commences on a line back of the second dorsal, and is formed like that fin.

The second anal arises just back of the third dorsal, and terminates nearly on a line with it.

The caudal fin is emarginated.

The fin rays are as follows: — D. 16, 24, 20. P. 21. V. 6. A. 26, 21. C. 35.

Length, one to two feet.

Remarks. Immense numbers of this species are found on our coast in the spring, and continue through the season until autumn. The best haddock are caught on rocky bottoms, where in summer they are most plenty; but in the colder portions of the year they are most abundant on clayey bottoms. It is not an uncommon circumstance for haddock to remain on the fishing-ground with a large school of cod. About thirty years since, this species was comparatively rare at Cape Cod; in 1839, when my "Report on the Fishes of Massachusetts" was published, it was almost as common there as in any part of the bay. It is estimated that in the warm season about twelve hundred-weight of haddock are taken to one hundred-weight of codfish in Massachusetts Bay, and in the winter about twelve hundred-weight of cod to one hundred-weight of haddock; but as the haddock-fishery is of longer duration, the quantities through the year will average about the proportion of three haddock to one cod. Large numbers are sold in the market; during the entire summer it is eaten by the poorer classes, who are often able to obtain from the fishing-smacks a fine fish weighing several pounds for one or two cents. When boiled or made into a chowder, it is an excellent table-fish.

In the winter, this fish is worth about a dollar and a quarter a hundred-weight, while the cod is worth a dollar and three quarters a hundred-weight. This species is sometimes taken weighing seventeen pounds, although the average weight is between two and six pounds.

Maine, Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

MORRHUA PRUINOSA, *Dekay.*

The Tom-Cod.

(PLATE XXVII. FIG. 5.)

Frost-Cod, and *Frost-fish,* PENNANT, Arctic Zoöl., Supplement, p. 114.
Gadus pruinosus, Tom-Cod, or *Frost-fish,* MITCH., Report in part, p. 4.
Gadus tomcodus, Tom-Cod, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 368.
Morrhua tomcodus, Tom-Cod, STORER, Report, p. 126.
Morrhua pruinosa, Tom-Cod, DEKAY, Report, p. 278, pl. 44, fig. 142.
" " " AYRES, Bost. Journ. Nat. Hist., IV. p. 276.
" " " STORER, Mem. Amer. Acad., New Series, II. p. 468.
" " " " Synopsis, p. 216.

Color. This species varies exceedingly in its color. Generally it is brown, greenish, or yellowish-brown, with deeper patches, spots, and blotches; beneath lighter. The whole upper portion of the sides is sprinkled with irregular black points or dots, which are continued upon the ventral, pectoral, and anal fins. The abdomen in front of the vent is almost free from dots in some specimens. Pupils black, irides golden.

Description. Body oblong, abdomen somewhat prominent. The length of the head is rather less than one fifth the length of the body. The depth of the fish over the anus, exclusive of the dorsal fin, is about one sixth the length of the body. The upper jaw projects beyond the lower; the snout is blunt; beneath the chin is situated a small barbel. Compact, small, and sharp teeth in the intermaxillary bone, lower jaw, and upper palatine bones. The eyes are circular; their diameter is equal to less than one half the distance between them. The nostrils are double, situated just anterior to the eyes; the posterior and inferior is much the larger.

The lateral line, arising above the operculum, curves upward to a line opposite the termination of the pectorals, and just beyond these fins commences a straight course, which is continued to the base of the caudal rays.

The first dorsal fin, which is of a triangular form, commences opposite the middle of the pectorals.

The second dorsal is subquadrangular.

The third dorsal is one fourth shorter than the second, and longer than the first.

The pectorals are one fourth shorter than high.

The ventrals are situated in front of the pectorals; the first two rays are free at their extremities; the second ray is considerably the longer.

The first anal fin is more than as long again as high.

The second anal is shorter than the first anal, and is of the same form as the third dorsal. The anals are separated from each other by a space equal to one fourth the length of the second anal.

The caudal fin is rounded at its posterior extremity.

The fin rays are as follows: — D. 13, 18, 19. P. 17. V. 6. A. 22, 18. C. 39.

Length, twelve to fourteen inches.

Remarks. This common species is taken by the hook from our wharves and bridges in the summer; and through the winter, Boston market is supplied with this fish from the mouths of the rivers in the vicinity, where it is taken in dip-nets. The amount of tom-cod taken at Watertown alone is estimated at two thousand bushels annually; about half of these are sent to Boston market, and the remainder to the neighboring towns.

Maine, Massachusetts, Storer. Connecticut, Linsley, Ayres. New York, Mitchill, Dekay.

GENUS II. MERLANGUS, Cuv.

Three dorsal and two anal fins. No barbels to the chin.

Merlangus purpureus, *Storer.*

The Pollack.

(Plate XXVIII. Fig. 3.)

Gadus purpureus, New York Pollack, Mitch., Trans. Lit. and Phil. Soc. of N. Y., i. p. 370.
Merlangus Purpureus, Pollack, Storer, Report, p. 130.
" " *New York Pollack,* Dekay, Report, p. 286, pl. 45, fig. 147.
" " Storer, Mem. Amer. Acad., New Series, ii. p. 472.
" " " Synopsis, p. 220.

Color. The upper part of the head and body is of a greenish-brown color; the sides are lighter; the abdomen is white. In very small specimens, the color above is deeper, and the abdomen is reddish. The pupils are black; the irides silvery, with greenish reflections. The dorsal, pectoral, and caudal fins are of the color of the back. The ventrals are white. The first anal fin is white at its base, and bluish above; the second

anal has a longitudinal white line at its base, and, as well as the first dorsal, is whitish at its top. The lateral line is grayish.

Description. Body oblong, subcompressed. Slightly arched above to the origin of the first dorsal fin. Its greatest depth about equal to the length of the head. The head is more than one fourth as long as the body, flattened above, somewhat pointed at the snout when the jaws are closed. The eyes are large; their diameter is less than half the distance between them. The gape of the mouth is quite large; the tongue is large, fleshy, fuliginous. The lower jaw is longer than the upper; minute teeth in both jaws; a single row only in the lower. The posterior nostril the larger. A line of mucous pores is situated on both maxillary bones, and upon the lower portion of the opercula. The division between the gill-covers is scarcely distinguishable when first examined; the posterior angle of the operculum is obtuse.

The lateral line, commencing above the posterior angle of the operculum and slightly curving over the pectorals to their extremity, pursues a straight course to the middle of the caudal rays.

The first dorsal fin is triangular, and arises opposite the middle of the pectorals.

The second dorsal is more than as long again as the first; the rays gradually diminish in height to the last, which is very short.

The third dorsal is three times as long as high, and terminates opposite the second anal.

The pectorals arise just beneath the posterior angle of the operculum; their depth at their base is equal to one third their height.

The ventrals are just in front of the origin of the pectorals; their second and third rays are longest.

The first anal fin arises opposite the commencement of the second dorsal, and terminates on a line opposite the termination of that fin.

The second anal is about half the height of the first; the first two rays are short and simple.

The caudal fin is large, strong, forked; the length of the outer rays is equal to the distance between the extremities of the fin when expanded.

The fin rays are as follows: — D. 14, 22, 21. P. 20. V. 6. A. 22, 21. C. $24\frac{8}{8}$.

Length, one to three feet.

Remarks. Immense numbers of this species are found in our waters in spring and autumn. A fleet of twenty or thirty boats frequently go off to Jeffries' Ledge, east of Cape Ann, in the fall of the year, and, having fastened their craft together, and thrown overboard a quantity of bait to entice the fish, capture in a single night from thirty to

forty quintals of pollack to a boat. When prepared in the same manner as the cod when intended for dun-fish, with proper care and good salt, this is really an excellent fish, and its value is increased from nine shillings to three or four dollars per quintal.

Maine, Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

GENUS III. LOTA, CUV.

Body elongated. Two dorsal fins. A single anal fin. One or more barbels on the chin.

LOTA COMPRESSA, *Lesueur.*

The Eel-pout.

(PLATE XXVIII. FIG. 4.)

Gadus compressus, LESUEUR, Journ. Acad. Nat. Sciences, I. p. 84.
Le Molve Hunt (*Molva Huntia*), LESUEUR, Mémoires du Muséum, V. p. 161.
Lota compressa, *Eel-pout*, STORER, Report, p. 134.
" " " THOMPSON, Hist. of Vermont, p. 147.
" " *Compressed Burlot*, DEKAY, Report, p. 285, pl. 78, figs. 244, 245.
" " STORER, Mem. Amer. Acad., New Series, II. p. 471.
" " " Synopsis, p. 219.

Color. The back and sides of this species are of a yellowish-brown, variegated with darker spots, which are more distinct anterior to the dorsal fin; abdomen yellowish. The first dorsal fin is lighter than the body, and variegated with black. Upon the lower portion of the second dorsal is a row of dark-colored spots, and its edge is margined with black.

Description. The body in front of the first dorsal is cylindrical, beginning to be compressed at the sides at the extremity of the pectorals, gradually becoming more so towards the tail, so that the caudal rays appear as a membranous prolongation of the body. The entire surface is covered with minute scales, appearing like cup-shaped depressions. The head is very much compressed above; its length is equal to one sixth the length of the body. The eyes are circular; the distance between them equal to one fourth the length of the head. The nostrils are double; from the back of the anterior nostril a very minute cirrhus is suspended. The upper jaw is the longer; to the chin is attached a cirrhus of a length nearly equal to the distance between the eyes. The jaws and palatines are armed with numerous minute, sharp teeth.

The lateral line arises above the operculum, and extends in a straight course to the middle of the fleshy portion of the tail.

The first dorsal fin is small, subquadrangular when expanded; it is situated one sixth the length of the fish back of the head.

The second dorsal, arising just back of the first, is continued to the tail; it is rounded at its posterior extremity.

The fan-shaped pectorals are three quarters the length of the head.

The ventrals are small, and terminate in a point.

The anal fin arises on a line just back of the origin of the second dorsal; it is of the same length as that fin, and, like it, is joined to the caudal fin.

The caudal is rounded at its extremity.

The fin rays cannot be accurately made out, owing to the fleshy membrane of which they are formed.

Length, six inches.

Remarks. This species was first described by Lesueur from a specimen taken at Northampton. The individual which has enabled me to furnish the above description was also brought from the Connecticut River, by Thomas M. Brewer, M. D., of this city.

GENUS IV. MOTELLA, Cuv.

Body elongated, cylindrical, compressed posteriorly; the first dorsal fin very slightly elevated, delicate in structure, scarcely perceptible; second dorsal and anal fins long, continued nearly to the base of the tail.

Motella caudacuta, *Storer.*

(Plate XXIX. Fig. 1.)

Motella caudacuta, Storer, Proc. Bost. Soc. Nat. Hist., III. p. 5.

Color. The general color of the body is a yellowish-brown; the posterior margin of the second dorsal and anal fins, as well as the edges of the caudal fin, of a dark-slate color; the whole of the pectorals also of this color; the ventrals are lighter. The body beneath is lighter; the throat and lower jaw are externally much lighter than the rest of the body; the inside of the mouth and tongue are purple. The barbels on the snout of the color of the head; that on the chin colorless.

Description. The body of this species is elongated; cylindrical anteriorly, much compressed posteriorly. The head above is flattened posteriorly, and rounded anterior to the eyes. The snout is blunted. The length of the head is equal to one sixth the length of the entire fish; the depth of the body is equal to about three fourths the

length of the head. The gape of the mouth is large. The upper jaw is the longer; a single row of sharp teeth in each jaw. The nostrils, situated just anterior to the eye, are large. The eyes are horizontally oblong; their longest diameter is equal to one fourth the length of the head. On each side of the snout, just anterior to the nostril, is a barbule half the length of the head; between these two, at the anterior inferior angle of the snout, is a third, much smaller; from the chin hangs another barbule, of about the same length as the third.

The uninterrupted lateral line arises at the posterior superior angle of the operculum, and passes obliquely downwards to near the centre of the fish, when it pursues a straight course to the tail.

The first dorsal fin has one free ray, which is three fourths the length of the head; the remainder of the fin consists of minute hair-like rays situated in a groove of the length of the first ray, in which, when unexpanded, they are all concealed. Directly back of this groove the second dorsal commences, which is continued to the fleshy portion of the tail, terminating just anterior to the caudal rays; it is of about the same height throughout.

The vent is upon the anterior half of the body.

The anal fin commences directly back of this, and terminates on a line opposite the second dorsal; this fin is not as high as the dorsal.

The ventral fin has the first two rays free; the second ray is the longest.

The pectoral fins are three fourths as high as the length of the head, and are rounded posteriorly.

The caudal fin is about as long as the height of the pectorals, and tapers to a point.

The fin rays are as follows: — D. 53. P. 16. A. 48. C. 24.

Length, six inches.

Remarks. The specimen here described was one of two taken at Long Point, Provincetown, by Mr. Heman M. Smith, of that place. They had apparently been thrown ashore but a short time previously, being perfectly fresh. Since these were found, Captain Atwood has noticed several specimens in the stomachs and mouths of codfish caught in Massachusetts Bay during the winter.

GENUS V. MERLUCIUS, Cuv.

The head flattened; the body elongated; the back furnished with two dorsal fins, the first short, the second long; but one anal fin, also very long; no barbels at the chin.

Merlucius albidus, *Dekay.*

The Whiting.

(Plate XXVIII. Fig. 2.)

Gadus albidus, New York Whiting, Mitch., Journ. Acad. Nat. Sciences, I. p. 409.
Gadus merlucius, The Hake, Mitch., Trans. Lit. and Phil. Soc. of N. Y., I. p. 371.
Merlucius vulgaris, Hake, Storer, Report, p. 132.
" " " Ayres, Bost. Journ. Nat. Hist., IV. p. 276.
Merlucius albidus, American Hake, Dekay, Report, p. 280, pl. 46, fig. 148.
" " Storer, Mem. Amer. Acad., New Series, II. p. 470.
" " " Synopsis, p. 218.

Color. When alive, this species is of a rusty-brown color upon the upper portion of the sides, golden in the sun; silvery beneath. Pupils black, irides with golden reflections. Dorsal and caudal fins rusty; pectorals and ventrals fuliginous; anal colorless. The whole interior of the mouth, jaws, throat, and tongue of a beautiful purple. Pupils black, irides silvery. The lateral line is lighter-colored than the upper part of the body.

Description. Body elongated, somewhat compressed in front of the anus, rounded posteriorly. The length of the head is equal to one fourth the length of the body. The top of the head is flattened, exhibiting depressions. The lower jaw is slightly the longer. The jaws as well as the palatine bones are armed with a row of prominent, sharp, incurved teeth, exterior to which is a row much smaller. Numerous teeth in the pharynx. The tip or middle of the upper jaw is edentate. A deep furrow exists in the suborbitar bones, extending from the side of the snout in the upper jaw to the posterior portion of the preoperculum; and beneath the lower, from the chin to the outer angle of the jaw. The eyes are large and circular; their diameter is equal to more than half the distance between them. The inferior portion of the gill-covers is naked, the upper portion is scaly. The scales upon the top of the head are smaller than those on any other part of the body. Those on the opercles are smaller than those of the body. At the anterior angle of the eye, a bony process is observed; just in front of this process are situated the nostrils; the anterior is circular, the posterior, which is much the larger, is vertical.

The lateral line, appearing like a smooth raised ridge, arises at the superior posterior angle of the operculum, and pursues a slightly oblique course to the anterior half of the second dorsal, and thence passes in a straight line to the tail.

The first dorsal fin, which is short and triangular, arises on a line a short distance behind the origin of the pectorals. The second, third, and fourth rays of this fin are the highest, and equal in their height to the length of the fin. The last rays are very short. The distance between this fin and the second dorsal is equal to about one third the length of the first dorsal.

The second dorsal is more than three times as long as the first. A deep emargination is observed between the nineteenth and twentieth rays, causing this fin to appear like two fins. The highest rays of the posterior portion of this fin are much higher than those of the anterior portion, but not as high as the rays of the first dorsal. The extremities of the rays in both fins are bifid.

The pectorals are broad when expanded, slightly rounded; their middle rays the longest. The length of the pectorals is to their height as one to five.

The ventrals arise just in front of the pectorals.

The anal fin arises on a line just back of the origin of the second dorsal, and terminates on the same plane as that fin. This fin is slightly higher than the dorsal; between the twentieth and twenty-first rays is an emargination similar to that in the dorsal fin, making this also to appear as two.

The caudal fin is but very slightly concave at its posterior extremity.

The fin rays are as follows: — D. 13, 41. P. 13. V. 7. A. 40. C. 23.

Length, one and a half to two feet.

Remarks. When my "Report" was published, in 1839, I stated that the whiting was taken, not however in large quantities, in our Bay in the summer, upon the cod-fishery ground. Since that period, this species has increased very perceptibly in our waters. It is frequently caught in considerable numbers with the hook upon Crab Ledge, a few miles from Boston Light-house, and has become at Provincetown a serious inconvenience to the fishermen. Captain Atwood informs me, that, when the fishermen at the latter place commence the mackerel fishery with nets, which usually takes place about the 20th of May, the whiting are scarce, and few are caught; by the 1st of June they become more plenty; and from the middle of June to the last of the fishery, which closes about the 20th of July, they are exceedingly numerous, in all parts of the bay, in all depths of water. In such quantities are they taken in the nets, that frequently eight or ten hours are required for a man to clear his nets of them. At this season of the year, so many of them are thrown from the boats upon the shore, that the Board of Health are sometimes called upon to interfere, and to compel the fishermen to bury them, from the fear of sickness being produced by their decomposition. While visiting Race Point, the easterly extremity of Cape Cod, in June, 1847, I saw quite a number of

this species strewed along the shore, where they had been left by the tide, while in pursuit of sand-eels and other small fishes. Since that period, the blue-fish having been more common, this species does not exist in as great abundance.

Occasionally this species is brought to market, and when perfectly fresh is a very sweet fish, boiled, broiled, or fried. It soon becomes soft, and is preserved with difficulty. As it does not appear to be known abroad, and the fishermen consequently have no call for it, it is not cured, but is considered worthless. In the months of September and October the whiting is used somewhat for bait for the dog-fish, and answers a good purpose. This species remains upon our coast until late in the autumn, when, the water becoming colder, they disappear.

Dr. Dekay's figure of this species is bad. The second dorsal and anal fins do not show the emargination at all, and the caudal is too deeply concave.

Dr. Dekay thinks that Mitchill was induced to attribute three dorsal fins to this species on account of "the accidental rupture of the membrane." I think this is not the case; but that, owing to this deep emargination, the membrane connecting the nineteenth and twentieth rays was so low as almost to seem like the extremity of a fin.

Massachusetts, Storer. Connecticut, Linsley, Ayres. New York, Mitchill, Dekay.

GENUS VI. PHYCIS, Artedi.

Body elongated. Two dorsal fins, first short, second long; ventral fins with a single ray only at the base, afterwards divided. Chin with one barbule.

Phycis Americanus, *Storer.*

The White Hake.

(Plate XXIX. Fig. 3.)

Enchelyopus Americanus, Schneider, Griffith's Cuv., x. p. 489.
Gadus longipes, Codling, Mitch., Trans. Lit. and Phil. Soc. of N. Y., i. p. 372, pl. 1, fig. 4.
Phycis furcatus, Storer, Bost. Journ. Nat. Hist., i. p. 418.
Phycis Americanus, American Hake, Storer, Report, p. 138.
" " *Codling*, Dekay, Report, p. 291, pl. 46, fig. 150.
" " Storer, Mem. Amer. Acad., New Series, ii. p. 473.
" " " Synopsis, p. 221.

Color. This fish, when first taken, is of a reddish-brown color above, bronzed upon the sides. The throat, and abdomen in front of the anus, are white, thickly sprinkled with minute black dots, causing them to appear almost fuliginous; less of this appear-

ance exists upon the belly and posterior portions of the fish. The snout is tinged with orange. The top of the head in front of the eyes, the cheeks and intermaxillaries, are also dotted. The upper edge of the dorsal fin is black. The pectorals are transparent, and dotted throughout their greater portion. The anal fin is of the color of the abdomen, and is also dotted, and black upon its edge. The caudal fin is reddish, with exceedingly minute black dots; its posterior extremity is black.

These colors fade in death, and the upper portion becomes of a grayish-brown, and the abdomen a dirty white.

Description. Body cylindrical, compressed posteriorly. Length of the head equal to nearly one fourth the entire fish; depth of the body in front of the pectorals one fifth its entire length; depth across from the anus, exclusive of the dorsal fin, about one sixth its length; depth of the body beyond the termination of the dorsal and anal fins equal to about one quarter the last measurement. Head much flattened above, broad, and strongly convex back of the eyes; sides somewhat compressed; snout projecting, rounded; eyes circular, large, prominent; the upper jaw projecting beyond the lower; both jaws are armed with several rows of sharp incurved teeth; five or six of these in the upper jaw, a less number in the lower; teeth also on the vomer; a small portion at the tip of each jaw is without teeth; that in the lower jaw is much the smaller. Tongue large and fleshy. A minute barbule at the chin.

The lateral line commences above and anterior to the posterior angle of the operculum, and curves with the body until it reaches a line opposite the eighteenth ray of the second dorsal, whence it pursues a straight course to the tail.

The first dorsal fin is triangular, and commences just back of the pectorals; its third ray is filamentous, and about twice the length of the fin.

The second dorsal commences just back of the first; its rays gradually diminish in height posteriorly. The membrane connecting the fin rays is much firmer than that of the first dorsal, although, like it, it is transparent; all the rays are slightly free at their tips. This fin terminates just anterior to the commencement of the fleshy portion of the caudal fin.

The pectorals commence just beneath the posterior angle of the operculum; their length is equal to about one fourth their height. They are rounded when expanded.

The ventrals commence at a point just half-way between the base of the pectorals and the angle of the lower jaw; they are composed apparently of a single ray, which bifurcates about its middle; but dissection shows they are formed of two rays, the inferior of which is much the longer.

The anal fin arises some distance back of the second dorsal, and terminates opposite

the termination of that fin; the first ten or eleven rays of this fin are the longest; they diminish in size towards the tail; this fin is not as high as the opposite dorsal.

The caudal fin is long; its rays are nearly even at its extremity; it is but very slightly convex.

The fin rays are as follows: — D. 10, 54. P. 17. V. 2. A. 48. C. 20.

Length, one to three feet.

Remarks. This species is taken in large numbers, between the first of June and the first of September, on muddy bottoms, between Cape Ann and Boston Light-house. In some seasons they are brought to market in October also. They are generally taken in the night with the hook, although they will sometimes take the bait in a cloudy day. Occasionally two thousand pounds' weight, varying in size from three to ten pounds or more, are taken in a single night by one man, where scarcely an individual was captured during the previous day. It sells for about half the price of cod, when fresh. It is a good fish fried and boiled, and is also used for chowder; for the latter purpose, it has perhaps no superior. It is also a valuable fish when salted.

Maine, Massachusetts, Storer. Connecticut, Linsley. New York, Mitchill, Dekay.

Phycis filamentosus, *Storer.*

The Squirrel-Hake.

(Plate XXIX. Fig. 4.)

Color. The upper part of the body is of a reddish-brown color. The sides are lighter and tinged with orange. The abdomen is of a pure white; the throat is also white. The anal fin is margined with white. Pupil black, irides silvery.

Description. Length of head one fifth that of the body, and rather more than the greatest depth of the fish. Depth at the base of the pectorals one seventh, at anus exclusive of dorsal fin one fifth, at posterior extremities of dorsal fin one twenty-first of the entire length. Top of head much depressed throughout its whole extent. Snout rounded and not very prominent. Eyes moderate; their diameter equal to three quarters the distance between them. Upper jaw projecting far beyond the lower. Teeth numerous, minute, incurved. The lateral line commences just above the operculum, and curves with the body to the tail. Scales very large, smaller upon the head.

The first dorsal fin is triangular; the third ray is filamentous, and from three to five times the length of the fin.

The second dorsal arises directly back of the first; its first few rays are shortest, the

remainder are of a uniform height, to the fleshy portion of the tail. It is stout and rounded, ending abruptly.

The pectorals arise just beneath the posterior angle of the operculum; they are rounded posteriorly.

The ventrals are composed of a single ray, bifurcated at their lower third; the outer portion being the shorter.

The anal fin arises at the posterior extremity of the longer portion of the ventral ray, and about opposite the tenth dorsal ray, on a line with which fin it terminates. The first four or five rays of this fin are the shortest.

The caudal fin is slightly expanded and nearly straight at its extremity.

The fin rays are as follows: — D. 10, 60. P. 16. V. 1. A. 55. C. 18.

Length, seventeen inches.

Remarks. This species is known by the fishermen of Massachusetts Bay as the "Squirrel-Hake." It seldom exceeds two pounds in weight, while the *P. Americanus*, when full grown, often weighs more than thirty pounds.

GENUS VII. BROSMIUS, Cuv.

Body elongated; a single dorsal fin extending the whole length of the back. One barbel at the chin. Ventral fins fleshy.

Brosmius flavescens, *Lesueur.*

The Cusk.

(Plate XXIX. Fig. 2.)

Le Brosme jaune, Brosmius flavescens, Lesueur, Mémoires du Muséum, v. p. 158, pl. 16.
Gadus (Brosmius) flavescens, Lesueur, *Yellow Tusk,* Rich., Fauna Boreal. Americ., iii. p. 252.
Brosmius vulgaris, Cuv., *Cusk,* Storer, Report, p. 136.
" " (?), *Cusk,* Dekay, Report, p. 289.
Brosmius flavescens, Lesueur, Storer, Mem. Amer. Acad., New Series, ii. p. 473.
" " Storer, Synopsis, p. 221.

Color. The back is of a brownish color in the larger specimens; the sides yellowish, and sometimes of a decided yellow; frequently, in very large specimens, the fish is whitish, with brownish patches, appearing as if abraded; beneath, white. In the smaller specimens, the body is of a uniform dark-slate color in some specimens; while in others six or eight transverse yellow bands are seen. The dorsal, anal, and caudal

fins are bordered with black or blue-black, and edged throughout with a white margin. The pectorals are of the color of the sides. The ventrals are fuliginous.

Description. Body cylindrical, compressed posterior to the anus, tapering to a point at the fleshy extremity of the caudal fin. The top of the head is flattened. A slight furrow between the nape of the neck and the dorsal fin. The upper jaw is slightly longer than the lower; several rows of prominent, sharp, incurved teeth upon the jaws; the innermost row of those upon the lower jaw the longest; similar teeth upon the palatine bones. The mouth is large, its vertical gape being nearly equal to three fifths the length of the head. A single barbel, about one fifth the length of the head, is suspended from the chin. The eyes are horizontally oval; the distance between them is rather greater than their longest diameter. The posterior nostril is situated directly in front of the anterior angle of the eye; a tubular cirrus projects from the anterior, which is much the smaller.

The lateral line commences just back of the eye, and curves backwards and downwards to a line above the origin of the anal fin, whence it pursues a straight course to the caudal rays.

The dorsal fin arises on a line above the anterior half of the pectorals; its height at its origin is equal to about one fifth the length of the head; it continues of this height until near its posterior termination. It is rounded at its extremity, and is continued to the caudal rays, with which it unites.

The pectorals are rounded posteriorly, and are equal in their height to two fifths the length of the head.

The fleshy ventrals are situated anterior to the pectorals, and are about the same height as those fins; the extremities of their rays are free.

The anal fin arises at a distance back of the termination of the pectorals equal to about one fifth the length of the fish; this fin terminates opposite the termination of the dorsal, and, like that fin, is united to the caudal rays.

The caudal fin is rounded when expanded.

The anus is small, and situated just in front of the anal fin.

The fin rays are as follows: — D. 98. P. 24. V. 5. A. 71. C. 34.

Length, two to three feet.

Remarks. This fine species is commonly taken on ledges in deep water; it is frequently caught upon the Middle Bank, between Cape Cod and Cape Ann, with the hook, while fishing for cod. In the spring of the year it is occasionally met with in Boston market, but does not sell as readily as the cod; in the winter season it is more rare, and not unfrequently sells for double the price of that species. It is an excellent

fish, and is considered by those best acquainted with it, when fresh, quite a delicacy, and, when salted, preferable to the cod. A large quantity of oil is procured from its liver, which is sometimes preserved by the fishermen for external application to burns. This species grows to the weight of thirty pounds. Captain Atwood informs me that he has never known an individual to be taken on the Cape Cod shore of Massachusetts Bay.

Massachusetts, LESUEUR, STORER.

FAMILY XIX. PLANIDÆ.

Body flat, compressed vertically. Upper surface dusky, and of various colors; beneath white. Dorsal single, extending the whole length of the back. Both eyes placed on the same side of the head. No air-bladder. Branchial rays six.

GENUS I. HIPPOGLOSSUS, CUV.

Eyes and colored surface on the right side. The fins are similar to those of the species of the genus Platessa; the jaws and the pharynx are armed with teeth that are sharper and stronger, and the form of the body is more elongated.

HIPPOGLOSSUS VULGARIS, *Cuv.*

The Halibut.

(PLATE XXX. FIG. 1.)

Pleuronectes hippoglossus, LIN., Syst. Nat., p. 456.
" " *Holybut*, BLOCH, II. p. 44, pl. 47.
" " FABRICIUS, Fauna Grœnlandica, p. 161.
" " *Holibut*, SHAW, Gen. Zoöl., IV. p. 295.
" " " PENNANT, Brit. Zoöl., III. p. 302.
" " *Halibut*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 386.
Hippoglossus vulgaris, *Holibut*, JENYNS, Brit. Vert., p. 460.
" " GRIFFITH'S CUV., X. p. 494.
" " YARRELL, Brit. Fish., 1st edit., II. p. 230; 2d edit., II. p. 321.
" " STORER, Report, p. 145.
" " DEKAY, Report, p. 294, pl. 49, fig. 157.
" " STORER, Mem. Amer. Acad., New Series, II. p. 475.
" " " Synopsis, p. 223.

Color. The entire right side of this species of an almost uniform dark-brown; the left side of a pure white. Very rarely, an individual is caught having the left side also brown.

Description. Body elongated. The length of the head is equal to one fourth the length of the entire fish. The eyes are large, oblong; their longest diameter equal to the distance between them. The lips are large and fleshy. The lower jaw the longer. The jaws are furnished with two rows of strong, sharp teeth, the inner of which is larger and incurved. The nostrils are double; the anterior is tubular, the posterior the larger.

The lateral line commences at the posterior superior angle of the operculum, and, making a high curve above the pectorals, assumes just back of their posterior extremity a straight line, which is continued to the rays of the caudal fin.

The dorsal fin arises over the anterior third of the eye, and terminates at the fleshy portion of the caudal fin. The highest rays of this fin are six times the height of those above the base of the pectorals.

The pectorals arise just back of the posterior angle of the operculum.

The ventrals are small, and situated beneath the base of the pectorals. The third ray is the longest.

The anal fin arises beneath the posterior half of the pectorals, and terminates opposite the dorsal fin.

Two apertures anterior to the anal fin; the anterior, the anus; the posterior, the smaller, the urinary outlet.

The fin rays are as follows, in two specimens examined: —

D. 99. P. 17. V. 6. A. 73. C. 18.
D. 100. P. 16. V. 6. A. 74. C. 17.

Length, three to six feet.

Remarks. In some rare instances, the eyes of this species are reversed, being situated on the left side of the fish.

By far the greatest quantity of halibut brought to Boston market is taken at George's Banks, twenty thousand pounds' weight being frequently captured at that place in a day or two, by the crew of a single smack, constituting what is called a "trip." Considerable numbers, however, are taken along our coast. Nantucket Shoals have for many years been a favorite resort for the halibut fishers, and formerly many were taken there. Captain Atwood informs me that, with a crew of eight men, he has captured there in a single day 7,300 pounds' weight of this species. They have of late years become more scarce. In the spring of 1845, four men, from the 20th of April to the 15th of May, landed 13,000 pounds, which they took on the south side of Cape Cod, and which sold in Boston market for $390. About eight or nine miles directly north of Race Point is a bank, which is called the Middle Bank; between this bank and Race Point the water is from about twenty-five to twenty-eight fathoms deep, with a

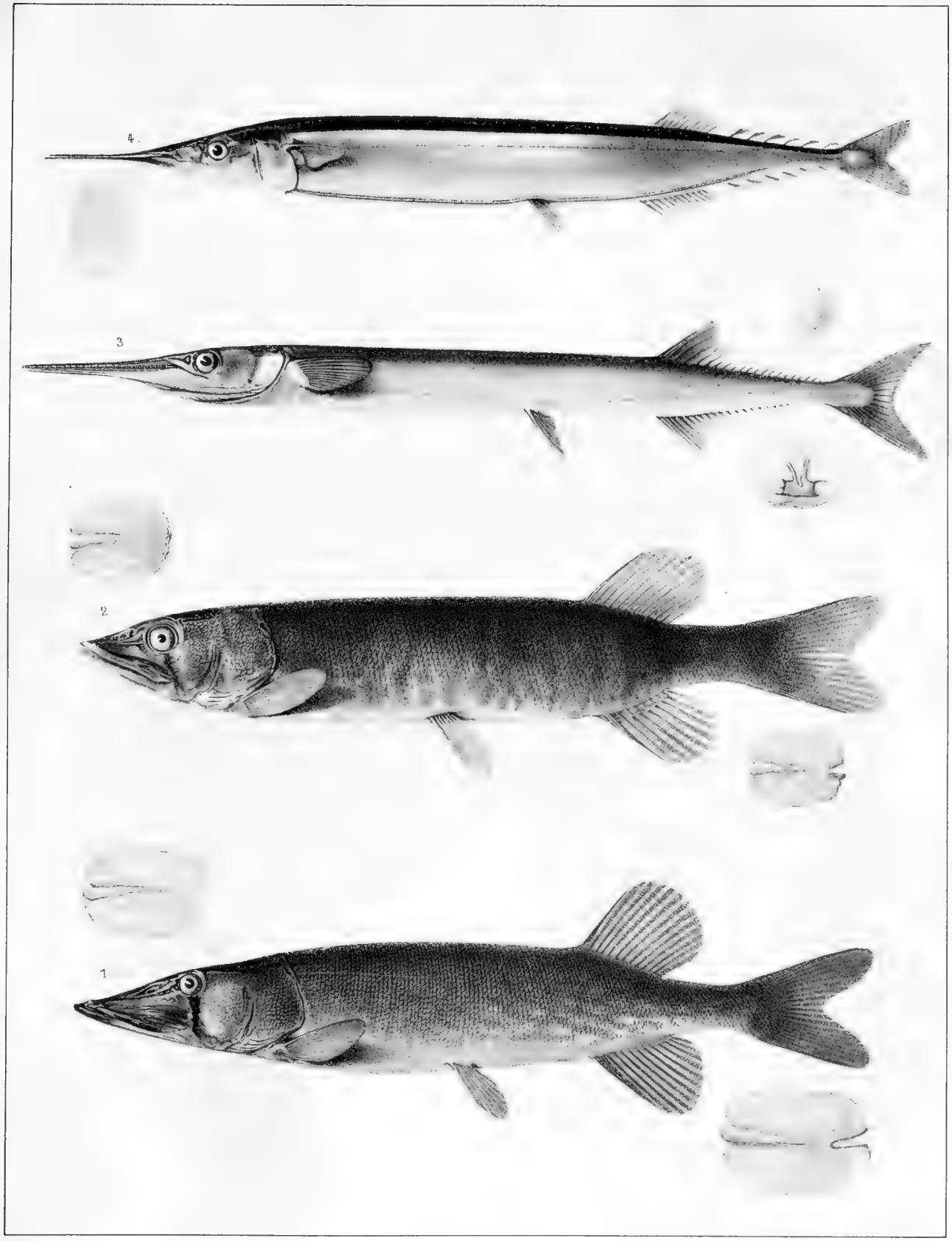
hard clayey bottom. This is called the "Gully." In the summer, this species strays up Massachusetts Bay, and scatters all along the shoal water, upon the hard bottoms; but in winter it goes back to this "Gully," and there remains during the cold weather. The reasons appear to be obvious. The shoal water would be too cold a situation for them during the winter; and the middle of the bay has a muddy bottom, which it avoids. Halibut were first taken in this "Gully" about twenty years since, and for several successive seasons the fishery was quite a lucrative business, but at present the fish are very scarce there. In the most successful year's fishery at this place, about 75,000 pounds of halibut were taken by the Provincetown fishermen. When the halibut were first caught at the "Gully," they averaged nearly one hundred pounds each; thirteen fish captured at one time weighed 2,043 pounds; those taken afterwards were smaller, and during the second and third years' fishery, they weighed sixty pounds or less upon an average.

An unusual number of halibut were brought to Boston market in the early part of 1837. Eighty large schooners, of from sixty to eighty tons' burden, belonging to Cape Ann, were thus employed. Captain Nathaniel Blanchard, of Lynn, one of our oldest fishermen, and to whom I am indebted for many valuable facts in the preparation of this report, informs me that the largest individual of this species he ever saw weighed 386 pounds. The late Mr. Lemuel Newcomb, then the oldest fishmonger in Boston market, stated to me in 1847, that, forty years before, a halibut was taken upon the South Shore, and brought to Boston, which, after the head and bowels were removed, weighed 420 pounds. This specimen when perfect must have weighed nearly 500 pounds.

For a knowledge of the largest specimen of which I have heard, I am indebted to Mr. Anthony Holbrook, a fishmonger in Boston market, — for many years a practical fisherman, and possessing an unusually extensive knowledge of our fishes, and a man of unimpeachable veracity. He assures me that a halibut weighing upwards of 600 pounds was taken at New Ledge, sixty miles southeast of Portland, Maine, in 1807.

This species feeds upon other fishes. In its stomach are frequently found portions of haddock, rays, menhaden, mackerel, herring, the eel-shaped blenny, &c. Its flesh is rather coarse and dry, but by many is much esteemed; when fresh, the fins are a great delicacy, as also when pickled and packed. When fresh, this species sells for a higher price than the cod. Large quantities are also smoked, and occasionally the dried flesh is eaten.

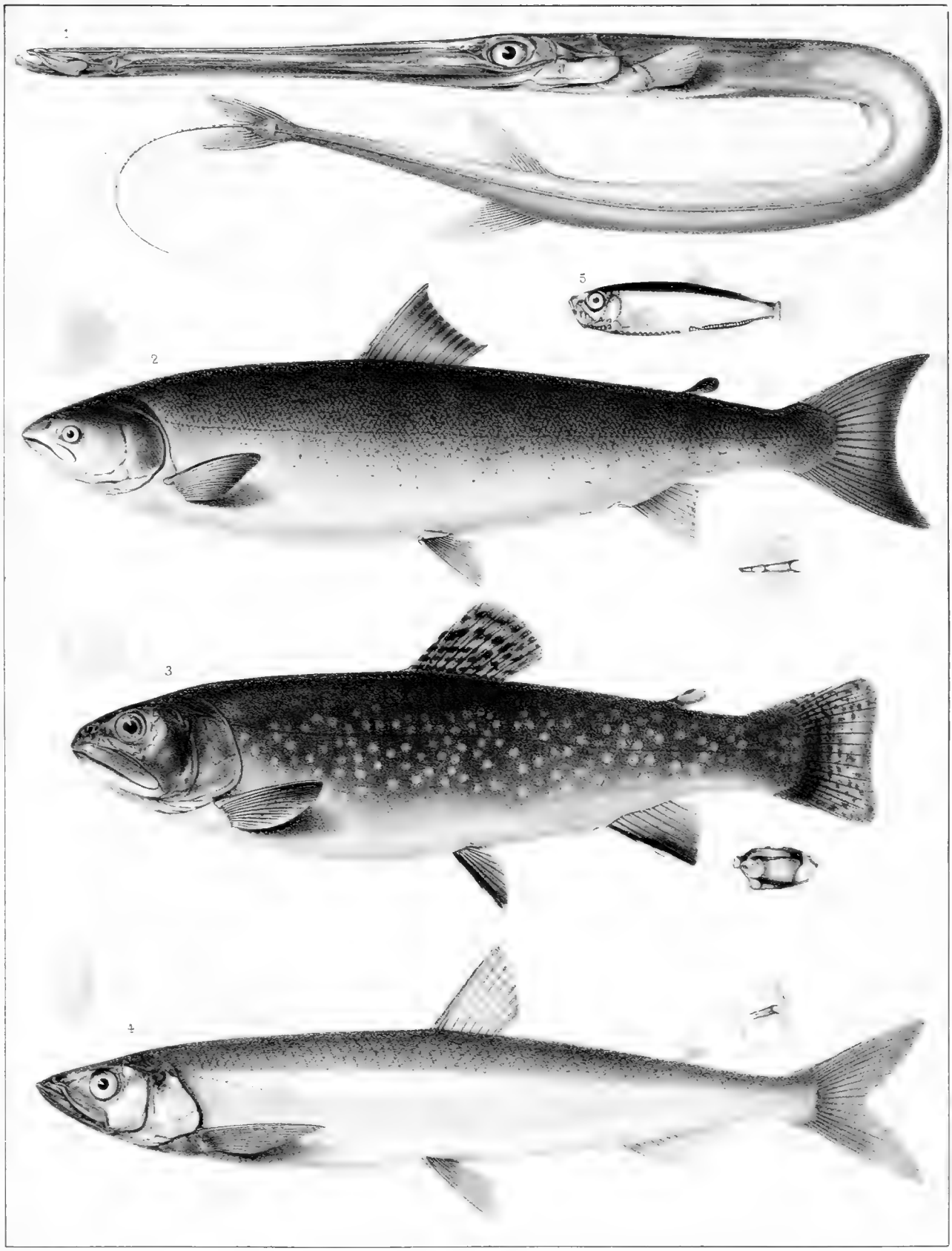
Greenland, Fabricius. Maine and Massachusetts, Storer. Connecticut, Linsley. New York, Mitchill, Dekay.



A. Sonrel.

L.H. Bradford & Co print.

1. ESOX RETICULATUS LeS. 2. ESOX ORNATUS Gir.
3. BELONE TRUNCATA LeS. 4. SCOMBERESOX STORERI Dek



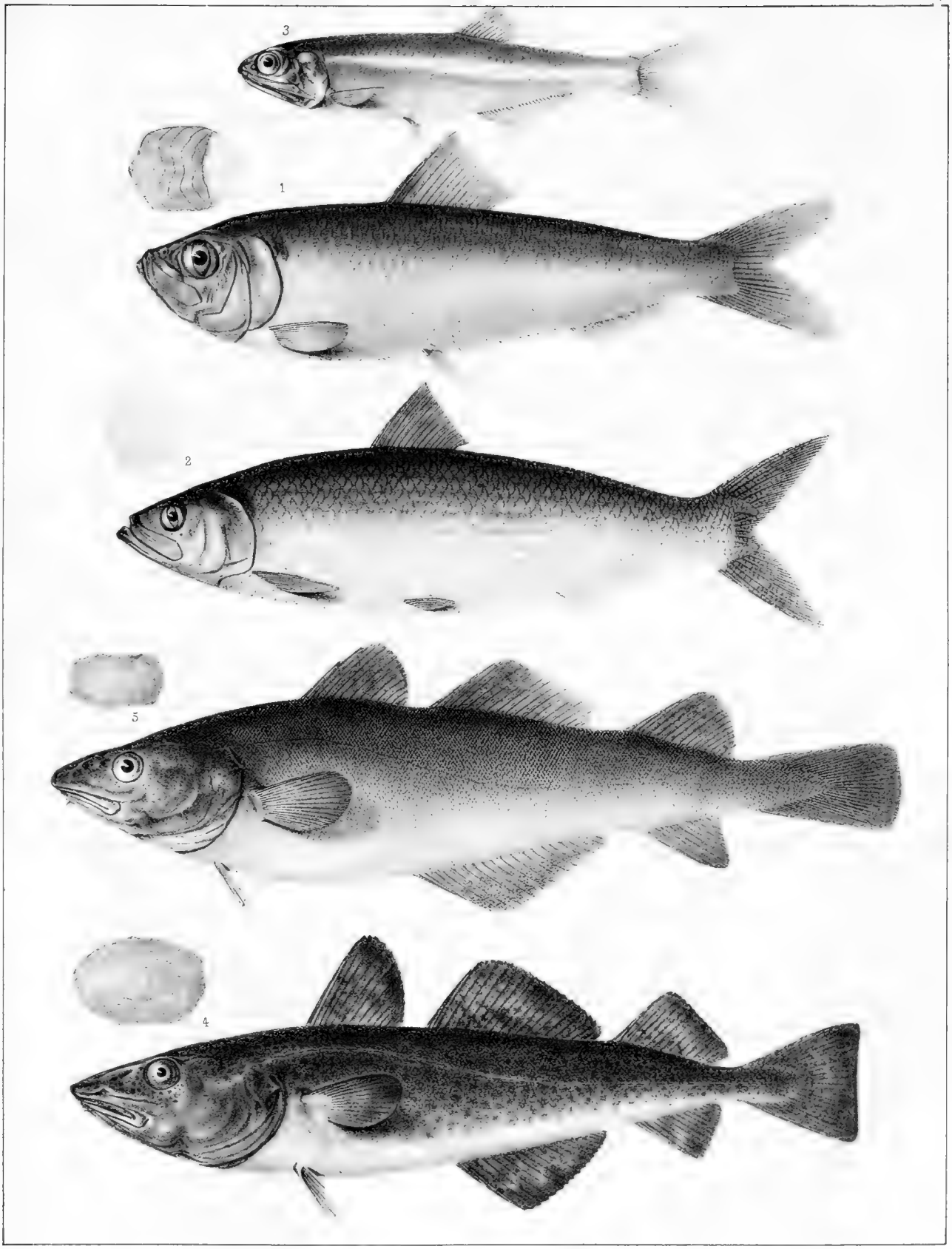
A. Sonrel. L. H. Bradford & Co. print.

1. FISTULARIA SERRATA Bloch. 2. SALMO SALAR Linn. 3. S. FONTINALIS Mitch.
4. OSMERUS VIRIDESCENS LeS. 5. SCOPELUS HUMBOLDTII Cuv

A. Sonrel

L.H. Bradford & Co. print

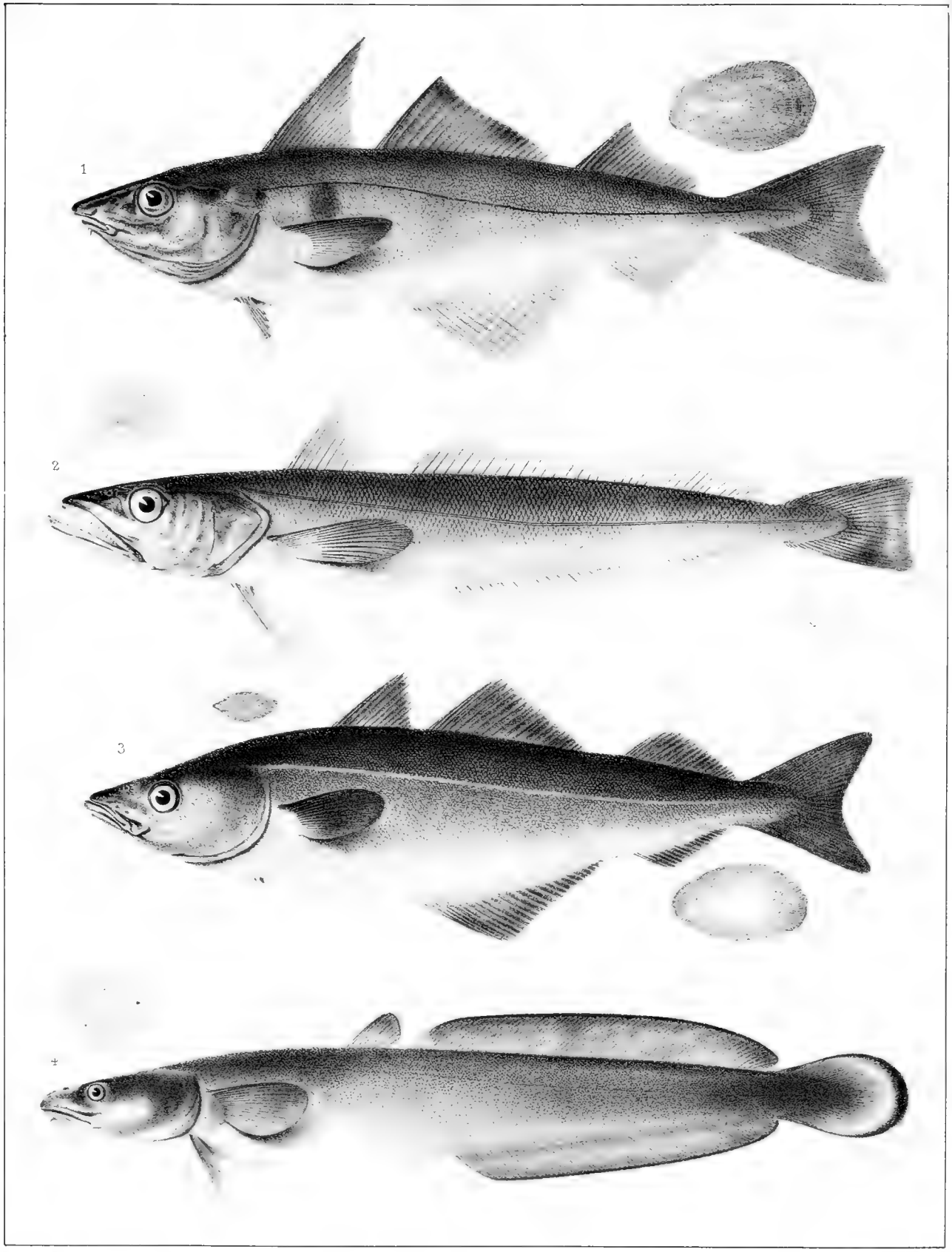
1. CLUPEA ELONGATA LeS. 2. ALOSA PRAESTABILIS Dek.
3. ALOSA TYRANNUS Dek 4. A. MENHADEN Storer



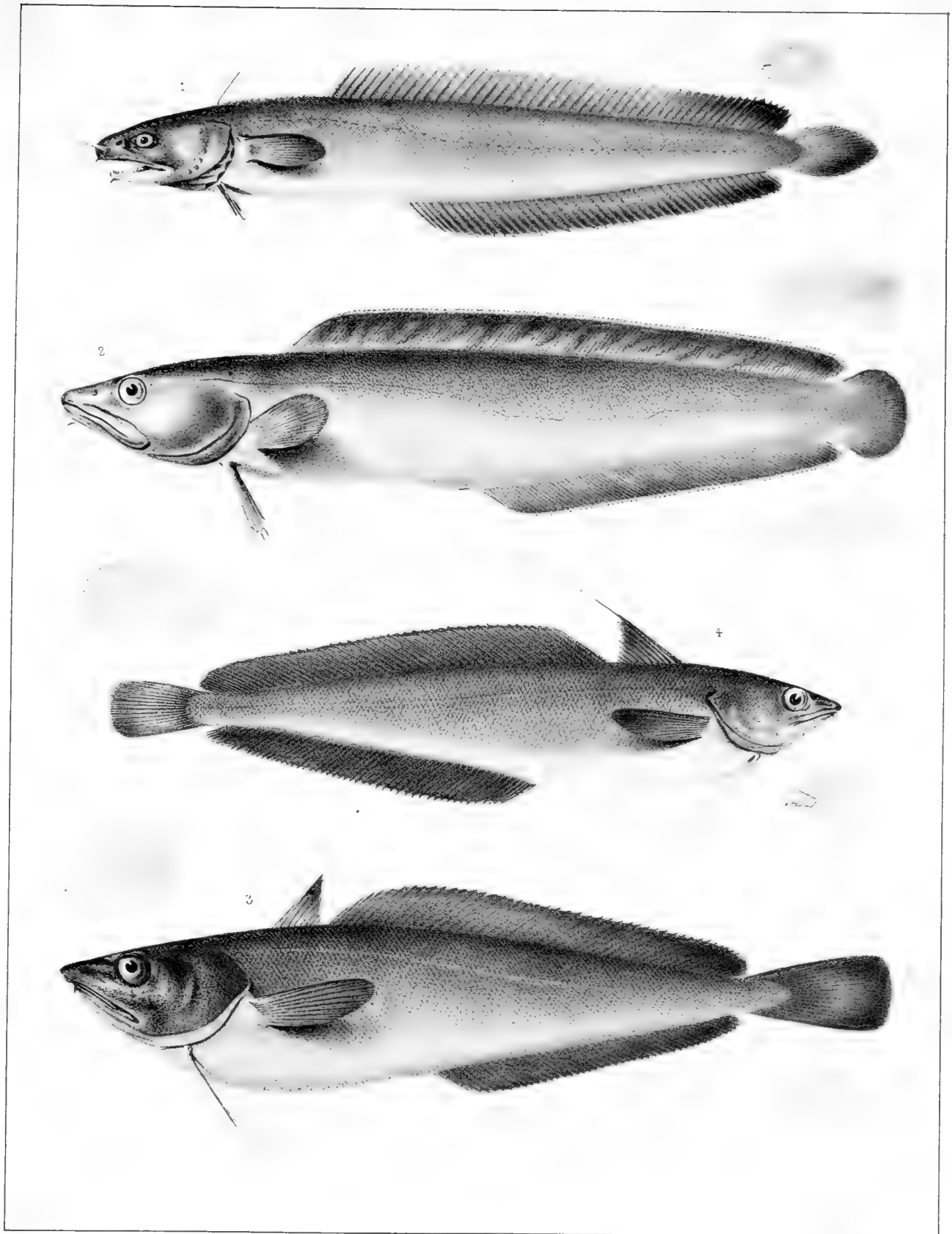
A Sonrel

L.H Bradford & Co print

1. ALOSA CYANONOTON Storer. 2. A. LINEATA Storer. 3. ENGRAULIS VITTATUS B. & G
4. MORRHUA AMERICANA Storer. 5. M. PRUINOSA Dek.



1. MORRHUA AEGLEFINUS Linn. 2. MERLUCIUS ALBIDUS Dek.
3. MERLANGUS PURPUREUS Storer. 4. LOTA COMPRESSA LeS



1. MOTELLA CAUDACUTA Storer.
3. PHYCIS AMERICANUS Storer

2 BROSMIUS FLAVESCENS Les.
4 P. FILAMENTOSUS Storer

VIII.

Neviusia, *a New Genus of Rosaceæ.*

By ASA GRAY, M. D.

(*Communicated to the Academy, August* 12, 1858.)

A specimen of the plant which forms the subject of this communication was sent to me, in May last, by the discoverer, the Rev. R. D. Nevius, of Tuscaloosa, Alabama. A specimen of a *Sedum*, also apparently undescribed, was communicated at the same time. The two plants were detected by Mr. Nevius in the spring of 1857, along cliffs in the vicinity of Tuscaloosa.

The *Sedum* — a small, white-flowered species, with short and nearly terete leaves, which may be named *Sedum Nevii* — cannot be adequately characterized until better specimens shall be obtained.

The other plant — a shrub, with the habit of *Spiræa* — was at once seen to be a new type. As the discovery of a shrub of a new genus within the United States east of the Mississippi is an uncommon event, and as this plant presents some points of peculiar interest, I take this opportunity to indicate its characters and affinities.

Mr. Nevius, upon being informed of the interest of his discovery, proposed to dedicate the genus to the memory of our lamented friend, the late Professor Tuomey, who, when suddenly removed from the scene of his scientific labors, was officially and most efficiently prosecuting his researches into the geology and the whole natural history of the State of Alabama. So that this elegant shrub, peculiar to the district of his residence, was appropriately chosen by his near friend and associate to commemorate his scientific labors and deck his early tomb. But the publication of the third part of the *Nereis Boreali-Americana* (since the present communication was made to the Academy) shows that the name of *Tuomeya* is preoccupied, Dr. Harvey having dedicated to Professor Tuomey's memory a curious fluviatile Alga discovered by the latter in Alabama, as well as by the late Professor Bailey in Virginia.

I may now, therefore, be permitted to name the present genus in honor of the discoverer. His name, however, is so nearly like that of the celebrated Roman poet, for whom (I presume) the learned Swedish mycologist has named his genus *Nævia*, that I must needs Latinize it in an unclassical, but not wholly unprecedented manner, as follows: —

NEVIUSIA, Nov. Gen. Rosacearum.

Calyx ebracteolatus, patentissimus, 5-partitus, segmentis foliiformibus inciso-serratis persistentibus. Corolla nulla. Stamina indefinita, disco tenui plano fundum calycis vestiente pluriseriatim inserta: filamenta subulato-filiformia, post anthesin marcescentia: antheræ didymæ. Ovaria 2 – 4, in fundo calycis sessilia: styli subterminales, filiformes, apice introrsum stigmatosi. Ovulum unicum, pendulum, anatropum. Achenia drupacea, epicarpio tenui carnoso, endocarpio crustaceo lævi. Seminis testa tenui-membranacea. Embryo in albumine parco carnoso inclusus, cotyledonibus ovalibus planis, radicula brevi supera accumbenti-inflexa. — Frutex alternifolius; stipulis parvis setaceo-subulatis liberis; pedunculis filiformibus ramulos breves terminantibus solitariis paucisve fasciculatis.

N. Alabamensis. — In præruptis umbrosis prope Tuscaloosam Alabamæ, ubi legit *Dom. R. D. Nevius.*

Caules glabri, 2 – 5-pedales, recurvo-patentes, medulla ampla farcti. Ramuli graciles, juniores cum foliis pedunculisque tenuiter puberuli. Folia ovata, nunc oblonga, rarius subcordata, membranacea, duplicato-serrata, vix incisa, recte penninervia, læte viridia, 1 – 2½-pollicaria. Pedunculi nudi, floriferi semipollicari, fructiferi fere pollicaria. Calycis lobi patentissimi vel reflexi oblonga, 3 lin. longa, post anthesin paullo aucta et obovata, obtusa, supra medium argute inciso-serrata, nervoso-reticulata. Filamenta alba, calyce demum longiora, e basi crassiori filiformia: antheræ breves, subintrorsæ, biloculares, longitudinaliter dehiscentes. Ovaria gibboso-ovata, cano-sericea: styli glabelli, staminibus æquilongi, subpersistentes, apice leviter incrassato recurvo intus longitrorsum stigmatosi. Ovulum suturæ ventrali prope apicem, ad insertionem styli respondenti, appensum. Achenia drupacea, oblique ovata, acuta, turgida, lineas 2 longa, angulo interno basilari inserta; sarcocarpio tenui sed manifesto; putamine nec reticulato nec punctato. Semen pendulum, loculo conforme; testa tenui albumini manifesto sed parco (embryonem omnino includenti) adhærente. Cotyledones subcarnosi, plani, late ovales, basi emarginati: radicula brevis versus hilum inflexa, cotyledonum margini fere accumbens.

As I have seen no unexpanded flowers, it is barely possible that there may be petals, which are caducous. But as no traces of their insertion can be detected, it is thought that the flowers are really apetalous.

The manifest stratum of albumen in the seeds of this plant no more hinders me from referring it to the Order *Rosaceæ*, than it would from referring *Cercis*, &c. to the *Leguminosæ*. Nor can I disregard the clear indications of affinity in this case, because the presence or absence of albumen has appeared to form the sole absolute technical distinction between the *Saxifragaceæ* and the *Rosaceæ*. If I am correct in this view, there now remains no single absolute distinction between these two great orders, taken in the largest sense. But, between the *Rosaceæ proper* (*Rosaceæ*, Endl. &c.) and the *Saxifrageæ*, the absence of all union of the carpels *inter se* and with the calyx, the fewness of the seeds, and the distinct development of the stipules in the former, contrasted with the manifestly opposite tendencies of the latter in all these respects, seem to afford well-founded distinctions; and these in the present instance outweigh that derived from the presence of a moderate amount of albumen in the seeds. Upon these grounds I venture to suggest a reversal of the position in which Dr. Hooker sets the two connecting links between these orders; namely, that "*Neillia* may be safely referred to *Saxifrageæ*, and *Astilbe* must, technically, fall into *Saxifrageæ* also, though its relationship to *Spiræa* is all but generic."* In my opinion, the resemblance of *Astilbe* to *Spiræa Aruncus*, close as it is, is one of habit, rather than in the floral characters, which are truly Saxifrageous; while *Neillia* — really the more ambiguous of the two — is so Rosaceous in the preponderance of its characters, as well as in aspect, that I think it must be remanded to that order.†

Intimately related to *Neillia* is Zuccarini's *Stephanandra*, from Japan; — a shrub

* In Journal of the Proceedings of the Linnæan Society, 2. p. 54.

† I could not, indeed, maintain this upon Dr. Hooker's diagnosis of *Neillia* (l. c. p. 57); but, having examined the two species, I may state that I find the calyx perfectly free from the gynæcium, and the latter in both species occasionally consisting of two pistils, perfectly separate and free, although closely sessile in the bottom of the calyx. I may add, that the calyx-lobes are evidently imbricated in æstivation, and the stamens not always numerous, being often as few as 15, or even 10, in *N. thyrsiflora*. The seeds in my specimens are all empty, so that I have not verified their internal structure.

However the line be drawn, it is evident that no grouping of the orders can be truly natural which does not bring the *Saxifragaceæ* and the *Crassulaceæ* into the same alliance with the *Rosaceæ*, or into contiguity thereto. This would have the further advantage of approximating the *Cunoniæ* to the *Legnotideæ*, according to the affinities indicated by Brown and confirmed by Bentham, and also, in bringing *Philadelphus* and its relatives (purely Hydrangeous genera in my opinion) nearer to *Myrtaceæ*, better satisfy those with whom "no doubt can exist that these plants have a near relation to Myrtleblooms."

with the habit, stipules, foliage, and flowers of *Spiræa*, but decandrous and monogynous, and with style, stigma, and seeds of *Neillia*, but only dispermous, or by abortion monospermous; while the achenioid pericarp resembles that of our genus *Neviusia*.

For the more immediate relatives of our new genus, we must still look to Japan, which abounds in counterparts of Eastern North American plants; and we find them in *Kerria* and *Rhodotypos*, both illustrated by Zuccarini. Both of these genera accord well with our plant in their whole habit, foliage, &c.; and no less so in the floral structure, except that *Neviusia* is apetalous. *Rhodotypos*, moreover, has foliaceous and serrated sepals (but only four in number, much like those of our plant, which simulate those of *Duchesnea* or *Fragaria Indica*), but differing remarkably from all its allies in its opposite leaves.* Nor does our plant exhibit any trace of the extraordinary *urceolus* of *Rhodotypos*, within the staminiferous disk, and enclosing the ovaries, like the disk of *Pæonia Moutan*. In this, as in other respects, it most resembles *Kerria*, and the staminiferous disk is similar, but broader. The stamens and the pistils are essentially alike in all three genera,† except that the stigma in *Rhodotypos* is terminal and capitellate; and the ovary biovulate, as in *Rubus* and *Dalibarda*. The fruit of both Japanese genera is like that of our genus, and (which is of most consequence) the embryo, as illustrated by Zuccarini, is quite the same, having the radicle bent down towards the ventral edge of the cotyledons, as in no other *Rosaceæ* known to me.

I have not myself seen ripe fruit or seeds of *Kerria* or *Rhodotypos*. Zuccarini describes the latter as exalbuminous. If it be so, these genera, with *Neviusia*, must needs form a part of the subtribe *Dalibardeæ*. If they all have a thin albumen, they would compose a separate division or subtribe, near to *Dalibardeæ*.

* So described without exception by Zuccarini, and so they are in my specimen. But upon the plate (tab. 99) a sterile branch with alternate leaves is represented, which receives no explanation in the letter-press.

† When the pistils accord in number with the sepals, they are opposite them in *Kerria*, and apparently in *Rhodotypos* also. In *Neviusia* they are fewer than the sepals.

PLATE XXX. Fig. 1. A branchlet in flower. 2. A branch in fruit. 3. Parts of a flower in vertical section. 4. The pistils. 5. View of the disk after flowering. 6. Vertical section of a nearly mature fruit. 7. Transverse section of a mature fruit and seed. 8. Vertical section of a fruit, exhibiting the embryo. 9. The embryo extrated. — The analyses all more or less magnified.

IX.

Diagnostic Characters of New Species of Phænogamous Plants, collected in Japan by CHARLES WRIGHT, *Botanist of the U. S. North Pacific Exploring Expedition. (Published by Request of* CAPTAIN JOHN RODGERS, *Commander of the Expedition.) With Observations upon the Relations of the Japanese Flora to that of North America, and of other Parts of the Northern Temperate Zone.*

BY ASA GRAY, M. D.

(*Read December* 14, 1858, *and January* 11, 1859.)

THE dried plants collected during the visit of the Expedition, commanded by Captain John Rodgers, to different parts of Japan, were intrusted to me by Mr. Wright for examination; and I have prepared a detailed account of them, intended to form a part of Mr. Wright's general report upon the extensive and interesting botanical collections made by him during the whole cruise of the Expedition. As this report, and that of the important scientific results of this Expedition in various other departments, may not be published for some time, I am permitted and requested, by the Commander of the Expedition, — ever considerate of the interests of science, — briefly to make known the principal novelties which have been discovered in this field. The discoveries in this case are by no means limited to the detection of entirely new species (in which, however, the collection will be seen to abound), but also relate to the detection of known species in a region where they were not known before, and to the identification and elucidation of many obscure species. It will be best, therefore, to take a cursory general notice of the more interesting plants of this collection, adding any remarks which it may be worth while now to make upon their geographical distribution or their characters, and appending the diagnoses of new genera and species in the form of foot-notes.

It should be mentioned that the botanical collections made at Ousima, Katonasima,

&c., — lying as these islands do nearest to the Loo Choo Islands, — have been deemed to belong to the Loo Choo, rather than to the proper Japan Flora. Consequently the present Japan collection is of a strictly temperate character, excepting a small number of plants gathered (between December 29th and January 3d) on the shore of Kagosima Bay, at the southern end of Kiu-siu, and a few picked up on Tanega Island (lat. 30° 32′ 44″) January 9th. The principal collections were made at Simoda (lat. 34° 40′) in May; and at Hakodadi (lat. 41° 47′ 11″) in June, 1855; where also were previously gathered the plants of the small collection communicated to me by Drs. Williams and Morrow, of which I published a short account in the second volume of the Narrative of the Japan Expedition commanded by the late Commodore Perry, Moreover, a scanty but invaluable collection of plants was gathered by Mr. J. Small, who was detailed as the Botanist's assistant, during the cruise of the small steamer to which he was attached, through the Straits of Sangar, touching upon both shores; thence along the west coast of Jesso, touching at Slope Point and Iwanai (between lat. 42° and 43°), to Capes Romanzoff and Soya (lat. 45° 30′), the northern extremity of Jesso, — a district entirely new to the botanist, and of unsurpassed interest.

This remark may indeed be extended, most emphatically, to all the northern Japanese islands. The reason why their vegetation is so remarkably interesting to the American botanist will appear in the sequel.

Among the *Ranunculaceæ* we have *Clematis patens*, Morr. & Decaisne (Lindley's *C. cærulea*), and Thunberg's *C. Japonica*, which proves to belong to the section *Cheiropsis*. It is doubtless Thunberg's plant, and probably Zuccarini's, although he does not mention the bractlets on the peduncle (above the middle), and the filaments are but sparsely hirsute above, and wholly glabrous below. The sepals appear to be thicker than in other species of the section. The relatives of this and of my *C. Williamsii* (which has not been a second time collected) are Himalayan species. None of those species were collected which in Japan represent our Eastern American *C. Virginiana*. *Thalictrum Thunbergii* has yellow flowers; otherwise it is very near *T. Kemense*, which Dr. Hooker reduces to *T. majus*, and then both to *T. minus*.

Besides *Ranunculus ternatus*, Thunb., which is not very different from some forms of R. repens, Mr. Wright gathered *R. repens* itself, the larger forms of the American type, *R. sceleratus*, and *R. propinquus* var. *hirsutus*, a Siberian plant nearly allied to *R. acris*.

Caltha palustris, in various forms, abounds at Hakodadi, as throughout the northern temperate zone; but the *Trollius* so like our American species, if not identical with it,

also *Coptis trifolia*, and the two new species characterized by Zuccarini, — one of which appears to be the Northwest American *C. asplenifolia*, and the other a representative of Nuttall's *C. occidentalis*, — as also Zuccarini's genus *Anemonopsis*, unfortunately were not met with.

I may remark that Zuccarini's *Isopyrum Japonicum* is clearly *I. adoxoides*, DC. It is not so nearly related to the Californian *I. occidentale* as our Eastern American *I. biternatum* is to the European *I. thalictroides.*

The *Aquilegia flabellata* is apparently a cultivated plant. I have never seen *A. Burgeriana*, Sieb. & Zucc.; but it seems to be the Japanese form of *A. Canadensis*, which stretches across the New World from the Atlantic coast to Kamtschatka. *Anemone Pennsylvanica*, Linn., is in similar case, but has penetrated well into Siberia; it is enumerated by Thunberg as a Japanese plant, probably correctly.

Actæa spicata is now for the first time found in Japan, both with slender and with thickish pedicels; the color of the berries not recorded. There are indications of *Cimicifuga fœtida* in Japan, — a species which extends from Oregon westward to Russia in Europe, while it is represented on our Alleghany Mountains by the too closely allied *C. Americana.* A different and more peculiar case of representation occurs in this group, *Cimicifuga* (*Macrotys*) *racemosa* and *cordifolia*, peculiar to North America east of the Mississippi, being plainly represented by Zuccarini's three species of *Pityrosperma* (one of them *Actæa Japonica* of Thunberg). Siebold also found a *Trautvetteria* in Japan; which, from the brief characters mentioned, seems not to differ from our own Alleghanian *T. palmata*, already identified on the Okotsk coast, and also (as *T. grandis*, Nutt., but with no marks to distinguish it from the Eastern plant) in Oregon and on the island of Kodiak, — close under the long peninsula of Ailaska, which points to Japan, and is in fact almost connected with it and with Kamtschatka by means of the Aleutian and the Kurile Islands.

Our collection contains specimens of *Glaucidium palmatum*, Sieb. & Zucc., with young fruit, and so affords the means for nearly completing the characters of this remarkable genus. The floral envelopes (lilac or pinkish) are evidently simple, calycine, and early deciduous; the anthers of the normal sort. But the remarkable point now brought to light is, that there are often two or three pistils, more or less connate at their bases, apparently follicular and above widely divergent in fruit, and containing numerous seeds in several ranks. The immature seeds are oval, flat, thin, and broadly winged except at the hilum. The number of pistils, as now revealed, excludes the idea of a relationship with *Podophyllum* and *Diphylleia*, which the foliage suggests. Zuccarini has rightly referred the genus to the Ranunculaceæ. It belongs,

however, not to the tribe *Pæonieæ*, but to the *Cimicifugeæ*, and in my opinion its nearest relative is the Alleghanian genus *Hydrastis*.

On the other hand, the *Pæonia* found in Japan, wild near Hakodadi, is a European type, and even a European species. In America this genus barely finds a place, in a well-marked species, upon the mountains of the western coast, from Northern Oregon to California.

Of the *Magnoliaceæ* (taken in the widest sense) — a type absent from Europe, and equally so from all Western North America — there are about as many Japanese species known as there are in Eastern America; and all the suborders are represented in both. *Illicium religiosum* of Japan is the counterpart of our two Floridian and Georgian species; the Japanese Magnolias (of which Mr. Wright collected only *M. hypoleuca*, the blossoms of which he records as exhaling the odor of Gaultheria) are not very close representatives of United States species, and there is also an allied genus *Burgeria;* and both *Kadsura* and *Sphærostema* in Japan represent our monotypic *Schizandra*. Indeed, a species which I have now to make known * (unfortunately from the male plant only) would certainly have been referred to *Schizandra* if the polyandrous species had remained undiscovered, although it is clearly a *Sphærostema* of the section "*filamentis basi monadelphis apice liberis*," with the androecium reduced to five stamens. *Schizandra* is the corresponding analogue of the other section of *Sphærostema*, with thickened stamens bearing disjoined anther-cells, also reduced to five.

Of the *Lardizabaleæ* only an *Akebia* was collected. The American representatives of this small order are in the western part of South America; the rest are Himalayan.

Of *Menispermaceæ*, also an extra-European order, only a *Stephania*, apparently *S. hernandifolia*, was gathered, at the southern end of Kiu-siu. It is probably Thunberg's *Menispermum Japonicum*.

Berberidaceæ. We have both the true *Berberis vulgaris* and *B. Thunbergii*, DC., the latter very near *B. Cretica*, and accordingly hardly distinguishable from our own Alleghanian *B. Canadensis*. The Japan *Mahonia*, a link between the Western American and Himalayan species, I have not seen. Nor was a single *Epimedium* collected, although Japan is apparently the focus of the genus. But perhaps the most interesting and most unexpected discovery of the expedition is that of two strictly Eastern North American species of this order, — each the sole representative of their genus, — viz. *Caulophyllum thalictroides*, and *Diphylleia cymosa*, of Michaux. The former was gath-

* Sphærostema Japonicum: foliis omnino *Schizandræ coccineæ;* floribus albis; staminibus 5 inæqualiter connatis. Hakodadi. An *S. Japonica*, Sieb. & Zucc., indescript.?

ered near Hakodadi, and also on the northern end of Nippon, — out of blossom, indeed, but with the ovaries just bursting, and the later specimens with the peculiar seed well formed. The latter, J. Small found at Cape Soya, the northeastern extremity of Japan, in fruit only. So that flowers are wanted to confirm the identity, of which, however, I have scarce a doubt. *Caulophyllum* inhabits rich woods, from Canada to the mountains of Carolina and northwest to Minnesota; *Diphylleia* was known only in the Alleghany Mountains between Virginia and Georgia.

Supposing these two plants to be satisfactorily identified as to species, are we to regard them as the descendants of a common stock, though now separated by one hundred and forty degrees of longitude? Or are we to suppose them independently originated in two such widely distant regions? The collocation of a larger body of such facts may lead to a satisfactory answer to these questions.

Nymphæaceæ. Zuccarini mentions two undetermined species of *Nymphæa.* It would no longer be surprising if our *N. odorata* should be one of them. Mr. Wright found only *Nuphar Japonica*, which, in appearance, is intermediate between *N. lutea*, of the northern part of the temperate zone generally, and the very local *N. sagittæfolia* of the Southeastern United States.

Of true *Papaveraceæ* none seem to be indigenous to Japan, except *Chelidonium.*

But *Fumariaceæ* are rather numerous. Mr. Wright gathered three of the seven species of *Corydalis* enumerated by Zuccarini, and the *Dicentra spectabilis*, now so well known in our gardens. *Dicentra pusilla*, Sieb. & Zucc., is likely to be the *D. lachenaliæflora*, which was collected in the adjacent Okotsk region.

Besides *Arabis hirsuta* and *A. lyrata*, Mr. Wright abundantly gathered the plant which in Perry's Japan Expedition I called *A. alpina*? var. *Japonica*, but now consider distinct.* The few other *Cruciferæ*, all Old-World species, had been already recorded as from Japan.

Having barely touched upon the southern island, Kiu-siu, Mr. Wright did not meet with the interesting Flacourtiaceous plant *Xylosma* (*Hisingera*) *Japonicum*, the congeners of which are mostly in the South Sea Islands and in Central America, &c.†

* Arabis Japonica (sp. nov.): pubescens; caule valido folioso (spithamæo ad pedalem); foliis dentatis, radicalibus obovatis oblongisve in petiolum attenuatis, caulinis ovatis oblongisve subcordato-amplexicaulibus; racemo densifloro; siliquis etiam confertis erectis strictis, valvis subplanis nervosis; stylo brevissimo; seminibus anguste alatis (vel apteris?). Hakodadi and Simoda.

† M. Clos, in his recent monograph of the *Flacourtiaceæ* (Ann. Sci. Nat. ser. 4, 8. p. 220, 227, &c.), recognizes the general identity of *Hisingera* with *Xylosma*, but keeps up the latter genus on account of the more united styles and stigmas, — a difference only of degree and with no marked limitation. He takes no notice

Violarieæ. Among the Violets of the collection are specimens, which (although in fruit) may be safely referred to *V. imberbis* of Ledebour, which appears to me identical with *V. umbrosa* of Fries, and with *V. Selkirkii* of Pursh. The latter name has the priority. Perhaps the *V. Kamtschatica* of Gingins is not different. *V. Patrinii* reminds us of our own *V. primulæfolia.* *V. sylvatica* of Fries (*V. canina*, Smith, &c.) is represented by a beardless variety.* Both this species and the true Linnæan *V. canina* (as understood by Fries, &c.) are wanting in America; where *V. striata* and *V. Muhlenbergii* are their representatives on the eastern side of the continent. On the western side *V. adunca* more nearly answers (in general appearance, at least) to *V. arenaria* and *V. pumila* of the Old World. My *V. laciniosa*, also an analogue of *V. striata*, but with blue flowers, occurs again, generally less stout, and with less foliaceous stipules, than the specimens upon which the species was founded. Finally, there is a new species (of which I had before a specimen too imperfect for description), which in aspect and in character is intermediate between *V. biflora* of the Old World and *V. Canadensis* of the New, but with nearly the stigma of the former.†

Some foliage of *Drosera rotundifolia* serves to show that this genus is not wanting to Japan.

Of *Caryophyllaceæ*, besides *Dianthus Japonicus* and *D. superbus*, we have the oblong-leaved form of *Honkenya*, like that of Oregon, *Mœhringia lateriflora*, and good specimens of the plant detected by Williams and Morrow, which I had mentioned under *Mœhringia*, but must now refer to *Sagina.*‡ It is the largest species of that genus. Also *Stellaria uliginosa*, answering to Thunberg's *S. undulata*, and resembling *S. crispa* of Northwestern America, *Malachium aquaticum*, &c.

of the description and figure I had published of both Forster's *Xylosmæ*, but describes three additional Oceanic species, two of which must belong to the original *X. suaveolens*, from which even *X. orbiculatum* is probably not distinct.

* Viola sylvatica, *Fries*, var. imberbis: stipulis magis laciniato-pectinatis, caulinis haud raro petiolum subæquantibus; petalis imberbibus; stigmate minus recurvo. — Forma macrantha (*V. Riviniana*, Reich. analoga). Hakodadi. Forma micrantha. Simoda.

† Viola verecunda (sp. nov.): glabra; caulibus e rhizomate repente? gracilibus erectis vel adsurgentibus folia 3 vel 4 reniformi-cordata gerentibus; stipulis lanceolatis spathulatisve basi vel uno latere parce dentatis; sepalis lanceolatis; corolla albida nunc purpureo-venosa imberbi; calcare brevissimo saccato; stigmate bilobo glabro. Hakodadi.

‡ Sagina maxima (sp. nov.): annua? cæspitans; caulibus elongatis spithamæis diffusis paucifloris; foliis linearibus crassiusculis muticis vel mucronulatis; floribus sæpius 5-meris; sepalis late ovatis demum orbiculatis ecarinatis extus cum pedunculo pl. m. glanduloso-hirtellis petala orbiculata capsulamque subæquantibus; staminibus 10 vel 8; stigmatibus brevibus. Hakodadi, Cape Sangar. Var. magis glandulosa: Loo Choo.

It is to be regretted that no *Tilia* were met with. It would be interesting to know whether the two species mentioned by Zuccarini are of the European or the American type. The genus is absent from Western America.

Of *Ternstræmiaceæ*, *Camelliaceæ*, &c., nothing of any novelty was collected, except that Small obtained, from the very northern extremity of Jesso, a species of *Actinidia*, Lindl. (*Trochostigma*, Sieb. & Zucc., — a genus manifestly related to *Saurauja*), very much like the one which Mr. Wright obtained at the northern Loo Choo Islands (and which is certainly both *T. rufa* and *T. arguta* of Siebold and Zuccarini), but apparently distinct. It needs to be compared with Lindley's original *Actinidia callosa*, of the Himalayas.

Geranium erianthum of Fischer, belonging as it does both to Northeastern Asia and Northwestern America, was a discovery to be expected in Japan. It was found at Hakodadi and elsewhere.

The northern part of Japan also yielded a new *Simarubacea*,* which should however be compared with Planchon's *Picrasma ailanthoides*, detected by Bunge in Northern China.

Of *Rutaceæ* there were collected only one of the four Japanese species of *Zanthoxylum*, Thunberg's *Skimmia Japonica* (from the northern end of Jesso), and a plant which, so far as can be told from the fruit, seems to be a new species of the Polynesian genus *Euodia*.†

From Simoda I had formerly received, from Drs. Williams and Morrow, an insufficient specimen of a *Coriaria*. The fine specimens gathered by Mr. Wright show it to be an entirely new species of this peculiar and anomalously distributed genus.‡ Dr. Hooker takes the Himalayan species for a variety of the European (although Wallich's figure looks different enough), as he also identifies the New Zealand species with the common one of the Andes. Besides these, there are indications of a species in Mexico.

* Picrasma Japonica (sp. nov.): orgyalis, fere glaber; foliolis sæpissime 13 ovatis acuminatis serratis basi abrupta vel subcordata petiolulatis; floribus fertilibus hermaphroditis 5–4-meris pluribus in cyma laxiflora fusco-pubescente. Iwanai, west coast of Jesso.

† Euodia ramiflora (sp. nov.): foliis alternis simplicibus obovato-oblongis seu obovato-cuneatis sæpe acuminatis, petiolo brevi; pedunculis axillaribus brevissimis; carpellis lunatis ad latera striato-reticulatis. Simoda.

‡ Coriaria Japonica (sp. nov.): glaberrima; foliis sarmentorum lanceolato-ovatis seu oblongo-ovatis, ramorum florif. orbiculatis; floribus pro genere maximis monœceis; racemis brevibus; filamentis gracillimis. Simoda.

Anacardiaceæ. It is well known that Japanese species of Rhus are of the Eastern North American type. From a comparison of specimens, I suspect that Linnæus may have been nearer right than his successors, when he united our Poison Sumach with that of Japan, under the name of *Rhus Vernix.* However that may be, I do not hesitate to refer to our *R. Toxicodendron*, var. *radicans*, specimens, in flower and with young fruit, which Mr. Wright gathered at Hakodadi. Since *R. diversiloba*, Torr. & Gray (*R. lobata*, Hook.), is no more than another form of the same species, this may be said to range from the Atlantic coast of America to Japan.

Vitaceæ. From a similar comparison of specimens, I venture even to refer the *Vitis Labrusca* of Thunberg (*V. Thunbergii*, Sieb. & Zucc.) to the Linnæan species of that name, our own Fox Grape; and I suspect that *V. Indica* and Bunge's *V. ficifolia* are the same thing. This species does not occur in Western America. Nor does *Ampelopsis Virginiana;* but Zuccarini indicates two species of this Eastern American genus in Japan.

Rhamnaceæ. Berchemia racemosa, Sieb. & Zucc., represents in Japan the *B. volubilis* of our Southern Atlantic States, as *Rhamnus crenatus*, Sieb. & Zucc. — apparently a *Frangula* — does our *F. Caroliniana.* But the *Rhamnus* which Wright brought from Japan (*R. globosus*, Bunge? Sieb. & Zucc., and *R. Davuricus*, &c.) is probably only a form of the European *R. catharticus.*

Upon the *Aquifoliaceæ*, which are about as numerous in Japan as in the Atlantic United States, there is no remark to make, except to note that the order is wanting in the whole western part of North America.

Celastraceæ. Thunberg has our *Celastrus scandens* (also wanting west of the Mississippi valley) in his Flora of Japan, but afterwards distinguished the plant. The Japanese species, which is probably *C. articulatus*, *punctatus*, and *striatus* of Thunberg, is a close congener of our own *C. scandens. Euonymus Japonicus* is of Eastern Asiatic type. Mr. Wright also obtained what appears to be the Himalayan *E. Hamiltonianus* (an analogue of our *E. atropurpureus*, and of the scarcely different *E. occidentalis*, Nutt., the sole representative of the genus in Oregon and California); *E. Sieboldianus*, which is closely allied both to *E. Europæus* and to *E. Americanus;* and a species which appears to be identical with *E. latifolius*, before unknown east of the Caucasian district.

Sapindaceæ. The *Staphylea Bumalda*, which strictly represents both the European and the Eastern North American species, makes however an approach in its fruit to the related Japanese genus, *Euscaphis.* At Hakodadi, on the sides of mountains, *Æsculus turbinata* of Blume was collected. This is a true Horse-Chestnut, although the petals

are only four, and the ovary indicates a smooth fruit. Blume mentions a second Japanese species, which would appear to resemble the *Æ. parviflora* (*Æ. macrostachya*, Michx.) of our Southern United States. I am not at present competent to elucidate the affinities of the numerous Japanese Maples. But *Acer pictum* is apparently an analogue of *A. saccharinum*, and *A. Japonicum* is much like *A. circinatum* of Oregon. I have not seen the *Negundo* mentioned by Siebold and Zuccarini.

Polygala Japonica in habit is similar to *P. Californica*, Nutt. (*P. cucullata*, Benth.), which is probably *P. Nutkana*, DC., and the only species known in Western North America.

Leguminosæ. Mr. Wright's specimens, and other materials, now enable us to circumscribe the characters and the geographical range of *Thermopsis fabacea*, DC. This species extends from the southern extremity of Japan, and even from the islands between it and the Loo Choo group, the shores of the Okotsk Sea, and the Kurile Islands to Oregon, California, and eastward to the Rocky Mountains in New Mexico. It includes the *T. macrophylla*, var. of Torr. & Gray's Flora; and Nuttall's *T. montana* is no more than a variety of it. *T. rhombifolia*, Nutt., east of the Rocky Mountains, if the characters hold, is distinguished by its smaller size, and the recurved, strongly falcate legumes. The real *T. macrophylla*, of Hooker and Arnott, may be known by its woolliness, and by the oblong-lanceolate, very villous legumes, nearly sessile in the calyx. Of this, *T. Caroliniana* of the Southern Alleghanies is the Eastern representative. On the other hand, Japan is the northeastern limit of the European, Himalayan, and Australian *Lotus corniculatus.*

The name of *Astragalus lotoides* is attributed by De Candolle to Lamarck, instead of to Pallas.

Mr. Wright gathered the Siberian *Orobus lathyroides* in the northern part of Japan, in one instance with the seta replaced by a regular terminal leaflet. Also, *Lathyrus palustris*, *L. maritimus*, and the *Vicia*,* which in Perry's Expedition I called *V. Orobus?* It is not that species, however, nor any described one, unless it be Turczaninow's *V. pallida.* The glabrate form much resembles *V. Americana* (which, including *V. Oregana*, Nutt., ranges from the Atlantic to the Pacific), but it wants the conspicuous villous tuft of the stigma.

* Vicia Japonica (sp. nov.): pedunculis 6 – 14-floris folia 6 – 9-juga subæquantibus; foliolis subalternis ellipticis obovatisve obtusissimis vel retusis mucronatis membranaceis nervoso-recticulatis, infimis cauli adproximatis; stipulis semisagittatis parvis; calycis dentibus inæqualibus subulatis brevibus, infimo tubo breviore; corolla late purpurea; stylo supra medium æqualiter pilosulo. — Exstant vars. glabella, et molliter pubescens. Simoda, Hakodadi.

In the well-known *Wistaria Sinensis*, which grows wild as far north as Hakodadi, we have a strict representative of *W. frutescens* of the United States east of the Mississippi; while *Milletia Japonica* (*Wistaria Japonica*, Sieb. & Zucc.), found on Kiu-siu, belongs to a more southern Asiatic type.*

None of the Japanese *Lespedezæ* were met with in this expedition. They are of the Siberian and Chinese, rather than of the Eastern American type; and the genus is absent from Western North America, as likewise is *Desmodium*, so abundant in the Atlantic United States, and with one species said to inhabit Japan.

Sophora Japonica is closely related to *S. affinis* of Texas, and to no other known species. I have not seen *S. angustifolia*, Sieb. & Zucc., to compare it with the Siberian *S. flavescens* and *S. alopecuroides* on the one hand, and on the other with *S. sericea* of our high Western plains.

Rosaceæ are much more numerous than Leguminous plants in Japan. *Prunus Mume* is probably the same as *P. Sibirica*, and too near the common Apricot. *P. Pseudo-Cerasus*, Lindl., is the representative of the Himalayan *P. Puddum*, and the European *P. Cerasus*. Imperfect specimens from Hakodadi belong either to the American *P. Virginiana*, or to *P. Padus*, which extends through nearly the whole breadth of the Old World. Not having well-formed fruit, I cannot tell whether the fruit is rugose, as in the latter, or smooth, as in the former. *P. spinulosa* represents, in a general way, our *P. Caroliniana* and the *P. Lauro-Cerasus* of Europe.

Of *Spiræa*, the present collection comprises *S. betulæfolia*, Pall., which extends from Eastern Siberia through Oregon to the eastern base of the Rocky Mountains, and then (under the name of *S. corymbosa*, Raf.) reappears in the Alleghanies of Virginia; *S. palmata* of Thunberg, which is very likely to prove the *S. palmata* of Pallas also (which is very close to the Alleghanian *S. lobata*), and is certainly only a glabrate form of *S. Kamtschatica*; and *S. Aruncus*. The latter extends through the Old World, but is rare in Western Europe, and through the Russian American Islands and Oregon, to the Alleghanies and their northern prolongation. Its petals are convolute in æstivation. No doubt *S. salicifolia* grows in Northern Japan, as well as on the adjacent mainland; this also extends through Asia and crosses the eastern borders of Europe, and reappears in the eastern part of North America, while wanting in the western. But it is replaced in Oregon by *S. Menziesii*.

* Through some oversight, Bentham, in Plantæ Junghuhnianæ, p. 249, adn., has enumerated *Wistaria Chinensis* as a *Millettia*. But *W. Japonica* must have been the species intended, as this is truly a *Millettia*, while the other is not.

To this order I should refer *Stephanandra* (obtained with young fruit), along with *Neillia*, as stated in a preceding memoir.

Sanguisorba tenuifolia, Fischer, from the northern end of Jesso, is hardly more than a variety of *S. Canadensis;* the Japanese *Agrimonia* is between true *E. Eupatoria* and *E. pilosa;* *Geum strictum* answers to the American plant; *Potentilla palustris* and *P. Anserina* were both found at Hakodadi; as also a stoloniferous form of *P. fragiformis*, Willd.,* which, however, should be compared with the plant from Eastern Siberia and the Aleutian Islands, the fruit of which has not been described. *P. fragarioides*, Linn., occurs in a large form, at Simoda. Also *P. reptans* (which I had mistaken before for *P. gelida*); and at Hakodadi was gathered a trifoliolate variety of the same. *Fragaria* (*Duchesnia*) *Indica* appears to be indigenous to Japan.

That *Rubus Chamæmorus* should be detected at the northern end of Jesso will excite no surprise. Thunberg's *R. palmatus* occurs under numerous forms, one of which is my *R. coptophyllus*. When it was published, I had not seen Thunberg's figure. My *R. hydrastifolius* (not again met with) may be Thunberg's *R. palmatus*. It is uncertain whether the *R. microphyllus* of the younger Linnæus belongs to Thunberg's *R. palmatus*, or to his *R. incisus*. There remain two or three Thunbergian species which I cannot identify. The species of which the characters are subjoined † should be compared with Bunge's *R. cratægifolius* from Northern China.

Rosa rugosa, Thunb., abounds on the shore near Hakodadi; it is evidently the *R. ferox* also.

Rhaphiolepis Japonica, Sieb. & Zucc., must include *R. integerrima*, Hook. & Arn., and, as a synonyme, the still older *Mespilus Sieboldii* of Blume (*Photinia Sieboldi*, Don). Apparently it will not be possible to keep separate *Rhaphiolepis rubra* and *R. phæostemon* from *R. Indica*.

Stransvaisia digyna, Sieb. & Zucc., evidently includes Thunberg's *Cratægus villosa* and his *C. lævis;* and the species is a genuine *Photinia* (*P. villosa*, DC.). There are as commonly three styles as two; and the ovary, almost free at the time of flowering,

* Potentilla fragiformis, var. Japonica: stolonifera; floribus minoribus, carpellis eximie costato-reticulatis. Fragaria sterilis, *Thunb.?* Hakodadi.

† Rubus Wrightii (sp. nov.): fruticosus, adscendens, aculeis brevibus recurvis parce armatus; foliis membranaceis subcordato-rotundis sæpius trifidis (summis nunc ovato-lanceolatis subincisis) supra præter venas glabris subtus ramulisque molliter pubescentibus, lobis ovatis seu ovato-lanceolatis duplicato-serratis subincisis; stipulis angustissime linearibus integerrimis; racemo terminali 5–7-floro petiolo breviore; calyce subvilloso, lobis triangulari-ovatis cuspidato-acuminatis petalis obovatis breviter unguiculatis albis patentibus brevioribus. Hakodadi.

has the cells more developed downward during the subsequent growth, so that in fruit only the villous and convex summit of the pericarp is free.

I cannot avoid here interpolating the statement that Mr. Wright found the Californian *Photinia arbutifolia* at the Bonin Islands, along with the *Osteomeles* of the Sandwich Islands. The latter was likewise gathered in the Loo Choo Islands, still nearer to Japan.

Besides *Pyrus spectabilis*, a specimen was gathered at the northern end of Nippon, which appears to be identical with the *P. rivularis* of Oregon. And *Cratægus alnifolia*, Sieb. & Zucc., certainly resembles *C. rivularis* of Oregon. *Pyrus* (*Sorbus*) *gracilis*, Sieb. & Zucc., is very probably the same as *P. sambucifolia*, var. *microphylla*, of Russian America.

Calycanthaceæ consist of three species of *Calycanthus* in the United States east of the Alleghany Mountains, one in California, and one, *Chimonanthus*, in Japan.

Onagraceæ. *Circæa alpina* was gathered at Cape Soya. Zuccarini has a *C. mollis*, probably a mere form of *C. Lutetiana*, which is found nearly round the world, except in Western America.

Grossulaceæ. On Cape Soya, Small gathered *Ribes laxiflorum*, of Northwestern America, which Steller had long ago collected in Eastern Siberia; where also grows *R. nigrum*, of which the American representative is *R. Hudsonianum*. The species of Gooseberry which Thunberg referred to *R. Cynosbati*, of the Northern United States, has not been rediscovered.

Saxifragaceæ. I have not seen the Japanese analogue of the *Mitella pentandra* of Northwestern America, *Mitellopsis Japonica*, Sieb. & Zucc. Nor did the expedition collect any *Astilbe*. Zuccarini's second species, *Hoteia Thunbergii*, if distinct, is certainly a very close representative of our Alleghanian *A. decandra*, since it is said to resemble *Spiræa Aruncus* much more closely than does *A. Japonica*. The other two species of the genus, as is well known, belong to the Himalayas, one species extending to the mountains of Java. The union of the carpels at their base, and with the base of the calyx, are Saxifrageous characters; yet the scarious-dilated bases of the petiole are better apologies for stipules than anything which *Spiræa Aruncus* can show.

One of the most interesting plants of the collection belongs to the present order, and forms the type of a new genus in it, allied to *Astilbe*, and still more to Bunge's little-known *Oresitrophe* from the North of China. I give expression to Mr. Wright's wishes, as well as to my own sentiments, in dedicating this genus to the commander of the expedition, in acknowledgment of the enlightened and generous interest he took in the naturalists of his squadron, and of his constant care to facilitate their explorations.

And the name is the more appropriately conferred upon the present very striking plant, since Captain Rodgers was himself one of its discoverers.*

The plant which in Perry's Expedition I had called *Chrysosplenium oppositifolium*, is now, by better specimens, shown to be *C. Kamtschaticum*. The seeds are narrowly oblong, smooth and glabrous, and more than twice the size of those of *C. oppositifolium*, which are short-ovoid and minutely roughened under a lens, and the floral leaves are more toothed. The seeds of *C. glechomæfolium*, Nutt. (which is very near *C. Nepalense*), are smooth and globular. Those of *C. Americanum* are oval and hispid. An interesting rediscovery is that of *C. ovalifolium* of M. Bieb. and of Ledebour, 1830, — not before known in fruit, but which I now can identify with Chamisso's *C. macrocarpum*, whose more appropriate name was published in 1831, and also with Trautvetter's *C. Sedakowii*. A new character is appended, drawn from Mr. Wright's specimens, gathered in mountain rivulets near Hakodadi.†

The genus *Hydrangea* is divided between Japan, with the Himalayas and the mountains of Java, on the one hand, and the Alleghany region of the United States on the other. In addition, Japan has the allied genera *Cardiandra*, *Schizophragma*, and *Platycrater;* the Himalayas, &c., *Adamia* (of which *Broussaissia* is the counterpart in the

* RODGERSIA, Nov. Gen.

Calyx tubo brevissimo turbinato basi ovarii adnato, limbo petaloideo 5-partito, lobis æstivatione valvatis ovatis post anthesin patentissimis persistentibus. Corolla nulla. Stamina 10, perigyna, calycis lobis opposita et alterna, iisdem mox longiora: filamenta subulata persistentia: antheræ innatæ, subdidymæ, longitudinaliter dehiscentes. Ovarium 2–3-loculare, 2–3-styla: styli subulati, stigmatibus crassis subcapitatis terminati. Ovula plurima, in placenta axili crassa retrorsum imbricata, pendentia. Semina immatura scobiformia, testa laxa utrinque producta. — Herba insignis, 3–4-pedalis, caule valido e rhizomate percrasso horizontali erecto 3–5-foliato; foliis magnis alternis (radicalibus maximis longe petiolatis, limbo nunc bipedali!) palmatim peltatimve 5-sectis, summis trisectis vel trilobatis, foliolis sessilibus cuneatis apice inciso-lobatis margine undique argute serratis, petiolo basi scarioso-dilatato seu adnatim stipulato; cymis scorpioideis plurimis in paniculam thyrsoideam nudam amplissimam collectis; floribus subsessilibus subsecundis ebracteatis luteo-albis.

Rodgersia podophylla. Hakodadi, etc. — Genus ab *Astilbi* plane diversum; calyce rotato-patente subampliato, æstivatione valvato, seminibus descendentibus, necnon habitu, floribus ut videtur hermaphroditis, inflorescentia cymosa, bracteis bracteolisque nullis, ovariis usque ad apicem coalitis: ab *Oresitrophi*, inflorescentia, ovario e carpellis alte connatis biloculari, ovulis seminibusque pendulis.

† Chrysosplenium ovalifolium (M. Bieb. ex Ledeb.): fere glabrum; caule basi repente nudo superne foliato (spithamæo et ultra); foliis aut oppositis aut alternis obovato-orbiculatis cuneatisve pl. m. crenatis, superioribus caul. ster. late ovalibus; cyma laxa basi nuda; floribus longiuscule pedicellatis; capsula maxima (4–5 lin. longa), valvis oblongis calycem plus duplo superantibus; seminibus ovoideis nitidis hispidulis (iis *C. oppositifolii* paullo majoribus).

Sandwich Islands) and Hooker's *Piliostegia;* and our Alleghany region, *Decumaria*. *Deutzia* is divided between Japan and the Himalayas (*D. staminea* of the latter differs from *D. crenata* of the former in the calyx-teeth and some subsidiary characters), and has an American analogue, but not a close one, in *Fendlera*. *Philadelphus* has one Himalayo-Japanese species (doubtless not indigenous in Europe); the rest of the genus is North American, partly western and partly eastern.

Itea Chinensis has not yet been found in Japan, but Mr. Wright gathered a form of it in the Loo Choo Islands. Hooker and Thomson found the same species in the eastern Himalayas. The type of the genus, and the only American species, belongs to the Atlantic United States.

Crassulaceæ. *Penthorum Chinense* (not yet detected in Japan) is apparently identical with the original *P. sedoides*, so abundant throughout the eastern part of North America, but unknown in the western. Hooker and Thomson's *Triactina*, of the Sikkim Himalayas, is only in a general way analogous to the American *Diamorpha* of Nuttall.

Hamamelideæ. Mr. Wright met with nothing of this order in Japan, but found a *Distylium* — apparently a variety of the Japanese species — in the Loo Choo Islands. *Hamamelis Japonica*, which I possess from the Leyden herbarium, is very closely related indeed to the only other strict congener, the *H. Virginica* of Eastern America. The species of the eastern borders of India, Dr. Hooker identifies with Brown's *H. Chinensis*. *Corylopsis* of Japan and the eastern Himalayas is analogous to *Fothergilla*, of the eastern borders of the United States. There is also a *Liquidambar* in Japan. The order is absent from the whole region west of the Mississippi, as well as from Europe.

Umbelliferæ. The additions to the Japan Flora in this order are *Bupleurum multinerve* of Siberia; a new *Angelica*,* of which fruiting specimens were obtained only at Katonasima, one of the islands between Japan and the proper Loo Choo group; and the European *Anthriscus sylvestris*, as it must be called, on account of the oblong and smooth fruit, rather than *A. nemorosa*, which is already recorded from the adjacent continent. There is, indeed, a minute ring of hairs at the base of the fruit; but this likewise is to be found in specimens of *A. sylvestris* of Western Europe. The two species are probably one.

* Angelica Japonica (sp. nov.): procera; foliis bipinnatisectis glabris, segmentis ovatis acuminatis argute serratis ultimis sæpe trilobis, superioribus sessilibus basique ala integerrima decurrente; umbella caulequ superne tomentulosis; involucellis polyphyllis, foliolis parvis scariosis lanceolatis acuminatis; alis fructus latiusculis jugisque subsuberosis; vittis commisuralibus 4. Cape Soya (in flower).

Mr. Wright did not obtain in Japan (where it was found by Drs. Williams and Morrow) the *Cœlospermum Gmelini* of Ledebour (*Physolophium saxatile*, Turcz.), but he collected fine fruiting specimens in Behring's Straits. An examination of these, and a comparison with the plant of Northern Oregon, and with that inhabiting the coast of the northern part of New England, shows (what I have long suspected), — 1. that *A. peregrina* of Nuttall, from both shores of North America, is of the same species; and 2. that the characters upon which De Candolle's *Archangelica Gmelini* has been separated from that genus are variable and of no moment. Indeed, it were better to restore *Archangelica* itself to *Angelica*. As to the number of vittæ, they vary in *A. Gmelini*, but are commonly rather few, only one for each interval, and two on the commissure, as stated in the Florula Ochotensis.

If the undeveloped specimens which, in Perry's Expedition, I doubtfully referred to *Archangelica officinalis*, DC., are identical with a low, littoral Umbellifer which Mr. Wright collected in the Loo Choo Islands, it may be held to be merely a glabrate variety of a plant discovered by Dr. J. G. Cooper on the sandy beaches of Puget's Sound, which I have characterized in the Botanical Appendix to the Report of Stevens's Pacific Railroad Exploration (still unpublished), under the name of *Cymopterus? littoralis*.

Some other American Umbelliferæ, of more southern range, also inhabit Japan, viz. *Cryptotænia Canadensis* (unknown west of the Mississippi valley), an *Archemora* (fide Zuccarini), *Heracleum lanatum*, and *Osmorrhiza longistylis*.

Most of the *Araliaceæ* of Japan are of Eastern and insular rather than of North American types. But it is quite otherwise in respect to the two plants of the order which were collected in the northern part of Japan. One of them is *Echinopanax horridus* (*Panax*, Smith, Hook.) of Northwestern America; the other, the still more interesting *Aralia* (*Ginseng*) *quinquefolia*, exactly our Northeastern American Ginseng, which is unknown west of the Mississippi and the Great Lakes. The early missionaries were correct in their identification of the Ginseng of America with that of Tartary; and the Himalayan plant may be safely added to the species. And *Aralia edulis* of Japan is analogous to our Eastern American *A. racemosa*. On the other hand, *Hedera Helix* of the Old World (of which *H. rhombea*, Sieb. & Zucc. is merely a form) is apparently indigenous to Japan, as well as to the Himalayas, although it appears not to extend through Northern Asia.

Cornaceæ. Upon the mountains northeast of Hakodadi, Mr. Wright gathered not only *Cornus Suecica*, which extends all round the borders of the frigid zone, but likewise our *C. Canadensis*, which has also been detected in the adjacent Kurile Islands, and

therefore has a continuous range from Newfoundland and Labrador to Japan. As to representatives, *Cornus officinalis* of Japan is very like *C. sessilis*, Torr., of California, on the one hand, and *C. mas*, of the Old World, on the other. *C. sanguinea*, extending from Europe to Japan, is represented by *C. Californica*, &c. in Western America, and by *C. sericea* east of the Rocky Mountains; and *C. alba* of Siberia and Japan may prove hardly distinct from our *C. stolonifera*. Even *Benthamia fragifera* of the Himalayas and *B. Japonica* of Japan cannot be generically different from our *Cornus florida* and its western form, *C. Nuttallii* of Audubon.

The *Caprifoliaceæ* of Japan are interesting under the same point of view. *Abelia* is peculiar to Japan, China, and the Himalayas. *Diervilla* (including *Weigela*) is divided between Japan (and the adjacent mainland) and Eastern North America. I was disposed to regard *Weigela* as a distinct genus, on account of the ampliate corolla, the deciduous limb of the calyx, the coriaceous capsule, and the reticulate-winged seeds. The last three distinctions were probably unknown to Mr. Brown when he united *Weigela* to *Diervilla*, as they certainly were to Alph. De Candolle when he again separated them, and referred Bunge's *Calysphyrum* to *Weigela*. Confidently reducing another genus of the Russian botanists, viz. the *Calyptrostigma Middendorffianum* of Trautvetter and Meyer's Florula Ochotensis, I must at the same time admit that Mr. Brown's sagacity was not at fault. I have not seen Bunge's *Calysphyrum;* but fruiting specimens of the Okotsk species, *Diervilla* (*Weigela*) *Middendorffiana*, were brought by Mr. Wright's assistant from Ayan. These, in this state, much resemble *Diervilla sessilifolia* of the Alleghany Mountains, and have an equally thin capsule, upon which the limb of the calyx is about equally persistent; that is, it persists until the fruit matures, and is then apt to fall off. The unequal union of the calyx-lobes in Middendorff's plant is probably accidental, and has been noticed by De Candolle in Bunge's *Calysphyrum;* the stigma is not essentially unlike that of the Japanese species in the bud (cap-shaped, at length becoming broadly peltate); and I have some doubt whether the anthers are really connivent after the flower opens, as represented. Finally, the seeds of the American species, although wingless, are invested with a close cellular pellicle, of a structure similar to that of the wing of the Asiatic species, which, moreover, is occasionally little developed.

To *Diervilla Japonica*, I refer the *D. Coræensis*, DC., also *D. grandiflora* and *D. versicolor*, Sieb. & Zucc., and the *Weigela rosea* of the gardens; and unite the *D. hortensis*, Sieb. & Zucc. to *D. floribunda*.

Additional specimens of the plant named *Lonicera Morrowi* in Perry's Expedition call for some alteration in the character; the species is nearly related to *L. Xylosteum* of Europe, &c. De Candolle's *L. brachypoda* is probably *L. cærulea*.

Viburnum Opulus was detected in the northern island: this species extends all round the world in the cooler latitudes. *V. plicatum*, Thunb., I have elsewhere identified with *V. lantanoides*, Michx., which is peculiar to the cool, moist woods of Canada and of the Northern United States, not extending westward beyond the Great Lakes. This and the last species, as well as others, have good stipules. *V. tomentosum*, Thunb., which, in Perry's Expedition, I referred, without sufficient reason, to the preceding species, I now suspect to be a radiate variety of Thunberg's *V. dilatatum*. This Mr. Wright collected abundantly, but uniformly rayless; the leaves much like those of *V. Lantana* of Europe, only not at all cordate, and more downy beneath. A less downy state of *V. dilatatum* (var. *nudiusculum*) is the *V. erosum* of De Candolle, Zuccarini, and of my enumeration of Drs. Williams and Morrow's collection, clearly passing into the former species on the one hand, and on the other perhaps not distinct enough from the genuine *V. erosum* of Thunberg. The latter, however, which was abundantly gathered near Hakodadi (while the variety of *V. dilatatum* came from Simoda), appears to be distinguished by its general smoothness, its thin leaves more coarsely toothed and conspicuously acuminated, and its smaller and simpler, long-peduncled cymes. I have seen no Japanese Viburnum answering to *V. cordifolium*, Wall., said by Dr. Hooker to occur in Japan. Fragments of the Himalayan plant most resemble *V. plicatum*. I cannot identify Thunberg's *V. cuspidatum*.

Japanese specimens are quite intermediate between the *Sambucus racemosa* of the Old World, and the North American *S. pubens*.

Rubiaceæ. The *Asperula odorata* was again collected, apparently indigenous; also *Galium pauciflorum*, Bunge, a mere variety of *G. Aparine*; *G. verum*, var. *lasiocarpum*; and *G. triflorum*, exactly like North American, Russian, and Scandinavian specimens. The species is not recorded from Northern Asia; and Dr. Hooker's Himalayan plant of the name slightly differs. My *G. trachyspermum* was gathered in better specimens (as also from Loo Choo), and with two marked varieties.* The only other addition to the Japanese Flora in this order is a dwarf and fleshy variety of *Oldenlandia paniculata*, from the southern extremity of Kiu-siu, also from Loo Choo.†

* GALIUM TRACHYSPERMUM, Gray, *in Perry's Jap. Exped.* 2, *p.* 313. G. rotundum (rotundifolium), *Thunb.*

Var. GRACILENS: foliis lanceolatis; pedicellis gracilioribus; floribus parvis. Simoda.

Var. SETULIFLORUM: foliis ovalibus oblongis lanceolatisve; corolla extus parce hispida. Simoda, Agenhu.

† The following are new *Rubiaceæ* from the Bonin collection:—

PSYCHOTRIA HOMALOSPERMA (sp. nov.): arborescens, glaberrima; stipulis brevibus latis basi excepta caducis; foliis obovatis seu obovato-oblongis breviter acuminatis basi in petiolum longiusculum angustatis opacis; pedunculo terminali nunc sublaterali ancipiti foliis dimidio breviores; cyma laxiflora; floribus fructi-

To *Valeriana dioica* (apparently wanting in Northern Asia) I now refer better specimens of the plant which I formerly named *V. Tripteris*: it ranges through the northern part of the American continent (but is rare eastward) under the name of *V. sylvatica*.

Compositæ. Specimens gathered at Tanegasima, off the south end of Kiu-siu, manifestly of Thunberg's *Aster hispidus* (excl. syn. Kæmpf.), have led me to the correction of a mistake, which originated in a wrong reference by Thunberg to Kæmpfer's Amœnitates, and the consequent application of the name, *Aster hispidus*, to plate 29 of Kæmpfer's Icones Selectæ, ed. Banks, representing a plant which by no means accords with Thunberg's description. This, not having been perceived by Zuccarini, has led to further confusion. Suffice it briefly to say, that *Heteropappus hispidus*, Less. & DC., excl. syn. Kæmpf. (*Aster hispidus*, Thunb.), is clearly identical with *Heteropappus rigens*, Sieb. & Zucc., perhaps *H. subserratus* also; and the genus ought to subside into a section of *Calimeris*.* Kæmpfer's plant, on the other hand, is manifestly what I had named *Dœllingeria scabra?* in Perry's Expedition, and is the "*Dœllingeria* n. sp.," Hook. & Arn. Bot. Beech. Voy. p. 195, but is hardly *D. trichocarpa*, DC. It is a genuine *Aster*, and may (for all I see to the contrary) take the name of *Aster Kæmpferi*. Zuccarini would appear to have received the Siberian *Calimeris incisa* from Japan:

busque pro genere maximis, alaribus sessilibus; calycis limbo brevi fere integerrimo; corolla hypocraterimorpha, tubo lobis ter longiore intus nudo; pyreniis 2 cartilagineis latissime ovatis valde complanatis dorso ad medium et margines tenuiter cristato-costatis; semine plano lamellæformi. Bonin Islands. — A remarkable species of Bentham's section *Notopleura*.

Stylocoryne? subsessilis (sp. nov.): fruticosa; foliis brevissime petiolatis e basi rotundata ovato-oblongis acuminatis subcoriaceis supra glaberrimis subtus cum ramulis junioribus striguloso-pubescentibus; cyma terminali sessili densa; baccis globosis 1 – 6-spermis. Bonin Islands.

Hedyotis leptopetala (sp. nov.): suffruticosa, glaberrima; caule quadrimarginato; stipulis brevibus nudis; foliis ovato- seu oblongo-lanceolatis subacuminatis mucronato-acutis basi sæpius acutis brevissime petiolatis chartaceis subtus fere aveniis; cyma terminali composita densiflora; calyce cyathiformi truncato brevissime 4-dentato pedicello 2 – 3-plo breviore; corollæ 4-partitæ nudæ tubo globoso, segmentis longe linearibus; filamentis styloque gracillimis glabris; capsula ovoidea apice libera primum loculicida demum septicida dicocca. H. multiflora, *Hook & Arn. Bot. Beech.* p. 264, non *Cav.* Bonin Islands.

* The following, from one of the islands south of Japan, is very closely related to *Heteropappus hispidus*, but is a true *Calimeris*: —

Calimeris ciliata (sp. nov.): subpedalis; caulibus ramisve adscendentibus foliosis fere glabris mono – oligocephalis; foliis radicalibus oblongo-spathulatis obtusis crenato-serratis, caulinis oblanceolatis linearibusque basi angustata sessilibus integerrimis, omnibus hispido-ciliatis, paginis glabris; involucri squamis biseriatis laxis herbaceis lineari-attenuatis cuspidatis hispido-ciliatis; pappo rufo rigido achenio hirsuto subdimidio breviore, radio conformi sed parciore. Ousima.

to it, under the name of *Heteropappus incisus*, Sieb. & Zucc., he has wrongly referred both Kæmpfer's and Thunberg's plants as synonymes.

Lessing's *Aster Japonicus*, with a dubious variety, I must refer to *Erigeron*.* It is the Japanese analogue of the Californian *E. glaucum*.

The form of *Solidago Virgaurea* common at the Loo Choo Islands and Hong Kong (var. *leiocarpa* = *Amphirepis leiocarpa*, Benth.) was likewise found in the southern part of Japan. It quite resembles European forms of the species, except in the glabrous achenia. This character it shares with *S. thyrsoidea*, Meyer (*S. leiocarpa*, DC.), a subalpine plant in Eastern North America, and probably another form of *S. Virgaurea*.

None of our collectors met with De Candolle and Zuccarini's *Porophyllum Japonicum;* which is surely not of this genus at all, but a *Gynura*, — most probably (since, according to Siebold, the plant was imported from China) *G. pinnatifida*, DC., the *Cacalia pinnatifida* of Loureiro. I presume there are no Asiatic species of the genus *Porophyllum*.

The collection affords an addition to the genus *Erythrochæte*, Sieb. & Zucc., but only a single specimen of it.† *Cacalia hastata*, Linn., the North Asian and Eastern European analogue of our Eastern American *C. suaveolens*, was found at Cape Soya, along with *Senecio palmatus*, Pall.; also, on the sea-shore, *S. Pseudo-Arnica*, a subarctic species of both shores of America.

Besides *Cirsium Kamtschaticum* at the north, and *C. Japonicum*, DC., farther south, there are in the collection specimens of a Thistle related to *C. eriophorum*, and which, indeed, I should take for Thunberg's *Carduus eriophorus*, if De Candolle had not referred that to his *C. Japonicum*, upon the authority of a Thunbergian specimen. It cannot well be *C. lappaceum;* so I am obliged to consider it new.‡

* Erigeron (Stenactis) Thunbergii. Inula dubia, *Thunb.* Aster Japonicus, *Less.*, etc. Erigeron pulchellum? *Gray in Perry's Exped.* (Ligulæ purpurascentes).

Var.? glabratum: caule validiore breviore apice nudo glanduloso; foliis glabris raro villoso-ciliatis; involucro multo minus hirsuto; ligulis purpureis. Cape Siriki-saki.

† Erythrochæte dentata (sp. nov.): foliis caulinis late cordatis crenato-dentatis, petiolo alato basi dilatata amplexicauli; involucro breviter campanulato. Nippon. "Flores purpurei."

‡ Cirsium (Eriolepis) pectinellum (sp. nov.): caule stricto hirtello apice arachnoideo; foliis supra scabridis viridibus subtus albo-lanatis profunde pinnatifidis, supremis basi angusta spinulifera sessilibus, cæteris in alas angustissimas lineasve pectinatim setosas longe decurrentibus, lobis lanceolatis sensim acuminatis mucrone vix pungente apiculatis; capitulis 2 – 3 breve pedunculatis subglobosis; involucri arachnoidei squamis e basi lanceolato subulato-acuminatissimis inermibus recurvato-patentibus. Nippon, Jesso. — Capitula iis *C. eriophori* dimidio minora, squamis involucri debilioribus magis caudatis, nec spiniferis.

Thunberg's *Carduus acaulis* was not met with in Japan, but a species probably the same was collected in various islands of the Loo Choo group.*

Among the *Cichoraceæ* is a new, small-flowered *Lampsana*, with the involucre only about two lines long in anthesis, and little longer in fruit.†

Youngia Japonica, DC. (*Prenanthes Japonica*, Linn., Thunb.) doubtless includes *Y. Thunbergiana*, *multiflora*, *runcinata*, and probably all of the eight species known to De Candolle except *Y. Mauritiana* (which I have not seen) and the ambiguous *Y. napifolia*. The pubescent tube of the corolla, the uniserial pappus, and the habit, may keep the genus distinct from *Crepis*. Under the name of *Youngia integra*, I refer to the genus — notwithstanding a somewhat different aspect — a plant gathered at Tanegasima, off the south end of Kiu-siu, and abundantly in Ousima and the Loo Choo Islands, which is doubtless Thunberg's *Prenanthes integra*, therefore De Candolle's *Y. lanceolata*, but whether Houttuyn's *Prenanthes lanceolata* is doubtful. That specific name, certainly, is not a good one for our plant. The rest of the Japanese species appended by De Candolle to *Youngia*, with a mark of doubt, I can now confidently refer, along with some new ones, to Cassini's genus *Ixeris*. I would add Don's *Chorisma* (*Chorisis*, DC.) to the number; remarking that Don had no good reason for describing the blossoms of *Chorisis repens* as "pale blue," and De Candolle still less for dropping the qualifying adjective. Linnæus in the original account called them yellow, and so they are. It is singular that a plant which inhabits these shores, from Loo Choo and Hong Kong to Kamtschatka, should have so long escaped rediscovery. I append the characters of the Japanese species before me, and of a doubtful one from the Bonin Islands.‡

* Cirsium brevicaule (sp. nov.): foliis profunde pinnatifidis dentatis spinosis et spinuloso-ciliatis utrinque glabris (costa subtus primum arachnoidea), radicalibus caule arachnoideo plerumque longioribus, caulinis semi-amplexicaulibus haud decurrentibus oblongis; capitulis 2–5 subcorymbosis breve pedunculatis; involucro pl. m. folioso bracteato hemisphærico glabro, squamis lanceolatis acuminatis erectis, exterioribus ovato-lanceolatis spinula terminatis. Carduus acaulis, *Thunb.?* Cirsium Japonicum, *Hook & Arn.?* Loo Choo Islands, etc.

† Lampsana parviflora (sp. nov.): glabra vel glabriuscula; caulibus e radice annua debilibus diffusis; foliis fere omnibus lyrato-pinnatifidis; capitulis laxe paniculatis parvis 14–20-floris; involucri squamis fructiferis planis ecarinatis acuminatis; acheniis breviter oblongis subcompressis, marginibus acutis hispidulo-scabris. Simoda, Hakodadi.

‡ Ixeris stolonifera (sp. nov.): pumila, subglauca; stolonibus filiformibus prorepentibus foliatis; foliis orbiculatis late ovalibusve basi obtusis vel subcordatis plerumque integerrimis petioli filiformi brevioribus; pedunculis elongatis scapisve monocephalis nudis; involucro 15–20-floro; acheniis ovali-oblongis rostro suo brevioribus, costis crassis lævibus. — Variat, foliis 2–12 lin. longis nunc parce denticulatis, nunc basi sub-

There are no *Lobeliaceæ* in the collection, and no *Campanulaceæ* new to Japan.

Ericaceæ. An interesting discovery is that of the American Cranberry (*Vaccinium macrocarpon*) in the northern part of Japan. I have never received this species from the western side of our continent, nor is it recorded from Russian America. Douglas, however, found it at the mouth of the Oregon, and states it to be common there. *Vaccinium Vitis-Idæa*, although equally new to the flora of Japan, is there within its

hastato-bidentatis; scapo digitali ad spithamæam; floribus flavis. Hakodadi; Simoda; Kagosima Bay, Kiu-siu. — Doubtless the *Youngia pygmæa* of Ledebour and Zuccarini, as to their Japan plant, but not *Prenanthes debilis*, Thunb., and not even a congener of *Prenanthes pygmæa*, Ledeb. (*Crepis nana* of Richardson), which is apparently a *Crepis*.

Ixeris debilis: caulibus gracilibus laxis basi stoloniferis superne longe nudis 1 – 5-cephalis; foliis radicalibus et stolonum obovato-spathulatis oblongis sublanceolatisve in petiolum longum attenuatis integerrimis vel denticulatis nunc pinnatifido-dentatis, caulinis subnullis paucisve; involucro 20 – 25-floro; acheniis breviter oblongis alato-costatis rostro suo æquilongis, costis lævibus. Prenanthes debilis, *Thunb. Fl. Jap. & Ic. Pl. Jap. t.* 39. P. humilis, *Thunb.?* Youngia? debilis, *DC.* Hakodadi, Simoda, etc. — Spithamæa ad pedalem: folia 3 – 5-pollicaria.

Ixeris (Chorisis) repens: caulibus humifusis longe repentibus; foliis petiolo brevioribus trilobis tripartitis trisectisve, nunc pedato-5-sectis raro integris, segmentis obovatis vel rotundatis obsolete denticulatis vel subsinuatis; pedunculis oppositifoliis petiolum superantibus 1 – 3-cephalis parce bracteatis aut unifoliatis; involucro 20 – 30-floro; floribus flavis; acheniis oblongis crasse 10-costatis (haud compressis) rostro quadruplo longioribus, costis acutiusculis acie minutissime scabriusculis; pappo pluriseriali. Prenanthes repens, *Linn.* Chorisma repens, *Don.* Chorisis repens, *DC.* Nabalus repens, *Ledeb.* Hakodadi, Japan; Loo Choo Islands; Hong Kong; on the sands of the sea-shore.

Ixeris ramosissima: glaucescens; caule paniculato ramoso folioso; foliis oblongis argute dentatis nunc runcinatis, infimis in petiolum marginatum longe attenuatis, superioribus basi auriculata vel hastata amplexicaulibus; capitulis numerosis corymbosis breviter pedicellatis 10 – 12-floris; corollis flavis; acheniis fusiformibus in rostrum breve vel longiusculum attenuatis, costis prominulis obtusis scabriusculis; pappo uniseriali. Prenanthes hastata, *Thunb. ex char.* Forma runcinata est Brachyramphus? ramosissimus, *Benth. in Lond. Jour. Bot.* 1. p. 489. Kagosima Bay, Kiu-siu. — The achenia are similar to those of *Ixeris versicolor*, DC., but not of genuine *Ixeris*; yet the plant is best referred to this genus.

Ixeris (Ixeridium: capitulum 5 – 10-florum; pappus sordescens) Thunbergii: caulibus basi vix stoloniferis foliosis superne parce ramosis; foliis oblongis membranaceis apice cuspidatis, radicalibus longe petiolatis plerisque laciniato-dentatis sublobatisve, caulinis basi lata vel cordata semi-amplexicaulibus infra medium pectinatim spinuloso-dentatis; panicula corymbosa vel fastigiata polycephala; involucro 6 – 8-phyllo 5 – 10-floro; floribus flavis; acheniis fusiformibus sensim longiuscule rostratis leviter 10-costatis glaberrimis; pappo uniseriali. Prenanthes dentata, *Thunb.* Youngia dentata, *DC.* — Var. gracilior; foliis angustioribus subintegerrimis basi nunc ciliato-dentatis. Simoda, Hakodadi. — This and the next must be congeners of *Ixeris versicolor*, DC., and probably of Miquel's *Aracium*.

Ixeris (Ixeridium) albiflora (sp. nov.): caulibus gracilibus basi stoloniferis gracilibus unifoliatis laxe 3 – 6-cephalis; foliis oblongo-lanceolatis integerrimis acuminato-cuspidatis, radicalibus in petiolum gracilem

known range. The same district (viz. the mountains northeast of Hakodadi) furnished a new *Vaccinium*, which in aspect, and in all its characters except the fruit, accords with the Blueberries of Eastern North America; but the fruit is that of *Euvaccinium*. As Mr. Small detected it again on Cape Romanzoff, it is only just that the species should bear the name of Mr. Wright's humble, but invaluable assistant.* *V. bracteatum* was not met with; but in one of the islands south of Japan an allied new species was discovered.†

Empetrum nigrum, Linn., was gathered on Cape Siriki-Saki, Nippon, apparently near the sea-level, in lat. $41\frac{1}{2}°$.

The vicinity of Hakodadi furnished a new *Leucothoë*, said to have light-green blos-

attenuatis, caulino subsessili basi utrinque sæpius 1–2-setigero; pedicellis gracilibus; involucro 5–6-floro; floribus albis; acheniis fusiformibus sensim longiuscule rostratis, costis scabriusculis. Cape Siriki-Saki, Nippon.

Ixeris? (Ixeridium?) linguæfolia (sp. nov.): caule folioso suffruticoso superne paniculato; foliis subglaucis crassiusculis integerrimis sessilibus obtusissimis, in caudice crasso lingulatis basi angustatis, in caulibus ramisve herbaceis floridis oblongis mucronatis basi cordata amplexicaulibus; capitulis numerosissimis parvis confertissime corymbosis; involucro cylindrico 4–5-phyllo vix calyculato 5-floro; "floribus albidis vel flavidis"; acheniis valde immaturis oblongis 10-striatis apice infra discum planum in collum constrictis; pappo sordescente uniseriali. Bonin Islands.

* Vaccinium Smallii (sp. nov.): caule 3–5-pedali ramulisque teretibus glabris; foliis deciduis ovalibus oblongisve breve acuminatis subsessilibus penniveniis creberrime ciliato-serrulatis ad costam venisque præsertim subtus pubescentibus; fasciculis corymbisve paucifloris sessilibus e gemma terminali; bracteis caducis; calycis limbo 5-fido, lobis semi-orbiculatis glanduloso-ciliolatis; corolla incarnata vel rubra breviter campanulata; filamentis villoso-ciliatis; antheris exaristatis, tubulis longis subexsertis; ovario 5-loculari.

On the western coast of Kamtschatka, Mr. Small also rediscovered the very rare *V. præstans*, mostly in fruit, but with a flower or two, which enables me to complete its characters.

Vaccinium præstans (Lamb.): pygmæum; caule 2–3-pollicari e basi gracili repente adsurgente inferne bracteato superne 3–5-foliato; foliis late obovatis ovatisve in petiolum subito contractis reticulato-venosis argute mucronato-serrulatis ciliatis subtus ad venas pubescentibus pro planta magnis ($1\frac{1}{2}$–2-pollic.) deciduis; racemo brevi 3–5-floro; bracteis lanceolatis scariosis deciduis; calycis limbo 5-lobo, lobis ovatis ciliatis; corolla cylindraceo-campanulata; filamentis pilosis; antheris inclusis, loculis breviter tubulosis, arista dorsali obsoleta; bacca ampla 5-loculari.

† Vaccinium (Batodendron) Wrightii (sp. nov.): glaberrimum, 2–5-pedale; foliis coriaceis perennantibus opacis ovatis oblongisve utrinque acutis vel subacuminatis subserratis; racemis brevibus laxifloris; pedicellis secundis nutantibus bracteam scariosam deciduam ter superantibus; calycis lobis acutissimis; corolla rubella glabra obovato-urceolata 5-carinulata, ore 5-dentato; filamentis villosis; aristis antherarum arrectis tubulis gracilibus brevioribus; ovario sub-10-loculari. Ousima. — Pedicels articulated with the flower, as in *V. bracteatum*, &c., and in our American *V. arboreum*. Not so in *V. stamineum*, which is the type of a peculiar section (*Picrococcus*, Nutt.), quite distinct from *Batodendron*.

soms.* I refer the plant to this genus rather than to *Gaultheria*,† on account of the calyx being wholly unchanged in fruit, beneath the naked capsule, and the placentæ pendulous from the summit of the cells. On the mountains in the vicinity were gathered *Ledum palustre*, both the ordinary form, so common in Europe, but only high northern in America, and the variety *dilatatum* of Wahlenberg, which very closely approaches our *L. latifolium*, but has oval capsules and less blunt leaves. Also, — and a more interesting discovery in Japan, — *Menziesia ferruginea*, and this, too, in the form essentially identical with that of our higher Alleghanies (*M. globularis*, Salisb.) rather than that of the northwest coast and islands. The differences are so unimportant, however, and the two supposed species so connected by means of an intermediate form, discovered by Drummond at an intermediate station (viz. in the northern Rocky Mountains), that I had long ago confidently regarded them as one.

The geographical range of this species, as now extended, is instructive. This, and the numerous similar instances already mentioned, or to be mentioned, are particularly recommended to the consideration of those (such as De Candolle the younger) who, although convinced that species in general have had a single, local origin, are yet constrained to adopt the hypothesis of a double origin in the special case of certain species known to occur only in two widely dissevered regions; — e. g. *Phryma leptostachia* in Nepaul, as well as in North America east of the Mississippi; or our own *Diphylleia* and *Caulophyllum*, occurring only here and in Japan. The number of instances, 1. of species strictly divided between Eastern North America and some part of Northern Asia; and 2. of those which are known to occur at one, two, or several intermediate stations, — is already so increased, that they can no longer be regarded as exceptional or casual, but must evidently receive a common explanation. And what that explanation is begins to be clear.

It was with pleasure that I observed in the present collection undoubtedly wild specimens of the miniature *Azalea* which I published under the name of *A. serpyllifolia*, with leaves, &c. no larger than those of Williams and Morrow's specimens. The Japanese have such fondness for, and such skill in producing, wonderfully depauperate

* Leucothoë chlorantha (sp. nov.): humilis, 1 – 2-pedalis; ramis glabris; foliis chartaceis subsessilibus ovalibus hirtello-ciliatis subtus reticulato-venosis, junioribus pl. m. hirtellis; racemis terminalibus erectis patentibusque fere glabris basi foliatis; bracteis plerisque lineari-lanceolatis flores subsecundos haud superantibus; pedicellis calyce æquilongis vel paullo longioribus; corolla globosa deinde breviter campanulata viridula; filamentis scabris; antheris muticis. Hakodadi.

† Siebold and Zuccarini have a *Gaultheria* from Japan; I know not whether allied to *G. Shallon* of Western, or *G. procumbens* of Eastern, North America.

varieties of plants, that the former cultivated specimens might be supposed to have been the subjects of this singular art.

Besides *Azalea Indica* and *ledifolia* (both wild and cultivated), of the typical form of that region, there were also scanty specimens of an *Azalea* of the American type, which appears to be new.* And *Rhododendron brachycarpum*, Don, rediscovered on the mountains northeast of Hakodadi, singularly resembles the *R. Catawbiense* of our Southern Alleghanies, from which it is distinguished by rather slight characters. So *Clethra barbinervis*, Sieb. & Zucc., appears not much unlike the Alleghanian *C. acuminata*, Michx.

Besides *Pyrola rotundifolia*, *P. minor*, and *Moneses uniflora*, which are dispersed around the world, there is also a specimen of *P. media*, which has not been observed in Asia east of the Caucasus, nor in America.

Diapensia Lapponica, the only strictly alpine plant of the collection, indicates a true alpine region upon the summit of the mountains northeast of Hakodadi, which, however, are said not to attain a great height.

The *Styracaceæ* and *Ebenaceæ*, the *Symplocos* (of Eastern American type), and the *Myrsinaceæ* of Japan, do not call for any particular remark.

Primulaceæ. There is a new Primrose in the collection, of which I possessed a fragment before, — a showy species, which manifestly belongs to Duby's section *Spondyphylla*, although the involucre is not foliaceous, and is a congener of De Vriese's *Cancrinia chrysantha*, although destitute of an epigynous radiate crown.† The three or four species of *Lysimachia* are not American in type (although one is represented in the Sandwich Islands); but the common *Naumburgia* was met with near Hakodadi.‡

* Azalea Japonica (sp. nov.): foliis cum floribus coëtaneis spathulato-oblongis obtusis ciliatis concoloribus supra strigoso-hispidulis subtus ad costam parce strigosis; umbella sessili pluriflora; pedicellis tubo corollæ longioribus cum calyce brevissimo pilis longissimis fulvis patentibus hispidis; corolla flava extus tomentello-pubescente; staminibus 5 subinclusis; ovario villoso-hispidissimo. Hakodadi; in gardens. — *A. Pontica*, *occidentali*, et *calendulaceæ* aff.

† Primula Japonica (sp. nov.): undique glabra; foliis oblongis spathulatisve obtusis argute sæpius duplicato-denticulatis in petiolum alatum brevem attenuatis membranaceis venosis efarinosis (sed junioribus subtus atomiferis); scapo angulato (1 – 1½-pedali) multifloro; floribus verticillatis; involucri phyllis linearisubulatis inappendiculatis integerrimis pedicellis multo brevioribus; calyce ovato-campanulato, lobis triangularisubulatis tubo intus farinifero æquilongis corollæ purpureæ tubo pluries brevioribus; lobis corollæ obcordatis; capsula globosa vertice nuda demum irregulariter rupta. Hakodadi.

‡ Subjoined are the characters of two new *Primulaceæ* from the islands south of Japan. The first is evidently a close congener of *Androsace saxifragæfolia*, Bunge, of Northern China, and of *A. rotundifolia* and *A. carnosula* of the Himalayas; and with them would probably be separated from that genus, on account of the

Utricularia intermedia is now for the first time met with in Japan. It had been found already upon the Okotsk coast, and in Altai, as well as in Europe and the Northern United States, but not west of the Rocky Mountains.

Zuccarini indicates a *Boschniaka*, probably the *B. glabra* of Siberia and North-western America.

Catalpa Kæmpferi is the Japanese analogue of our Southern Alleghanian Catalpa; as is *Tecoma grandiflora* of our common Trumpet-Creeper.

The new *Scrophulariaceæ* are a *Scrophularia* resembling *S. aquatica*, but with flowers of twice the size;* a *Veronica* near *V. Chamædrys*, evidently Thunberg's plant of that

five-parted calyx rotately spreading in fruit, were they not connected with it through *A. Gmelini*, *incisa*, &c. The second, much as it resembles the first in floral structure, differs too widely from *Androsace* in inflorescence and habit to be referred to that genus, and its corolla is not at all constricted or fornicate at the throat. The discoverer dedicates the plant to his companion, Mr. W. Stimpson, the acute and assiduous zoölogist of the Expedition.

Androsace patens (*C. Wright, ined.*): villoso-pubescens; foliis omnibus e radice exili rosulatis rotundatis raro subcordatis grosse crenato-dentatis petiolo subæquilongis scapis diffusis multoties brevioribus; umbellæ pauci–plurifloræ pedicellis elongatis divergentibus; involucri parvi phyllis oblongis linearibusque obtusis; calyce alte 5-partito patente corollam adæquante, laciniis oblongo-ovatis hispidulis, post anthesin accrescentibus et subchartaceis nervosis stellato-patentissimis capsula 5-valvi polysperma paullo longioribus; corolla alba fauce æqualiter leviter constricta, lobis oblongis vix retusis. Ousima; on the grassy summits of mountains. — The specimens are mostly in fruit; a few of the latest flowers show the corolla. Scapes one or two inches long: pedicels in fruit from half an inch to an inch and a half in length. Fructiferous calyx 3 or 4 lines in diameter.

STIMPSONIA, Nov. Gen. C. Wright, ined.

Calyx pentaphyllus, persistens; phyllis linearibus foliaceis, fructiferis leviter accrescentibus patentibus. Corolla hypocraterimorpha, tubo brevi calyce paullo longiore, fauce nuda (pilosula) haud constricta, lobis cuneatis retusis. Antheræ, pistillum, etc. *Androsacis.* Filamenta antheris æquilonga. Capsula globosa, polysperma, 5-valvis (valvis ut in *Androsaci* sepalis oppositis). — Herba annua, exilis, villoso-pubescens, subviscosa; caule bi–tripollicari erecto simplici vel simpliciter ramoso; foliis alternis teneribus rotundatis argute sæpius duplicato-dentatis, infimis breviter petiolatis, superioribus ad bracteas diminutis pedicellos racemi simplicis erectos breves fulcrantibus; corolla alba.

Stimpsonia chamædrioides, C. Wright. — On the sides of mountains, Katonasima. — Habit of *Veronica Chamædrys*, but diminutive, and with alternate leaves.

* Scrophularia alata (sp. nov.): glabra; caule valido pl. m. tetraptero; foliis ovatis acuminatis crenatis basi plerumque subcordatis; petiolis alatis inappendiculatis; thyrso elongato basi foliato; cymis pedunculatis laxe multifloris tenuiter glanduloso-pubescentibus; calycis laciniis orbiculatis margine subscariosis; anthera sterili obovato-rotunda petaloidea flabellato-venosa magna (labio postico corollæ vix breviore); capsula ovato-globosa. Hakodadi; Straits of Sangar.

name,* and a marked variety of *V. longifolia*, near *V. luxurians*, Ledeb., but with the leaves whitish-downy beneath and the racemes panicled. I have not seen Thunberg's *Veronica Virginica* (*V. Leptandra*, *Japonica*, Steud.); but it would seem scarcely different from the Linnæan, Eastern American species. *Pedicularis resupinata*, which extends westward to the eastern borders of Europe, but is not found in Western America, greatly resembles the Eastern American *P. lanceolata*.

Verbenaceæ. Some of the Japanese species of *Callicarpa* are related to *C. Americana* of the Southern Atlantic States; the others are mostly of the Indian type. I suspect that Thunberg's *C. Japonica* is Siebold and Zuccarini's *C. gracilis*, rather than what they take for it.

One plant only of the small Eastern Australian and Polynesian family *Myoporaceæ* occurs in Japan, viz. *Polycœlium bontioides*, and this is a close representative of a Sandwich Island species.

Labiatæ. I have not seen Thunberg's *Teucrium Japonicum;* but the name which he at first applied to it suggests a resemblance to the common Eastern American species. Of the Old-World genus *Ajuga*, there are three species in the collection; one appears to be a more villous variety of Bunge's *A. ciliata* of Northern China, and is probably *A. orientalis*, Thunb.; a second is clearly Thunberg's *A. decumbens*, and perhaps Bentham's *A. remota;* the third is a very small species, apparently new to botanists, which as to floral characters might equally well be referred to *Teucrium*.† At the northern end of Jesso, *Thymus Serpyllum* was met with. It is interesting to see how closely this plant approaches the American continent on both sides (being in Greenland also) without coming into it. At Simoda, and also at the Loo Choo Islands, Bentham's *Calamintha? gracilis*, of Java, is abundant. Technically this would be a *Hedeoma*, as the posterior pair of stamens is abortive in all the flowers examined. *Nepeta Glechoma* has developed into a very large form,‡ of which single specimens would naturally be taken for a distinct species. There is an equally marked variety of *Dracocephalum*

* Veronica Thunbergii (sp. nov.): caulibus e basi prostrato adscendentibus validis bipedalibus crebre æqualiter velutino-tomentosis; foliis sessilibus ovatis subcordatis obtuse serratis subincisis molliter pubescentibus; racemis laxis plerumque oppositis; pedicellis calyce subæquilongis bractea subdimidio brevioribus; capsula plano-compressa orbiculato-obcordata transverse satis latiori glabra margine ciliata. Hakodadi.

† Ajuga pygmæa (sp. nov.): glabella, effuse stolonifera, subacaulis; foliis rosulato-confertis spathulatis sinuatis repandisve basi in petiolum attenuatis flores axillares plerumque superantibus; calycis lobis oblongis obtusis; corollæ cœruleæ tubo longe exserto, labio postico bipartito lobis lateralibus paullo breviore, antico lobo intermedio emarginato-bifido. Simoda?

‡ Nepota Glechoma, var. grandis: foliis sesqui–bipollicaribus sinu sæpius levi; calyce magis campanulato, dentibus tubo dimidio brevioribus; corolla in maximis pollicari, tubo exserto. Hakodadi.

Ruyschiana (including *D. Argunense*).* *Scutellaria Indica* in Japan passes by gradations almost into *S. Japonica*, Morr. & Decaisne (growing in shady places, the anthers also minutely and densely ciliate in both), which very closely resembles the scarce Alleghanian *S. saxatilis;* and a *Stachys* from Hakodadi seems to be only a narrow-leaved form of *S. aspera*, Michx., one of the varieties of *S. palustris*.

Several of Thunberg's species of *Ocymum* still remain to be identified.

Borraginaceæ. In the northern part of Japan, the Expedition found *Lithospermum officinale*, *Mertensia maritima*, and good specimens of the plant which, in the Botany of Perry's Expedition, I mentioned as a doubtful *Omphalodes*. But, much as it resembles *O. verna*, the fruit refers it to *Eritrichium* § *Oreocharis*, DC. The species is dedicated to the excellent discoverer, Dr. Williams.† Also a remarkable *Heliotropium*, the flowers of which are surpassed in size only by *H. convolvulaceum* (*Euploca*, Nutt.) of the United States west of the Mississippi.‡ The plant which I had named *Lithospermum? Japonicum* has not been rediscovered.

The single *Apocynea* is the *Nerium divaricatum* of Thunberg, referred by Zuccarini to the South American genus *Malouetia* (*M. Asiatica*, Sieb. & Zucc.), which he could not have done had he possessed the fruit. The plant is evidently a congener of Miquel's *Parechites Borneana;* but it scarcely differs from the genus *Echites* itself, except in wanting the umbraculiform reflexed membrane below the stigma. This is represented in the present plant by a narrow annular indusium, which closely girds the base of the stigma, and to which the anthers adhere.‖ I have not seen *Amsonia elliptica*, Sieb. & Zucc., — a representative of a peculiarly Eastern North American genus.

* Dracocephalum Ruyschiana, var. Japonicum: caule cum foliorum costa marginibusque revolutis puberulis; bracteis ovatis aristatis villoso-ciliatis calyces hirto-pubescentes æquantibus. Calycis dentes angustiores: corolla ampliata sesquipollicaris, pallide cærulea. Cape Siriki-Saki.

† Eritrichium Guilielmi (sp. nov.): *Omphalodi vernæ* simillimum; racemis elongatis nudis; corolla alba fauce lutea; nucibus arrectis a stylo brevi liberis triquetris puberulis facie exteriori planis late deltoideiovatis acuminatis, margine acuto integerrimo, stipite crasso. Hakodadi.

‡ Heliotropium Japonicum (sp. nov.): nanum, e radice perenni multicaule, sericeo-villosum; foliis ellipticis seu obovato-oblongis sessilibus; cymis brevibus confertifloris, calycis hirsutissimi laciniis erectis lineari-lanceolatis obtusis tubo corollæ hirsuto dimidio brevioribus; limbo corollæ amplo (semipollicari) albo valde plicato, lobis subrotundis; antheris mucronulatis; stigmate conico-agariciformi obtusissimo medio leviter constricto stylo breviore. Hakodadi, on the sandy shore.

‖ Parechites Thunbergii: scandens; foliis lanceolato-oblongis ellipticisve sæpius cum acumine obtuso; laciniis calycis nec carinatis nec ciliatis, singulis glandulis 2 squamæformibus truncatis pectinato-3 – 6-fidis auctis; corolla alba suaveolente, limbo tubo paullo longiore; antheris basi biaristulatis. Simoda, &c.

Of the other Monopetalous orders, the collection affords nothing new, or worthy of special remark.

Phytolaccaceæ. Linnæus, Thunberg, and all subsequent authors, have referred Kæmpfer's *Jamma Gobo* to *Phytolacca octandra*, — misled in this by the figure, in which the inflorescence appears to be spicate. But Kæmpfer states that the flowers are borne upon pedicels of half an inch in length: they are from 3 to 5 lines long in our specimens. And the plant is an undescribed species (unless it prove to be *P. acinosa*, Roxb. of Nepaul), of well-marked characters, intermediate between our own *P. decandra* and *P. dodecandra*, and destructive of Moquin-Tandon's genus *Pircunia*.* J. Small collected specimens on the west coast of Jesso.

No *Aristolochiaceæ* were collected in this expedition. I have never seen the plant which Thunberg took for *Asarum Virginicum* (*Heterotropa asaroides*, Morr. & Decaisne); but I have long ago indicated its close relationship to the Alleghanian *A. Virginicum*, Linn., and *A. arifolium*. No similar species are found in any other parts of the world. Thunberg has also an *A. Canadense*, — whether really the Eastern American species, or the Western *A. Hookeri*, or an allied species, remains to be determined.

Of *Polygonaceæ*, I need here only mention *P. Sieboldii*, very near our *P. sagittatum*; *P. perfoliatum* and *P. Thunbergii*, representing our *P. arifolium*; *P. multiflorum*, Sieb. & Zucc., which may be our *P. scandens*, or *P. pterocarpum* or *P. dumetorum* of Asia and Europe, &c. All the American analogues here mentioned are wanting on the western side of our continent. The opposite is the case with the subalpine *P. Bistorta*, which occurs in Oregon and the Rocky Mountains, but is wanting farther east.

Thymelæaceæ. The two species of *Stellera* or *Wikstromia*, and the two known species of *Daphne*, were not collected. But there are fruiting specimens of a new *Daphne*, at present clearly distinguishable from the European and Siberian *D. Mezereum* only by the inflorescence; thus suggesting the name which I have applied to it.†

Of *Elæagnaceæ* we have Thunberg's *Elæagnus umbellata*, with indications that it may comprise his *E. multiflora* and *E. pungens*, and certainly Royle's *E. parvifolia*; his *E. macrophylla* (perhaps his *E. glabra* likewise), which, with a new character, will be well

* Phytolacca Kæmpferi (sp. nov.): caule sulcato; foliis ovalibus ovatisve undulatis; racemis erectis breviter pedunculatis confertifloris folio brevioribus; pedicellis floribus albis subduplo longioribus; staminibus stylisque 8; carpellis axi leviter coadunatis toro brevi cylindraceo impositis, maturis tenuiter baccatis.

† Daphne Pseudo-Mezereum (sp. nov.): foliis sparsis lanceolato-oblongis seu lato-lanceolatis plerumque obtusis basi in petiolum attenuatis subtus pallidis tenuiter venosis deciduis; floribus plerumque ramulos laterales brevissimos terminantibus vel e basi ramorum hornotinorum ortis brevissime pedicellatis; seminibus exalbuminosis. Simoda.

distinguished from *E. latifolia;* and incomplete specimens of a new species, distinguished by its elongated and upwardly thickened peduncles.*

In *Laurineæ* several Japanese species of *Benzoin* are analogous to ours and to the *Sassafras* of Eastern America, as is *Machilus* to our *Persea;* while *Tetranthera Japonica* has a general analogue on each side of the American continent.

Houttuynia cordata, Thunb., is represented in the southwestern part of North America by Nuttall's *Anemiopsis;* as is *Saururus Loureiri* by our eastern *S. cernuus*, from which it differs only by its short filaments and distinctly pedicelled flowers.

The *Chloranthaceæ* of Japan, &c. have no North American representatives. *Chloranthus serratus* was collected in this expedition. *Sarcandra* of Gardner and Wight rests on a character (the total suppression of the lateral anthers) which Brown had long ago indicated as inconstant. *S. chloranthoides* of Gardner is probably *Chloranthus brachystachys* of Blume, and perhaps Brown's *C. monander*. My *Tricercandra* (which may be Thunberg's *Bladhia glabra*, known only in fruit) was rediscovered in abundant and more fully developed specimens. In a single instance, the vestige of an anther was detected upon the middle filament. A second species, from the north of China (communicated by Dr. Hooker), confirms the genus, while showing that it rests, not upon the order of the suppression of the anthers, but upon the remarkable form of the stamens. These are deciduous, as in *Chloranthus*. The style affords a subsidiary character. I append the diagnoses of the two species.†

Euphorbiaceæ. Siebold and Zuccarini's *Pachysandra terminalis* (sparingly gathered on the mountains northeast of Hakodadi) is a very close (and the only) congener of our *P. procumbens*, which is restricted to a narrow district between the Alleghanies and the Mississippi. *Goughia Nilgherriensis*, Wight, is new to the Japan Flora, &c., but was already known at Hong Kong. The rest of the *Euphorbiaceæ* are also mostly of Indian or Oceanic types, except two *Euphorbiæ*, viz. the *E. palustris* of Europe,

* Elæagnus longipes (sp. nov.): arborescens, inermis; ramulis angulatis ferrugineo-lepidotis; foliis membranaceis ovali-oblongis cum acumine obtuso basi acutis supra glabris (junioribus lepidibus parvis parcis caducis conspersis) subtus cinereo-argenteis; pedunculis solitariis clavato-filiformibus (1½-pollicaribus) flore multoties longioribus; perigonio cum pedunculo nunc articulato, tubo fusiformi sub limbo cylindraceo lobis ovatis dimidio longiori attenuato-constricto. Simoda.

† Tricercandra quadrifolia (Gray in Perry, Jap. Exped. 2. p. 318): foliis ovalibus semper 4 ad apicem caulis nudi quasi verticillatis; stamine intermedio ananthero. Hakodadi.

Tricercandra Fortuni (sp. nov.): foliis oblongis 6 subdistantibus (i. e. internodiis duplo longioribus); stamine intermedio anthera biloculari, lateralibus antheris unilocularibus instructis; stylo magis producto. N. China, *Fortune*.

and a new species, related to *E. Esula* of the Old World, and to the unpublished *E. leptocera*, Engelm., of California.*

There are no novelties among the *Urticaceæ*. *Laportea bulbifera*, Sieb. & Zucc., I may remark, has the pedicels of the *female* flowers articulated as distinctly as those of the other sex. This and *L. terminalis* (also Himalayan) closely represent our *L. Canadensis*, while the genus is absent from Western America; as also is *Pilea*, though represented by related species in Eastern America and Japan.

The common Hop is indigenous all round the northern temperate zone, and there is a second species in Japan and the vicinity.

Celtis, Elms, *Maclura*, and Mulberry-trees are all absent from Western North America, but all represented in Japan and in Eastern North America, and by nearly related species. *Ulmus parvifolia* much resembles *U. crassifolia*, Nutt., of Louisiana and Texas.

Juglandeæ are not indigenous either to Europe or to Western America. But Siebold and Zuccarini mention a Japanese *Juglans*, — probably the one which Thunberg referred to the American Black Walnut; likewise a *Platycarya*, and two species of the Caucasian genus *Pterocarya*. The latter would appear from Mr. Wright's specimens to be mere forms of one species.

Cupuliferæ. Most of the numerous Japanese Oaks are of Asiatic types. There is one, somewhat intermediate in foliage between *Quercus Ilex* and *Q. coccifera*, which seems to be new.†

Castanea Japonica, Blume, looks different from the common Chestnut, but exhibits no decisive characters. The smoother forms are more like the European than the American *C. vesca;* the canescent ones resemble our *C. pumila*. Both American Chestnuts are strictly confined to the Atlantic side of the continent; and *C. vesca* ap-

* Euphorbia Guilielmi (sp. nov.): glaberrima; caule 1–2-pedali e rhizomate repente; umbella 5–6-fida, radiis dichotomis; foliis sessilibus subtus glaucescentibus integerrimis obtusis vel retusis, caulinis sparsis oblongis seu spathulato-oblongis basi attenuatis, involucralibus conformibus sed paullo majoribus basi obtusioribus, involucellis imis triangulari-oblongis, ultimis acutis, omnibus longioribus quam latioribus; glandulis lunatis longe et subparallele bicornibus; capsula seminibusque glaberrimis. Yokuhama, *Williams & Morrow*. Simoda, Hakodadi.

† Quercus phillyræoides (sp. nov.): ramulis novellis (cum petiolis 2–3 lin. longis) gilvo-tomentellis; foliis coriaceis perennantibus ellipticis oblongisve rarius sub-obovatis obtusiusculis (1–2-pollic.) basi rotundatis ultra medium subserratis glabris, novellis subtus vel costa utrinque furfuraceo-tomentulosis, venis divergentibus inconspicuis; amentis masculis filiformibus laxis; floribus 4–5-andris; cupula crateriformi albido-tomentosa (squamis brevissimis arcte appressis) glande multo breviore. Simoda, *Williams & Morrow* (in flower). Tanegasima.

pears to be absent from Central Asia. But *C. chrysophylla* of Oregon and California, like one or two Californian Oaks, seems to be Asiatic in type.

The Japanese Beech (collected by Wright at Hakodadi) appears to belong to the European species, which, however, does not penetrate far into Asia. The genus is absent from Western North America, while *F. ferruginea*, very near the European species, abounds in the cooler parts of the Atlantic side of the continent. *Carpinus* is also wanting on the western side of America, but is represented by one species on the eastern, and by four in Japan. It is otherwise with the Hazels. *Corylus heterophylla* in Japan is a close representative of *C. Americana*, as *C. Sieboldiana* probably is of *C. rostrata*. Both American species range from the Atlantic to the Pacific, and both have analogues in Europe.

Sufficient materials are wanting for the comparison of the Japanese Birches with those of Eastern America, and with a species of Oregon. If I mistake not, *Betula carpinifolia*, Sieb. & Zucc., is identical with *Alnus* (*Alnaster*) *firma*, Sieb. & Zucc., and belongs to the latter genus. There are only two flowers to each scale, forming oval achenia, with pellucid wings of variable breadth; the scales are persistent, at length reflexed or widely spreading. *A. viridis* was detected in the northern part of Japan, as might have been expected.

Of Pines, only *P. Massoniana* and *P. densiflora* were collected, both of the *P. sylvestris* type. *P. parviflora* and *P. Koræensis* must be nearly related to *P. cembroides* of the Californian and Rocky Mountains, as well as to *P. Cembra* of the Old World. The Larch of Japan is more like the Siberian, European, and Oregon species than the eastern *Larix Americana*. *Abies Tsuga* of Japan is very like *A. Brunoniana* of the Himalayas on the one hand, and our Hemlock-Spruce, of both sides of the American continent, on the other. The remaining species have only a general resemblance to *A. Menziesii* of Oregon, and to our Black and White Spruces. *Glyptostrobus* (native only of China?) answers to our *Taxodium*. *Chamæcyparis pisifera*, Sieb. & Zucc., with one if not two other Japan species, is represented by *C. Nutkaënsis* in Western, and (less intimately) by *C. thyoides* in Eastern North America. But our *Thuja occidentalis* is much more like the Western American than the Japanese species; — all extra-European types. *Juniperus rigida*, however, is near to *J. communis*, which ranges round the world; and *J. Chinensis* is very near *J. occidentalis* of Oregon, *J. Virginiana* of the whole eastern part of America, and *J. Sabina* of the Old World. The Yews of Japan, Central Asia, Europe, Eastern North America, and Oregon, are similarly allied, — perhaps all derivative forms of one species. *Cephalotaxus*, Sieb. & Zucc., is peculiar to Japan, unless there is a Himalayan species.

Finally, *Torreya nucifera* of Japan, *T. Californica*, Torr., of the mountains of California, and *T. taxifolia*, Arn., of Florida, — the only species known, — appear to be so much alike, that, if they all belonged to one region, it is most probable they would never have been distinguished.

Aroideæ. The genus *Arisæma* is mainly divided between the Himalayo-Javan and Japanese region, and Eastern America, being unknown on the western side of either continent. We have three species in the United States east of the Mississippi; six are recorded from Japan, of which four are in the present collection, including what I take for Blume's *A. latisectum* (founded on the foliage only). But this is related to *A. Japonicum* rather than to *A. Thunbergii;* indeed, it might be regarded as a slender variety of the former species, with a green spathe and a long peduncle, except for the sterile appendage of the spadix, which is narrower and cylindrical, scarcely if at all thickened upwards.

In fresh-water marshes at Hakodadi, Mr. Wright gathered more advanced and complete specimens of an Aroideous plant, which had also been detected by Drs. Williams and Morrow, but was omitted in the published account of that collection. I may now state that the plant is an evident congener of *Dracontium Camtschatcense*, Linn. (the *Symplocarpus Kamtschaticus* of Bongard), which occurs on the northwest coast of America; indeed, it appears to differ only in having no spathe, unless the slender sheath of the scape, like that of *Orontium*, without any lamina, be so called. These plants do not belong to *Symplocarpus* (although they represent that genus and *Orontium* likewise — both strictly Eastern American genera), but constitute a well-marked new genus, between these two, and approaching *Dracontium* in the generally bilocular ovary. From our Skunk-Cabbage the new genus is distinguished by the elongated scape, the membranaceous spatha or sheath, the spiciform spadix, the membranaceous perianth, the horizontal orthotropous ovules, and probably by the nature of the fruit, which I have not seen mature.* I lay little stress upon the bilocular ovary, because one of the cells is occasionally abortive or wanting in the Japanese

* ARCTIODRACON, Nov. Gen.

Spadix nudus, scapum terminans, cylindricus. Flores hermaphroditi. Perigonium tetraphyllum, basi ovarii adnatum, phyllis obovatis membranaceis subconcavis. Stamina 4: filamenta plana: antheræ extrorsæ, biloculares, loculis ovalibus rima longitudinali ex apice fere ad basim dehiscentibus. Ovarium biloculare, rarius abortu uniloculare: stylus conicus, stigmate depresso simplici terminatus. Ovula in loculis solitaria, dissepimento paullo supra basim inserta, horizontalia, orthotropa. Pericarpia carnosa, 1 – 2-sperma, in receptaculum commune spongiosum coalescentia, stylo crasso-conico acuto apiculata. Semina haud visa. — Herbæ paludosæ, boreali-Pacificæ, acaules; foliis magnis *Symplocarpi* cum scapo elongato coëtaneis e rhizomate crasso

plant, and because the ovary of *Symplocarpus* itself not rarely exhibits vestiges of a second cell.*

Nothing noteworthy occurs until we reach the *Orchidaceæ*. The species of this order were generally supposed to have a narrow geographical range, but some striking exceptions to this rule have recently been made known, such as the discovery of our *Tipularia discolor*, or of a species very like it, in the Sikkim Himalayas. The present expedition has detected in Japan two Orchids, which were until now supposed to be peculiar to North America east of the Mississippi, viz. *Liparis liliifolia*, and *Pogonia ophioglossoides*. The latter was gathered both at Simoda, in the southern part of Nippon, and at Hakodadi in the island of Jesso. In the United States, this species is commonly, if not always, accompanied by *Calopogon pulchellus*. In place of this, among the specimens gathered at Hakodadi, were mingled those of a new *Arethusa*,† — another genus equally peculiar to Eastern North America, where the beautiful *A. bulbosa* (the only species known before) also grows in the same bogs with *Calopogon* and *Pogonia ophioglossoides*, but flowers a month earlier.

The Japanese flora furnishes at least one instance of a species of this order which has apparently extended in the opposite direction, although with a continuous range, namely, *Orchis aristata* of Fischer, which is regarded as a mere form of the European

horizontali ortis; spatha aut vagina radicali membranacea e spadice remota, limbo aut nullo, aut membranaceo colorato basi convoluto.

Arctiodracon Japonicum (sp. nov.): foliis ovalibus oblongisve; spatha nulla nisi vagina tenui basim scapi cingente. Hakodadi.

Arctiodracon Camtschaticum: spatha vaginante superne in limbum lanceolatum seu ellipticum acuminatum coloratum explanata. Dracontium, *Linn.* Symplocarpus, *Bongard, Hook.* Kamtschatka, Okotsk? Sitcha, N. Oregon.

* The ovule of *Symplocarpus* is rightly described by Dr. Torrey (in Flora of New York) as anatropous. It was by a mere oversight that it continued to be described as anatropous in the second edition of my Manual of the Botany of the Northern United States; for I had long ago ascertained the contrary.

As respects *Orontium*, Endlicher's description (drawn from Hooker's figures) of the ovule as "basilare, transversum, excentrice amphitropum," which has been implicitly adopted ever since, is correct in only one and the least important particular. For the ovule is anatropous and attached to the side of the cell. Also, the stigma is not minute, and the anther is essentially like that of *Arctiodracon*, only the cells are shorter, and opening only half-way down, so that the dehiscence seems to be transverse.

It is evident that there are no grounds for separating *Orontium* from the *Dracontieæ*, as Schott and Endlicher have done.

† Arethusa Japonica (sp. nov.): caule basi unifoliato; flore subnutante, nunc altero erecto; labello amplissimo obovato-dilatato apice subtrilobo nudo, lobo medio angustiore breviter producto integerrimo superne lamella parva instructo; gynostemio anguste alato, ala superne antheram cassidiformem haud superante. Hakodadi.

O. latifolia. It was long since discovered on the northwest coast of America, and has lately been detected in the northern part of Japan.

The fact perhaps is, that species of *Orchidaceæ* are not so much restricted in range as fastidious in their requirements, establishing themselves only where all the conditions of their well-being are very exactly fulfilled. Excepting those which grow in bogs, and only a part of these, the Orchideous plants of the United States are generally sparser or rarer in individuals than those of other families, or abound only in certain favored localities. From my own experience, I should judge that very few botanists have ever met with a dozen living individuals, in any one year, of *Liparis liliifolia*, *Tipularia discolor*, *Calypso borealis*, *Microstylis monophyllos*, or even of *Cypripedium arietinum*, or *Platanthera orbiculata*, &c. And if any of our species have once ranged continuously across this continent and beyond, we can readily conceive that the present differences in the character of the climate of the two sides would surely tend to obliterate them from the one or the other, while those adapted to survive in the Eastern United States would equally flourish in the similar climate of Japan.

Our *Aplectrum hyemale*, Nutt., of the Atlantic United States, also has its analogue in Japan, in the form of an interesting new species of Dr. Lindley's recent genus *Oreorchis*. Such poor flowers as I possess of *Aplectrum* certainly show no caudicle and gland to the pollen-masses, which are obliquely collateral; but in other characters, as in habit, *Oreorchis* and *Aplectrum* are much alike. Dr. Lindley has compared the Japan plant with the two Himalayan species, and with the very rare *O. patens* of Siberia (the particular habitat of which is apparently unknown), and has kindly indicated to me the characters which distinguish it from the latter.*

The detection of *Platanthera tipuloides* at the northern extremity of Japan gives occasion for some emendation of the specific character. Only the lower bracts exceed, or even equal, the "greenish-purple" flowers; the fleshy petals are rather oblong-linear than ovate, and the labellum, of similar texture, is still narrower. Thunberg's *Orchis Japonica* is not a *Platanthera*, but a *Habenaria*.† His *Serapias falcata* is, as I suppose,

* Oreorchis lancifolia (sp. nov.): folio late lanceolato; vaginis scapi oblique truncatis appressis; racemo multifloro laxo; labelli unguiculati lobo intermedio apice crispo basi cuneato, lamellis 2 contiguis linearibus quam lobis lateralibus paullo brevioribus. Hakodadi.

† Habenaria Japonica: caule folioso $\frac{2}{3}$ – 2-pedali; foliis inferioribus ovalibus oblongisve obtusis, superioribus bracteisque sensim angustioribus lanceolatis acutis; spica elongato-oblonga multiflora; ovario sessili apice angustato; floribus albis; sepalis lato-ovatis subconformibus; petalis oblongo-linearibus uninerviis; labello angustissime lineari crasso-carnoso integerrimo demum elongato filiformi dependente calcare gracili vix clavato apice acuto 2 – 3-plo breviore; retinaculo amplo lineari-oblongo squamæformi. Hakodadi.

only the *Cephalanthera ensifolia*, to which Dr. Lindley has already referred all the Indian *Cephalantheræ*. We have, in the collection from Hakodadi, specimens quite like a depauperate form of the European *C. ensifolia*, and from Simoda a large variety (as I must needs regard it) with all the lower flowers even more leafy-bracted than in Wight's figure of *C. acuminata*, the like of which Dr. Lindley had never seen. The labellum, likewise, is rather more saccate at the base, and the epichilium smoother. Still, the few specimens gathered exhibit such transitions towards the ordinary form, that I cannot hesitate to unite them. Very different from this, and a very well-marked species, is my *C. Japonica*, to which I had formerly adduced Thunberg's *Serapias falcata*, with some doubt. I should now refer to it Thunberg's *Serapias erecta ;* yet the flowers of that plant are said to be white, and, as represented, are much smaller than those of *C. Japonica.**

My *Epipactis Thunbergii* (*Serapias longifolia*, Thunb.) has not been again collected. It resembles more than any others *E. veratrifolia* of the Himalayas, and *E. Americana*, which ranges from Oregon to Texas and Mexico, and is the sole representative of this European and North Asian genus in the New World.

Finally, there are one or two specimens of a *Cremastra*, with unopened flower-buds, which I had supposed to be Blume's *Hyacinthorchis variabilis ;* but, not to speak of the lancet-shaped process on the lip, (since the roundish, shrivelled process represented in Blume's figure may not be normal,) the column is more slender, almost filiform, and at the summit abruptly dilated into a very remarkable, semi-umbraculiform, stigmatiferous body, into the hollow of which, in the bud, the process of the lip is deeply inserted.†

* Cephalanthera Japonica (Gray in Perry, Jap. Exped. 2. p. 319, excl. syn. Thunb.): foliis amplexicaulibus ovato-oblongis subacuminatis, summis lanceolatis; bracteis brevissimis; floribus 2–7 luteis subpedicellatis; labello sepalis petalisque ovalibus obtusissimis breviore, hypochilio sacco conico porrecto quasi calcarato, epichilio latissimo (bis latiore quam longo) repando-subtrilobo imberbi plurilamellato, lamellis centralibus 3–5 eximiis; anthera super stigma sessili. Serapias erecta, *Thunb. Fl. & Ic. Pl. Jap. t.* 4. Simoda.

† Cremastra mitrata (sp. nov.): folio oblongo; vaginis scapi 2 spathaceis laxis; bracteis lanceolatis subacutis; gynostemio fere filiformi sub stigmate in corporem hinc planum deltoideo-rotundum, versus labellum cavum mitræforme vel umbraculiforme, appendicem labelli oblongam acutatam planam in alabastro claudentem, abrupte dilatato. Hakodadi.

In the Bonin Islands, Mr. Wright gathered a *Luisia* (*L. brachycarpa*, C. Wright), certainly different from the Oceanic species, and probably no less so from *L. teres*, on account of its short-oval fruit; but the blossoms are still unknown. On one of the islands between Japan and the Loo Choo Islands was gathered a new, small-flowered *Aceras*, near the Himalayan *A. angustifolia*, viz.:—

Aceras longicruris (C. Wright, sp. nov.): spica densiflora; petalis angusto-linearibus obtusis; labello deflexo sepalis plus duplo longiori paullo ultra medium fisso cum lacinula intermedia brevi; cæt. *A. angustifoliæ*. Katonasima.

Iridaceæ are represented in the collection by *Iris setosa*, Pall., *I. lævigata*, Fisch. (probably Thunberg's *I. versicolor*), *I. orientalis*, Thunb.? and a low species which appears to be new.*

Passing to the variously connected tribes which are probably to constitute one great order, *Liliaceæ*, I notice a well-marked new species of *Smilax*,† — probably Thunberg's *S. Pseudo-China*, but not that of Loureiro. It should be compared with *S. Sieboldii* of Hasskarl, which is enumerated as from Japan, but not described in any work known to me. The species which I had named *S. Japonica* in Perry's Expedition is evidently the Linnæan *S. China*, and perhaps Kunth's *Coprosmanthus Japonicus* also. I find, indeed, only single ovules in each of the three cells; but Kæmpfer states that the seeds are four, five, or six, and figures the latter number. I have seen nothing answering to Kunth's *Heterosmilax Japonica*, nor to his *Coprosmanthus consanguineus*; the latter may perhaps be one of the forms of the Eastern North American *S.* (*Coprosmanthus*) *herbacea*. *Smilax* had appeared to be absent from the western portion of the United States, although so abundant in the eastern; but Hartweg found a species, allied to *S. rotundifolia*, in California.

Paris is a strictly Old-World genus, and our *Medeola* is its analogue in Eastern North America. From Hakodadi and the vicinity, the expedition obtained Chamisso's rare *P. hexaphylla*, with seven or eight leaves, — resembling those of *Medeola Virginica*, the larger ones five inches long, and the cusp of the stamens considerably shorter than the anther: also a new species, closely resembling the European and Siberian *P. quadrifolia*, but apetalous, with rather broader leaves, and with muticous anthers! The specific name chosen for it is intended to suggest the resemblance.‡ The Japanese

* Iris gracilipes (sp. nov.): caulibus e rhizomate gracili repente pluribus (spithamæis et ultra) gracilibus 3–4-foliatis folia radicalia lineari graminea subæquantibus; pedunculis filiformibus folia caulina eos fulcrantia æquantibus; flore intra spatham scariosam monophyllam sessili solitario; perigonii cærulei tubo ovario brevi trigono triplo longiore, laciniis obcordato-oblongis, exterioribus lamella tenui glabra cristatis quam interioribus breviter unguiculatis duplo majoribus; stigmatibus bifidis laciniatis. Hakodadi.

† Smilax stenopetala (sp. nov.): inermis, glabra; caule tereti scandente; foliis amplis late ovalibus seu ovatis vix subcordatis ex apice obtusissimo vel retuso acuminulatis, concoloribus submarginatis triplinerviis cum nervis 2–4 lateralibus inconspicuis reticulatis; pedunculis brevibus sæpius compositis; umbellis multifloris; perigonii rubelli phyllis 3 interioribus (petalis) ligulatis sursum attenuatis carinato-uninerviis post anthesin revolutis exteriora oblonga (sepala) et filamenta filiformia ad æquantibus; ovarii loculis (sæpius 3) uniovulatis; baccis purpureis. Kagosima Bay, Kiu-siu; Hakodadi.

‡ Paris tetraphylla (sp. nov.): foliis quaternis sessilibus rhomboideo-ovatis acuminatis; flore tetrasepalo apetalo octandro; antheris prorsus muticis sepalis ovato-lanceolatis stylisque 4 basi modice connatis dimidio brevioribus. Hakodadi, &c.

Trillium now occurs in a more advanced state: I still regard it as a mere variety of the Alleghanian and Canadian *T. erectum*, from which it differs only in its generally more dilated leaves (the largest 6 or 7 inches broad), and proportionally shorter peduncle.* The relations of our Eastern American species with those of the western side of the continent should be scrutinized anew. Our *T. cernuum*, towards its northwestern limit in British America, appears to elevate and lengthen its peduncle until it is hard to distinguish, in dried specimens, from the white variety of *T. erectum*. And this latter species is apparently reproduced in Oregon and California (both with white and with purple petals) as *T. ovatum*, Pursh, which in Northern Oregon and in Kamtschatka becomes Pursh's *T. obovatum*, which again is probably a northern form of *T. grandiflorum*. *T. sessile* reappears in California, under the same variety of forms as in the Alleghany region; and the characters of *T. recurvatum*, Beck, of Illinois and Missouri, are carried to an extreme in Pursh's *T. petiolatum*, of the interior of Oregon.

Lindley's *Asparagus lucidus* (*A. falcatus* of Thunberg, but hardly of Linnæus) was gathered at Simoda; and from Hakodadi there is an undescribed species, unless it be Kunth's *A. schoberioides* of Java.†

There would seem to be a mixture of European and of Eastern American species of *Polygonatum* in Japan. Of the former there is *P. vulgare* (one form of which I suppose is *P. Japonicum*, Morr. & Decaisne); of the latter, a plant which I cannot distinguish from the American *P. giganteum*. Both were found at Hakodadi; and in the same neighborhood, as also at Simoda, were gathered the true European *P. multiflorum* (the filaments villous with long, many-jointed hairs), and some forms which apparently connect the Caucasian *P. polyanthemum* and the Eastern American *P. biflorum* with the same species. To this probably belong Kunth's *P. Thunbergii*, and what I formerly took for *P. Japonicum*. There were also gathered at Simoda two specimens, which may possibly be a peculiar form of *P. multiflorum;* but their long and narrow falcate leaves (4 to 7 inches long, and very gradually tapering from near

* Trillium erectum, Linn.; var. Japonicum: pedunculo foliis amplissimis dimidio breviore; petalis albidis vel purpureis. T. erectum, var. album, *Gray in Perry, Exped.* 2. *p.* 320. Hakodadi.

† Asparagus Wrightii (sp. nov.): herbaceus, erectus e rhizomate crasso horizontali, glaberrimus; ramis adscendentibus ramulisque striato-angulatis; foliis squamæformibus scariosis, caulinis basi subcalcaratis inermibus; cladodiis setaceis acutissimis ut videtur compressis subfalcatis (5 – 10 lin. longis) binis ternis quinisve; floribus masculis cum pedicello brevissimo articulatis; antheris cordato-didymis haud apicatis filamentis linearibus 2 – 3-plo brevioribus. Hakodadi.

the rounded or obtuse base) are peculiar.* Like so many other amphigæan genera, *Polygonatum* is wanting in Western America. So also is *Convallaria majalis*, which, ranging through the whole breadth of the Old World, from Western Europe to Japan, is found in the New World only in the higher Alleghany Mountains south of Pennsylvania (the most northern known station is about lat. 37°), although the climate of all the northern part of our country seems well adapted to the species, since it flourishes and multiplies in gardens and grounds without the least care.

On the other hand, *Smilacina* (*Majanthemum*) *bifolia* extends around the world, but under three pretty well marked geographical varieties; — the European, which extends to Eastern Siberia; the var. *Kamtschatica*, which replaces the former on the Pacific Siberian coast, in Japan, and in North America west of the Rocky Mountains; and the var. *Canadensis*, throughout all the northern part of this country east of the Mississippi and the Rocky Mountains. But it is curious to notice that *Smilacina stellata*, which extends across the whole breadth of the American continent, and even occurs in Norway, is absent from Asia, unless *S. Dahurica* be identical with it; while *S. trifolia*, here confined to the northeastern part of America, and unknown in Europe, also inhabits Siberia, and probably Japan also, as it has been detected on the shores of the Okotsk Sea. And *S. racemosa*, which ranges across the whole breadth of North America, is replaced in Japan by *S. Japonica*, Gray, the characters of which are confirmed by additional specimens. The Himalayan species upon which Kunth founded his genera *Iocaste* and *Medora* appear to be strict congeners of *S. racemosa* and *S. Japonica*.

Another American type, repeated in Japan and Northeastern Asia, is *Clintonia*, Raf. Fruiting specimens gathered in the northern part of Japan doubtless belong to *C. Udensis*, Trautv. & Meyer, from the adjacent Okotsk region. This species and *C. Andrewsiana*, Torr., of California, are somewhat intermediate between the two Eastern American species, of which the northern one, *C. borealis*, is replaced by *C. uniflora* west of the Rocky Mountains. The Himalayan *C. alpina* I have not seen.

Good specimens were obtained of *Disporum sessile*, which varies considerably in foliage, but appears to keep distinct from *D. pullum* and from the Himalayan *D. Pitsutum*; also, of my *D. smilacinum*, the character of which now needs some emendation, especially as to the ovules. These, in the present specimens, are two in each cell, as

* Polygonatum falcatum (sp. nov.): glabrum; caule tereti 1 – 2½-pedali; foliis alternis elongato-lanceolatis sensim a basi ad apicem angustatis falcatis breviter petiolatis, nervis validioribus 3; pedunculis brevibus 2 – 6-floris; floribus flavidis; filamentis subclavatis glanduloso-scabris. Simoda.

in the genus. The anther is extrorse in its attachment, but the line of dehiscence slightly introrse. This is the case, in a more decided manner, in *Medeola*. It becomes abundantly evident that the insertion of the anthers, and the partial or complete separation of the styles, are too artificial and (through gradations) too indefinite characters for warranting the ordinal separation of the *Uvularieæ* from the *Convallarieæ*. It would appear that the order *Liliaceæ* must be opened, according to Mr. Bentham's indications, to receive not only these plants, but the *Trilliaceæ*, *Melanthaceæ*, &c., and I suspect even *Smilaceæ* itself, notwithstanding its orthotropous ovules.*

Streptopus amplexifolius, DC., was gathered at Cape Soya. This is a truly northern plant in the New World, extending from Hudson's Bay, Newfoundland, and New England to our northwestern coast and islands; thence to Kamtschatka and Japan. It has not been detected elsewhere in Asia, nor is it known in Europe north of Saxony and Silesia, whence it ranges southward to the Pyrenees, the mountains of Calabria, and those of Hungary. So its geographical position in Europe is analogous to that of the Lily of the Valley in the United States of America. Our *Streptopus roseus*, Michx. doubtless inhabits the northern part of Japan, since it occurs in the Aleutian Islands on the one side, and in the Okotsk district on the other, where it is clearly Ledebour's *Smilacina streptopoides!*

Although *Lilium maculatum* of Thunberg, which I have not seen, would appear to represent our *L. Canadense* and its near allies, yet most of the Japanese species are of European or Himalayan types. A Lily which was abundantly met with on the coast of Jesso may be equally well referred to *L. spectabile*, Link., or to the Linnæan *L. bulbiferum*, of which the former is apparently a mere variety. A single specimen, and that with an unopened flower-bud only, was collected of a Lily, so well marked in character that it may be named and described, even from such incomplete materials.† Drs. Williams and Morrow gathered, at Simoda, a specimen of *Gagea triflora*, R. & S., hitherto collected only by Tilesius, — the habitat unknown to Ledebour, probably on the eastern coast of Siberia, or in Kamtschatka. The plant connects *Loydia* with *Gagea:* flowers apparently white, destitute of folds or pits at the base of the segments, and with only about six ovules in each cell.

* Ledebour and some other botanists have adopted Endlicher's error in considering the ovules of most *Convallarineæ* to be orthotropous.

† Lilium? medeoloides (sp. nov.): glabrum; bulbo granulato; caule simplicissimo longe nudo ad apicem folia plura (pseudo-)verticillata gerente et pedunculo superne bracteato unifloro terminato; perigonii in alabastro parvi phyllis oblongis dorso carinatis nudis apice calloso intus barbulatis. Genitalia omnino *Lilii*. Hakodadi.

Allium Schœnoprasum abounds in the north of Japan, as might be expected. *A. Thunbergii* is the Japanese analogue of *A. Canadense;* as is *A. Victorialis* (from the northern part of Japan, and Kamtschatka, ranging thence to Eastern Europe) of the Eastern American *A. tricoccum.*

Fluggea Japonica of Richard, which probably includes more than one of Kunth's species, abounds on the shores of Kiu-siu, &c. None of the other *Ophiopogoneæ*, or of the *Aspidistreæ* of Japan, were met with. I have not seen *Roxburghia Japonica* of Blume; perhaps it is not indigenous to Japan.

I now come to a very interesting plant, of which two or three specimens were gathered on Cape Romanzoff, in fruit only, but with all the parts of the flower so far persistent that the whole structure has been made out, and secured by drawings. It may be briefly described as a *Helonias* with few flowers, a single and slender style surmounted by a depressed-capitate stigma, and the seeds appendaged only at the hilum.* Two things are noteworthy respecting this plant: — 1. Its conformity to the rule, if it may be so called, that peculiar Eastern North American types have their counterparts in Japan. For the original and only true *Helonias* — one of the rarest plants in the United States — is found only in a few localities in New Jersey, the adjacent parts of Pennsylvania and Delaware, and in Virginia. 2. Its single style, with even the stigmas united into one, annihilates one of the two diagnostic characters of the order *Melanthaceæ.* There is reason for supposing that the common *Chamælirium luteum* (*Veratrum luteum*, Linn., *Helonias dioica*, Pursh.), of the Atlantic United States, likewise has a Japanese counterpart in the *Melanthium luteum* of Thunberg, or *Helonias? Japonica*, R. & S.; but this plant has not been rediscovered.

Veratrum nigrum, exactly the European and Siberian plant, was also collected. Our

* HELONIOPSIS, Nov. Gen.

Flores hermaphroditi. Perigonium sexphyllum, fere herbaceum, phyllis lineari-spathulatis persistentibus. Stamina 6, imæ basi perigonii phyllorum inserta, eadem subsuperantia: filamenta filiformia, persistentia: antheræ oblongo-sagittatæ, sinu profundo affixæ, extrorsæ, biloculares, longitudinaliter dehiscentes. Stylus filiformis, e sinu ovarii profundo longe exsertus: stigma peltato-capitatum, integerrimum. Capsula chartacea, usque ad medium obcordato-triloba vel biloba, lobis divergentibus, trilocularis, loculicida. Semina in placenta brevi axili plurima, anatropa, globoso-ovalia; testa subcrustacea conformi, pelliculo reticulato tenui arcte obvoluta, apice nuda, ad hilum in carunculam fungosam semine vix angustiorem producta. Embryo in basi albuminis carnosi subinclusus, eodem plus dimidio brevior, cylindraceus, super radiculam brevissimam quasi truncatam leviter constrictus. — Herba paludosa, facie omnino *Heloniadis bullatæ*, foliis tamen brevioribus, floribus in racemo paucis majoribus.

HELONIOPSIS PAUCIFLORA. Cape Romanzoff, northwestern extremity of Jesso.

American *V. viride* (reproduced in Oregon as *V. Eschscholtzii*) is probably in Japan also, since Middendorff gathered it on the Okotsk coast.

Lambert's *Aletris Japonica* was met with by Mr. Wright only upon Katonasima and the Loo Choo Islands; it is a close congener of our two species of the Atlantic United States, but has more grass-like leaves, and pinkish flowers.

Juncaceæ. The *Luzulæ* of Japan, and *Juncus effusus*, are species found all round the northern hemisphere. *Juncus xiphioides* belongs to Japan and the western coast of North America.

In passing, we may note the absence from Japan of *Xyris*, and especially of *Eriocaulon*, — two types (otherwise mostly tropical) which have wandered northward only along our Atlantic coast, even to Canada, and in some unusual way (probably by the Gulf Stream) contributed one species (*E. septangulare*) to the western shores of the British Islands.

Cyperaceæ. There is a new *Eleocharis*,* resembling *E. palustris*, but with larger and more compressed achenia, crowned by a very large, cellular-spongy, cap-shaped tubercle, closely applied to the summit of the achenium by a concave base; the hypogynous setæ delicate and fragile, or in many flowers apparently obsolete. It should be compared with Steudel's *E. mitracarpa*, from Persia, the tubercle of which is said to be squamose and minutely hispid. The only other plants of this order requiring notice are the *Carices*, which, like those of Williams and Morrow's collection, have been examined by Dr. Boott, who sums them up as follows: — "I have seen thirty-seven species of *Carex* from Japan, of which twenty are peculiar to that country, and seventeen common to other countries, viz. three to Europe (*C. præcox*, *polyrrhiza*, *pilulifera*); † two to North America (*rostrata* and *stipata*); five to Europe and North America (*remota*, *stellulata*, *muricata*, *vesicaria*, and *filiformis*); one to Northeastern Asia and the northwestern coast of America (*macrocephala*); one to Kamtschatka (*longerostrata*); two to India (*Doniana* and *Royleana*); one to Australia (*Gaudichaudiana*); one to Australia and Chili! (*pumila*); and one to the Sandwich Islands (*Wahuensis*). Peculiar to Japan, *C. nana*, *anomala*, *picta*, *incisa*, *transversa*, *papulosa*, *parciflora*, *confertiflora*, *micans*, *Ringgoldiana*, *rigens*, *villosa*, *dispalata*, *pisiformis*, *Morrowi*, *excisa*, *conica*,

* Eleocharis pileata (sp. nov.): cæspitosa; rhizomatibus filiformibus vix repentibus, culmis vaginis et spica *E. palustris*; glumis ovatis obtusis rufis margine leviter scariosis; stylo alte bifido; tuberculo cellulososo suberoso albo mitriformi vel pileiformi obtuso lævi achenium obovato-lenticulare obtusangulum læve pallidum longitudine ac latitudine subæquante; setis 4 – 6 fragilibus nunc achenio æquilongis nunc evanidis. Hakodadi, in fresh-water marshes.

† All likewise in Kamtschatka, &c., fide Treviranus in Ledeb. Flora Rossica.

puberula, monadelpha (cernua, Herb. Par.)." One of these, *C. Ringgoldiana*, was gathered on Ousima only, which we rank rather with the Loo Choo Islands; but it probably occurs in Japan proper also. Appended are the characters of the new species from Japan, and of a few from the Loo Choo Islands, as named and described by Dr. Boott.* Points of relationship with America would appear on studying the affinities

* "CAREX NANA (Boott, sp. nov.): spica simplici androgyna apice mascula oblonga olivacco-ferruginea nuda; stigmatibus 3; perigyniis ovatis turgidis inæqualiter triquetris sensim rostellatis (ore integro) obscure 2–3-nervatis glabris horizontaliter patentibus resinoso- demum ferrugineo-punctatis deciduis squama ovata obtusissima mutica ferruginea margine albo-hyalina medio pallida longioribus. — Aff. *C. capillaceæ*, Boott, Ill. Car. p. 44, t. 110. Omnibus partibus major; culmo altiori (8–10-poll.) lævi; foliis latioribus brevioribus; spica pauciflora; squamis nunquam ciliatis; perigyniis duplo majoribus turgidis, nervis paucioribus. Hakodadi.

"CAREX PICTA (Boott, sp. nov.): spicis 2–3 pedunculatis ferrugineis, terminali mascula gracili erecta, fœmineis 1–2 longe setaceo-pedunculatis evaginatis nutantibus subremotis viridi-ferrugineo pictis; bractea culmo paullo longiori; stigmatibus 2; perigyniis ellipticis utrinque acutis brevissime aut vix rostellatis (ore integro) compressis undique papilloso-asperulis superne ad margines nunc parce dentatis enerviis aut leviter nervatis ferrugineis apice viridibus squama elliptica obtusiuscula longiuscule hispido-cuspidata subæquilata viride ferruginea basi pallida nervo viridi paullo longioribus (cuspide) brevioribus. — A *C. cryptocarpa*, Meyer, differt spicis fœmineis 2 ferrugineis nec apice masculis; squamis cuspidatis; perigyniis majoribus; culmo scabro. A *C. macrochæta*, Meyer, stigmatibus 2; spicis longe pedunculatis; squamis masculis obtusis nervo vix excurrente, fœmineis brevius cuspidatis; perigyniis papillosis margine dentatis; fibris radicalibus lignosis nec villosis. Hakodadi.

"CAREX CONFERTIFLORA (Boott, sp. nov.): spicis 6 alternatim subcontiguis erectis, terminali mascula cylindrica gracili ferruginea, reliquis fœmineis fusco-olivaceis concoloribus oblongo-cylindricis obtusis densifloris, superioribus sessilibus, summa abbreviata apice mascula, infima vaginata brevi-exserte pedunculata; bracteis inferioribus late foliaceis culmum superantibus; stigmatibus 3; perigyniis triquetro-ovatis ventricosis rostratis (ore ferrugineo membranaceo margine hyalina oblique secto demum bilobo) glabris nervatis confertis membranaceis squama lineari longe attenuato-acuminata ferruginea nervata longioribus triplo latioribus. — Affinis *C. olivaceæ*, Boott, Ill. Car. p. 56, t. 149: differt spicis paucioribus multum brevioribus densifloris obtusis nec apice masculis; bracteis culmoque multum brevioribus; squamis fœmineis attenuatis nec longe cuspidatis. Hakodadi.

"CAREX PAPULOSA (Boott, sp. nov.): spicis 3 oblongis remotis, terminali mascula lanceolata gracili longe pedunculata erecta, reliquis fœmineis olivaceis exserte pedunculatis nutantibus distantibus; bracteis culmo brevioribus; stigmatibus 3; perigyniis triquetro-lanceolatis in rostrum sensim longe acuminatis (ore obliquo integro membranaceo) superne vacuis glabris crebre nervatis olivaceis squama ovata obtusa valide cuspidata ferruginea medio viridi-nervata sub lente papulosa angustioribus longioribus. — A *C. villosa*, Boott, differt, spicis nutantibus remotis; squamis medio papillosis nec emarginatis; perigyniis ore integro; culmo foliisque glabris. A *C. Jackiana*, Boott, Ill. Car. p. 9, t. 25 differt, spicis fœmineis 2 remotis longe pedunculatis nutantibus simplicibus; bracteis brevioribus; squamis masculis muticis, fœmineis firmis latioribus. Hakodadi.

"CAREX PARCIFLORA (Boott, sp. nov.): spicis oblongis parcifloris laxis pallidis, terminali mascula abbreviata oblique gracillima breve pedunculata, reliquis fœmineis erectis laxifloris, suprema masculæ arcte contigua,

of some of these Carices. For instance, *C. picta* is compared with *C. cryptocarpa* and *C. macrochæta*, both natives of the northwestern coast of America; *C. parciflora*, with the Eastern American *C. laxiflora*; *C. rigens*, with our *C. granularis* of the same region; *C. incisa*, with *C. lenticularis*, Michx.; *C. dispalata*, with *C. amplifolia* of Oregon, which is allied to the Eastern American *C. scabrata*, &c. And as many other species have close Himalayan representatives. So *C. Bongardi*, Boott, (which Mr.

inferioribus remotis exserte pedunculatis; bracteis superioribus culmo paullo longioribus; stigmatibus 3; perigyniis ovato-triquetris sensim in rostrum breve acuminatis (ore integro obliquo pallido) olivaceis glabris oblique divergentibus nervatis squama ovata alba nervo tenui viridi excurrente latioribus longioribus. — A *C. papulosa* differt spica mascula abbreviata obliqua, fœmineis erectis laxifloris; perigyniis minoribus; squamis albis tenuiter cuspidatis; culmo pedunculisque ancipitibus. A *C. Jackiana*, spicis laxifloris remotis, mascula obliqua; perigyniis brevioribus, nervis paucioribus, ore integro; culmo debili. Ad. *C. laxifloram*, Lam., proprius accedit: differt inflorescentia breviori; spica mascula obliqua, fœmineis brevioribus; perigyniis basi minus productis olivaceis, ore integro, nervis paucioribus; squamis acutis; rhachi recta; foliis tricostatis. Hakodadi.

"Carex rigens (Boott, sp. nov.): spicis 3–4 oblongo-cylindraceis approximatis erectis, terminali mascula subsessili sæpe obliqua, reliquis fœmineis fusco-olivaceis, superioribus masculæ contiguis, infima subremota exserte pedunculata laxiflora; bracteis foliaceis culmo longioribus; stigmatibus 3; perigyniis ovatis ventricosis obtuse triquetris rostratis glabris vel rostro parce dentato (ore membranaceo albido bifido, laciniis scabris) crebre valide nervatis fusco-olivaceis divergentibus squama ovata acuta vel truncata longe valideque cuspidata albida nervo viridi latioribus longioribus vel cuspide brevioribus. — Affinis *C. granulari*, Muhl.: differt spicis fusco-olivaceis laxis; perigyniis rostro bifido longiori. Hakodadi; Ousima.

"Carex micans (Boott, sp. nov.): spicis 3–4 cylindricis stricte erectis, terminali mascula sessili gracillima castanea vix apicem fœminæ superioris attingente, reliquis fœmineis teretibus fusco-olivaceis, superioribus 1–2 masculæ arcte contiguis, infima remota longe exserte pedunculata, bracteis vaginatis culmum longe superantibus; stigmatibus 3; perigyniis ovalibus plano-triquetris rostellatis (ore integro ferrugineo) læte demum fusco-viridibus papillis micantibus undique asperatis costato-nervatis squama oblonga obtusa rarius acuta mutica vel nervo excurrente alba medio læte viridi demum ferruginea latioribus longioribusque. — Sesquipedalis: folia 2 lin. lata, culmo breviora. Simoda.

"Carex Ringgoldiana (Boott, sp. nov.): spicis 4–5 cylindricis erectis gracilibus, terminali mascula capillari inconspicua laxiflora sessili castanea, fœmineis superioribus breviori, reliquis fœmineis olivaceis, superioribus 1 vel 2 masculæ arcte contiguis sessilibus vel insertis, inferioribus remotissimis laxifloris breve exserte pedunculatis, infima subradicali; bracteis foliaceis elongatis, superioribus culmo paullo longioribus; stigmatibus 3; perigyniis oblongo-ovatis obtuse triquetris turgidis tenuiter acuminato-rostratis (rostro decolori, ore leviter emarginato-lobato ciliato) olivaceis undique crebre nervatis squama parva ovata acuta mutica albida ciliata vel mucronata latioribus triplo longioribus. — Habitus *C. granularis*, Muhl. Ousima.

"Carex discoidea (Boott, sp. nov.): spicis 3–4 parvis paucifloris congestis sessilibus pallidis, terminali mascula oblonga sæpe abbreviata inconspicua, reliquis fœmineis ovatis evaginatis, infima subinde paullo remota; bracteis culmo longioribus; stigmatibus 3; perigyniis ovalibus utrinque acutis (ore albido integro vel subemarginato) obtuse triquetris nervatis pubescentibus pallide viridibus squama alba acuminata acuta breve hispido-cuspidata nervo viridi angustioribus brevioribus vel subæquilongis. — Habitus *C. Novæ-Angliæ*, Schw. A

Wright gathered abundantly at the Bonin Islands,) is nearly related to *C. aristata*, R. Br., of the Great Lakes and the Saskatchawan, which again (as *C. orthostachys*, Meyer, which is referred to it by Dr. Boott) ranges from Kamtschatka through Siberia to European Russia. *C. Bongardi*, by the way, is now ascertained by Dr. Boott to be the *C. Boottiana* of Hooker and Arnott (Bot. Beech. Voy. p. 273), the earliest published name, but singularly overlooked by Kunth, Boott, Steudel, &c. Meanwhile another *C. Boottiana*, from the Southern United States, has been published and beautifully illustrated, rendering it most desirable that the strict rule of priority should be waived in this instance, and that the Bonin species should retain the name of *C. Bongardi*.

The Japanese *Gramineæ* of this collection have been studied by that excellent agrostologist, Colonel Munro. He finds only one new species among them, but that is a most remarkable one, belonging as it does to a genus, *Ehrharta*, mainly South African, yet with a few Australian representatives.* The grass which I had formerly taken for *Trisetum cernuum*, Trin., is a form of *T. flavescens* according to Colonel Munro, —

C. puberula, Boott, differt, spicis perigyniisque ovalibus obtuse triquetris, nec subglobosis, minoribus; squamis acutis; foliis bracteisque angustioribus. A *C. leucochlora*, Bunge, et *C. Royleana*, Nees, spicis evaginatis minoribus; basi styli discoidea articulata, nec annulata. Loo Choo Islands.

"Carex sociata (Boott, sp. nov.): spica subelongata e spiculis 6 pallidis oblongo-cylindricis erectis, terminali mascula sessili, reliquis fœmineis ima basi parce masculis, superioribus masculæ arcte contiguis, inferioribus paullo remotis exserte pedunculatis; bracteis spicis suis brevioribus; vaginis subturgidis scabris; stigmatibus 3; perigyniis ovali-triquetris basi productis rostratis bidentatis valide nervatis pubescentibus pallide viridibus squama oblonga truncata vel emarginata brevi hispido-cuspidata albida æquilata longioribus. — A *C. Chinensi* differt achenio ad *facies* (nec angulos) tumente, apice insigniter annulato; inflorescentia breviori; squamis fœmineis brevioribus latioribus brevius cuspidatis; perigyniis minus divergentibus; nec spicis comosis. Loo Choo Islands." *Boott, Mss.*

* Ehrharta caudata (Munro, sp. nov.): racemo simplici subcaudato; pedicellis hispidis; floribus neutris inæquilongis subulatis 5–7-nerviis quam glumis inæqualibus acutissimis trinerviis fere duplo longioribus, hermaphrodito palea inferiori longe aristata; staminibus 3. Hakodadi, on the sides of mountains near rivulets.

"A very distinct species, in some respects approaching *E. avenacea*, Willd. (of Isle Bourbon). Stems stoloniferous, a foot and a half high, with three joints. Leaves 6 to 12 inches long, narrowly linear, scarcely 3 lines broad, almost smooth. Sheaths smooth or slightly hairy: upper ligules almost acute; the lower obtuse, slightly tinged with black. Raceme 6 inches long, slender, slightly bent to one side. Pedicels about a line long, almost deflexed. Lowest neutral flower $4\frac{1}{2}$ lines, the upper $6\frac{1}{2}$ lines, in length; smooth, except on the keels. Lower palea of the perfect flower about an inch long, inclusive of its remarkable awn-like termination, inconspicuously fringed; the upper palea fringed on the two nerves, which are very close together. Styles 2, distinct to the very base. — This is perhaps Thunberg's *Alopecurus caudatus*." *W. Munro, Mss.*

who refers to the latter species the *T. Ruprechtii* of Griesbach, *T. Sibiricum* of Ruprecht, *Bromus bifidus* of Thunberg, and *B. avenæformis* of Steudel, and distinguishes *T. cernuum* of Northwestern America by its bearded ovary. The inflorescence of the latter is also much looser, and the spikelets mostly smaller. It will be seen, by the accompanying tabular view, that most of the Grasses in this collection are of northern temperate types, and of widely diffused species. There are others in the southern part of Japan of a different character, most of them well-known Indian or Malayan species.

The *Filices* of the collection have been critically studied by Mr. Eaton, of New Haven. The characters of a few new species are published in the Proceedings of the American Academy, 4. p. 110. The distribution of those species which occur in other portions of the northern temperate zone is appended to the tabular view. The specially American species are *Adiantum pedatum*, which also occurs in Oregon; and *Osmunda cinnamomea*, which does not.* One specially European form occurs, viz. *Athyrium fontanum*. Those which occur all round the world are *Athyrium Filix-fœmina*, *Lastrea dilatata*, and *Polypodium vulgare;* while *Lastrea Filix-mas* ranges round the Eastern continent, but is wanting throughout America, and *Struthiopteris Germanica* is apparently absent from Western America only. *Blechnum Spicant* is more interrupted, being unknown through the whole breadth of Asia east of the Caucasus, but found in Kamtschatka, Japan, and on the northwestern coast of America, and again wholly absent from the rest of the New World. *Osmunda regalis*, on the other hand, is apparently absent from all Western America, although (in the form of *O. spectabilis*) very common in the Atlantic United States: it appears to be absent also from all Northern Asia, but occurs in the Himalayas, according to Sir William Hooker both in the ordinary state, and with sterile and fertile fronds separate. Since the latter is, then, just the same as *O. Japonica*, the range of *O. regalis* under this form would extend to China and Japan. We may expect some day to receive from Japan or Mantchuria *O. Claytoniana* (*O. interrupta*, Michx.), a species so far as now known strictly divided between Eastern North America (from Newfoundland and Pennsylvania to Lake Winipeg) and the Eastern Himalayas. Surely there can be no question of the complete distinctness of this species from *O. cinnamomea*, however each may vary in respect to the sterility or fertility of the fronds.

* While this sheet is under revision, a letter from Dr. Hance, of Hong Kong, informs me that, among the plants which he has received from the northern part of Japan and the coast of Mantchuria, occurs another and most peculiarly American Fern, viz. *Onoclea sensibilis*. This is a wide-spread species in the Atlantic United States, extending south to Florida and to Texas, and northwest to the valley of the Saskatchawan.

Among the few *Lycopodiaceæ* the only thing remarkable is the discovery of our Eastern American *Lycopodium lucidulum*, Michx., in Japan. Its known northwestern limit before was the valley of the Saskatchawan. Our *L. dendroideum*, however, which ranges westward to the northwest coast, was already known in Kamtschatka and Eastern Siberia.

The *Musci* of the collection are now under examination by Messrs. Sullivant and Lesquereux. They exhibit a similar mixture of North American and of European species. The *Lichenes*, which Professor Tuckerman, and the *Algæ*, which Professor Harvey, are now studying, will probably afford interesting geographical data. The *Fungi*, upon which Messrs. Berkeley and Curtis have drawn up a report, are too cosmopolitan for our purpose.

In the following table I have endeavored to enumerate the species, or at least the genera, of the Japanese plants known to me, which have particular relatives in other and distant parts of the northern temperate zone. Tropical or subtropical forms, of which there are a few in the southern districts, are omitted. So are all the types peculiar to the Japano-Chinese region, or which have near relatives only in tropical or southern parts of the world, and all weeds or other plants which may owe their present diffusion to man's agency. Some species enumerated in the Japanese column which have not fallen under my observation, are distinguished by being enclosed in parentheses.

A very few species are mentioned which as yet have been found only on the adjacent mainland, as *Sedum sedoides* on the Chinese, and *Streptopus roseus* on the Okotsk coast.

In parallel columns on each side, I have added the identical, analogous, or nearly related species, so far as known to me, or for which there is good authority, indigenous on the one hand to Western North America (i. e. to the district west of the Rocky Mountains, or at least west of the great plains of their eastern slope) and to Eastern North America; on the other hand, to Central and Northern Asia, and to Europe.

For Northern Asia, Ledebour's Flora Rossica is a sufficient guide. Only those species are mentioned in this column which range westward as far as the Davurian, or eastward as far as to the Altaic region. For the central or Himalayan region the means of comparison available to me are necessarily very imperfect, until Drs. Hooker and Thomson have proceeded farther with the Flora Indica and the Præcursores, and with the distribution of their great collections, of which I am generously allowed a share. I cannot pretend to have examined many of the Himalayan species here mentioned; nor am I able to estimate their relationship to their Japanese congeners at all critically. So that I have generally cited only identical or apparently closely repre-

sentative species. This column may hereafter be much better filled; and in a more particular view the Himalayan species should be distinguished from the Siberian by some mark. The comparisons made in the European, and especially in the two American columns, are naturally more complete, and of higher critical value.

To a certain extent I have attempted to express degrees of relationship, by printing identical and closely related species in italic type. The identical species in any or all of the regions are made evident by the repetition of the specific name. The other italicized names indicate species so like the Japanese one, that either they may prove to be conspecific, or might be so regarded by a botanist who took wider views of the possible variation of species than now prevail; or else they indicate species which, however distinct in their special character, are manifestly counterpart or strictly representative species, the one of the other; as, for instance, our Texan *Sophora affinis* of *S. Japonica*, our *Wistaria* of the Japanese species, and *Arethusa Japonica* of our *A. bulbosa*. In a few cases plants of different genera are italicized, to note a case of remarkable representation; as our *Schizandra* in the Atlantic United States, representing both *Kadsura* and an oligandrous *Sphærostema* in Japan; or *Aplectrum*, here the evident analogue of *Oreorchis* on the other side of the hemisphere. The names in ordinary type indicate species of less intimate, but still of near relationship, — how near, it is difficult to express in words; but general botanists will readily perceive what is intended, upon looking over the table.

Authorities for the species are wholly omitted, to save room upon the page.

*** Under the *Nymphæaceæ*, on p. 381, the well-known case was inadvertently omitted of our *Brasenia peltata*, inhabiting the Atlantic side of North America, from Canada to Texas; also occurring in Japan (Planchon has identified it as Thunberg's *Menyanthes nymphoides*), in the Eastern Himalayas, and in Eastern Australia.

TABULAR VIEW OF THE DISTRIBUTION OF JAPANESE PLANTS AND THEIR NEAREST ALLIES IN THE NORTHERN TEMPERATE ZONE.

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
Clematis Viticella		Clematis florida & patens		
	C. Nepalensis & montana	Clematis Williamsii & Japonica		
	C. grata	Clematis apiifolia, biternata, &c.	C. ligusticifolia	C. Virginiana.
T. Kemense	T. Kemense	Thalictrum Thunbergii		
T. simplex	*T. affine*	*Thalictrum affine*		
P. pratensis	P. pratensis	Pulsatilla cernua		P. Nuttalliana
	A. umbrosa	*Anemone umbrosa*		
	A. Altaica	*Anemone Altaica*		
	A. Baikalensis	*Anemone Baikalensis*		
A. narcissiflora	*A. narcissiflora*	(*Anemone narcissiflora*)	*A. narcissiflora*	
	A. Pennsylvanica	(*Anemone Pennsylvanica*)	*A. Pennsylvanica*	*A. Pennsylvanica*
H. triloba	*H. triloba*	(*Hepatica triloba*)	*H. triloba*	*H. triloba* & *acutiloba*
		(*Trautvetteria Japonica*, S. & Z.)	*T. palmata*	*T. palmata*
A. Apennina	*A. Apennina, Sibirica*	(*Adonis Apennina, var. Sibirica*)		
R. repens	*R. repens*	*Ranunculus repens, var.*	*R. repens, vars.*	*R. repens, vars.*
R. sceleratus	*R. sceleratus*	*Ranunculus sceleratus*	*R. sceleratus*	*R. sceleratus* (scarce)
R. acris	*R. propinquus*	*Ranunculus propinquus*		
Caltha palustris	*Caltha palustris*	*Caltha palustris*	*Caltha palustris*	*Caltha palustris*
T. Europæus	*T. patulus*	*Trollius patulus?*		*T. Americanus*
C. trifolia	*C. trifolia*	*Coptis trifolia*	*C. trifolia*	*C. trifolia*
		(*Coptis brachypetala*, S. & Z.)	*C. asplenifolia*	
	(*C. Teeta*)	(*Coptis anemonæfolia*, S. & Z.)	C. occidentalis	
I. thalictroides		Isopyrum adoxoides	I. occidentale	I. biternatum
A. vulgaris	A. vulgaris & vars.	(*Aquilegia Burgeriana*)	*A. Canadensis*	*A. Canadensis*
A. Lycoctonum	*A. Lycoctonum*	(*Aconitum Japonicum*)		*A. reclinatum*
A. spicata	*A. spicata, & vars.*	*Actæa spicata*	*A. spicata, v. rubra*	*A. spicata, v. alba & rubra*
C. fœtida [E. Eu.]	*C. fœtida*	(*Cimicifuga fœtida?*)	*C. fœtida*	*C. Americana*
		Pityrosperma acerinum, obtusilobum, [& biternatum		Cimicifuga (Macrotys) [cordifolia & racemosa
		Glaucidium palmatum		Hydrastis Canadensis
P. officinalis	*P. officinalis*	*Pæonia officinalis*	*P. Rossii*	
	I. Griffithii	Illicium religiosum		I. Floridum & parvifl.
	Magnolia & Michelia spp.	Magnolia & Burgeria spp.		Magnolia spp.
	K. Roxburghiana	*Kadsura Japonica*		*Schizandra* coccinea
	Sphærostema spp.	*Sphærostema Japonicum*		
	Parvatia & Hollbollia	Akebia & Stauntonia spp. [Lardizabala spp. in Chili.]		
	Cocculus spp. & Meni- [spermum?	Cocculus Thunbergii, &c.		Cocculus & Menisper- [mum
B. vulgaris	*B. vulgaris*	*Berberis vulgaris*		
B. vulgaris, Cretica	*B. vulgaris, Cretica*	*Berberis Thunbergii*		*B. Canadensis*

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
	B. Nepalensis	(*Berberis* (*Mahonia*) *Japonica*)	B. Aquifolium	B. trifoliolata
		Caulophyllum thalictroides!		*C. thalictroides*
		Diphylleia cymosa!		*D. cymosa*
E. alpinum	Epimedium spp. aff.	Epimedium & Aceranthus spp.	Vancouveria	
N. lutea	*N. lutea*	*Nuphar Japonica*	*N. lutea & advena*	*N. sagittæfolia, lutea, &c.*
N. alba	*N. alba*	(*Nymphæa alba?*)		*N. odorata*
		Dicentra spectabilis &	D. formosa & Cucullaria	D. formosa, Cucullaria & Canadensis
	D. lachenaliifolia	*Dicentra pusilla*		
	C. ambigua	*Corydalis ambigua*		
Corydalis spp. aff.	Corydalis spp. aff.	Corydalis, 6 spp.	C. aurea & glauca	C. aurea & glauca
N. officinale	*N. officinale*	*Nasturtium officinale*		
N. palustre	*N. palustre*	*Nasturtium palustre*	*N. palustre*	*N. palustre, vars.*
T. glabra	*T. glabra*	*Turritis glabra*	*T. glabra*	*T. glabra* (scarce)
A. hirsuta	*A. hirsuta*	*Arabis hirsuta*	*A. hirsuta*	*A. hirsuta, vars.*
A. alpina	*A. alpina*	*Arabis Japonica*		
A. petræa	*A. petræa*	*Arabis lyrata*	*A. lyrata, ambigua*	*A. lyrata*
C. Impatiens	*C. Impatiens*	*Cardamine Impatiens*		
C. parviflora	*C. parviflora*	*Cardamine parviflora*		
	C. macrophylla	*Cardamine macrophylla*		
D. nemorosa	*D. nemorosa*	*Draba nemorosa*	*D. nemorosa*	*D. nemorosa* (scarce)
V. Selkirkii (umbrosa)	*V. Selkirkii, imberbis*, Led.	*Viola Selkirkii*		*V. Selkirkii*
	V. Patrinii	*Viola Patrinii*		V. primulæfolia
		Viola grypoceras	V. adunca?	V. rostrata?
V. sylvatica	*V. sylvatica*	*Viola sylvatica* (canina, Sm.)	V. adunca	V. Muhlenbergii
		Viola laciniosa		V. striata
V. biflora	V. biflora	Viola verecunda, n. sp.	V. Canad. & pcellata	V. Canadensis
D. rotundifolia	*D. rotundifolia*	*Drosera rotundifolia*	*D. rotundifolia*	*D. rotundifolia*
P. palustris	*P. palustris*, &c.	(*Parnassia mucronata*, S. & Z.)	*P. palustris & parvifl.*	*P. palustris & Carolin.*
D. superbus	*D. superbus*	*Dianthus superbus*		
Lychnis spp.	*L. fulgens*	*Lychnis Senno*		
H. peploides	*H. peploides*	*Honkenya peploides*, v. *oblongifolia*	*H. peploides, oblongif.*	*H. peploides*
M. lateriflora	*M. lateriflora*	*Mœhringia lateriflora*	*M. lateriflora*	*M. lateriflora*
S. uliginosa & borealis	*S. uliginosa & borealis*	*Stellaria uliginosa, var. undulata*	*S. uliginosa & crispa*	*S. uliginosa & borealis*
M. aquaticum	*M. aquaticum*	*Malachium aquaticum*		
C. vulgatum & visc.	*C. vulgatum & viscosum*	*Cerastium vulgatum & viscosum*	*C. vulgatum & viscosum*	*C. vulgatum & viscosum*
Tilia spp.	Tilia spp.	(Tilia 2 spp. ex S. & Z.)		Tilia spp.
	Eurya spp. aff.	Eurya Japonica		
	C. Wallichiana	*Cleyera Japonica*		
	C. Kissi, &c.	Camellia Japonica & Sesanqua		
	T. Assamica	*Thea Chinensis*		
		Stuartia monadelpha		S. Virginica, & pentagyna
	Actinidia callosa	*Actinidia callosa & spp.*		
O. corniculata	*O. corniculata*	*Oxalis corniculata*	*O. corniculata*	*O. corniculata*
O. Acetosella	*O. Acetosella*	(*Oxalis Acetosella* ex Thunb.)	*O. Oregana & trilliif.*	*O. Acetosella, Amer.*
	G. eriostemon	*Geranium erianthum*	*G. erianthum*	
G. palustre	*G. palustre?*	(*Geranium Thunbergii*)		
	Zanthoxylum spp.	Zanthoxylum 4 spp.		Z. Amer. & Carol.
	S. Laureola	*Skimmia Japonica*		
	P. Nepalensis	Picrasma Japonica, n. sp.		

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
	B. albiflora	*Bœnninghausenia albiflora*		
C. myrtifolia	C. Nepalensis	Coriaria Japonica, n. sp.	[C. ? atropurpurea, Mex.]	
		Rhus Toxicodendron	*R. Toxic. diversiloba*	*R. Toxicodendron*
	R. vernicifera	*Rhus vernicifera*		*R. venenata*
R. Coriaria	*R. semialata*	*Rhus semialata*		R. Copallina
	V. Indica	*Vitis Labrusca* (*Thunbergii*)		*V. Labrusca*
	Cissus spp.	Cissus spp.		Cissus spp.
		(Ampelopsis spp. ex S. & Z.)		Ampelopsis Virgin.
R. catharticus	*R. Davuricus & virgatus*	*Rhamnus catharticus* (*globosus*)		
F. rupestris		Frangula (Rh. crenatus, S. & Z.)	F. Californica	F. Caroliniana
	Berchemia sp.	Berchemia (lineata &) racemosa		B. volubilis
	H. inæqualis	Hovenia dulcis		
Ilex sp.		Ilex spp. plur.		Ilex & Prinos
	E. lucidus, &c.	Evonymus Japonicus		
E. Europæus		*Evonymus Sieboldianus*		*E. Americanus*
	E. Hamiltonianus	*Evonymus Hamiltonianus*	E. occidentalis	E. atropurpureus
E. latifolius		*Evonymus latifolius*		
		Celastrus articulatus, punctulatus, &c.		*C. scandens*
S. pinnata		Staphylea Bumalda		S. trifolia
	Æ. Hippocastanum	Æsculus turbinata & dissimilis	Æ. Californica	Æsculus & § Pavia
	Sapindus spp.	(Sapindus Mukurossi)		S. marginatus
		Acer 10 spp., mostly of Himalayan or peculiar types : —		
		A. Japonicum, the counterpart of	A. circinatum	
A. platanoides		A. pictum, of		A. saccharinum
		(*Negundo cissifolium*, S. & Z.)	*N. aceroides*	*N. aceroides*
		Thermopsis fabacea	*T. fabacea* &	*T. Caroliniana, fraxini-*
			T. macrophylla	[*folia*, & *mollis*
L. corniculatus	*L. corniculatus*	*Lotus corniculatus*	Hosackia spp.	Hosackia sp.
	O. lathyroides	*Orobus lathyroides*		
L. palustris	*L. palustris*	*Lathyrus palustris*	*L. palustris*	*L. palustris*
Vicia spp.	V. pallida	Vicia Japonica, n. sp.	V. Americana, var.	V. Americana
	Desmodium spp.	(Desmodium racemosum)		Desmodium spp.
	Lespedeza spp. aff.	Lespedeza, 4 spp.		Lespedeza spp.
	Dumasia villosa, &c.	(*Dumasia truncata*, S. & Z.)		
	Rhynchosia spp.	Rhynchosia volubilis		Rhynchosia spp.
		Wistaria Sinensis & brachybotrys		*W. frutescens*
	Millettia spp.	Millettia Japonica		
	S. flavescens & alopec.	(Sophora angustifolia, S. & Z.)		S. sericea
		Sophora Japonica		*S. affinis*
	P. Armeniaca & Sibirica	*Prunus* (*Armeniaca*) *Mume*		
P. Cerasus	*P. Puddum*	*Prunus Pseudo-Cerasus*		
	P. tomentosa	*Prunus tomentosa*		P. gracilis & maritima
P. Padus	*P. Padus*	*Prunus Virginiana?*	*P. demissa*	*P. Virginiana*
P. Lauro-Cerasus	P. acuminata	Prunus spinulosa		P. Caroliniana
	S. callosa	*Spiræa callosa*		
S. hypericif. & crenata	*S. hypericif. & crenata*	*Spiræa Thunbergii*		
S. chamædrifolia	*S. chamædrifolia*	*Spiræa chamædrifolia*		
		Spiræa betulæfolia	*S. betulæfolia*	*S. betulæfol.* (*corymbosa*)

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
S. salicifolia [E.]	*S. salicifolia*	*Spiræa salicifolia*	*S. Menziesii*	*S. salicifolia, var.*
S. Ulmaria	*S. Kamtschatica*	*Spiræa palmata*		*S. lobata*
S. Aruncus [E.]	*S. Aruncus*	*Spiræa Aruncus*	*Spiræa Aruncus*	*S. Aruncus*
	Neillia, spp.	Stephanandra, Kerria, & Rhodotypos		Nevia Alabam., n. g.
S. Europæa	*S. alpina*	*Sanguisorba tenuifolia*	*S. Canadensis*	*S. Canadensis*
A. Eupatoria & pilosa	*A. Eupatoria*, &c.	*Agrimonia Eupatoria, viscidula*		*A. Eupatoria*, &c.
G. strictum [E.]	*G. strictum*	*Geum strictum*	*G. strictum?*	*G. strictum*
P. palustris	*P. palustris*	*Potentilla palustris*	*P. palustris*	*P. palustris*
P. Anserina	*P. Anserina*	*Potentilla Anserina*	*P. Anserina*	*P. Anserina*
	P. fragarioides	*Potentilla fragarioides*		
		Potentilla fragiformis	*P. fragiformis*	
P. reptans	*P. reptans*	*Potentilla reptans & var.*		
	F. Indica	*Fragaria Indica*		
R. Chamæmorus	*R. Chamæmorus*	*Rubus Chamæmorus*	*R. Chamæmorus*	*R. Chamæmorus*
	R. rosæfolius, parvifol.	*Rubus rosæfolius, parvifolius*		
R. alpina	*R. acicularis*	*Rosa acicularis*	*R. fraxinifolia*	*R. stricta?*
	E. elliptica	Eriobotrya Japonica		
	P. sp. ined., Hook.	*Photinia villosa & lævis*		
		Photinia serrulata (and in Bonin		
	P. integrifolia	*Photinia arbutifolia*)	*P. arbutifolia*	
		[Osteomeles anthyllidifolia, Loo Choo, Bonin, & Sandwich Islands.]		
		Crataegus alnifolia	*C. rivularis*	C. Crus-galli, prunif.
A. vulgaris	*A. vulgaris*, &c.	*Amelanchier Asiatica*	*A. Canadensis, vars.*	*A. Canadensis*
P. torminalis	P. torminalis	*Pyrus rivularis?*	*P. rivularis*	
P. Malus	*P. Malus?*	*Pyrus spectabilis*		P. coronaria
P. aucuparia	P. ursina	*P.* (*Sorbus*) *gracilis*	*P. sambucifolia, var.*	P. Americana.
		Chimonanthus fragrans	Calycanthus occid.	Calycanthus 3 spp.
C. alpina	*C. alpina*	*Circæa alpina*	*C. alpina*	*C. alpina*
C. Lutetiana	*C. Lutetiana*	(*Circæa mollis*, S. & Z.)		*C. Lutetiana*
	A. barbata & rubra	*Astilbe Japonica & Thunbergii*, &		*A. decandra*
		Rodgersia podophylla, n. g.		
		(*Mitella, Mitellopsis, Japonica*, S. & Z.)	*M. pentandra*	M. diphylla
C. oppositifolium	*C. Nepalense & trichosper.*	*Chrysosplenium Kamtschaticum*	*C. Nepalense, glechom.*	*C. Americanum*
	C. ovalifolium	*Chrysosplenium ovalifolium*		
	Hydrangea spp. aff.	Hydrangea spp. plur.		Hydrangea, 3 spp.
	Piliostegia	{ Cardiandra, Schizophragma, Platycrater, }		Decumaria
	D. staminea, macrantha,	*Deutzia crenata*, scabra, & gracilis		Fendlera?
	P. coronarius, var.	*Philadelphus coronarius*, &c.	P. Lewisii	P. inodorus, &c.
	I. Chinensis	[*Itea Chinensis*, Loo Choo]		I. Virginica
		[*Penthorum sedoides*, China]		*P. sedoides*
	Sedum hybridum, &c.	*Sedum hybridum*, &c.		
	H. Chinensis & Parrotia	*Hamamelis Japonica*		*H. Virginica*
	C. Himalayana	*Corylopsis spicata & pauciflora*		Fothergilla alnifolia
	L. Altingia	(Liquidambar spp.)		L. styraciflua
		(*Ribes Cynosbati*, ex Thunb.)		*R. Cynosbati*
		Ribes laxiflorum	*R. laxiflorum*	*R. prostratum*

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
R. nigrum	*R. nigrum*	*Ribes nigrum* (Okotsk)	*R. Hudsonianum*	*R. Hudsonianum*
S. Europæa	*S. elata*	*Sanicula elata*	Sanicula spp.	S. Canadensis & Maril.
	B. multinerve	*Bupleurum multinerve*		
		Cryptotænia Canadensis		*C. Canadensis*
A. officinalis		*Archangelica Gmelini*	*A. Gmelini = peregrina*	*A. Gmelini = peregrina*
		Angelica Japonica		A. atropurpurea?
		Cymopterus? littoralis, glaber	*C.? littoralis*	
		Heracleum lanatum	*H. lanatum*	*H. lanatum*
		(Archemora sp. ex S. & Z.)		Archemora rigida
A. sylvestris & nemor.	*A. sylvestris & nemorosa*	*Anthriscus sylvestris*		
		Osmorrhiza longistylis	*O. longistylis & brevist.*	*O. longistylis & brevist.*
		Echinopanax horridus	*E. horridus*	
	A. (Ginseng) quinquefolia	*Aralia (Ginseng) quinquefolia*		*A. (Ginseng) quinquefolia*
		Aralia edulis		*A. racemosa*
H. Helix	*H. Helix*	*Hedera Helix*		
	A. Himalaica	*Aucuba Japonica*		
C. Suecica	*C. Suecica*	*Cornus Suecica*	*C. Suecica*	*C. Suecica*
		Cornus Canadensis	*C. Canadensis*	*C. Canadensis*
	B. fragifera	*Benthamia Japonica*	Cornus Nuttallii	C. florida
C. sanguinea	*C. sanguinea*	*Cornus sanguinea*	*C. Californica*	*C. sericea*
	C. alba	*Cornus alba*		*C. stolonifera*
C. mas		*Cornus officinalis*	*C. sessilis*	
	A. triflora	Abelia serrata & spathulata		
		Diervilla (Weigela) Japonica, & Diervilla (Weigela) floribunda		D. trifida & sessilifolia
L. borealis	*L. borealis*	(*Linnæa borealis*)	*L. borealis*	*L. borealis*
	L. Japonica	*Lonicera Japonica*		
L. Xylosteum		*Lonicera Morrowi*		L. oblongifolia
L. cærulea		(*Lonicera brachypoda*)		*L. cærulea*
V. Opulus	*V. Opulus*	*Viburnum Opulus*	*V. Opulus, var.*	*V. Opulus*
	V. cordifolium	*Viburnum plicatum*		*V. plicatum = lantanoides*
V. Lantana		*Viburnum (tomentosum &) dilatatum*		V. pubescens, var.
		Viburnum erosum		*V. dentatum*
	V. odoratissimum	*Viburnum odoratissimum*		
S. racemosa	*S. racemosa*	*Sambucus racemosa, var.*	*S. racemosa (pubens)*	*S. racemosa (pubens)*
S. Ebulus	*S. Ebulus*	(*Sambucus ebuloides*)		
A. odorata	*A. odorata*	*Asperula odorata*		
G. verum, lasiocarpum	*G. verum, lasiocarpum*	*Galium verum, lasiocarpum*		
G. triflorum	*G. triflorum?*	*Galium triflorum*	*G. triflorum*	*G. triflorum*
	G. Hamiltoni	Galium trachyspermum		
G. Aparine & var.	*G. Aparine, var.*	*Galium Aparine, Vaillantii*	*G. Aparine*	*G. Aparine*
	R. cordifolia	(*Rubia cordifolia*)		
	P. fœtida	*Pœderia fœtida*		
		(*Mitchella undulata*, S. & Z.)		*Mitchella repens*
V. dioica		*Valeriana dioica*	*V. dioica*	*V. dioica*
	P. Sibirica, &c.	Patrinia parviflora		
	A. latifolium	*Adenostoma glutinosum?*		
	E. Finlaysonianum	*Eupatorium Finlaysonianum*		E. album

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
		Eupatorium Reevesii		E. pubescens
E. cannabinum		(*Eupatorium Japonicum*)		
P. albus	*P. albus*	*Pctasites albus*		
	A. (Dollingeria) spp.	Aster Kæmpferi		
	A. Tartaricus	*Aster Tartaricus*		
A. Tripolium	*A. Tripolium*	(*Aster Tripolium*)	A. occidentalis	A. flexuosus
	Calimeris incisa	(*Calimeris incisa*)		
		Erigeron Thunbergii	*E. glaucum*	E. glabellum
S. Virgaurea, vars.	*S. Virgaurea, vars.*	*Solidago Virgaurea, leiocarpa*	*S. Virgaurea, multiradiata*	*S. Virgaurea, thyrsoidea*
	E. prostrata & erecta	*Eclipta prostrata*		E. erecta, procumbens
	S. orientalis	*Siegesbeckia orientalis*	[S. Jorullensis in Mexico]	
	A. Sibirica	*Achillea Sibirica*	*A. Sibirica*	
A. vulgaris	*A. vulgaris*	*Artemisia vulgaris*	*A. Ludoviciana*	*A. Ludov. & vulgaris*
	A. borealis	*Artemisia borealis*	*A. borealis*	*A. borealis*
	G. multiceps	*Gnaphalium multiceps*		
		(*Gnaphalium polycephalum*, fide Hance)		*G. polycephalum*
C. cernuum & abrotanoides	C. racemosum	Carpesium divaricatum & Thunbergianum		
	L. retusa & reniformis ?	Ligularia Kæmpferi & gigantea		
C. hastata [E. Eu.]	*C. hastata*	*Cacalia hastata*		*C. suaveolens*
		(Cacalia farfaræfolia & delphinifolia)		C. atriplicifolia, &c.
		Senecio Pseudo-Arnica	*S. Pseudo-Arnica*	*S. Pseudo Arnica*
	S. palmatus	*Senecio palmatus*		
	Gynura ? = P. Cusimbua	Gynura pinnatifida = Porophyllum Jap.		
	A. multicaulis	*Aplotaxis multicaulis*		
	S. elongata, &c.	*Saussurea Japonica*		
C. acaule		Cirsium brevicaule, n. sp.		C. pumilum ?
C. lappaceum		Cirsium pectinellum, n. sp.		
		Anandria Bellidiastrum		Chaptalia tomentosa
L. communis	*L. communis*	*Lampsana parviflora*, n. sp.		
P. hieracioides	*P. hieracioides (Dahurica)*	*Picris hieracioides*		
T. Dens-leonis	*T. Dens-leonis*	*Taraxacum Dens-leonis*	*T. Dens-leonis*	*T. Dens-leonis*
	Ixeris 2 spp.	Ixeris 5 spp.		
	Youngia Japonica, &c.	*Youngia Japonica*, &c.		
	I. Roxburghianus	Isolobus campanuloides & radicans		
	W. agrestis	*Wahlenbergia marginata*		
	A. verticillata	*Adenophora verticillata*		
		(Campanula remotiflora, S. & Z.)	C. Scouleri ?	C. divaricata ?
C. Trachelium	*C. Trachelium*	*Campanula Trachelium*		
	C. punctata	*Campanula punctata*		
	P. grandiflorum	*Platycodon grandiflorum*		
	C. lanceolata & Javanica	*Campanumœa lanceolata*		
V. Oxycoccus	*V. Oxycoccus*	*Vaccinium macrocarpon*	*V. macroc. & Oxycoc.*	*V. macroc. & Oxycoc.*
V. Vitis-Idœa	*V. Vitis-Idœa*	*Vaccinium Vitis-Idœa*	*V. Vitis-Idœa*	*V. Vitis-Idœa*
		Vaccinium Smallii, n. sp.	V. myrtilloides	V. § Cyanococcus
	V. bracteatum	*Vaccinium bracteatum*		
	V. Dunalianum	Vaccinium Wrightii, n. sp. (Ousima)		
E. nigrum	*E. nigrum*	*Empetrum nigrum*	*E. nigrum*	*E. nigrum*

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
	Gaultheria, spp.	(Gaultheria triquetra, S. & Z.)	G. Shallon	G. procumbens
		Leucothoe chlorantha		Leucothoe spp.
	A. (P.) ovalifolia	*Andromeda (Pieris) elliptica*		
		(Andromeda (Pieris) Japonica)		A. (P.) phillyreæfolia
	Clethra spp.	*Clethra barbanervis*		*C. acuminata*
		Menziesia ferruginea, globularis	*M. ferruginea*	*M. ferruginea, globularis*
L. palustre & var. dilat.	*L. palustre & var. dilat.*	*Ledum palustre & var. dilatatum*	*L. palustre & latifol.*	*L. palustre & latifolium*
A. Pontica		Azalea Japonica sp. nov.	A. occidentalis	A. calendulacea
	R. campanulatum, &c.	*Rhododendron brachycarpum*		*R. Catawbiense*
R. Ponticum	R. spp. plur.	Rhododendron Metternichii	R. macrophyll.& Calif.	R. maximum
P. rotundifolia	*P. rotundifolia, incarnata*	*Pyrola rotundifolia, incarnata*	*P. rotundifolia, incarnata*	*P. rotundifolia, incar-*
P. media		*Pyrola media*		*[nata, & uliginosa*
P. minor	*P. minor*	*Pyrola minor*	*P. minor*	*P. minor*
M. uniflora	*M. uniflora*	*Moneses uniflora*	*M. uniflora*	*M. uniflora*
D. Lapponica	*D. Lapponica*	*Diapensia Lapponica*	*D. Lapponica*	*D. Lapponica*
S. officinale	S. Finlaysonianum ?	Styrax Obassia		
		Styrax Japonica	S. Californica	S. platanifol. & grandif.
		Pterostyrax 3 spp.		Halesia tetraptera
	Symplocos spp.	Symplocos Japonica		S. tinctoria
D. Lotus [Eu.]	Diospyros spp.	Diospyros Kaki & Japonica		D. Virginiana
	A. odontophylla & spp.	*Ardisia Japonica* & spp.		
	M. capitellata & parvifolia	*Myrsine neriifolia*		M. Floridana
	M. montana	*Mæsa Doræna*		
	P. cortusoides	*Primula cortusoides*		
	P. prolifera	Primula Japonica, n. sp.		
L. Ephemerum, &c.	L. lobelioides, &c.	Lysimachia clethroides & lubinioides [L. aff., Sandwich Islands.]		
L. nemorum	*L. debilis*	*Lysimachia Japonica*		
N. thyrsiflora	*N. thyrsiflora*	*Naumburgia thyrsiflora*	*N. thyrsiflora*	*N. thyrsiflora*
P. media & major	*P. media & major*	*Plantago media & major*		
U. intermedia	*U. intermedia*	*Utricularia intermedia*		*U. intermedia*
	B. glabra	(*Boschniakia* ex Zucc.)	*B. glabra, & spp.*	
	Æ. Indica	*Æginetia Japonica*		
		Catalpa Kæmpferi		*Catalpa bignonioides*
		Tecoma grandiflora		*T. radicans*
S. aquatica	*S. aquatica*	*Scrophularia alata*, n. sp.		
V. Anagallis	*V. Anagallis*	*Veronica Anagallis*	*V. Anagallis ?*	*V. Anagallis*
V. Chamædrys	*V. laxa*	*Veronica Thunbergii*, n. sp.		
V. paniculata	*V. paniculata*	(*Veronica paniculata*)		
V. longifolia	*V. longifolia*	*Veronica longifolia, var.*		
	V. Sibirica	(*Veronica (Leptandra) Japonica*)		*V. Virginica*
Pæderota spp.		Pæderota axillaris & bracteata		
P. resupinata [E. Eu.]	*P. resupinata*	*Pedicularis resupinata*		*P. lanceolata*
	Callicarpa spp.	Callicarpa spp. plur.		C. Americana
		[*Polycœlium bontioides* is represented in Sandwich Islands by *P. Sandwicense.*]		
	T. Wallichianum	(Teucrium Japonicum)		T. Canadense
A. Genevensis	*A. Genevensis*	*Ajuga ciliata*		
	A. remota	*Ajuga decumbens*		
T. Serpyllum	*T. Serpyllum*	*Thymus Serpyllum*		

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
	C. umbrosa & debilis	Calamintha gracilis		
C. Clinopodium	*C. Clinopodium*	*Calamintha Chinensis*		
	S. plebeia	*Salvia plebeia*, &c.		
N. Glechoma	*N. Glechoma*	*Nepeta Glechoma & var. grandis*		
		(Cedronella Japonica, Hassk.)		Cedronella cordata
D. Ruyschiana	*D. Ruyschiana*	*Dracocephalum Ruyschiana, var. Jap.*		
B. vulgaris	*B. vulgaris*	*Brunella vulgaris*	*B. vulgaris*	*B. vulgaris*
	S. violacea, &c.	*Scutellaria Indica*		
		Scutellaria Japonica		*S. saxatilis*
S. minor	S. minor	Scutellaria hederacea		S. nervosa
S. palustris	*S. palustris, vars.*	*Stachys palustris, aspera*	*S. palustris, vars.*	*S. palustris, aspera*
L. album	*L. petiolatum*	*Lamium petiolatum*		
L. officinale	*L. officinale*	*Lithospermum officinale*		*L. latifolium*
M. maritima	*M. maritima*	*Mertensia maritima*	*M. maritima*	*M. maritima*
M. arvensis	*M. arvensis*	*Myosotis arvensis*		*M. arvensis* ?
	E. pedunculare	*Eritrichium pedunculare*		
	B. tenellum	Bothrospermum asperugoides		
Omphalodes verna !		Eritrichium Guilielmi, n. sp.		
		Heliotropium Japonicum		H. convolvulaceum
S. nigrum	*S. nigrum*	*Solanum nigrum*	*S. nigrum*	*S. nigrum*
	P. Alkekengi ?	*Physalis Alkekengi*		P. angulata
L. vulgare		*Lycium vulgare*		L. Carolinianum
C. Soldanella	*C. Soldanella*	*Calystegia Soldanella*	*C. Soldanella*	*C. Soldanella*
P. cæruleum	*P. cæruleum*	*Polemonium cæruleum*	*P. cæruleum & pulch.*	*P. reptans*
P. Carinthiaca	*P. rotata*	*Pleurogyne rotata*	*P. rotata*	*P. rotata*
	O. paniculata	Ophelia bimaculata		
	C. speciosa & fasciculata	Crawfurdia Japonica		
	G. aquatica	Gentiana Thunbergii		
G. prostrata	*G. squarrosa*	*Gentiana squarrosa*	G. prostrata	
M. trifoliata	*M. trifoliata*	*Menyanthes trifoliata*	*M. trifoliata*	*M. trifoliata*
		Amsonia elliptica		*A. Tabernæmontana*
Vincetoxicum spp.	Vincetoxicum spp.	Vincetoxicum 6 spp.		
O. Europæa	Olea spp.	Olea Aquifolium		O. Americana
L. vulgare	*L. Nepalense*	*Ligustrum* 3 spp.		
F. Ornus		Fraxinus Sieboldiana	F. dipetala	
	F. floribunda	Fraxinus longicuspis		
F. excelsior	Fraxinus spp.	Fraxinus pubinervis		
A. Europæum	*A. Himalaicum*	(*Asarum Canadense*, ex Thunb.)	*A. Hookeri*	*A. Canadense*
		(*Asarum Virginicum*, Thunb. = Heterotropa)		*A. Virg.* & arifolium
		Aristolochia Kæmpferi		A. tomentosa
A. longa		Aristolochia debilis		
	P. acinosa	*Phytolacca Kæmpferi*, n. sp.		*P. decandra*
C. maritima	*C. maritima*	*Chenopodina maritima*	*C. maritima*	*C. maritima*
R. acetosa	*R. acetosa*	*Rumex acetosa*	*R. acetosa*	*R. acetosa*
R. maritimus	*R. maritimus*	*Rumex persicarioides*	*R. persicarioides*	*R. persicarioides*
	P. barbatum	*Polygonum Japonicum*		
		Polygonum filiforme		*P. Virginianum*
P. Bistorta	*P. Bistorta*	*Polygonum Bistorta*	*P. Bistorta*	
	P. Chinense	*Polygonum Chinense*		

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
	P. perfoliatum	*Polygonum perfoliatum*, &c.		*P. arifolium*
	P. sagittatum & horridum	*Polygonum Sieboldii*		*P. sagittatum*
P. Convolvulus	*P. Convolvulus*	*Polygonum Convolvulus*		*P. cilinode*
P. dumetorum	*P. pterocarpum* & *dumet.*	(*Polygonum multiflorum*)		*P. scandens*
E. angustifolia, &c.	E. latifolia, *umbellata*, &c.	Elæagnus macrophylla, *umbellata*, & 3 spp.		E. argentea
D. Mezereum	*D. Mezereum*	*Daphne Pseudo-Mezereum*, n. sp.		
D. Laureola	D. papyracea, &c.	Daphne odora & Japonica		
	S. or W. spp.	Stellera or Wikströmia, 2 spp.		
Thesium spp.	Thesium spp.	Thesium decurrens	Comandra umbellata, &c.	C. umbel. & livida
	S. fragrans	Schœpfia jasminodora		
	Machilus sp.	Machilus, 2 spp.		Persea Carolinensis ?
		Benzoin trilobum		Sassafras officinale
		Benzoin sericeum & var.		B. odoriferum
	Benzoin sp.	Benzoin 4 spp.		B. æstivale & meliss.
	Tetranthera spp.	Tetranthera Japonica	Oreodaphne Calif.	T. ? geniculata
	Daphnidium spp.	Daphnidium spp.		
	Litsæa foliosa	*Litsæa foliosa* & glauca		
	H. cordata	*Houttuynia cordata*	Anemiopsis Californica	
		Saururus Loureiri		*Saururus cernuus*
	C. Indicus, &c.	*Chloranthus inconspicuus*, serratus, & [Tricercandra, n. g.		
C. verna	*C. verna*	*Callitriche verna*	*C. verna*	*C. verna*
		Pachysandra terminalis		*P. procumbens*
B. sempervirens		*Buxus microphylla* & *semperv.* ?		
	Phyllanthus spp.	Phyllanthus lepidocarpus		P. Carolinianus
M. annua		*Mercurialis leiocarpa*		
		Stillingia Japonica		S. ligustrina
E. palustris	*E. palustris*	*Euphorbia palustris*		E. Darlingtonii
E. Esula	*E. Esula*	*Euphorbia Guilielmi*, n. sp.	*E. leptocera*	
Urtica spp.	Urtica spp.	Urtica, 2 spp.		Urtica sp.
	L. terminalis	*Laportea terminalis* & bulbifera		*L. Canadensis*
	Pilea spp.	Pilea petiolaris		P. pumila
	B. platyphylla & *nivea*	*Bœhmeria platyphylla*, *nivea*, &c.		
	V. frutescens	*Villebrunia frutescens*		
	Debregeasia spp.	Debregeasia edulis		
H. Lupulus	*H. Lupulus*	*Humulus Japonicus*	*H. Lupulus*	*H. Lupulus*
C. orientalis & austr.	*C. serotina*	*Celtis Sinensis*		C. occidentalis
	U. lancifolia	Ulmus parvifolia		U. crassifolia
		Maclura gerontogæa		M. aurantiaca
M. nigra	*M. alba* ?	*Morus alba*		M. rubra & *parvifolia*
	J. regia, in Caucasus	Juglans (nigra, Thunb.) ex Zucc.		J. nigra & cinerea
	Pterocarya Caucasica	Pterocarya, 2 sp. & Platycarya		
Q. Ilex	Querci aff.	Quercus, 18 spp., — the greater part of Himalayan or E. Indian types; but also species allied to	Q. agrifolia & Q. densiflora, &	Q. Prinus & Q. Catesbæi
C. vesca		*Castanea Japonica*		*C. vesca*, *Amer.*, & *pumila*
F. sylvatica		*Fagus sylvatica*		*F. ferruginea*
C. orientalis	*C. viminea*	*Carpinus* (Distegocarpus) 4 spp.		C. Americana
C. Avellana	*C. heterophylla*	*Corylus heterophylla*	*C. Americana*, *var.*	*C. Americana*

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
C. tubulosa		(*Corylus Sieboldiana*)	*C. rostrata*	*C. rostrata*
Betula sp.		Betula spp.	B. occidentalis	Betula spp.
A. viridis	*A. viridis*	*Alnus viridis* & firma	*A. viridis*	*A. viridis*
	Myrica spp.	Myrica rubra	M. Californica	M. cerifera
	S. Babylonica ?	*Salix Japonica* & *Babylonica* ?		
S. alba	*S. alba*	(*Salix alba*, ex Thunb.)	S. Wrightii	
S. fragilis	*S. fragilis*	*Salix subfragilis*, Anders. n. sp.*		
S. purpurea	*S. purpurea*	*Salix purpurea* (*integra*, Thunb.)		
S. amygdalina	*S. amygdalina*	*Salix padifolia*, Anders. n. sp.		S. amygdaloides
S. hastata ?	S. hastata ?	Salix viridula, Anders. n. sp.	S. cordata ?	S. cordata ?
S. phylicifolia ?		Salix Sieboldiana	S. phylicoides ?	
S. nigricans ?		Salix vulpina, Anders. n. sp.		
S. acutifolia	*S. acutifolia*	*Salix acutifolia* ?		
P. sylvestris	P. sylvestris	Pinus densiflora Pinus Massoniana	P. resinosa ?	P. resinosa, &c.
P. Cembra	*P. Cembra*	*Pinus parviflora* *Pinus Koræensis*	*P. cembroides*	
L. Europæa	*L. Dahurica* & *Ledebourii*	*Larix leptolepis*	L. occidentalis	L. Americana
	A. Brunoniana	*Abies Tsuga*	*A. Capadensis*	*A. Canadensis*
A. pectinata	A. Sibirica	Abies homolepis & firma	A. bracteata	A. balsamea & Fraseri
A. excelsa	A. orientalis	Abies Jessoensis & polita	A. Menziesii	A. alba & nigra
		(*Glyptostrobus*, China)	Sequoia	*Taxodium*
		Chamæcyparis squarrosa, *pisifera*, &c.	*C. Nutkaensis*	*C. thyoides*
		Thuja orientalis & pendula	T. plicata & gigantea	T. occidentalis
J. communis	*J. communis*	*Juniperus rigida*	*J. communis, var.*	*J. communis, var.*
J. Sabina	*J. Sabina*, &c.	*Juniperus Chinensis*	*J. occidentalis*	*J. Virginiana*
	Cephalotaxus ?	Cephalotaxus, 2 spp.		
T. baccata	*T. baccata* & *Wallichiana*	*Taxus cuspidata*	*T. baccata* & *brevifol.*	*T. baccata v. Canad.*
		Torreya nucifera	*T. Californica*	*T. taxifolia*
	Podocarpus spp.	Podocarpus, 4 spp.	[Podocarpus in Mexico.]	
C. humilis		(Chamærops excelsa & Biroo)		C. Hystrix & Palmetto.
	Arisæma spp.	Arisæma spp. 6		Arisæma spp. 3
		Arctiodracon Japonicum	*A. Kamtschaticum*	*Symplocarpus* & *Oront.*
P. natans	*P. natans*	*Potamogeton natans*, &c.	*P. natans*, &c.	*P. natans*, &c.
Z. marina		(*Zostera marina* ex Thunb.)		*Z. marina*
A. Calamus	*A. Calamus*	*Acorus gramineus*		*A. Calamus*
S. sagittæfolia	*S. sagittæfolia*	(*Sagittaria sagitta* & *obtusa*, Thunb.)	*S. variabilis* ?	*S. variabilis*, &c.
		Liparis liliifolia !		*Liparis liliifolia*
	O. patens, &c.	*Oreorchis lancifolia*		*Aplectrum* hyemale
	C. Wallichiana	*Cremastra variabilis* & mitrata		
	Calanthe spp.	Calanthe striata & discolor		
O. latifolia & *vars.*	*O. latifolia* & *var.*	*Orchis latifolia, var. Beringiana*	*O. latifol. Beringiana*	
C. ensifolia	*C. ensifolia*	*Cephalanthera ensifolia* & *var.* &c.		
Epipactis spp.	*E. veratrifolia*	*Epipactis Thunbergii*	*E. Americana*	*E. Americana*, Tex.
		Pogonia ophioglossoides !		*P. ophioglossoides*
		Arethusa Japonica !		*Arethusa bulbosa*

* *Vide* Appendix, p. 450.

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
S. æstivalis	*S. australis*	*Spiranthes australis*	Spiranthes spp.	S. gracilis
C. guttatum [E. Eu.]	C. guttatum	Cypripedium Japonicum	C. guttatum	C. guttatum (N. W.) & [acaule
	I. setosa & *lævigata*	*Iris setosa* & *lævigata*	*I. setosa*	
	Dioscorea spp.	Dioscorea spp.		Dioscorea villosa
		Aletris Japonica		*Aletris farinosa* & *aurea*
	S. ovalifolia	Smilax China, &c.	S. Californica	S. rotundifolia, &c.
		(*Smilax* (*Coprosmanthus*) *consanguinea*)		*S.* (*Coprosm.*) *herbacea*
	P. obovata & *quadrifolia*	*Paris hexaphylla*		Medeola Virginica
P. quadrifolia	*P. quadrifolia*	*Paris tetraphylla* n. sp.		
	(Trillidium)	*Trillium erectum var. Japonicum*	*T. ovatum*	*T. erectum*
Asparagus spp.	*Asparagus falcatus*	*Asparagus lucidus* & *Wrightii* n. sp.		
P. vulgare	*P. vulgare*	*Polygonatum vulgare*		
		Polygonatum giganteum		*P. giganteum*
P. multiflorum & *vars.*	*P. multiflorum* & *vars.*	*P. multiflorum* & *var.*		*P. biflorum*
C. majalis	*C. majalis*	*Convallaria majalis*		*C. majalis* (local)
S. bifolia	*S. bifolia*	*Smilacina bifolia, v. Kamtschat.*	*S. bifolia, v. Kamts.*	*S. bifolia, Canadensis*
	S. trifolia	*Smilacina trifolia* (Okotsk)		*S. trifolia*
	S. pallida	*Smilacina Japonica*	*S. racemosa*	*S. racemosa*
	C. alpina	*Clintonia Udensis*	C. unifl. & *Andrewsii*	C. umbellata & borealis
	D. Pitsutum	*Disporum sessile, pullum*, &c.	Prosartes Smithii, &c.	P. lanug. & maculata
S. amplexifolius		*Streptopus amplexifolius*	*S. amplexifolius*	*S. amplexifolius*
		Streptopus roseus (Okotsk)	*S. roseus*	*S. roseus*
L. bulbif. & *croceum*	*L. spectabile*	*Lilium bulbiferum, var.* Thunb.		L. Philadelphicum
L. Martagon	L. Martagon	(*Lilium maculatum*, Thunb.)	*L. superbum var.?*	*L. superbum* & *Canad.*
	L. tenuifolium	Lilium callosum		
L. candidum	L. Wallichianum	Lilium longifolium		
	L. Japonicum?	*Lilium Japonicum*		
	L. giganteum	*Lilium cordifolium*		
	O. oxypetala	*Orithya oxypetala*		
	F. cirrhosa, &c.	(Fritillaria? = Uvularia cirrhosa, Thunb.)		
	H. flava & *graminea*	*Hemerocallis fulva*, &c.		
G. lutea	*G. lutea*	*Gagea triflora*		
Scilla spp.	Scilla spp.	(Scilla orientalis & Japonica)	S. (Camassia) escul.	S. Fraseri
A. Schœnoprasum	*A. Schœnoprasum*	*Allium Schœnoprasum*	*A. Schœnoprasum*	*A. Schœnoprasum*
		Allium Thunbergii		*A. Canadense*
A. Victorialis	*A. Victorialis*	*Allium Victorialis*		A. tricoccum
	Fluggea 3 *spp.*	*Fluggea Japonica*, &c.		
	O. spicatus, &c.	*Ophiopogon spicatus*		
	Roxburghia sp.	(Roxburghia Japonica, Blume)		Croomia pauciflora
		Heloniopsis pauciflora, n. gen.		*Helonias bullata*
		(*Helonias* (*Chamælirium?*) *Japonica*)		Chamælirium luteum
V. nigrum	*V. nigrum*	*Veratrum nigrum*		*V. Woodii*
V. album	*V. album*	*Veratrum viride*, var.	*V. viride, var.*	*V. viride*
		Juncus xiphioides	*J. xiphioides*	
J. effusus	*J. effusus*	*Juncus effusus*	*J. effusus*	*J. effusus*
L. pilosa & *campestris*	*L. pilosa* & *campestris*	*Luzula pilosa* & *campestris*	*L. pilosa* & *campestris*	*L. pilosa* & *campestris*
	C. communis	*Commelyna polygama*		*C. Virginica*
C. rotundus	*C. rotundus*	(*Cyperus rotundus*)		*C. rotundus var. Hydra*

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
	C. Iria	(*Cyperus Iria* (*microiria*, Steud.)		*C. Iria*
		(*Cyperus strigosus* ex Thunb.)		*C. strigosus*
E. palustris	*E. palustris*	*Eleocharis pileata*	*E. palustris?*	*E. palustris, var.*
S. lacustris	*S. lacustris*	*Scirpus lacustris*	*S. lacustris & var.*	*S. lacustris*
E. gracile	*E. gracile*	*Eriophorum gracile*	*E. gracile*	*E. gracile*
C. præcox & polyrrh.	*C. præcox & polyrrhiza*	*Carex præcox & polyrrhiza*		[*Novæ-Angliæ*
C. pilulifera		*Carex pilulifera* & puberula		*C. Pennsylvan.* &
		Carex rostrata		*C. rostrata*
		Carex stipata	*C. stipata*	*C. stipata*
C. remota	*C. remota*	*Carex remota*	*C. remota* (Sitcha)	
C. stellulata	*C. stellulata*	*Carex stellulata*	*C. stellulata*	*C. stellulata, sterilis*, &c.
C. vesicaria	*C. vesicaria*	*Carex vesicaria*	*C. vesicaria*	*C. vesicaria?*
C. filiformis	*C. filiformis*	*Carex filiformis*		*C. filiformis*
		Carex macrocephala	*C. macrocephala*	
C. muricata	*C. muricata*	*Carex muricata*	*C. muricata*	*C. muricata?*
	C. Doniana	*Carex Doniana*		
	C. Royleana	*Carex Royleana & leucochlora*		
		Carex Wahuensis	(*C. Wahuensis*, Oahu)	
C. vulgaris & cæspitosa	*C. cæspitosa*, &c.	*Carex Gaudichaudiana*	*C. decidua, Pacifica*, &c.	*C. vulgaris*, &c.
	C. capillacea	Carex nana		
C. cryptocarpa		Carex picta	C. cryptocarpa, &c.	
	C. notha	Carex incisa		
	C. tumida	Carex transversa		
C. pilosa	C. Jackiana	Carex papulosa & villosa		C. pubescens
		Carex parciflora	*C. laxiflora?*	*C. laxiflora*
	C. olivacea	Carex dispalata Carex confertiflora	C. amplifolia	
		Carex rigens & Ringgoldiana		C. granularis
C. aristata (orthost.)	C. aristata (orthostachys)	Carex Bongardii, Bonin Islands.	C. aristata?	C. aristata
B. erucæformis	*B. erucæformis*	*Beckmannia erucæformis*	*B. erucæformis*	*B. erucæformis* (W.)
P. arundinacea	*P. arundinacea*	*Phalaris arundinacea*	*P. arundinacea*	*P. arundinacea*
A. geniculatus & fulvus	*A. geniculatus & fulvus*	*Alopecurus geniculatus*	*A. geniculat. & aristul.*	*A. geniculat. & aristul.*
H. borealis, &c.	*H. borealis*, &c.	*Hierochloa borealis*	*H. borealis*	*H. borealis*
M. effusum	*M. effusum*	*Milium effusum*		*M. effusum*
	S. elongatus	*Sporobolus elongatus*	*S. elongatus*	*S. elongatus*
	A. scabra	*Agrostis scabra*	*A. scabra*	*A. scabra*
T. flavescens	*T. flavescens*	*Trisetum flavescens, var.*	*T. cernuum*	
P. pratensis	*P. pratensis*	*Poa pratensis*	*P. pratensis*	*P. pratensis*
P. nemoralis & serot.	*P. nemoralis & serotina*	*Poa nemoralis, serotina*, &c.	*P. serotina & nemor.*	*P. serotina & nemoralis*
	P. acroleuca (*Nepalensis*)	*Poa acroleuca*		
G. fluitans	*G. fluitans & Caspia*	*Glyceria fluitans & Caspia*	*G. fluitans*	*G. fluitans*
M. nutans	*M. nutans*	*Melica nutans*		
F. rubra	*F. rubra*	*Festuca rubra*	*F. rubra*	*F. rubra* (N.)
		Festuca pauciflora	*F. pauciflora* (*occident.*)	
B. patulus, vestit. &c.	*B. patulus*, &c.	*Bromus Japonicus*		
T. caninum	*T. caninum*	*Triticum caninum*	*T. caninum*	*T. caninum*
		Triticum semicostatum	*T. semicostatum*	
I. arundinacea	*I. arundinacea*	*Imperata arundinacea*		*I. arundinacea* (Texas)

Europe.	Central & N. Asia.	Japan.	W. N. America.	E. N. America.
	Arundinaria spp.	*Arundinaria Japonica*, [and other Grasses	*A. Kurilensis?*	A. macrosperma
B. spicant		*Blechnum spicant*	*B. spicant*	
		Adiantum pedatum	*A. pedatum*	*A. pedatum*
P. Cretica		*Pteris Cretica*		*P. Cretica* (S.)
A. fontanum		*Athyrium fontanum*		
A. Filix-fœmina	*A. Filix-fœmina*	*Athyrium Filix-fœmina*	*A. Filix-fœmina*	*A. Filix-fœmina*
		(*Onoclea sensibilis*, ex Hance!)		*O. sensibilis*
S. Germanica	*S. Germanica*	*Struthiopteris Germanica*		*S. Germanica*
P. vulgare	*P. vulgare*	*Polypodium vulgare*	*P. vulgare*	*P. vulgare*
P. aculeatum		*Polystichum polyphlebeium*		*P. aculeatum*
L. dilatata & spinul.	*L. dilatata*, &c.	*Lastrea dilatata*	*L. dilatata*	*L. dilatata & spinulosa*
L. Filix-mas	*L. Filix-mas*	*Lastrea Filix-mas*		L. Goldianum
O. regalis	*O. regalis & Japonica*	*Osmunda Japonica*		*O. regalis*
		Osmunda cinnamomea		*O. cinnamomea*
O. vulgatum	*O. vulgatum*	*Ophioglossum vulgatum?*	*O. vulgatum* (Unalas.)	*O. vulgatum*
	L. serratum	*Lycopodium serratum*		
		Lycopodium lucidulum!		*L. lucidulum*
L. Selago	*L. Selago*	*Lycopodium Selago*	*L. Selago*	*L. Selago* (subalpine)
	L. dendroideum	(*Lycopodium dendroideum*, Okotsk)	*L. dendroideum*	*L. dendroideum*

The principal facts which this table illustrates will be apparent upon inspection, although the plan upon which it is constructed does not favor the deduction of exact numerical conclusions.

The whole number of Japanese entries is about								580		
"	"	"	Asiatic	"	"	"	444;	in italics,	274	
"	"	"	European	"	"	"	282;	"	214	
"	"	"	W. American	"	"	"	216;	"	162	
"	"	"	E. American	"	"	"	356;	"	223	

It is interesting to notice that, notwithstanding the comparative proximity of Japan to Western North America, fewer of its species are represented there than in far distant Europe. Also, — showing that this difference is not owing to the separation by an ocean, — that far more Japanese plants are represented in Eastern North America than in either. It is, indeed, possible that my much better knowledge of American botany than of European may have somewhat exaggerated this result in favor of Atlantic North America as against Europe, but it could not as against Western North America.

If we regard the identical species only, in the several floras, the preponderance is equally against Western as compared with Eastern North America, but is more in favor of Europe. For the number of species in the Japanese column which likewise occur in Western North America, are about 120; in Eastern North America, 134; in Europe, 157.

Of the 580 Japanese entries, there are which have corresponding

European representatives, a little above	0.48	per cent;	of identical species,	0.27
Western N. American representatives, about	0.37	"	"	"	"	0.20
Eastern	"	"	"	"	"	0.61	"	"	"	"	0.23

So geographical continuity favors the extension of identical species; but still Eastern North America has more in common with Japan than Western North America has.

The relations of this kind between the floras of Japan and of Europe are obvious enough; and the identical species are mostly such as extend continuously — as they readily may — throughout Russian Asia, some few only to the eastern confines of Europe, but most of them to its western borders. To exhibit more distinctly the features of identity between the floras of Japan and of North America, and also the manner in which these are distributed between the eastern and the western portions of our continent, — after excluding those species which range around the world in the northern hemisphere, or the greater part of it, or (which is nearly the same thing in the present view), which are unknown in Europe, — I will enumerate the remaining peculiar species which Japan possesses in common with America: —

In Japan.	*In W. N. America.*	*In E. N. America.*
Anemone Pennsylvanica		A. Pennsylvanica
(Coptis asplenifolia?)	C. asplenifolia	
(Trautvetteria palmata)	T. palmata	T. palmata
Caulophyllum thalictroides		C. thalictroides
Diphylleia cymosa		D. cymosa
Brasenia peltata		B. peltata
Geranium erianthum	G. erianthum	
Rhus Toxicodendron	R. Toxicodendron, var.	R. Toxicodendron
Vitis Labrusca (Thunb.)		V. Labrusca
Thermopsis fabacea	T. fabacea	
Prunus Virginiana?		P. Virginiana
Spiræa betulæfolia	S. betulæfolia	S. betulæfolia
Photinia arbutifolia, in Bonin.	P. arbutifolia	
Pyrus rivularis?	P. rivularis	
Ribes laxiflorum	R. laxiflorum	
(Penthorum sedoides, China)		P. sedoides
Cryptotænia Canadensis		C. Canadensis
Heracleum lanatum	H. lanatum	H. lanatum
(Archemora rigida?)		A. rigida
Archangelica Gmelini	A. Gmelini	A. Gmelini
Cymopterus littoralis?	C. littoralis	
Osmorrhiza longistylis	O. longistylis	O. longistylis
Echinopanax horridus	E. horridus	
Aralia quinquefolia		A. quinquefolia
Cornus Canadensis	C. Canadensis	C. Canadensis
Viburnum plicatum		V. plicatum (lantanoides)
*Achillea Sibirica	*A. Sibirica	
*Artemisia borealis	*A. borealis	*A. borealis
Vaccinium macrocarpon	V. macrocarpon	V. macrocarpon
Menziesia ferruginea	M. ferruginea	M. ferruginea
(Boschniakia glabra?)	B. glabra	
*Pleurogyne rotata	*P. rotata	*P. rotata
(Asarum Canadense?)		A. Canadense
*Polygonum Bistorta	P. Bistorta	
Rumex persicarioides	R. persicarioides	R. persicarioides
Liparis liliifolia		L. liliifolia
Pogonia ophioglossoides		P. ophioglossoides
Iris setosa	*I. setosa	
Trillium erectum, var.		T. erectum
(Smilacina trifolia)		S. trifolia
Polygonatum giganteum		P. giganteum

In Japan.	*In W. N. America.*	*In E. N. America.*
(Streptopus roseus)	S. roseus	S. roseus
Veratrum viride	V. viride	V. viride
Juncus xiphioides	J. xiphioides	
(Cyperus Iria)		C. Iria
Carex rostrata		C. rostrata
Carex stipata	C. stipata	C. stipata
Carex macrocephala	C. macrocephala	
Sporobolus elongatus	S. elongatus	S. elongatus
Agrostis scabra	A. scabra	A. scabra
Festuca pauciflora	F. pauciflora	
Adiantum pedatum	A. pedatum	A. pedatum
Onoclea sensibilis		O. sensibilis
Osmunda cinnamomea		O. cinnamomea
Lycopodium lucidulum		L. lucidulum
(Lycopodium dendroideum)	L. dendroideum	L. dendroideum

The names enclosed in parentheses are of species which I have not seen from Japan; some of them inhabit the adjacent mainland; some are imperfectly identified. Those marked * are high northern species in America.

Of these 56 extra-European species, 34 inhabit Western, and 41 Eastern North America. And 15 are Western, and not Eastern; 22 Eastern, and not Western; and 19 common to both sides of the continent. About eight or nine of these 56 species extend eastward into the interior of Asia.

On the other hand, the only species which I can mention as truly indigenous both to Japan and to Europe, but not recorded as ranging through Asia, are

Euonymus latifolius,	Fagus sylvatica,	Blechnum Spicant,
Valeriana dioica,	Streptopus amplexifolius,	Athyrium fontanum.
Pyrola media,		

Two of these species extend across the northern part of the American continent, and on to the Asiatic; another occurs on the northwest coast of America; and another, the *Fagus*, is represented, in Eastern America, by a too closely related species. It is noteworthy, that not one of these seven plants is of a peculiarly European genus, or even a Europæo-Siberian genus; — while of the fifty-six species of the Americo-Japanese region wanting in Europe, twenty are of extra-European genera; seventeen are of genera restricted to the North American, East Asian, and Himalayan regions (except that *Brasenia* has wandered to Australia); fourteen of the genera (most of them monotypic) are peculiar to America and Japan or the districts immediately adjacent; one is peculiar to our northwest coast and Japan; and eight are monotypic genera wholly

peculiar (*Brasenia* excepted) to the Atlantic United States and Japan. Add to these the similar cases of other American species (nearly all of them peculiarly Atlantic-American) which have been detected in the Himalayas or in Northern Asia, — such as *Menispermum Canadense* (*Dauricum*, DC.), *Amphicarpæa monoica? Clitoria Mariana*, *Osmorrhiza brevistylis*, *Monotropa uniflora*, *Phryma leptostachya*, *Tipularia discolor?* &c., — and it will be almost impossible to avoid the conclusion, that there has been a peculiar intermingling of the Eastern American and Eastern Asian floras, which demands explanation.

The case might be made yet stronger by reckoning some subgeneric types as equivalent to generic in the present view, and by distinguishing those species or genera which barely enter the eastern borders of Europe; e. g. *Cimicifuga fœtida*, *Mœhringia lateriflora*, *Geum strictum*, *Spiræa salicifolia*, &c.

It will be yet more strengthened, and the obvious conclusion will become irresistible, when we take the nearly allied, as well as the identical, species into account. And also when we consider that, after excluding the identical species, only 15 per cent of the entries in the European column of the detailed tabular view are in italic type (i. e. are *closely* representative of Japanese species); while there are 22 per cent of this character in the American column.

For the latter, I need only advert to some instances of such close representation, as of

Trollius patulus	by	*T. Americanus,*	*Astilbe Thunbergii* & *Japonica*	by	*A. decandra,*
Aquilegia Burgeriana	"	*A. Canadensis,*	*Mitchella undulata*	"	*M. repens,*
Rhus vernicifera	"	*R. venenata,*	*Hamamelis Japonica*	"	*H. Virginica,*
Celastras scandens	"	*C. articulatus,*	*Clethra barbinervis*	"	*C. acuminata,*
Negundo cissifolium	"	*N. aceroides,*	*Rhododendron brachycarpum*	"	*R. Catawbiense,*
Sophora Japonica	"	*S. affinis,*	*Amsonia elliptica*	"	*A. Tabernæmontana,*
Sanguisorba tenuifolia	"	*S. Canadensis,*	*Saururus Loureiri*	"	*S. cernuus,*

and many others of the same sort, — several of which, when better known, may yet prove to be conspecific; while an equally large number could be indicated of species which, although more positively different, are yet no less striking counterparts.

To demonstrate the former proposition, I have only to contrast the extra-American genera common to Europe and Japan with the extra-European genera common to North America and Japan. The principal European genera of this category are *Adonis*, *Epimedium*, *Chelidonium*, *Malachium*, *Lotus*, *Anthriscus*, *Hedera*, *Asperula*, *Rubia*, *Carpesium*, *Ligularia*, *Lampsana*, *Picris*, *Pœderota*, *Ajuga*, *Thymus*, *Nepeta*, *Lamium*, *Ligustrum*, *Kochia? Daphne*, *Thesium*, *Buxus*, *Mercurialis*, *Cephalanthera*, *Paris*, *Asparagus*, — to which may as well be added *Pæonia* and *Bupleurum*, the former having a representative on the mountains, and the latter in the arctic regions, of Western

America, but both absent from the rest of our continent. Excepting *Pœderota* and *Buxus* (the latter a rather doubtful native of Eastern Asia), none of these genera are peculiar to Europe, but all extend throughout Asia and elsewhere over large parts of the world.

The following incomplete list of North American genera or peculiar subgeneric types represented in Japan and its vicinity, but unknown in Europe, presents a very different appearance. Those which are absent from the flora of Western North America are italicized.

Trautvetteria
Cimicifuga (barely reaches Europe)
Illicium
Magnolia
Cocculus & Menispermum?
Mahonia
Caulophyllum
Diphylleia
Brasenia
Nelumbium
Dicentra
Stuartia (& *Gordonia?*)
Zanthoxylum
Cissus
Ampelopsis
Berchemia
Æsculus
Sapindus
Negundo
Thermopsis
Wistaria
Desmodium
Lespedeza
Rhynchosia
Sophora
Photinia
Astilbe
Mitella
Hydrangea
Itea
Philadelphus
Penthorum
Hamamelis
Liquidambar
Cryptotænia
Cymopterus?
Archemora
Osmorrhiza
Aralia & § *Ginseng*
Echinopanax
Diervilla
Mitchella
Oldenlandia
(Siegesbeckia, in Mexico)
Cacalia (reaches E. Europe)
Gaultheria
Leucothoë
Pieris
Clethra
Menziesia
Symplocos
Ardisia
Boschniakia
Catalpa
Tecoma
Dicliptera
Leptandra
Callicarpa
Cedronella
Amsonia
Asarum § *Heterotropa*
Phytolacca
Benzoin & Sassafras?
Tetranthera
Saururus
Pachysandra
Laportea
Pilea
Bœhmeria
Microptelea
Maclura
Juglans
Abies § Tsuga
Chamæcyparis
Torreya
Arisæma
Arctiodracon
Pogonia
Arethusa
Dioscorea
Aletris
Coprosmanthus
Trillium
Clintonia
Streptopus § Hekorima
Chamælirium?
Sporobolus
Arundinaria
Adiantum
Onoclea

Here are about 90 extra-European genera or forms, 65 of which are absent from Western North America out of the tropics (the latter comprising a very large part of

the most striking representative species), and almost as many more are divided between North America and extra-tropical (chiefly Northern and Eastern) Asia. About 40 of the latter are genera or groups of single, or of two or few closely related species, peculiar, or nearly peculiar, to the regions just mentioned.

This list should be supplemented by those additional North American genera which have one or more closely representative species in the Himalayan region only, such as *Podophyllum*, *Pyrularia*, &c.; and also by the numerous cases in which Eastern-American plants are represented in the Himalayo-Japanese region by strikingly cognate, although not congeneric species; such as our *Macrotys* by *Pityrosperma*; *Schizandra* by *Kadsura* and *Sphærostema*; *Neviusia* by *Kerria* and *Rhodotypos*; *Calycanthus* by *Chimonanthus*; *Cornus florida* by *Benthamia*; *Prosartes* by *Disporum*; *Helonias* by *Heloniopsis*; and so of others, which have been mentioned in the former part of this memoir, and exhibited in the accompanying tabular view.

I had long ago, in Silliman's Journal, presented some data illustrative of this remarkable parallelism, and also more recently, in my "Statistics of the Flora of the Northern United States" (Vol. 22, Second Series); where I had noticed the facts, — 1. that a large percentage of our extra-European types are shared with Eastern Asia; and 2. that no small part of these are unknown in Western North America. But Mr. Bentham was first to state the natural conclusion from all these data, — though I know not if he has even yet published the remark, — viz. that the interchange between the temperate floras even of the western part of the Old World and of the New has mainly taken place *via* Asia. Notwithstanding the few cases which point in the opposite direction (e. g. *Eriocaulon septangulare*, *Spartina*, *Subularia*, *Betula alba*), the general statement will be seen to be well sustained. Also, in the Journal of the Proceedings of the Linnæan Society, 2. p. 34, Mr. Bentham "calls to mind how frequently large American genera (such as *Eupatorium*, *Aster*, *Solidago*, *Solanum*, &c.) are represented in Eastern Asia by a small number of species, which gradually diminish or altogether disappear as we proceed westward toward the Atlantic limits of Europe; whilst the types peculiar to the extreme west of Europe (excluding of course the Arctic flora) are wholly deficient in America. These are among the considerations which suggest an ancient continuity of territory between America and Asia, under a latitude, or at any rate with a climate, more meridional than would be effected by a junction through the chains of the Aleutian and the Kurile Islands."

I shall presently state why connection in a more meridional latitude need not be supposed.

The deficiency in the temperate American flora of forms at all peculiar to Western

Europe is almost complete, and is most strikingly in contrast with the large number of Eastern American forms repeated or represented in Eastern Asia. Of genera divided between Eastern North America and Europe, I can mention only *Ostrya*, *Narthecium*, *Psamma*, the maritime *Cakile*, and perhaps *Scolopendrium*. *Hottonia* might have been added, but for a species accredited to Java. And if we extend the range across our continent, we add only *Cercis* and *Læflingia*. Of the ampler genera at all characteristic of the European flora, I can enumerate from the Flora of the Northern United States nothing more important than *Helianthemum* and *Valerianella*, two or three species of each, (but those of the former hardly congeners of the European ones,) adding that *Hieracia* and perhaps *Cirsia* are somewhat more plentiful in Eastern than in Western America. Let it also be noted, that there are even fewer Western-European types in the Pacific than in the Atlantic United States, notwithstanding the similarity of the climate!

That representation by allied species of genera peculiar, or nearly peculiar, to two regions, furnishes evidence of similar nature and of equal pertinency with representation by identical species, will hardly be doubted. Whether or not susceptible of scientific explanation, it is certain that related species of phænogamous plants are commonly associated in the same region, or are found in comparatively approximate (however large) areas of similar climate.* Remarkable exceptions may indeed be adduced; but the fact that they are remarkable goes to confirm the proposition. Indeed, the general expectation of botanists in this regard sufficiently indicates the common, implicit opinion. The discovery of a new *Sarracenia* or a new *Halesia* in the

* The fundamental and most difficult question remaining in natural history is here presented; — the question whether this actual geographical association of congeneric or other nearly related species is primordial, and therefore beyond all scientific explanation, or whether even this may be to a certain extent a natural result. The only noteworthy attempt at a scientific solution of the problem, aiming to bring the variety as well as the geographical association of existing species more within the domain of cause and effect, is that of Mr. Darwin and (later) of Mr. Wallace, — partially sketched in their short papers "On the Tendency of Species to form Varieties, and on the Perpetuation of Varieties and Species by natural Means of Selection," in the Journal of the Proceedings of the Linnæan Society, Vol. 3 (Zoölogy), p. 45. The views there suggested must bear a prominent part in future investigations into the distribution and probable origin of species. It will hardly be doubted that the tendencies and causes indicated are really operative; the question is as to the extent of their operation. But I am already disposed, on these and on other grounds, to admit that what are termed closely related species may in many cases be lineal descendants from a pristine stock, just as domesticated races are; or, in other words, that the limits of occasional variation in species (if by them we mean primordial forms) are wider than is generally supposed, and that derivative forms when segregated may be as constantly reproduced as their originals.

Atlantic United States, or of a new *Eschscholtzia*, *Platystemon*, or *Calais* west of the Rocky Mountains, would excite no surprise. A converse discovery, or the detection of any of these genera in a remote region, would excite great surprise. The discovery of numerous closely related species thus divided between two widely separated districts might not, in the present state of our knowledge, suggest former continuity, migration, or interchange; but that of identical species peculiar to the two inevitably would.

Why should it? Evidently because the natural supposition is that individuals of the same kind are descendants from a common stock, or have spread from a common centre; and because the progress of investigation, instead of eliminating this preconception from the minds of botanists, has rather confirmed it. Every other hypothesis has derived its principal support from difficulties in the application of this. A review of what has been published upon the subject of late years makes it clear that the doctrine of the local origin of vegetable species has been more and more accepted, although, during the same period, species have been shown to be much more widely dispersed than was formerly supposed. Facts of the latter kind, and the conclusions to which they point, have been most largely and cogently brought out by Dr. Hooker, and are among the very important general results of his extensive investigations. And the best evidence of the preponderance of the theory of the local origin of species, — notwithstanding the great increase of facts which at first would seem to tell the other way, — is furnished by the works of the present De Candolle upon geographical botany. This careful and conscientious investigator formerly adopted and strenuously maintained Schouw's hypothesis of the double or multiple origin of species. But in his great work, the *Géographie Botanique Raisonnée*, published in the year 1855, he has in effect discarded it, and this not from any theoretical objections to that view, but because he found it no longer needed to account for the general facts of distribution. This appears from his qualified, though dubious, adherence to the hypothesis of a double origin, as a *dernier resort*, in the few and extraordinary cases which he could hardly explain in any other way. His decisive instance, indeed, is the occurrence of the Eastern American *Phryma leptostachya* in the Himalaya Mountains.

The facts presented in the present memoir effectually dispose of this subsidiary hypothesis, by showing that the supposed single exception belongs to a not uncommon case. Indeed, so many species are now known to be common to Eastern and Northern Asia and Eastern North America, — some of them occurring also in Northwestern America and some not, — and so many genera are divided between these two regions, that the antecedent improbability of such occurrence is done away, and more cases of the kind may be confidently expected. However others may regard them, it is clear

that De Candolle would now explain these cases in accordance with the general views of distribution adopted by him, under which they naturally fall, — so abandoning the notion of a separate creation.

I know not whether any botanist continues to maintain Schouw's hypothesis. But its elements have been developed into a different and more comprehensive doctrine, that of Agassiz, which should now be contemplated. It may be denominated the *autochthonal* hypothesis.

In place of the ordinary conception, that each species originated in a local area, whence it has been diffused, according to circumstances, over more or less broad tracts, — in some cases becoming widely discontinuous in area through climatic or other physical changes operating during a long period of time, — Professor Agassiz maintains, substantially, that each species originated where it now occurs, probably in as great a number of individuals occupying as large an area, and generally the same area, or the same discontinuous areas, as at the present time.

This hypothesis is more difficult to test, because more ideal than any other. It might suffice for the present purpose to remark, that, in referring the actual distribution, no less than the origin, of existing species simply to the Divine will, it would remove the whole question out of the field of inductive science. Regarded as a *philosophical* question, Maupertuis's well-known "principle of least action" might be legitimately urged against it; namely, "that it is inconsistent with our idea of Divine wisdom, that the Creator should use more power than was necessary to accomplish a given end." This philosophical principle holds so strictly true in all the mechanical adaptations of the universe, as Professor Peirce has shown, that we cannot think it inapplicable to the organic world also, and especially to the creation of beings endowed with such enormous multiplying power, and such means and facilities for dissemination, as most plants and animals. Why then should we suppose the Creator to do that supernaturally which would be naturally effected by the very instrumentalities which he has set in operation?

Viewed, however, simply in its *scientific* applications to the question under consideration, (the distribution of plants in the temperate zone of the northern hemisphere,) the autochthonal hypothesis might be tested by inquiring whether the primitive or earliest range of our species could possibly have remained unaffected by the serious and prolonged climatic vicissitudes to which they must needs have been subject; and whether these vicissitudes, and their natural consequences, may not suffice to explain the partial intermingling of the floras of North America and Northern Asia, upon the supposition of the local origin of each species. Let us bring to the inquiry

the considerations which Mr. Darwin first brought to bear upon such questions, and which have been systematically developed and applied by the late Edward Forbes, by Dr. Hooker, and by Alphonse De Candolle.

No one now supposes that the existing species of plants are of recent creation, or that their present distribution is the result of a few thousand years. Various lines of evidence conspire to show that the time which has elapsed since the close of the tertiary period covers an immense number of years; and that our existing flora may in part date from the tertiary period itself. It is now generally admitted that about 20 per cent of the Mollusca of the middle tertiary (miocene epoch), and 40 per cent of the pliocene species on the Atlantic coast still exist; and it is altogether probable that as large a portion of the vegetation may be of equal antiquity. From the nature of the case, the direct evidence as respects the flora could not be expected to be equally abundant. Still, although the fossil plants of the tertiary and post-tertiary of North America have only now begun to be studied, the needful evidence is not wanting.

On our northwestern coast, in the miocene of Vancouver's Island, among a singular mixture of species referable to *Salix*, *Populus*, *Quercus*, *Planera*, *Diospyros*, *Salisburia*, *Ficus*, *Cinnamomum*, *Persoonia* or other *Proteaceæ*, and a Palm (the latter genera decisively indicating a tropical or subtropical climate), Mr. Lesquereux has identified one existing species, a tree characteristic of the same region ten or fifteen degrees farther south, viz. the Redwood or *Sequoia sempervirens*. In beds at Somerville referred to the lower or middle pliocene by Mr. Lesquereux, this botanist has recently identified the leaves of *Persea Carolinensis*, *Prunus Caroliniana*, and *Quercus myrtifolia*, now inhabiting the warm sea-coast and islands of the Southern States.*

The pliocene quadrupeds of Nebraska also show that the climate east of the Rocky Mountains at this epoch was much warmer than now. About the Upper Missouri and Platte there were then several species of Camel (*Procamelus*) and allied Ruminantia, and a Rhinoceros, besides a Mastodon, an Elephant, some Horses and their allies, not to mention a corresponding number of carnivorous animals. These herbivora probably fed in a good degree upon herbage and grasses of still existing species. For herbs and grasses are generally capable of enduring much greater climatic changes, and are therefore likely to be even more ancient, than trees. These animals must have had at least a warm-temperate climate to live in: so that in lat. 40° – 43° they could not have been anywhere near the northern limit of the temperate flora of those

* These and other data, obligingly communicated by Mr. Lesquereux, will be published in the May number of the American Journal of Science and Arts.

days; indeed the temperate flora, which now in Western Europe touches the Arctic Circle, must then have reached equally high latitudes in Central or Western North America. In other words, the temperate floras of America and Asia must then have been conterminous (with small oceanic separation), and therefore have commingled, as conterminous floras of similar climate everywhere do.

At length, as the post-tertiary opened, the glacier epoch came slowly on, — an extraordinary refrigeration of the northern hemisphere, in the course of ages carrying glacial ice and arctic climate down nearly to the latitude of the Ohio. The change was evidently so gradual that it did not destroy the temperate flora, at least not those enumerated above as existing species. These and their fellows, or such as survive, must have been pushed on to lower latitudes as the cold advanced, just as they now would be if the temperature were to be again lowered; and between them and the ice there was doubtless a band of subarctic and arctic vegetation, — portions of which, retreating up the mountains as the climate ameliorated and the ice receded, still scantily survive upon our highest Alleghanies, and more abundantly upon the colder summits of the mountains of New York and New England: — demonstrating the existence of the present arctic-alpine vegetation during the glacial era; and that the change of climate at its close was so gradual that it was not destructive to vegetable species.

As the temperature rose, and the ice gradually retreated, the surviving temperate flora must have returned northward *pari passu*, and — which is an important point — must have advanced much farther northward, and especially northwestward, than it now does; so far, indeed, that the temperate floras of North America and of Eastern Asia, after having been for long ages most widely separated, must have become a second time conterminous. Whatever doubts may be entertained respecting the existence of our present vegetation generally before the glacial era, its existence immediately after that period will hardly be questioned. Here, therefore, may be adduced the direct evidence recently brought to light by Mr. Lesquereux, who has identified our Live Oak (*Quercus virens*), Pecan (*Carya olivæformis*), Chinquapin (*Castanea pumila*), Planer-tree (*Planera Gmelini*), Honey-Locust (*Gleditschia triacanthos*), *Prinos coriaceus*, and *Acorus Calamus*, — besides an Elm and a *Ceanothus* doubtfully referable to existing species, — on the Mississippi, near Columbus, Kentucky, in beds which Mr. Lesquereux regards as anterior to the drift. Professor D. D. Owen has indicated their position "as about 120 feet lower than the ferrugineous sand in which the bones of the *Megalonyx Jeffersonii* were found." So that they belong to the period immediately succeeding the drift, if not to that immediately preceding it. All the vegetable remains of this deposit, which have been obtained in a determinable condition, have been referred, either positively or

probably, to existing species of the United States flora, most of them now inhabiting the region a few degrees farther south.

If, then, our present temperate flora existed at the close of the glacial epoch, the evidence that it soon attained a high northern range is ready to our hand. For then followed the second epoch of the post-tertiary, called the *fluvial* by Dana, when the region of the St. Lawrence and Lake Champlain was submerged, and the sea there stood five hundred feet above its present level; when the higher temperate latitudes of North America, and probably the arctic generally, were less elevated than now, and the rivers vastly larger, as shown by the immense upper alluvial plains, from fifty to three hundred feet above their present beds; and when the diminished breadth and lessened height of northern land must have given a much milder climate than the present.

Whatever the cause, the milder climate of the fluvial epoch is undoubted. Its character, and therefore that of the vegetation, is decisively shown, as geologists have remarked, by the quadrupeds. While the *Megatherium*, *Mylodon*, *Dicotyles*, &c. demonstrate a warmer climate than the present in the Southern and Middle United States, the *Elephas primigenius*, ranging from Canada to the very shores of the Arctic Ocean, equally proves a temperate climate and a temperate flora in these northern regions. This is still more apparent in the species of the other continent, where, in Siberia, not only the *Elephas primigenius*, but also a Rhinoceros, roamed northward to the arctic sea-coast. The quadrupeds that inhabited Europe in the same epoch are well known to indicate a warm-temperate climate as far north as Britain, in the middle, if not the later post-tertiary. North America then had its herds of Mastodons, Elephants, Buffaloes or Bisons of different species, Elks, Horses, *Megalonyx*, the Lion, &c.; and, from the relations between this fauna and that of Europe, there is little doubt that the climate was as much milder than the present on this as on the other side of the ocean. All the facts known to us in the tertiary and post-tertiary, even to the limiting line of the drift, conspire to show that the difference between the two continents as to temperature was very nearly the same then as now, and that the isothermal lines of the northern hemisphere curved in the directions they now do.

A climate such as these facts demonstrate for the fluvial epoch would again commingle the temperate floras of the two continents at Behring's Straits, and earlier — probably through more land than now — by way of the Aleutian and Kurile Islands. I cannot imagine a state of circumstances under which the Siberian Elephant could migrate, and temperate plants could not.

The fluvial was succeeded by the "*terrace* epoch," as Dana names it, "a time of transition towards the present condition, bringing the northern part of the continent

up to its present level, and down to its present cool temperature," * — giving the arctic flora its present range, and again separating the temperate floras of the New and of the Old World to the extent they are now separated.

Under the light which these geological considerations throw upon the question, I cannot resist the conclusion, that the extant vegetable kingdom has a long and eventful history, and that the explanation of apparent anomalies in the geographical distribution of species may be found in the various and prolonged climatic or other physical vicissitudes to which they have been subject in earlier times; — that the occurrence of certain species, formerly supposed to be peculiar to North America, in a remote or antipodal region affords of itself no presumption that they were originated there; — and that the interchange of plants between Eastern North America and Eastern Asia is explicable upon the most natural and generally received hypothesis, (or at least offers no greater difficulty than does the Arctic flora, the general homogeneousness of which round the world has always been thought compatible with local origin of the species,) and is perhaps not more extensive than might be expected under the circumstances. That the interchange has mainly taken place in high northern latitudes, and that the isothermal lines have in earlier times turned northward on our eastern, and southward on our northwest coast, as they now do, are points which go far towards explaining why Eastern North America, rather than Oregon and California, has been mainly concerned in this interchange, and why the temperate interchange, even with Europe, has principally taken place through Asia.

* For the collocation and communication of the geological data here presented, I am indebted to the kindness of my friend, Professor Dana.

*** On page 425, after line 6, insert *Brasenia peltata* in the Asiatic, Japanese, Western North American, and Eastern North American columns. To the remarks upon the known range of this species, I have now to add the interesting fact, that it exists upon the northwestern coast of America, having been gathered by Dr. Pickering, in Wilkes's South Sea Exploring Expedition, in a stream which falls into Gray's Harbor, lat. 47°. It must be local on the western side of the continent, or it would have been met with before. When this remarkable plant was known to occur only in Eastern North America and Eastern Australia, it made the strongest case in favor of double creation that perhaps has ever been adduced. But since it has been found to occur throughout the Eastern Himalayas and in Japan, and has now been detected in Northwestern America also, the case seems to crown the conclusions to which this memoir arrives.

Page 428, line 11, in the Asiatic column, add *Osmorrhiza brevistylis*.

APPENDIX.

SALICES e Japonia, quas descripsit N. J. Andersson Holmiensis.

1. Salix Japonica, *Thunb. Fl. Jap.* p. 24; *Gray in Perry, Jap. Exped.* 2. p. 319: amentis sessilibus nudis cylindricis acutiusculis, defloratis valde elongatis flexuosis gracillimis; squamis ovatis concoloribus testaceis glabriusculis capsulam fere dimidiam æquantibus; capsulis ovatis obtusis glabris subsessilibus; stylo minuto glabro; stigmatibus integris; foliis lanceolatis cuspidatis acute serratis glabris subtus pallidioribus. — Hab. juxta Nagasaki et alibi, *Thunberg.* Hakodadi, *Williams & Morrow.*

Arbor mediocris ex *Thunb.* Rami graciles, torulosi, cortice flavo-cinerascente glabro nitente obducti. Folia bipollicaria et minora, juniora interdum utrinque pilis raris et caducis conspersa, anguste lanceolata, apice subobliquo cuspidato-acuminata; adulta latiora, apice brevius cuspidata, utrinque glaberrima, subtus pallidiora vel immo fere glaucescentia, venis pulchre anastomosantibus reticulato-venulosa, margine acute serrata, serraturis productis. Amenta (fœminea et efflorata tantum vidi) numerosa, condensata, usque ad 4 poll. longa, patentia, laxe flexuosa, bracteis subnullis suffulta; rhachis hirta; squamæ vix lineam longæ, pallide testaceæ, obtusæ, concolores. Capsulæ linea longiores, basi ovata crassæ, gibbæ, apice subtruncato obtusæ, testaceo-rufescentes, glaberrimæ: pedicellus obsoletus: stylus vix productus: stigma crassiuscula.

Specimina hic descripta in herbario proprio Thunbergii Upsaliæ asservata, a *Salice Babylonica* — cui capsulis et squamis earum fere omnino congruit — foliis brevibus exacte late lanceolatis (non lineari-lanceolatis) acute et sat dense serratis, serraturis evidenter productis, amentis eximie numerosis et confertis, longissimis et laxissimis, luculenter differt. In herbario autem Holmiensi et musei Parisiensis specimina plurima foliifera vidi e Japonia a Thunbergio reportata et communicata, sine ullo dubio ad *S. Babylonicam* veram referenda, sed *S. Japonica* etiam a Thunbergio inscripta. Quæ quum ita sint de vera specie *S. Japonicæ*, Thunb. non parum sum incertus.

2. Salix Babylonica, *L. Spec. p.* 1473. E pluribus locis Japoniæ in herbariis variis (semper *S. Japonica* appellata) a Thunbergio ipso communicatam vidi. In China frequenter culta, et inde forsan in Japoniam immigrata.

3. Salix alba, *L. Spec. p.* 1479; *Thunb. Fl. Jap. p.* 25. Nulla specimina e Japonia unquam vidi; in herbario Thunbergii non adest.

4. Salix subfragilis, *Anders. sp. nov.?* Hab. ad Hakodadi Japoniæ legerunt *Williams & Morrow.* (Hb. A. Gray.) Specimen mancum *Salici* nostræ *fragili* tam simile ut vix ab ea sit distinguendum.

Amenta (fœminea) brevissima, pedunculata, bracteis paucis subspathulatis integris glabris suffulta, vix pollicem longa, recurvata, subdensiflora, obtusiuscula; rhachis hirsuta: squamæ concolores pallide flavescentes, lanceolato-lineares, obtusæ glabræ, capsulas initio omnino tegentes. Capsulæ viridulæ subsessiles, ovato-conicæ, glabræ vel basi interdum puberulæ, stylo producto rostratæ, stigmatibus integris excurvatis. Folia (novella tantum vidi) lanceolata, glabra, vel subtus pilis adpressis hirsuta, margine integra, venis obscurioribus percursa.

5. Salix purpurea, *L. Spec. p.* 1477. S. integra, *Thunb. Fl. Jap. p.* 27, sec. specimina in herb. propr. Thunb. (Capsulæ valde crassæ, adpresse albo-tomentosæ : folia rotundato-obtusata, subtus crebre albo-punctata.)

Sub nomine *S. integræ*, Thunb. in herb. Hook. specimen vidi depauperatum, de quo hæc annotavi : "*Salice repente* in Europa vulgatissimæ proxima videtur, præsertim varietati hujus maxime insigni *arenariæ* : folia tamen lingulata, basi valde contracta, margine acute revoluto, acutissime et dense sed non profunde serrulata, vel potius denticulata, supra obscure viridia costa tamen alba, subtus argenteo-sericea costis et venis elevatis, ob nervos transversim connexos pulchre reticulatim areolata." Specimina mihi hodie non adsunt, quam ob rem de hac forma nil certe enuntiare audeo.

6. Salix padifolia, *Anders. sp. nov.* : amentis sessilibus præcocibus gracilibus flexuosis breviusculis ; squamis concoloribus glaberrimis ; capsulis subcylindricis vel ovato-conicis glaberrimis, pedicello nectarium bis terve superantibus ; stylo parvo ; stigmatibus integris brevissimis ; foliis ovato-lanceolatis cuspidato-acuminatis utrinque glaberrimis subtus glaucescentibus margine serrulatis. — Hab. ad Simoda legerunt *Williams & Morrow.* (Hb. A. Gray.)

Arbor videtur sat procera. Rami graciles, læves, cortice castaneo glabro obducti. Folia 2 – 3 poll. longa, ad medium 1 – 1½ poll. lata, basi rotundata sæpius subcordata, apice in cuspidem obliquum abrupte producta, supra saturate viridia, subtus opace glaucescentia, costa fulva percursa, margine plus minusve sed non profunde serrulata ; petiolus 2 lin. longus, planiusculus, glaber. Amenta (fœminea tantum vidi) anguste cylindrica, arrecto-patentia, flexuosa, laxiuscula, densiflora, deflorata 3 – 3½ poll. longa, 2 – 3 lin. crassa, subsessilia, bracteis minutis 2 – 3 subtus hirsutis suffulta. Capsulæ testaceo-viridulæ, 1 lin. longæ, omnino glabræ, basi crassiores, ceterum subcylindricæ, obtusiusculæ ; pedicellis glabris nectarium ovatum sat crassum ter superans. Stylus pedicello duplo brevior, glaber : stigmata brevissima, crassiuscula, integra. Squamæ lingulatæ, testaceæ, glaberrimæ, ventrem capsularum superantes.

Hæc species quoad habitum, formam, consistentiam et glabritiem foliorum ad *S. amygdalinam* ita proxime accedit ut vix, nisi amentis longissimis et gracillimis, pedunculo nullo foliato infixis, tute distinguatur ! Folia tamen non subtus reticulato-venulosa.

7. Salix viridula, *Anders. sp. nov.* Hab. ad Yokuhama legerunt *Williams & Morrow.* (Hb. A. Gray.)

Amenta (mascula) breve pedunculata, foliis paucis suffulta, arrecta, subdensiflora, cylindrica, acutiuscula, e basi florentia ; rhachis cinereo-hirsuta : squamæ oblongo-spathulatæ, pallide testaceæ, concolores, convexæ, glabræ, apice rotundatæ : stamina gemina ; filamentis longis squamas duplo superantibus pallidis ; antheris sat magnis rotundatis. Folia fere pollicaria, semipollicem lata, subsessilia, exacte ovalia, basi subrotundata, apice nonnunquam parum producta, margine integra vel serrulata, serraturis acutis glanduligeris adpressis, utrinque glaberrima, pallide virescentia, venis anastomosantibus pulchre reticulato-areolata, subtus parum pallidiora.

Si cuidam nostratum sit comparanda *S. hastatæ* quoad habitum proxima. In utraque folia ovalia, brevissime petiolata, virescentia, præsertim subtus reticulato-venulosa : amenta mascula etiam haud dissimilia, sed squamæ concolores, quare etiam *S. amygdalinam* nonnihil refert.

8. Salix Sieboldiana, *Blume, Bijdr. p.* 517 ; *Gray in Perry, l. c.* : amentis sessilibus nudiusculis erecti-usculis densifloris ; squamis lanceolato-linearibus testaceis concoloribus margine pilis conspersis, capsulis conicis rostratis pilis rigidis inferne dense hirtis apice glabrescentibus fuscis, pedicello hirto nectarium duplo superante ; stylo producto ; stigmatibus integris ; foliis obovato-ovalibus utrinque glaberrimis subtus opacis margine acute glanduloso-serratis. — Hab. ad Hakodadi legerunt *Williams & Morrow.* (Hb. A. Gray.)

Arbor. Rami cortice fusco-glabro nitente obducti. Folia 1½ poll. longa, supra medium vix pollicem lata,

exacte obovata, apice recto nonnihil producta, margine acute serrata, serraturis subacutis glanduligeris, utrinque glaberrima, supra obscure viridia, venis elevatiusculis striata, subtus pallidiora subglaucescentia costa et venis prominulis, pulchre reticulato-venulosa: petiolus lineam longus, glaber. Amenta (fœminea tantum vidi) pollicaria, cylindrica, acutiuscula, densiflora, cinerascentia, bracteis paucis et minutis suffulta; rhachis villoso-hirta: squamæ lineari-lanceolatæ, obtusissimæ, concolores, ut videtur persistentes, capsulam fere dimidiam æquantibus: pedicellus parvus, nectarium crassissimum duplo superante, albo-hirtus. Capsulæ linea longiores, conico-rostratæ, ventre pilis rigidis albis condensatis hirto, rostro glabro fusco. Stylus productus pedicello longitudine, etiam glaber et fuscus: stigmata sat crassa, fulvescentia, integra.

A speciebus in Europa cognitis sat longe recedit, nec omnino certus sum an potissimum hanc maxime affinem credam. Quoad formam amentorum ut etiam foliorum *S. phylicæfoliæ* quodammodo similis; capsulæ autem multo brevius pedicellatæ, basi albo-strigoræ, et *squamæ concolores!*

9. Salix vulpina, *Anders. sp. nov.*: diandra; amentis subsessilibus bracteatis; squamis acutis apice nigricantibus utrinque pilis rufis nitentibus dense hirtis; foliis obovatis oblique acutis serratis utrinque glabris subtus pallidioribus. — Hab. ad Yokuhama legerunt *Williams & Morrow.* (Hb. A. Gray.)

Frutex videtur sat altus. Rami mediocriter crassi, dense foliati, cortice fusco-castaneo nitenti obducti. Gemmæ 1½ lin. longæ, etiam castaneæ glabræ nitentes. Folia subsessilia, petiolo brevissimo planiusculo glabrescente insidentia, juniora exacte obovata et minuta, præsertim subtus vellere tenui rufescenti-piloso et facile caduco obtuta, adulta fere pollicem longa, supra medium ¾ poll. lata, basi angustata, obovato-elliptica, apice parvo nonnihil producto sæpissime obliquo acutata, margine sat distincte profunde et æqualiter serrulata, supra obscure viridia costa albescente-puberula, ceterum glaberrima, venis regulariter arcuatis percursa, subtus pallidiora, costa et venis dilutioribus pulchre venulosis, omnino glabra, exsiccatione subnigrescentia. Amenta (mascula tantum vidi) 1½ poll. longa, 2½ lin. crassa, exacte cylindrica, obtusa, subflexuosa, erecto-patentia, densiflora, basi foliis parvis 3 – 4 suffulta: squamæ ½ lin. longæ, ex ovata basi acutiusculæ, apice nigrescentes et subcalvescentes, ceterum utrinque pilis sat longis rufo-ferrugineis hirsutæ. Stamina gemina; filamentis squamas duplo superantibus pallide flavescentibus glabris superne crassioribus; antheris sat magnis rotundatis aurantiacis.

A speciebus omnibus mihi cognitis aperte recedit squamis capsularum rufo-hirtis. Quoad folia *S. nigricanti*, in Europa vulgatissimæ, certe proxima.

10. Salix acutifolia, *Willd. Spec.* 4. *p.* 688?

Ad hanc speciem non sine multa hæsitatione specimina quatuor parva et incompleta, ad Hakodadi Japoniæ a Williams et Morrow lecta (Hb. A. Gray), referre coactus sum. Rami cortice valde nitente castaneo obducti. Gemmæ maximæ, glabræ. Amenta mascula fere bipollicaria et 3 – 4 lin. crassa, densissime et hirsuta, arrecto-adpressa, e gemmis magnis erumpentibus, nullis foliis suffulta sed omnino sessilia: squamæ acutæ, atræ, pilis longis lucidis cinereo-flavicantibus obtectæ. Stamina gemina; filamentis longis pilos squamarum superantibus albis; antheris minutis rotundatis. Folia (novella tantum adsunt) lanceolata, crassiuscula et plana, integra vel obsoletissime serrulata, pure et lucide viridia.

N. J. Andersson.

Holmiæ, d. 13. Feb., 1859.

X.

On the Genus Croomia, *and its Place in the Natural System.*

By ASA GRAY, M. D.

(*Read April* 12, 1859.)

CROOMIA, Torr. & Gray.

Perigonium alte 4-partitum, persistens; phyllis ovalibus cruciatim oppositis enerviis, æstivatione imbricatis (duobus interioribus), in anthesi patentissimis. Stamina 4, fundo perigonii inserta, phyllis anteposita: filamenta discreta, brevia, crassa, erecta: antheræ apici filamenti oblique introrsum inserta, immobiles, connectivo vix ullo, loculis appositis ovalibus fere bilocellatis longitudinaliter dehiscentibus. Pollen globosum. Ovarium simplex, ovato-globosum, liberum, arcte sessile, vel ima basi fundo perigonii leviter accretum, uniloculare, stigmate sessili integro depresso apiculatum. Ovula 4 – 6, anatropa, e summo loculo suspensa; funiculis brevibus criniferis. Folliculus ovatus, sæpe rostrato-acuminatus, subcoriaceus, demum bivalve; placenta nerviformi, e sutura ventrali secedente vel separabili, apice 1 – 3-sperma. Semina majuscula, obovata, appensa, rugoso-pluricostata, ad chalazam planam inappendiculata, superne fibris crinalibus copiosissimis longis e funiculo longiusculo rhapheque ortis quasi arillata. Testa coriacea. Embryo minimus, in albumine carnoso-corneo prope umbilicum inclusus, obovatus cum extremitate radiculari supera brevi angustata, monocotyledoneus. — Herba perennis, caule humili simplicissimo e rhizomate subterraneo repente longe enodi apice confertim sed alternatim vel subfasciculatim 4 – 6-phyllo; foliis longius petiolatis Dioscoreineis oblongo-cordatis 5 – 9-costatis cum venulis transversis reticulatis; pedunculis axillaribus paucifloris, pedicellis medio articulatis superne clavellato-incrassatis; floribus parvis, perigonio viridulo basi intus filamentisque purpureis, antheris lateritiis.

Corpus lignosum caulis inter medullam et corticem cellulosum circulatim dispositum, in caule proprio e fasciculis 7 – 10 parvis late discretis (raro binatis) uniseriatis, in rhizomate zonam integram, radiis medullaribus nullis percursam, efficiens.

Croomia pauciflora, *Torr. & Gray, Fl. N. Amer.* 1. *p.* 663; *Gray, Gen. Ill.* 1. *p.* 89, *t.* 37. Anonymos dioscoroides, *Croom in Sill. Jour.* 28, *p.* 165. Cissampelos pauciflora, *Nutt. in Jour. Acad. Philad.* 7, *p.* 115. Hab. in umbrosis Floridæ occidentalis et Alabamæ.

When this genus was characterized by Dr. Torrey and myself, almost twenty years ago, we were puzzled to decide whether the plant was monocotyledonous and endoge-

nous, or dicotyledonous and exogenous. As the structure of the embryo could not be made out, and the germination was unknown, we were obliged to depend mainly upon the structure of the stem. A portion of the creeping rhizoma, attached to the base of some of the original specimens, exhibited a closed zone of wood, surrounding a small cellular pith, and itself surrounded by a thick and purely parenchymatous cortical stratum. This we naturally took for an exogenous structure; — a view we were the more inclined to adopt, from knowing at the time no Smilaceous, Dioscoreaceous, or other allied Monocotyledonous plant having a simple ovary and an arillus like that which is so remarkable in *Croomia*. Among Dicotyledons the nearest approach to our plant in structure and in habit was found in some of the herbaceous *Berberidaceæ;* and we accordingly referred it to that order, notwithstanding the simple and persistent perigonium.

No additional materials were at hand when the first volume of the *Genera Illustrata* was prepared. So the genus was left appended to the *Berberidaceæ*, but mentioned as of wholly doubtful affinity.

Within the last two years I have been supplied, by Dr. Cabell and the Rev. Mr. Nevius of Alabama, with excellent dried specimens, including mature fruit and seeds. Mr. Nevius has also communicated living rootstocks, from which I have now the plant in blossom in the conservatory of the Cambridge Botanic Garden. I have therefore had the opportunity of a complete examination of *Croomia*, except as to the germination, in respect to which our attempts have thus far been unsuccessful.

From these observations an amended generic character is given above. One correction of considerable consequence is, that the stamens are not really hypogynous, but are inserted upon the base of the calyx, which, moreover, shows some tendency to be connate with the base of the ovary. In the nearly full-grown flower-bud, the cavity of the ovary at its broad base sinks slightly below the line of junction with the perianth (as in Fig. 3); in anthesis it deepens somewhat, so as to give a slight appearance of adnation, as is represented in Fig. 4. As the fruit forms, however, this incipient adnation disappears. The mature fruit is usually somewhat contracted or tapering at the base, and above dilated where the large seeds are contained; but the cell extends down to the very insertion of the perianth and stamens, so that there is no trace of any intervening hypogynous receptacle, as in *Thalamifloræ*.

The singular arillus, if it may be so denominated, belongs wholly to the funiculus, in the first instance. In the young flower-bud it consists of short-cylindrical simple cells, like forming root-hairs, growing from its whole surface. As these lengthen, they are converted, by the formation of transverse partitions, into a simple series of

cylindrical cells, as shown in Fig. 6. Long before the seed matures, each of these hairs or rows of uniserial cells becomes a much thicker and longer thread or band, more or less club-shaped towards the extremity, and composed of a tissue of cells (Fig. 12). Some of these threads are now found to originate from the rhaphe, but far the greater part of them belong to the funiculus.

Upon a re-examination of the minute embryo, taken from well-matured seeds, the obscure nick which had before been discerned at its larger or cotyledonar extremity, was found to be eccentric. The figures 13 and 14 exhibit the embryo under the microscope, as it appeared to Mr. H. J. Clark, who kindly furnished these figures. As the views obtained by Mr. Sprague and myself, although not so clear, were not essentially different, we conclude that the embryo is monocotyledonous.

The structure of the stem is more ambiguous. The woody bundles which compose the whole fibro-vascular tissue of the proper stem above ground, from seven to ten in number, as seen in a transverse section, stand strictly in a circle, thus dividing the general parenchyma into a central medullary and an external cortical portion, just as in the seedling or nascent stem of an herbaceous Exogen. Indeed, the whole appearance is far more like the exogenous type than is that of the stalk of *Podophyllum*, in which the somewhat similar bundles are irregularly dispersed.

In *Croomia*, however, the anatomical structure of the individual bundles does not accord with that of ordinary exogenous bundles. These remain as definite threads, cylindrical or nearly so, and separated by uncompressed parenchyma, although two adjacent bundles are occasionally confluent into a broader double one; and there is no appearance of a cambial stratum dividing each bundle into an outer and an inner portion, answering to liber and to wood. But — so far as revealed by a rather superficial examination, under moderate powers of the microscope — each separate bundle consists of nascent or cambium cells in the centre, surrounded by a zone of thick-walled elongated cells, the inner ones apparently bast-cells, and the outer common prosenchyma; this in turn surrounded by a complete, or nearly complete, zone of ducts, commonly uniserial and the greater part scalariform; and this by a more or less definite and thin layer of prosenchyma or wood-cells. These woody bundles, therefore, — although peculiar, and worthy of detailed examination by a phytotomist, — appear to be endogenous, or at least not exogenous, in type.

In the rhizoma, the more abundant fibro-vascular tissues form a complete and closed, although somewhat irregular, zone of wood, surrounding a small but well-defined pith, and itself surrounded by a broad parenchymatous cortical portion (the parenchyma of both loaded with starch); thus closely imitating the exogenous structure. But there

are no medullary rays, and no trace of cambium-layer and liber. Not being prepared to illustrate its anatomy at present, it may suffice to say that the woody layer of the rhizoma appears as if composed of a series of such bundles as those in the leafy stem, but completely and very irregularly confluent into a closed zone.

The only endogenous stems I know of which exhibit a distinct pith are those of *Dioscorea*. The rhizoma of *Croomia* in structure is not materially unlike the herbaceous leafy stems of *Dioscorea villosa*, and the foliage and habit of *Croomia* are altogether Dioscoreaceous.

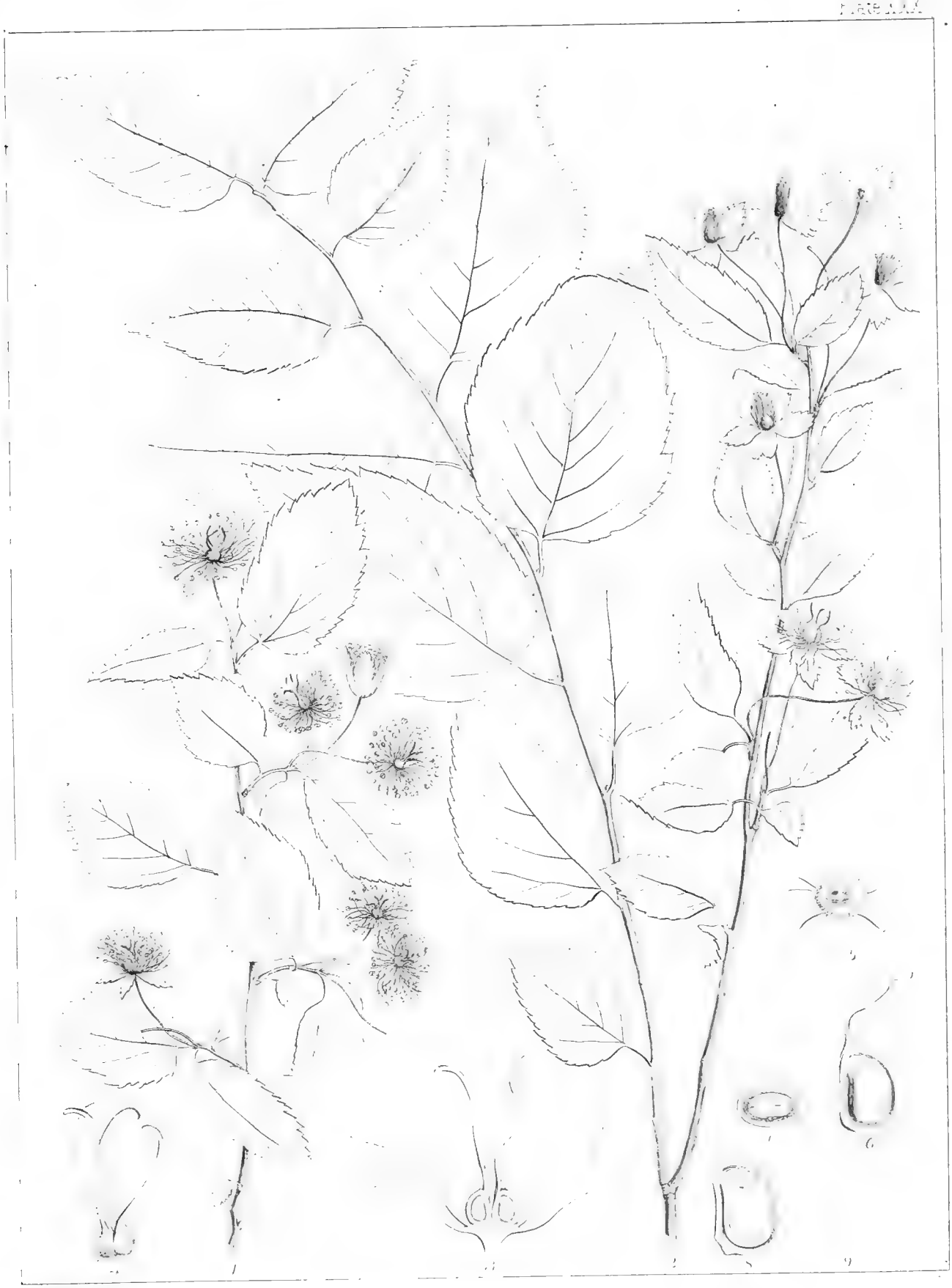
It is needless to enumerate the obvious points of difference between *Croomia* and the *Dioscoreaceæ*, now that I can point to a different but allied group, hitherto monotypic and altogether peculiar, to which our present genus may doubtless be directly referred; namely, the *Roxburghiaceæ*, proposed as a natural order to contain the small Eastern-Asian genus *Roxburghia* alone. As now augmented by another genus, it may prefer a better claim to ordinal rank.

I possess no specimens of *Roxburghia;* but a comparison with the published characters, and with Wallich's figures of the fruit and seed of *R. viridiflora*, leave no doubt that *Croomia* and *Roxburghia* are members of the same and a peculiar natural group. The principal differences are in the configuration of the stamens, in the attachment of the seeds, &c., and are merely generic. The two genera may be contrasted in their essential characters as follows: —

1. Roxburghia. Sepala plurinervia, acuta vel acuminata. Filamenta basi monadelpha: antheræ facie interiore connectivi maximi apice subulato-producti adnatæ, loculis angustis ex apice vacuo subulatis vel mucronatis. Semina ad chalazam rostellata, ex *Endl.* "in placentis parietalibus ad basin valvularum plurima e funiculis elongatis, apice in arillum stuposum solutis erecta." Embryo "albumine quadruplo brevior" (ex *Kunth*), subclavatus, "extremitate radiculari incrassata." (*Endl.*) — Suffrutices volubiles, Orientali-Asiatici, foliis plerisque oppositis seu verticillatis, floribus sat magnis.

2. Croomia. Sepala ovalia, obtusa, fere enervia. Stamina discreta: antheræ breves, filamento oblique introrsum impositæ, connectivo nullo. Semina pauca, per funiculos breviusculos copiose crinigeros apici placentæ filiformis intervalvularis inserta, suspensa. Embryo minutus, obovatus, extremitate cotyledonea incrassata. — Herba humilis Americæ Borealı-orientalis, caule erecto apice folioso, floribus parvis.

Plate XXXI. Flowering plant of *Croomia pauciflora*, of the natural size. Fig. 1. Peduncle and flower-buds. 2. Diagram of the flower in transverse section. 3. Vertical section of a flower-bud. 4. Vertical



PROCKIA PAUCIFLORA

section of an expanded flower. 5. An ovule. 6. Hair-like processes of the funiculus, which compose the arillus? 7. A fruit, of the natural size. 8. Vertical section of a fruit, showing the seeds, &c. 9. The filiform sutural placenta detached, with one of the seeds hanging from its summit. 10. Vertical section of a seed. 11. One of the threads of the arillus. 12. Its extremity, much more magnified. 13, 14. The embryo detached, in two different positions. 15. Section of the stalk or stem above ground. 16. Transverse section of one of the woody bundles of the stalk, much magnified. 17. Section of the subterranean rhizoma. — All the analyses, except Fig. 7, more or less magnified.

XI.

Characters of Ancistrophora, *a New Genus of the Order Compositæ, recently detected by* Charles Wright, Esq. *in the Eastern Part of Cuba.*

By ASA GRAY, M. D.

(*Read April* 12, 1859.)

ANCISTROPHORA, Nov. Gen.

Capitulum multiflorum, heterogamum; floribus homochromis, radii 8–10 ligulatis fœmineis, disci tubulosis hermaphroditis. Involucrum disci brevius; squamis æqualibus bi–triseriatis, exterioribus herbaceis oblongis obtusis, intimis angustioribus receptaculi paleas referentibus. Receptaculum convexum, paleatum; paleis linearibus fere membranaceis planis persistentibus achenia æquantibus. Ligulæ oblongæ, tubulo brevissimo. Corollæ disci e tubo brevi campanulato-ampliatæ, 4-dentatæ. Antheræ breves, ecaudatæ. Styli rami fl. herm. subplani, appendice triangulari acuta hispidula superati. Achenia conformia, late obovata, compresso-plana, margine calloso crasso (nunc subalato) cincta, apice hinc uniaristata; arista achenio longiore persistente lævi apice arcte uncata. — Herba pusilla, acaulis, hirtella, *Bellidis* seu *Lagenophoræ* facie, sed floribus aureis. (Nomen ex ἄγκιστρον, *hamus*, et φέρω, *fero*, ob achenium hamigerum, dicatum.)

Ancistrophora Wrightii. In montosis Cubæ orientali, prope "*Monte Verde*," saxatilis. — Radix annua? Folia rosulata, obovata, subintegerrima, pilis articulatis conspersa, membranacea. Scapi plurimi, bi–tripollicares, nudi, monocephali. Capitulum sesquilineam latum. Ligulæ breviter exsertæ. Squamæ et paleæ demum, fructu delapso, reflexæ. Achenia vix $\frac{3}{4}$ lin. longa, parce hispidula, facie utraque leviter unicostata, margine calloso-incrassato, ad apicem latere interiore aristam arcte hamatam corolla disci subæquilongam, exteriore aristellam brevissimam sæpius evanidam, gerentia.

The specimens from which the above characters are derived were detected by Mr. Wright in the month of February, both in blossom and with well-formed fruit.

I am acquainted with no genus to which this little plant is particularly related. It is uncertain whether De Candolle would have referred it to his subtribe *Eclipteæ*, or to his *Heliantheæ-Verbesineæ ;* and it is hardly worth while to consider the question, since these groups have to be re-arranged and brought into closer connection. The style would answer for either.

This well-marked genus is one of the first fruits of Mr. Wright's second visit to Cuba, the eastern district of which, especially in the more elevated parts, seems likely to furnish many new and interesting species.

Monte Verde, where the present plant, and a considerable portion of Mr. Wright's former collection, were obtained, is the name of the principal plantation of M. Lescaille, a gentleman who deserves the best thanks of botanists for the enlightened zeal and great kindness which he has manifested in furthering Mr. Wright's explorations in Cuba.

XII.

On a New Species of Medusa related to Stephanomia, CRYSTALLOMIA POLYGONATA.

BY JAMES W. DANA.

THE species here described was taken by the writer in the Pacific, in lat. 30° N. and long. 179° E., on the 24th of May, 1841.

The animal is nearly colorless and transparent. Length, 4 inches; diameter, $1-1\frac{1}{6}$ inches. The body is naturally divided into an anterior and posterior portion, the *former* polygonally ovoid, the *latter* subprismatic, a little tapering.

The pieces or blocks of the posterior portion are thin wedge-shaped (Fig. B), and lie in two longitudinal series, facing in opposite directions, the blocks of the two overlapping and alternating with one another. Together they give to this part of the body approximately the form of a six-sided prism, with the sides slightly concave. From the position of the mouth, two of these sides may be called the dorsal, and two the ventral; the two lateral consist each of two longitudinal planes, owing to a slight angle along the medial line.

The angle between the two dorsal surfaces, and also that between the two ventral, is truncated; and at this place in each block there is a circular aperture closed by a valve opening into a sac situated transversely within the block or piece (Fig. B). The valve was in constant action when the animal was first taken. A slender vessel runs inwardly from the sac through the block, perforating its inner or thin edge, showing the existence of a kind of aquiferous system in the animal.

The blocks constituting the ovoidal or anterior portion of the animal are of very different shape from those of the posterior part, as seen in Fig. C; and they are so arranged together as to give the ovoid a series of narrow longitudinal faces a little concave. They are like quadrangular wedges, thinning from one angle to that diagonally opposite, and having the two outer faces divided vertically into two concave faces. These blocks are so set together that one series corresponds to the angles, and another to the faces, of the hexagonal prism of the posterior portion of the body.

The ovoidal anterior portion has a long longitudinal opening on one side, at the inner part of which, just below the medial line of the body, there is a large number of tentacles surrounding the mouth, and small red clusters of retracted nettling-filaments.

The tentacles (see Fig. A) are short, and not at any time exsert beyond the body; their length is about one sixth of an inch, and their general appearance much as in the Actiniæ. From the red clusters a few slender nettling-filaments were usually extended; the animal kept dropping them slowly and retracting them wholly or partially by sudden starts. When most protruded, they were twice the length of the body. The filaments themselves are colorless, or nearly so; but the bulbs they bear at intervals are red (Fig. D), and these give the red color to the retracted filaments.

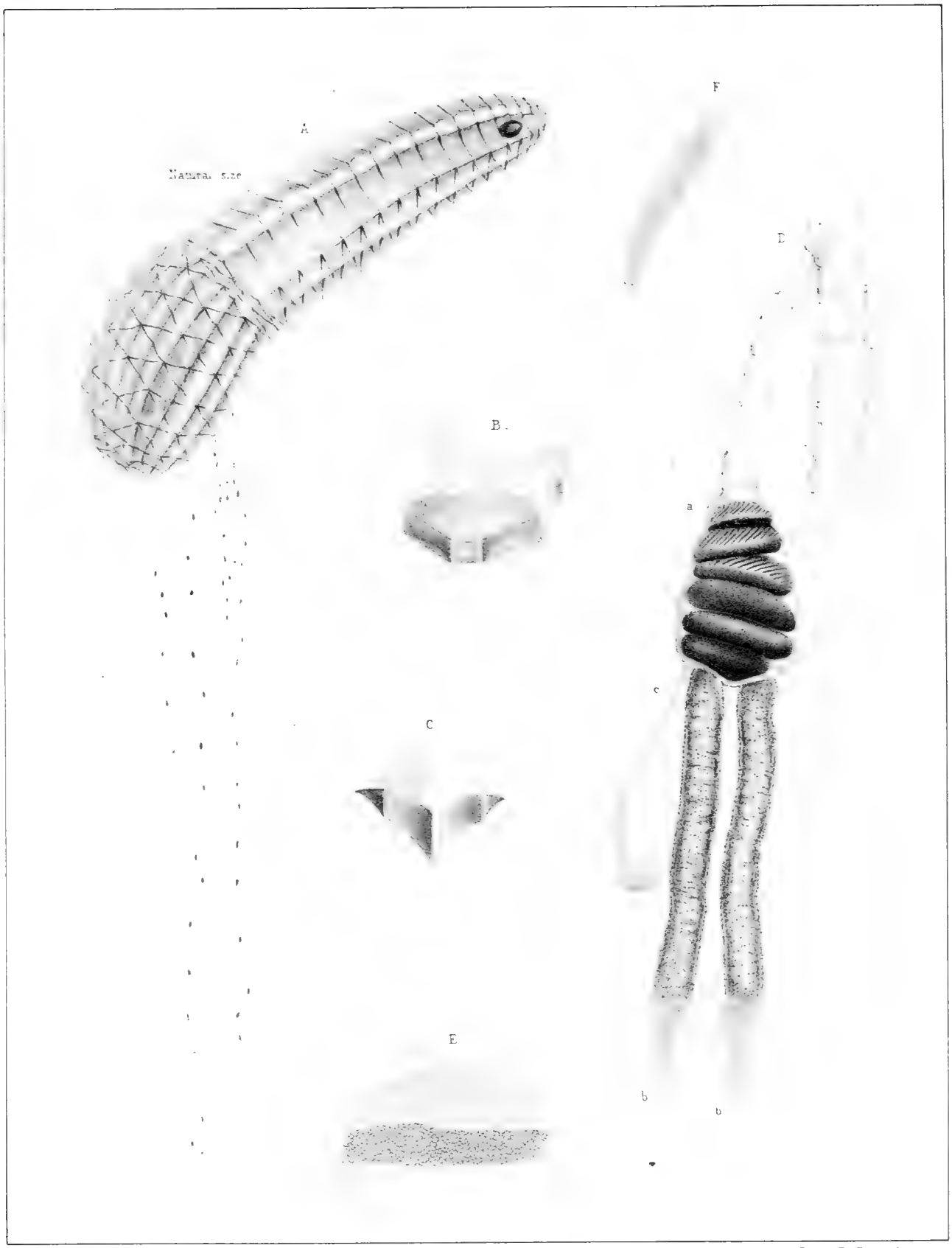
The *filaments* appeared to be tubular (Fig. D), and this tube extended into the bulbs, through the slender pedicel by which they were suspended. The bulb contains a red convoluted cord, — there being usually about *six* turns. The upper three of the turns had an oblique striated appearance, arising from an oblique series of spiculæ (Fig. D, *a*, and Fig. F); but this oblique striation stopped short of the lower side of the turn; and, in the three lower turns, no such striation was seen in any part on the side of the cord exposed to view. The surface of the red cord is very minutely hexagonal. The *spiculæ* (Fig. F) were slender cells, glassy in aspect when separated from the cord; each contains a delicate and seemingly beaded thread, in several longitudinal convolutions. They evidently correspond in structure to the so-called "lasso-cells" of Agassiz.

The bulb bears below two *tentacle-like cords* (Fig. B, *b*, *b'*), as large in diameter as the convoluted cord, being apparently the continuation of this cord, and indicating that the convolution was probably in two coils. There is also along side *an oblong pellucid sac* (Fig. D, *c*). The tentacle-like prolongations were very retractile. They were covered with papillæ or minute prominences, and had a red color, nearly to the extremity; the extremity was colorless, and showed a tube-like appearance within, as if it were the termination of the tube of the filament above. The pellucid sac (*c*) is about as long as the bulb.

From near the mouth a canal, apparently alimentary (see Fig. A), passes in a straight line along the middle of the body posteriorly, nearly to its posterior extremity, where it terminates in an ovoidal organ of a deep brown color, a little glassy in aspect, or at least shining.

The Stephanomia hitherto figured and described have generally been mere fragments of perfect individuals. These figures represent the glassy body at the posterior extremity as wholly uncovered, and the nettling-filaments as centrally terminal at the other extremity; and this would be the condition if the blocks of the posterior extremity and all of the ovoidal anterior portion had been lost. These blocks actually drop apart very easily, so that this is no improbable supposition.

I suggest for the genus the name *Crystallomia*, and for the species, *C. polygonata*.



James D. Dana from nat

CRYSTALLOMIA POLYGONATA Dana.

XIII.

A New Method for Correcting a Planet's Orbit.

By TRUMAN HENRY SAFFORD, A.B.

(*Communicated by Professor Peirce.*)

1. It will be assumed that values of the elements are so nearly known, that the squares of their deviation from the true ones can be neglected; the mass of the planet will also be neglected.

2. The approximate elements will be denoted as follows: —

M° the mean anomaly at the origin of time;

p° the semi-parameter of the orbit;

φ° the angle of eccentricity ($e^\circ = \sin \varphi^\circ$);

π° the longitude of the perihelion;

Ω° the longitude of the ascending node;

i° the inclination;

L° (the mean longitude at the time t_0) $= M^\circ + \pi^\circ$;

a° (the mean distance) $= p^\circ \sec^2 \varphi^\circ$;

μ° (the mean daily motion) $= \frac{k}{\sin 1''} a^{\circ -\frac{3}{2}}$, where $\log k = 8.2355814 - 10$;

$\log k - \log \sin 1'' = 3.5500066$.

The corrected elements to be found will be denoted by the same letters without the °; and the prefix δ to any of these letters denotes the correction to be applied to, or any variations of, these same elements.

Analogous modifications of all functions of these quantities will be expressed in the same way.

We shall use the expressions D_M, &c., however, to denote the partial differential coefficients with respect to M, &c. of their functions, even when, for instance, M has the value M°; and so with the rest.

3. But instead of computing *directly* the partial differentials of any coördinates with

respect to the elements, we shall introduce certain intermediate linear functions of the variations δ M, &c., which last may be considered as themselves variations of conceivable finite functions of M, &c.

4. There are, however, two distinct kinds of changes to which the elements are subject; we may (1) vary the magnitude of the orbit and its position in its own plane, or (2) the position of the plane of the orbit. If the latter change alone takes place, it will affect Ω and i, and through Ω the value of π; so that in this case $\delta\pi = \delta\Omega\,(1 - \cos i)$. But π is also subject to other changes, those of the kind (1); it will therefore be better if we make

$$\delta\chi = \delta\pi - (1 - \cos i)\,\delta\Omega. \tag{1}$$

Putting, for convenience, $\chi^\circ = \pi^\circ$, and substituting $\chi = \chi^\circ + \delta\chi$, $\pi = \pi^\circ + \delta\pi$,

$$\chi = \pi - (1 - \cos i)\,\delta\Omega. \tag{2}$$

We shall, instead of the longitude π of the perihelion, substitute the distance χ of the perihelion, counted from that point, A, fixed in the orbit, which is as far back, in a direction contrary to the motion, from the ascending node, as the equinox is; the former distance being counted upon the orbit and the latter upon the ecliptic.

5. Let now r, v denote the planet's actual radius-vector and true anomaly, at the time t; and (as before stated, see § 2) r°, v° the same, calculated with the approximate elements; and δr, δv the variations $r - r^\circ$, $v - v^\circ$; we shall then get these quantities, as also the planet's heliocentric longitude, $\mathit{\Lambda}$, counted from the point A, just alluded to, in the following way: —

$$\left.\begin{aligned} \mathrm{E}^\circ - e^\circ \sin \mathrm{E}^\circ &= \mu^\circ t + \mathrm{M}^\circ, \\ r^\circ \cos v^\circ &= a^\circ (\cos \mathrm{E}^\circ - e^\circ), \\ r^\circ \sin v^\circ &= a^\circ \cos\varphi^\circ \sin \mathrm{E}^\circ, \\ \mathit{\Lambda}^\circ &= v^\circ + \pi^\circ. \end{aligned}\right\} \tag{3}$$

$$\left.\begin{aligned} \mathrm{E} - e \sin \mathrm{E} &= \mu t + \mathrm{M}, \\ r \cos v &= a\,(\cos \mathrm{E} - e), \\ r \sin v &= a \cos\varphi \sin \mathrm{E}, \\ \mathit{\Lambda} &= v + \chi. \end{aligned}\right\} \tag{4}$$

6. Let now z be a new function of the elements and their variations, and of the time t, such that

$$\left.\begin{aligned} \mathfrak{E} - e^\circ \sin \mathfrak{E} &= \mu^\circ z + \mathrm{M}^\circ, \\ \mathfrak{r} \cos \mathfrak{v} &= a^\circ (\cos \mathfrak{E} - e^\circ), \\ \mathfrak{r} \sin \mathfrak{v} &= a^\circ \cos\varphi^\circ \sin \mathfrak{E}, \\ \mathit{\Lambda} &= \mathfrak{v} + \pi^\circ, \end{aligned}\right\} \tag{5}$$

We have thus obtained $\mathit{\Lambda}$, the direction in the orbit-plane as seen from the sun, as a function of the approximate elements and z, precisely as it is of the corrected ones and of t; but in order to determine the position in space which the varied elements would give us, we must superpose other variations.

7. The first of these will be δw, such that if $w^\circ = 0$,

$$r = \mathfrak{r}\, c^{w-w^\circ} = \mathfrak{r}\, c^{\delta w}, \tag{6}$$

c being the base of the Napierian system of logarithms.

By its aid, and that of z, we can take account of all the variations of the elements which give the dimensions, &c. of the orbit, but not of changes of the orbit-plane itself; and z may be considered as the time when the planet would be in the same heliocentric longitude (modified as before, like π), as it really is, if its elements were M°, &c. The other variation, δw, may be defined as the change necessary to adapt the natural logarithm of r, calculated by means of the approximate elements and for the time z, to its true value for the time t.

8. It will be noticed that we have so far adopted a similar course, in representing the effect of changes in the elements, to that which Mr. Hansen has employed in his theory of perturbations. Our mode of expressing it is taken, with the necessary changes, from Prof. Zech's article on Hansen's Method, Vol. XL. of the *Astronomische Nachrichten*, reproduced by Prof. Encke, *Mathematische Abhandlungen der Berliner Akademie* for 1855, p. 39.

9. The orbit-plane will be made to assume a new position by the change of Ω and i; and the planet will be at a distance δ Z from its position in the unchanged plane; the axis of Z being perpendicular to the orbit.

10. Our first work will be to compute the partial differentials of z, w, Z with respect to the elements. It may be noticed, however, that these quantities, z, w, Z, enjoy but a temporary existence as functions of the elements; they correspond to nothing actually existent. We shall, for convenience, omit the °.

11. By the *Theoria Motus*, article 15, p. 15,

$$dv = \frac{a\,a\cos\varphi}{r\,r}\,d\,(\mathrm{M} + \mu\,t) + \frac{a\,a}{r\,r}\,\frac{(r+p)}{a}\sin\mathrm{E}\,d\varphi;$$

Hence,
$$dA = \frac{a\,a\cos\varphi}{r\,r}\,d\,(\mathrm{L} - \pi + \mu\,t) + \frac{a\,a}{r\,r}\,\frac{r+p}{a}\sin\mathrm{E}\,d\varphi + d\chi;$$

Letting now $\mathrm{L} - \mathrm{L}_{,} = \pi - \chi$, and $\mathrm{L}_{,} - \mathrm{M} = \chi$, there will result

$$dA = \frac{a\,a\cos\varphi}{r\,r}\,d\,(\mathrm{L}_{,} - \chi + \mu\,t) + \frac{a\,a}{r\,r}\,\frac{r+p}{a}\sin\mathrm{E}\,d\varphi + d\chi. \tag{7}$$

From (5) we get
$$\delta A = \delta z\,\frac{dA}{dz}; \tag{8}$$

and as $z^\circ = t^\circ$ and δz is very small, we can assume $\frac{dA}{dz} = \frac{dA}{dt}$. So will

$$\delta A = \delta z\,\frac{dA}{dt}. \tag{9}$$

The law of areas gives us

$$r\,r\,\frac{d\,\Lambda}{d\,t} = k\sqrt{p} = a\,a\cos\varphi\,.\,\mu, \tag{10}$$

and from (7), (9), (10),

$$\delta z = \frac{\delta L_1}{\mu} + \frac{t\,\delta\mu}{\mu} + \frac{r+p}{\mu\,a\cos\varphi}\sin \mathrm{E}\,\delta\varphi + \frac{1}{\mu}\left(\frac{r\,r}{a\,a\cos\varphi} - 1\right)\delta\chi. \tag{11}$$

It may be sometimes more convenient to use

$$\mu\,\delta z = \delta\,\mathrm{L}_1 + t\,\delta\mu + \frac{r+p}{a\cos\varphi}\sin \mathrm{E}\,\delta\varphi + \left(\frac{r\,r}{a\,a\cos\varphi} - 1\right)\delta\chi. \tag{12}$$

12. The equation $$p = \left(\frac{k}{\sin 1''}\right)^{\frac{2}{3}}\mu^{-\frac{2}{3}}\cos^2\varphi$$

gives $$\log p = +\tfrac{2}{3}\log k - \tfrac{2}{3}\log\sin 1'' - \tfrac{2}{3}\log\mu + 2\log\cos\varphi;$$

and therefore, $$\tfrac{2}{3}\log\mu = +\tfrac{2}{3}\log k - \tfrac{2}{3}\log\sin 1'' - \log p + 2\log\cos\varphi;$$

$$\frac{d\,\mu}{\mu} = -\tfrac{3}{2}\,d\log p - 3\tan\varphi\,d\,\varphi. \tag{13}$$

If, as we propose, we consider μ as a function of $\log p$ and φ, we shall get

$$\mathrm{D}_{\log p}\,z = -\tfrac{3}{2}\,t \tag{14}$$

$$\mathrm{D}_{\varphi}\,z = -3\,t\tan\varphi + \frac{r+p}{\mu\,a\cos\varphi}\sin \mathrm{E}, \tag{15}$$

which will be combined with $$\mathrm{D}_{\mathrm{L}_1}\,z = \frac{1}{\mu}; \tag{16}$$

$$\mathrm{D}_{\chi}\,z = \frac{1}{\mu}\left(\frac{r\,r}{a\,a\cos\varphi} - 1\right). \tag{17}$$

13. As is well known, $$r = \frac{p}{1+e\cos(\Lambda-\chi)}; \tag{18}$$

but we also have, by (6), $$r = \mathfrak{r}\,c^{w},$$

$$d\log r = d\log\mathfrak{r} + d\,w, \tag{18'}$$

$$d\log\mathfrak{r} = \frac{d\log\mathfrak{r}}{d\,t}\,d\,z,$$

by considerations mentioned in § 11. And as, likewise, we can omit the products *inter se* of the variations of r, among which is $\mathfrak{r} - r$, we shall have, near enough for our present purpose,

$$\frac{d\log\mathfrak{r}}{d\,t} = \frac{d\log r}{d\,t};$$

so that

$$\begin{aligned}\delta\,w &= \delta\log r - \delta\log\mathfrak{r},\\ &= \delta\log r - \delta\,z\,\frac{d\log r}{d\,t},\\ &= \delta\log r - \delta\,\Lambda\,\frac{d\log r}{d\,\Lambda};\end{aligned} \tag{18''}$$

And hence, by (18), (18″),

$$\delta w = \delta \log p - \frac{\cos\varphi \cos(\Lambda - \chi)}{1 + e\cos(\Lambda - \chi)}\,\delta\varphi - \frac{e \sin(\Lambda - \chi)}{1 + e\cos(\Lambda - \chi)}\,\delta\chi,$$

$$= \delta \log p - \frac{r\cos\varphi\cos v}{p}\,\delta\varphi - \frac{e\,r\sin v}{p}\,\delta\chi;$$

$$= \delta \log p - \frac{r\cos v}{a\cos\varphi}\,\delta\varphi - \tan\varphi \sin \mathrm{E}\,\delta\chi; \qquad (19)$$

or,
$$= -\tfrac{2}{3}\frac{\delta\mu}{\mu} - \left(2\tan\varphi + \frac{r\cos v}{a\cos\varphi}\right)\delta\varphi - \tan\varphi\sin\mathrm{E}\,\delta\chi. \qquad (19')$$

If the planet's place in the corrected orbit be referred to the plane of the uncorrected, it will not be in this plane, but above or below it, if the node and inclination do not remain unchanged. The coördinate δ Z, perpendicular to the plane (A), which, as before stated, is that of the approximate orbit, can be ascertained by the usual method.

Thus, let (counted from the ascending node upon the ecliptic) Θ be the ascending node of the corrected orbit upon the plane (A), and δ I its inclination to that plane. We shall then have $\delta Z = r \sin \delta I \sin(v + \omega - \Theta)$, where $\omega = \pi - \Omega$.

But to determine Θ and δ I we shall have, by spherical trigonometry (omitting infinitesimals of the second order),

$$\left.\begin{aligned} \sin\delta I \sin\Theta &= \sin i \sin\delta\Omega, \\ \sin\delta I \cos\Theta &= \sin\delta i, \end{aligned}\right\}$$

or,
$$\delta Z = r\sin\delta i \sin(v+\omega) - r\sin i\sin\delta\Omega\cos(v+\omega). \qquad (20)$$

14. So far, we have briefly shown how to resolve the effect upon the planet's place in its orbit of slight variations of the first order in the elements, into three portions: the first, which, divided by its velocity at the time, we have called δz, we have considered as the variation of a function, z, of the time t; differing from t only by variations of the order of the changes in the elements. This is, of course, in the direction of the tangent to the orbit. The second portion we denote by $r\delta w$, and is in the direction of the radius-vector; the third, perpendicular to the plane of the orbit.

The first practical use we shall make of this will be to compute the variations of any geocentric coördinates with respect to the elements; and afterwards study the same relations with respect to certain new geocentric coördinates which we shall adopt.

Goetze, *Ergänzungsheft zu den Astronomische Nachrichten*, Altona, 1849, has shown that if the planet's geocentric place be defined by its position with regard to any plane (II.), and if any other plane (I.) (with regard to which ω_0, Ω_0, i_0, and χ_0 denote what the distance of the perihelion from the ascending node upon the ecliptic, the longitude of that latter point, the inclination, and, lastly, the angle χ, used above, do

with regard to the ecliptic) be employed as a plane of reference for the elements; and again, if $l\ b$ denote, with respect to the other plane (II.), what geocentric longitude and latitude do to the ecliptic; if, yet again, R, S, W denote, with Encke, the directions respectively of the radius-vector, the perpendicular to it in the direction of the motion, and the perpendicular to the orbit; and also F, the direction of the planet as seen from the earth; E, a direction perpendicular to F in a plane perpendicular to (II.), the "longitude," l, of any line in which is the same as that of F; and finally, D, a direction perpendicular to both E and F (the positive direction of E being that of $b = 90°$, and that of D, that of $l + 90°$); we shall have (using, with Encke, R S to denote the angle made between R and S, and so with other letters),

$$\left.\begin{aligned} \Delta \cos b\, \delta l &= \cos \mathrm{R\,D}\, \delta r + r \cos \mathrm{S\,D}\, (\delta v + \delta \chi_0) + \delta \mathrm{Z} \cos \mathrm{W\,D}, \\ \Delta\, \delta b &= \cos \mathrm{R\,E}\, \delta r + r \cos \mathrm{S\,E}\, (\delta v + \delta \chi_0) + \delta \mathrm{Z} \cos \mathrm{W\,E}, \\ \delta \Delta &= \cos \mathrm{R\,F}\, \delta r + r \cos \mathrm{S\,F}\, (\delta v + \delta \chi_0) + \delta \mathrm{Z} \cos \mathrm{W\,F}, \end{aligned}\right\} \textit{Erg. Heft,}\ (4), \text{ p. } 162.$$

In these formulæ we have put (see (20) above) our δ Z for its equivalent,

$$r \sin (v + \omega) \sin \delta i - r \cos (v + \omega) \sin i\, \delta \Omega,$$

which is a distance in an absolutely determined direction, and must therefore be the same if we employ ω_0, i_0, Ω_0, instead of ω, i, Ω. In general, however, the plane (I.) will be the ecliptic. If we transform the above-cited formulæ, as Goetze has done, into the following,

$$\begin{aligned} &\cos \mathrm{R\,D} = \sin \mathrm{W\,D} \sin \mathrm{M}' \qquad \cos \mathrm{R\,E} = \sin \mathrm{W\,E} \sin \mathrm{N}' \qquad \cos \mathrm{R\,F} = \sin \mathrm{W\,F} \sin \mathrm{P}'; \\ &\cos \mathrm{S\,D} = \sin \mathrm{W\,D} \cos \mathrm{M}' \qquad \cos \mathrm{S\,E} = \sin \mathrm{W\,E} \cos \mathrm{N}' \qquad \cos \mathrm{S\,F} = \sin \mathrm{W\,F} \cos \mathrm{P}'; \end{aligned}$$

and make

$$\left.\begin{aligned} \mathrm{D}_t r &= \mathrm{D}_t r = q^0 \cos \mathrm{Q}^0, \\ r\, \mathrm{D}_t (v + \chi_0) &= q^0 \sin \mathrm{Q}^0, \end{aligned}\right\} \text{ whence, } \begin{cases} q^0 \cos \mathrm{Q}^0 = \dfrac{k}{\sqrt{p}}\, e \sin v = \dfrac{k\sqrt{p}}{r} \tan \varphi \sin \mathrm{E}; \\ q^0 \sin \mathrm{Q}^0 = \dfrac{k\sqrt{p}}{r}; \end{cases}$$

we shall have, by similar equations to his (11), (12), in the article above cited,

$$\left.\begin{aligned} \cos b\, \mathrm{D}_t l &= \frac{q^0}{\Delta} \sin \mathrm{W\,D} \sin (\mathrm{M}' + \mathrm{Q}^0), \\ \mathrm{D}_t b &= \frac{q^0}{\Delta} \sin \mathrm{W\,E} \sin (\mathrm{N}' + \mathrm{Q}^0), \\ \mathrm{D}_t \Delta &= q^0 \sin \mathrm{W\,F} \sin (\mathrm{P}' + \mathrm{Q}^0). \end{aligned}\right\} \tag{21}$$

Again, as

$$\begin{aligned} \mathrm{D}_w r &= r, \\ \mathrm{D}_w v &= 0, \end{aligned}$$

the equations before quoted give us,

$$\left.\begin{aligned} \cos b\, D_w l &= \frac{r}{\Delta} \sin W\, D \sin M'; \\ D_w b &= \frac{r}{\Delta} \sin W\, E \sin N'; \\ D_w \Delta &= r \sin W\, F \sin P'. \end{aligned}\right\} \tag{22}$$

And, finally,

$$\left.\begin{aligned} \cos b\, D_Z l &= \frac{\cos W\, D}{\Delta}; \\ D_Z b &= \frac{\cos W\, E}{\Delta}; \\ D_Z \Delta &= \cos W\, F. \end{aligned}\right\} \tag{23}$$

The following are (*Astr. Nachr.* XXVIII. 115) Goetze's general expressions, by means of which W D, M', &c. may be computed:

$$\left.\begin{aligned} \sin W\, D \sin M &= -\sin (l - \Omega'); \\ \sin W\, D \cos M &= \cos (l - \Omega') \cos I; \\ \cos W\, D &= -\cos (l - \Omega') \sin I; \\ M' &= M + \omega' + v; \end{aligned}\right\} \tag{24}$$

$$\left.\begin{aligned} \sin W\, E \sin N &= -\cos (l - \Omega') \sin b; \\ \sin W\, E \cos N &= -\sin (l - \Omega') \sin b \cos I + \cos b \sin I; \\ \cos W\, E &= \sin (l - \Omega') \sin b \sin I + \cos b \cos I; \\ N' &= N + \omega' + v; \end{aligned}\right\} \tag{25}$$

$$\left.\begin{aligned} \sin W\, F \sin P &= \cos (l - \Omega') \cos b; \\ \sin W\, F \cos P &= \sin (l - \Omega') \cos b \cos I + \sin b \sin I; \\ \cos W\, F &= -\sin (l - \Omega') \cos b \sin I + \sin b \cos I; \\ P' &= P + \omega' + v. \end{aligned}\right\} \tag{26}$$

In these expressions, Ω', ω', I, denote respectively the distance of the planet's ascending node upon the plane II., counted from the same origin as l is, the distance (in the direction of motion) from this ascending node to the perihelion, and the inclination to the plane II.

15. We will now let the approximate orbit-plane itself become the plane II. We have first to devise means for referring observed geocentric places to it. We shall, therefore, suppose that the planet's geocentric orbit-longitude, so to speak, is denoted by η, it being counted from the ascending node upon the equator; that θ denotes, likewise, its geocentric orbit-latitude, referred in the same way to the orbit.

It must be observed that throughout this portion of the investigation we are speaking of the approximate orbit as a *fixed* plane of reference.

Let Ω_1, ω_1, i_1, denote the approximate longitude of the ascending node upon the equator,

the distance (in the direction of the motion) of the perihelion from this node, and the inclination to the equator. Let α, δ denote the geocentric right-ascension and declination.

Then will η, θ be the same functions of $\alpha - \Omega_1$, δ, i_1, that the geocentric longitude and latitude are of α, δ, and the obliquity.

We shall thus have (*Theoria Motus*, Art. 68, p. 64),

$$\left.\begin{aligned}
\sin(45^\circ - \tfrac{1}{2}\theta)\sin\tfrac{1}{2}(\mathrm{E} - \eta) &= \cos[45^\circ + \tfrac{1}{2}(\alpha - \Omega_1)]\sin[45^\circ - \tfrac{1}{2}(i_1 + \delta)];\\
\sin(45^\circ - \tfrac{1}{2}\theta)\cos\tfrac{1}{2}(\mathrm{E} - \eta) &= \sin[45^\circ + \tfrac{1}{2}(\alpha - \Omega_1)]\cos[45^\circ - \tfrac{1}{2}(i_1 - \delta)];\\
\cos(45^\circ - \tfrac{1}{2}\theta)\sin\tfrac{1}{2}(\mathrm{E} + \eta) &= \sin[45^\circ + \tfrac{1}{2}(\alpha - \Omega_1)]\sin[45^\circ - \tfrac{1}{2}(i_1 - \delta)];\\
\cos(45^\circ - \tfrac{1}{2}\theta)\cos\tfrac{1}{2}(\mathrm{E} + \eta) &= \cos[45^\circ + \tfrac{1}{2}(\alpha - \Omega_1)]\cos[45^\circ - \tfrac{1}{2}(i_1 + \delta)].
\end{aligned}\right\} \quad (27)$$

It will not be necessary in general to compute η, θ with extreme accuracy, as what we most wish are their variations. These will be (see same article in *Theoria Motus*, *ad finem*, where, as in (27), E is *not* the eccentric anomaly),

$$\left.\begin{aligned}
d\eta\cos\theta &= \sin\mathrm{E}\, d\alpha\cos\delta + \cos\mathrm{E}\, d\delta;\\
d\theta &= -\cos\mathrm{E}\, d\alpha\cos\delta + \sin\mathrm{E}\, d\delta.
\end{aligned}\right\} \quad (27')$$

In applying now the formulæ (24) to (26), we shall have $\mathrm{I} = 0$. Ω', indefinite, but $\Omega' + \omega' = \omega$, as the origin of η is at the ascending node, on the equator. The letters η and θ are substituted, as the things which they denote are here the same, for l and b, Goetze's notation.

Then,

$$\left.\begin{aligned}
\mathrm{W\,D} &= 90^\circ;\\
\mathrm{M} &= -\eta + \Omega';\\
\mathrm{M}' &= \omega_1 + v - \eta;
\end{aligned}\right\} \quad (24')$$

$$\left.\begin{aligned}
\mathrm{W\,E} &= \theta;\\
\mathrm{N}' &= 270^\circ + \omega_1 + v - \eta;
\end{aligned}\right\} \quad (25')$$

$$\left.\begin{aligned}
\mathrm{W\,F} &= 90^\circ - \theta;\\
\mathrm{P}' &= 90^\circ + \omega_1 + v - \eta.
\end{aligned}\right\} \quad (26)$$

From (23), (24') we have the expression

$$\mathrm{D}_Z\,\eta = 0; \quad (27)$$

and as the variations z, w do not contain Ω or i, and are thus (to terms of the first order with respect to the changes of the elements) independent of small changes in the orbit-plane, so also is η.

That is, so soon as we know the positions of the orbit-plane correct within limits of error of the first order, we can obtain *one* geocentric coördinate which depends only upon four elements.

16. If a set of rectangular coördinates be employed, the axes of x, y in which are in the approximate orbit-plane, and the former passes through the nodes upon the equator, the positive direction of x being towards the ascending node, and if Ξ, Υ, Ψ denote the sun's geocentric coördinates, we shall have, if the elements are supposed unvaried (Δ denoting, as usual, geocentric distance),

$$\left.\begin{aligned} r^\circ \cos(\omega_1{}^\circ + v^\circ) + \Xi &= \Delta^\circ \cos\eta^\circ \cos\theta^\circ; \\ r^\circ \sin(\omega_1{}^\circ + v^\circ) + \Upsilon &= \Delta^\circ \sin\eta^\circ \sin\theta^\circ; \\ \Psi &= \Delta^\circ \sin\theta^\circ. \end{aligned}\right\} \tag{28}$$

The elements being supposed changed, we shall have $\delta(\omega_1 + v) = \delta\Delta$, provided we consider $\delta\omega_1$ as the variation arising from a change in the position of the perihelion, and do not permit it to be affected by the change in the orbit-plane.

So that Q being any angle whatever, and Ξ, Υ, Ψ being invariable, we shall have

$$\delta[r \sin(\omega_1 + v + Q)] = \delta[\Delta \sin(\eta + Q)\cos\theta]. \tag{28'}$$

17. We will now apply the formulæ we have obtained to a practical problem of very frequent occurrence, — the case in which a set of elements is desired which shall satisfy two observed or normal positions precisely, and certain others nearly.

In our case we will, with regard to those positions which are not to be exactly represented, content ourselves with satisfying the observed value of our coördinate, η; the plane to which it refers being that of an approximate orbit satisfying the first-mentioned positions.

We will, therefore, assume values of Δ corresponding to times t_1, t_2, for which we have observed right-ascensions. From this the orbit is easily found, corresponding to these distances.

A variation of the distance for the time t, which we may denote by Δ, will produce the following change in equation (28):

$$\delta[r \sin(\omega_1 + v + Q)] = \delta\Delta \,.\, \sin(\eta + Q)\cos\theta. \tag{29}$$

But we put $\delta L_{,} = \delta(\omega_1 + v)$ under the form $\delta z \,.\, D_t v = \delta z \,.\, D_t \Delta$, as in (9); whence by (18)

$$\delta \log r = D_t \log r \,.\, \delta z + r\,\delta w,$$

and (29) becomes

$$\delta[r \sin(\omega_1 + v + Q)] = D_t[r \sin(\omega_1 + v + Q)]\,\delta z + r \sin(\omega_1 + v + Q)\,\delta w.$$

Making now

$$\left.\begin{aligned} D_t r &= \frac{k\sqrt{p}}{r}\tan\varphi \sin E = c\cos\psi, \\ r\, D_t v &= \frac{k\sqrt{p}}{r} = c\sin\psi, \end{aligned}\right\} \tag{30}$$

we shall have, if δ denote the effect of changing Δ only,

$$\delta\Delta \sin(\eta + Q)\cos\theta = c\sin(\omega_1 + v + \psi + Q)\,\delta z + r\sin(\omega_1 + v + Q)\,\delta w. \tag{31}$$

If $Q = -\omega_1 - v - \psi$, (31) becomes

$$\delta\Delta \sin(\eta - \omega_1 - v - \psi)\cos\theta = -r\sin\psi \,.\, \delta w;$$

$$D_\Delta w = \frac{\sin(\omega_1 + v + \psi - \eta)}{r\sin\psi}\cos\theta. \tag{32}$$

So also, making $Q = -\omega_1 - v$, we find

$$D_\Delta z = \frac{\sin(\eta - \omega_1 - v)}{c \sin \psi} \cos\theta = \frac{r \sin(\eta - \omega_1 - v)}{k\sqrt{p}} \cos\theta. \tag{33}$$

If Δ, and consequently the orbit, is changed, so that the plane to which the coördinates are referred is no longer the actual plane of the orbit, the last equation of the group (27) becomes

$$\delta Z + \psi = \Delta \sin\theta. \tag{34}$$

And thus $$D_\Delta Z = \sin\theta.$$

An arbitrary variation in either assumed geocentric distance is thus separated into three components; one, $c\,\delta z$, in the direction of the tangent to the orbit, at the planet's place for the time to which the varied distance refers, c being the tangential velocity; another, $r\,\delta w$, in the direction of the radius vector, and so not making an angle $= 90°$, but one $= \psi$, with the former; and a third δZ, perpendicular to the orbit-plane, which is the plane in which the other two lie.

A new orbit computed with the distance Δ_1, varied by the amount $\delta\Delta_1$, and the distance Δ_2 unvaried, but still using α_1, α_2, δ_1, δ_2, will be connected with the former in the following way.

If $f_1 = D_{\Delta_1} z_1$, $g_1 = D_{\Delta_1} w_1$, then there will be four equations, of which the known terms will be f_1, $D_{\Delta_1} z_2 = 0$, g_1, $D_{\Delta_1} w_2 = 0$, and the unknown the differential coefficients of these elements which lie in the orbit-plane; the coefficients of these unknown quantities being the coefficients of the variations of the elements in (11) and (19′).

But instead of μ as an element, we shall use p, whereby

$$\begin{aligned} d\log\mu &= -\tfrac{3}{2}\, d\log p + 3\, d\log\cos\varphi\,; \text{ or,} \\ d\log\mu &= -\tfrac{3}{2}\, d\log p - 3\tan\varphi\, d\varphi. \end{aligned} \tag{13}$$

Our four equations will be, then,

$$\left.\begin{aligned} f_1 &= \frac{1}{\mu} D_{\Delta_1} L_{,} - \tfrac{3}{2} t_1 D_{\Delta_1} \log p + \left(\frac{r_1 + p}{\mu a \cos\varphi} \sin E_1 - 3\tan\varphi \cdot t_1\right) D_{\Delta_1}\varphi + \frac{1}{\mu}\left(\frac{r^2}{a^2\cos\varphi} - 1\right) D_{\Delta_1}\chi\,; \\ 0 &= \frac{1}{\mu} D_{\Delta_1} L_{,} - \tfrac{3}{2} t_2 D_{\Delta_1} \log p + \left(\frac{r_2 + p}{\mu a \cos\varphi} \sin E_2 - 3\tan\varphi \cdot t_2\right) D_{\Delta_1}\varphi + \frac{1}{\mu}\left(\frac{r^2}{a^2\cos\varphi} - 1\right) D_{\Delta_1}\chi\,; \\ g_1 &= D_{\Delta_1}\log p - \frac{r_1\cos v_1}{a\cos\varphi} D_{\Delta_1}\varphi - \tan\varphi \sin E_1 D_{\Delta_1}\chi\,; \\ 0 &= D_{\Delta_1}\log p - \frac{r_2\cos v_2}{a\cos\varphi} D_{\Delta_2}\varphi - \tan\varphi \sin E_2 D_{\Delta_1}\chi. \end{aligned}\right\} \tag{35}$$

By subtracting the first of these equations from the second, we can at once reduce our equations to the number of three, with three unknown quantities; determining $D_{\Delta_1} L_{,}$ afterwards from the second equation explicitly, or, what is perhaps better, leaving $\frac{1}{\mu} \cdot D_{\Delta_1} L_{,}$ expressed in terms of the variations $D_{\Delta_1}\log p$, &c., in which form it can be easily used.

If now we vary Δ_2, we shall have similar equations, in which, after performing the subtraction indicated above, we shall have, in place respectively of $-f_1, g_1, 0$, as known terms, the values $f_2, 0, g_2$; and as unknown quantities, the first derivatives of the elements with respect to Δ_2.

18. Having now these derivatives with respect both to Δ_1 and Δ_2, we can for any other time easily compute, by formulæ (11), (19), using the former as modified by (13),

$$\delta z = \frac{1}{\mu}\delta L_{,} - \tfrac{3}{2} t\, \delta \log p + \left(\frac{r+p}{\mu a \cos\varphi}\sin E - 3t \,.\, \tan\varphi\right)\delta\varphi + \frac{1}{\mu}\left(\frac{r^2}{a^2\cos\varphi} - 1\right)\delta\chi, \qquad (36)$$

the values of $D_{\Delta_1} z$, $D_{\Delta_1} w$; and as, by (26′),

$$D_Z \eta = 0,$$

the value (which we do not know) of δZ will not affect η; and the coefficients $D_{\Delta_1}\theta$, $D_{\Delta_2}\theta$ are, with regard to almost all planets, of such slight amount that they cannot increase the weight of our solution much over $\frac{1}{100}$ part, as has been shown in Mr. G. P. Bond's Memoir on "Equivalent Factors," assuming the modulus of $D_{\Delta_1}\theta$ as about $\frac{1}{10}$, which is as much as it can often be with regard to five sixths of the asteroids.

19. We have thus, if at least two positions besides those to be exactly satisfied are given, the means of determining what changes the assumed Δ_1, Δ_2 must undergo to satisfy all the geocentric places we have, with almost if not quite the accuracy of a least-square solution. After this is done, it only remains to compute from the variations of Δ_1, Δ_2 the changes which the orbit-plane must undergo, in order to pass exactly through the positions to which they refer. This is done by combining (20) and (34).

We have

$$\left.\begin{aligned} \delta Z_1 &= \sin\theta_1\, \delta\Delta_1 = r_1 \sin(v_1+\omega)\,.\,\delta i - r_1 \sin i \cos(v_1+\omega)\,.\,\delta\Omega; \\ \delta Z_2 &= \sin\theta_2\, \delta\Delta_2 = r_2 \sin(v_2+\omega)\,.\,\delta i - r_2 \sin i \cos(v_2+\omega)\,.\,\delta\Omega. \end{aligned}\right\} \qquad (37)$$

The readiest practical way to obtain δi, $\delta\Omega$ will be to form these equations and solve them numerically.

After this is done, we shall find also, by the equations in which D_{Δ_1}, $L_{,}$, &c. occurred, the values of $\delta L_{,}$, $\delta \log p$, $\delta\varphi$, $\delta\chi$; and the resulting changes in the usual elements will be,

$$\left.\begin{aligned} \delta L &= \delta L_{,} + (1-\cos i)\,\delta\Omega; \\ \delta\pi &= \delta\chi + (1-\cos i)\,\delta\Omega; \\ \delta \log a &= \delta \log p + 2\tan\varphi\,.\,\delta\varphi \sin 1''; \\ \delta\mu &= -\tfrac{3}{2}\mu\,\delta\log p - 3\mu\tan\varphi\,.\,\delta\varphi\sin 1''. \end{aligned}\right\} \qquad (38)$$

It is to be noticed that all the variations, those of Δ_1, Δ_2, and $\log p$ inclusive, will be expressed in seconds; so that we must add to their logarithms the log 4.6855749 — 10, or must divide them by 206264.8 to reduce them to the unit required.

20. As an example, we have selected the planet Aglaja ⑰. But few observations of it were made near its first observed opposition, in 1857; and five normals contain as much of the material at hand, as, on account of its scattered nature, we have thought it well to use. For several very exact normals do not help the matter much, if they must, from the nature of the case, be so combined with less exact ones that the burden shall fall on these last; the chain is not stronger than its weakest link.

The normals are: —

Number.	Date. Washington M. T.	No. Obs.	α	δ
			° ′ ″	° ′ ″
I.	1857, Sept. 17.5	13	0 21 29.8	—0 49 44.2
II.	" Oct. 21.0	11	354 21 7.6	—2 11 17.4
III.	" Nov. 16.0	9	353 38 16.4	—1 45 47.6
IV.	1858, Jan. 11.0	3	3 52 10.9	+3 32 41.7
V.	" Feb. 10.5	2	13 21 32.7	+7 52 1.2

Assuming the following for the logarithms of two geocentric distances,

Sept. 17.5 0.201821, Nov. 16.0 0.307251,

the resulting elements, referred to the equator and mean equinox of 1857, Jan. 0, were,

	Epoch, 1857, Nov. 16.0
	° ′ ″
$M°$	46 20 24.3
ω_1	313 31 56.7
Ω_1	0 49 9.5
i_1	28 27 7.0
$\varphi°$	7 21 56.8
$\mu°$	12 5.719

The other normals were represented thus,

Number.	Date. Washington M. T.	C. — O. $\Delta\alpha$	C. — O. $\Delta\delta$
		″	″
II.	1857, Oct. 21.0	+ 0.4	+ 0.1
IV.	1858, Jan. 11.0	+25.4	+11.9
V.	" Feb. 10.5	+54.9	+33.0

For those dates the equations (27), (27′) give us,

	η	θ	E	C. — O.	
	° ′	° ′	° ′		
II.	353 15.58	+1 9.04	61 44.36	$\delta\eta$ = + 0.40	$\delta\theta$ = —0.10
IV.	4 21.78	+1 40.38	61 34.72	+27.96	—1.60
V.	14 44.20	+1 1.88	62 16.84	+63.50	+3.91

For the dates I. and III., we find

	η	θ
	° ′	° ′
I.	359 11.38	—0 30.50
III.	352 49.85	+1 51.75

As we do not wish E here, we can apply a method like the simpler well-known forms of converting right-ascension and declination into latitude and longitude.

From the elements

$$\log (k \sqrt{p^\circ}) = 8.461728;$$

and from what has been previously obtained,

	$\log r$	v	ψ
Sept. 17.5	0.413888	43° 50'.67	85° 21'.16
Nov. 16.0	0.423901	58 11.80	84 10.36

From (32) and (33) are now derived,

		$\log f.$	$\log g.$
For	$t_1 =$ Sept. 17.5	+0.45230	+9.58475
	$t_2 =$ Nov. 16.0	−1.47254	+9.56672

The equations (36) for determining D_{Δ_1}, $\log p$, &c. become, subtracting the second of them from the first, and also those with the same coefficients for finding $D_{\Delta_2} \log p$, &c. if we make $D_{\Delta_1} \log p = l_1$, $D_{\Delta_2} \log p = l_2$, $D_{\Delta_1} \varphi = m_1$, $D_{\Delta_2} \varphi = m_2$, $D_{\Delta_1} \chi = n_1$, $D_{\Delta_2} \chi = n_2$,

$$\left.\begin{array}{rrcl} \overset{(1.)}{+2.833} & \overset{(2.)}{+29.685} & = & (1.95061)\, l - (1.83514)\, m - (1.03991)\, n; \\ +0.38437 & 0.00000 & = & (0.00000)\, l - (9.81607)\, m - (8.91004)\, n; \\ 0.00000 & +0.36874 & = & (0.00000)\, l - (9.68983)\, m - (9.00885)\, n; \end{array}\right\} \quad (39)$$

of which the solutions are,

$\log (D_{\Delta_1} \log \text{nat } p) = +9.8222$; $\log (D_{\Delta_1} \varphi) = -9.9737$; $\log (D_{\Delta_1} \chi) = +1.0423$;
$\log (D_{\Delta_2} \log \text{nat } p) = -9.4000$; $\log (D_{\Delta_2} \varphi) = +9.9620$; $\log (D_{\Delta_2} \chi) = -1.0199$.

When Δ_1 is changed, the value of z for t_2 remains unchanged, and *vice versa;* so that, for any time,

$$D_{\Delta_1} z = D_{\Delta_1} (z - z_2); \quad (40)$$

But $z - z_2$ does not contain $L_,$, so that we shall have

$$D_{\Delta_1} z = D_{\log p} (z - z_2)\, D_{\Delta_1} \cos p + D_\varphi (z - z_2)\, D_{\Delta_1} \varphi + D_\chi (z - z_2)\, D_\Delta \chi. \quad (40')$$

Similarly,
$$D_{\Delta_2} z = D_{\Delta_2} (z - z_1). \quad (41)$$

Nor does δw contain $\delta L_,$.

We now find for the times of normals II., IV., and V., by formulæ (11), (19′), as modified in (40), (41),

	$D_{\Delta_1} z$	$D_{\Delta_1} w$	$D_{\Delta_2} z$	$D_{\Delta_2} w$
II.	− 4.373	+.1645	− 11.33	+.2108
IV.	+37.39	−.3285	− 96.07	+.6848
V.	+72.52	−.4890	−146.44	+.8395

And we thus finally form the equations in which $\delta\eta\cos\theta$ is the known term, $\delta\Delta_1$, $\delta\Delta_2$ the unknown quantities, and $\cos\theta\,D_{\Delta_1}\eta$, $\cos\theta\,D_{\Delta_2}\eta$ the coefficients.

From normals

$$\left.\begin{array}{lrrr} \text{II.} & 0 = +0''.40 & +\ 0.0249\,\delta\Delta_1 & -\ 0.0036\,\delta\Delta_2 \\ \text{IV.} & 27.96 & 0.0284 & -\ 0.1259 \\ \text{V.} & 63.50 & 0.1145 & -\ 0.2672 \end{array}\right\} \qquad (41)$$

From these equations were derived, by least squares, the values

$$\delta\Delta_1 = -6\sin 1'',$$
$$\delta\Delta_2 = +231.2\sin 1'',$$

the weights being made proportional to the number of observations.

By means of the previously computed partial differential coefficients, we are now enabled to obtain the values

$$\left.\begin{array}{r} \delta\log\text{nat}\,p = -300.9 \\ \therefore\ \delta\,\text{com}\log p = -130.6 \end{array}\right\} \text{in the sixth place of decimals.}$$
$$\log p = 0.452163,$$
$$\delta\varphi = 3'\ 37''.4,$$
$$\varphi = 7^\circ\ 25'\ 34''.2, \quad \text{hence,} \quad \log\cos\varphi\ 9.996342.$$
$$\delta\chi = \chi - \pi^\circ = -41'\ 26''.6,$$
$$\log a = 0.459479.$$

Referring the previous, and still unchanged, node and inclination to the mean ecliptic and equinox of 1857.0, we find

$$\Omega^\circ \quad 4^\circ\ 28'\ 34''.7,$$
$$\omega^\circ \quad 309\ 47\ 34.0,$$
$$i^\circ \quad 5\ 0\ 25.6.$$

Hence, $\chi = 313\ 34\ 42.1.$

From the value of $D_{\Delta_2} z_2 = f_2$, we obtain for 1857, Nov. 16.0,

$$\delta z_2 = f_2 \cdot \delta\Delta_2 = -0^d.03328.$$

Consequently, $$\delta v_2 = \delta\Delta_2 - \delta\chi = \frac{k\sqrt{p}}{r^2_2 \sin 1''}\,\delta z_2 - \delta\chi.$$

This then gives us $$\delta v_2 = -28''.2 - \delta\chi = +40'\ 58''.4.$$

Then
$$v_2 = 58^\circ\ 52'\ 46''.2,$$
$$\mathrm{M} = 46^\circ\ 49'\ 58''.7.$$

Check, $$r_2 = \frac{p}{1 + e\cos v_2} = r^\circ_2\,(1 + \delta w_2),$$

which comes out exactly 0.424080 in both.

From the equations (38) the values of $\delta i = +11''.2$, $\delta\Omega = -16''.1$, were rather roughly estimated; whence $\pi - \chi = 2\sin^2\frac{1}{2}\,i\,.\,\delta\Omega = -0''.1$.

The elements will then be,

Epoch, 1857, Nov. 16.0. — M. Equinox, 1857.0.

M	46°	49′	58.″7
π	313	34	42.0
Ω	4	28	18.6
φ	7	25	34.2
i	5	0	36.8
μ		12	5.752
log a	0.459479.		

The remaining errors, $\delta\,\eta\,\cos\theta$, after the solution of the conditional equations (41), were,

	C. — O.
II.	—0″.6
IV.	—1″.3
V.	+1″.0

(42)

Substituting the new elements in the formulæ for the geocentric places, we obtain values of $\delta\,\alpha$, $\delta\,\delta$ corresponding with them; and from these, by (27), values of $\delta\,\eta\cos\theta$, differing from those in (42) very slightly.

The resulting differences in the other geocentric coördinate, θ, are nearly as follows:

	$\delta\,\theta$ (C. — O.)
II.	+1″.3
IV.	—2″.0
V.	+5″.7;

which is a small difference, seeing that the last normal depends upon but two observations, and those, as is apparent by Mr. Oeltzen's investigation (*Astr. Nachr.*, No. 1167) disagreeing largely, as indeed do the observations upon which IV. is based.

Ten months after the date of the last of these normals, the comparison of an ephemeris computed from the above elements with a Cambridge observation, kindly furnished me by Prof. W. C. Bond, was as follows:

	C. — O.	
	$\Delta\,\alpha\cos\delta$	$\Delta\,\delta$
1858, Dec. 28	+1′.6	+1′.2;

showing an agreement much more satisfactory than is usual in determinations from the first apparition of an asteroid, especially considering the weakness of normals IV. and V., upon which, as may be seen by (41), almost the entire weight of the computation rests. Perturbations, too, were entirely neglected.

The calculation of the above orbit was executed entirely with six decimal places (less

in portions). The usual method (of varying two mean distances, actually computing three orbits) would not only have required more operations, but these must, many of them, have been carried to seven decimals, in order to obtain with any degree of accuracy the coefficients of the unknown quantities in the equations (41). At least one third the labor appears to be saved by this process, while a differential method, in general much better than the rule of false position, is substituted for the latter.

Moreover, the general relations developed in the first part of this paper are not without very interesting aspects with regard to the general problem of representing long series of geocentric observations by an orbit, by the method of least squares; and it is not impossible that further calculations may be made upon the theory of Aglaja, using the numbers and formulæ already obtained, and approximating more and more closely to the true elements, when the observations requisite shall have been made.

STATUTES

AND

STANDING VOTES

OF THE

AMERICAN ACADEMY OF ARTS AND SCIENCES.

(*Adopted May 30th, 1854, and amended September 8th, 1857.*)

CHAPTER I.

Of Fellows and Foreign Honorary Members.

1. The Academy consists of *Fellows* and *Foreign Honorary Members*. They are arranged in three classes, according to the Arts and Sciences in which they are severally proficient, viz.: Class I. The Mathematical and Physical Sciences; Class II. The Natural and Physiological Sciences; Class III. The Moral and Political Sciences. Each Class is divided into four Sections, viz.: Class I. Section 1. Mathematics; Section 2. Practical Astronomy and Geodesy; Section 3. Physics and Chemistry; Section 4. Technology and Engineering. Class II. Section 1. Geology, Mineralogy, and Physics of the Globe; Section 2. Botany; Section 3. Zoölogy and Physiology; Section 4. Medicine and Surgery. Class III. Section 1. Philosophy and Jurisprudence; Section 2. Philology and Archæology; Section 3. Political Economy and History; Section 4. Literature and the Fine Arts.

2. Fellows resident in the State of Massachusetts can alone vote at the meetings of the Academy.* They shall each pay to the Treasurer the sum of five dollars on admission, and an annual assessment of two dollars, with such additional sum, not exceeding three dollars, as the Academy shall, by a standing vote, from time to time determine.

* The number of Resident Fellows is limited by the Charter to 200.

3. Fellows residing out of the State of Massachusetts shall be known and distinguished as Associate Fellows. They shall not be liable to the payment of any fees or annual dues, but, on removing within the State, shall be admitted to the privileges, and be subject to the obligations, of Resident Fellows. The number of Associate Fellows shall not exceed *one hundred*, of whom there shall not be more than *forty* in either of the three classes of the Academy.

4. The number of Foreign Honorary Members shall not exceed *seventy-five;* and they shall be chosen from among persons most eminent in foreign countries for their discoveries and attainments in either of the three departments of knowledge above enumerated. And there shall not be more than thirty Foreign Members in either of these departments.

CHAPTER II.

Of Officers.

1. There shall be a President, a Vice-President, a Corresponding Secretary, a Recording Secretary, a Treasurer, and a Librarian, which officers shall be annually elected, by written votes, at the Annual Meeting, on the day next preceding the last Wednesday in May.

2. At the same time and in the same manner, nine Councillors shall be elected, three from each class of the Academy, who, with the President, Vice-President, and the two Secretaries, shall constitute a Council for Nomination. It shall also be the duty of this Council to exercise a discreet supervision over all nominations and elections, and to exert their influence to obtain and preserve a due proportion in the number of Fellows and Members in each of the sections.

3. If any office shall become vacant during the year, the vacancy shall be filled by a new election, and at the next stated meeting.

CHAPTER III.

Of the President.

1. It shall be the duty of the President, and, in his absence, of the Vice-President or next officer in order, as above enumerated, to preside at the meetings of the Academy; to summon extraordinary meetings, upon any urgent occasion; and to execute or see to the execution of the statutes of the Academy.

2. The President, or, in his absence, the next officer as above enumerated, is empowered to draw upon the Treasurer for such sums of money as the Academy shall direct. Bills presented

on account of the Library, or the publications of the Academy, must be previously approved by the respective committees on these departments.

3. The President, or, in his absence, the next officer as above enumerated, shall nominate members to serve on the different committees of the Academy.

4. Any deed or writing, to which the common seal is to be affixed, shall be signed and sealed by the President, when thereto authorized by the Academy.

CHAPTER IV.

Of Standing Committees.

1. At the Annual Meeting there shall be chosen, upon the nomination of the President, the following Standing Committees, to serve for the year ensuing, viz.: —

2. The Committee of Finance, to consist of the President, Treasurer, and one Fellow, who shall recommend to the Academy, from time to time, any measures that they may think ought to be adopted concerning the disposition and management of the funds and trusts of the Academy, including all questions of appropriations and expenditures.

3. The Rumford Committee, of five Fellows, to consider and report on all applications for the Rumford Premium.

4. The Committee of Publication, of three Fellows, to whom all memoirs submitted to the Academy shall be referred, and to whom the printing of memoirs accepted for publication shall be intrusted.

5. The Committee on the Library, of three Fellows, who shall examine the Library, and make an annual report on its condition and management.

6. An Auditing Committee, of two Fellows, for auditing the accounts of the Treasurer.

CHAPTER V.

Of the Secretaries.

1. The Corresponding Secretary shall conduct the correspondence of the Academy, recording or making an entry of all letters written in its name, and preserving on file all letters which are

received; and at each meeting he shall present the letters which have been addressed to the Academy since the last meeting. With the advice and consent of the President, he may effect exchanges with other scientific associations, and also distribute copies of the publications of the Academy among the Associate Fellows and Foreign Honorary Members, as shall be deemed expedient; making a report of his proceedings at the Annual Meeting. Under the direction of the Council for Nomination, he shall keep a list of the Fellows, Associate Fellows, and Foreign Honorary Members, arranged in their classes and in sections in respect to the special sciences in which they are severally proficient; and shall act as secretary to the Council.

2. The Recording Secretary shall have charge of the Charter and statute-book, journals, and all literary papers belonging to the Academy. He shall record the proceedings of the Academy at its meetings; and after each meeting is duly opened, he shall read the record of the preceding meeting. He shall notify the meetings of the Academy, and apprise committees of their appointment. He shall post up in the Hall a list of the persons nominated for election into the Academy; and when any individual is chosen, he shall insert in the record the names of the Fellows by whom he was nominated.

3. The two Secretaries, with the chairman of the Committee of Publication, shall have authority to publish such of the proceedings of the Academy as may seem to them calculated to promote the interests of science.

CHAPTER VI.

Of the Treasurer.

1. The Treasurer shall give such security for the trust reposed in him as the Academy shall require.

2. He shall receive officially all moneys due or payable, and all bequests or donations made to the Academy, and, by order of the President or presiding officer, shall pay such sums as the Academy may direct. He shall keep an account of all receipts and expenditures; shall submit his accounts to the Auditing Committee; and shall report the same at the expiration of his term of office.

3. The Treasurer shall keep a separate account of the income and appropriation of the Rumford Fund, and report the same annually.

4. All moneys which there shall not be present occasion to expend, shall be invested by the Treasurer, on such securities as the Academy shall direct.

5. The Treasurer shall have the power, with the consent of the Committee of Finance, to remit the admission fee of five dollars, and likewise any annual assessment above the sum of two dollars, in all such cases as he shall deem reasonable and proper.

CHAPTER VII.

Of the Librarian and Library.

1. It shall be the duty of the Librarian to take charge of the books, to keep a correct catalogue of the same, and to provide for the delivery of books from the Library. He shall also have the custody of the publications of the Academy.

2. The Librarian, in conjunction with the Committee on the Library, shall have authority to expend, as they may deem expedient, such sums as may be appropriated, either from the Rumford or the General Fund of the Academy, for the purchase of books and for defraying other necessary expenses connected with the Library. They shall have authority to propose rules and regulations concerning the circulation, return, and safe-keeping of books; and to appoint such agents for these purposes as they may think necessary.

3. Every person who takes a book from the Library shall give a receipt for the same to the Librarian or his assistant.

4. Every book shall be returned in good order, regard being had to the necessary wear of the book with good usage. And if any book shall be lost or injured, the person to whom it stands charged shall replace it by a new volume or set, if it belong to a set, or pay the current price of the volume or set to the Librarian; and thereupon the remainder of the set, if the volume belonged to a set, shall be delivered to the person so paying for the same.

5. All books shall be returned to the Library for examination, at least one week before the Annual Meeting.

CHAPTER VIII.

Of Meetings.

1. There shall be annually four stated meetings of the Academy; namely, on the day next preceding the last Wednesday in May (the Annual Meeting), on the second Wednesday in August, on the second Wednesday in November, and on the last Wednesday in January; to

be held in the Hall of the Academy, in Boston. At these meetings only, or at meetings adjourned from these and regularly notified, shall appropriations of money be made, or alterations of the statutes or standing votes of the Academy be effected.

2. Fifteen Fellows shall constitute a quorum for the transaction of business at a stated meeting. Seven Fellows shall be sufficient to constitute a meeting for scientific communications and discussions.

3. The Recording Secretary shall notify the meetings of the Academy to each Fellow residing in Boston and the vicinity; and he may cause the meetings to be advertised, whenever he deems such further notice to be needful.

CHAPTER IX.

Of the Election of Fellows and Honorary Members.

1. Elections shall be made by ballot, and only at the stated meetings in May, November, and January.

2. Candidates for election as Resident Fellows must be proposed by two or more Resident Fellows, in a recommendation signed by them, specifying the section to which the nomination is made; which recommendation shall be read at a stated meeting, and then stand on the nomination list during the interval between two stated meetings, and until the balloting. No person shall be elected a Resident Fellow, unless he shall have been resident in this Commonwealth one year next preceding his election; and any Resident Fellow, hereafter elected, who shall reside out of the Commonwealth for the term of five years, and shall discontinue the payment of his assessments during that time, shall be deemed to have abandoned his fellowship; provided, nevertheless, that this abandonment of fellowship for non-residence shall not apply to persons engaged in the service of the State, or of the United States.

3. The nomination of Associate Fellows shall take place in the manner prescribed in reference to Resident Fellows; and after such nomination shall have been publicly read at a stated meeting previous to that when the balloting takes place, it shall be referred to a Council for Nomination; and a written approval, authorized and signed at a meeting of said Council by at least seven of its members, shall be requisite to entitle the candidate to be balloted for. The Council may in like manner originate nominations of Associate Fellows; which must be read at a stated meeting previous to the election, and be exposed on the nomination list during the interval.

4. Foreign Honorary Members shall be chosen only after a nomination made at a meeting of the Council, signed at the time by at least seven of its members, and read at a stated meeting previous to that on which the balloting takes place.

5. Three fourths of the ballots cast must be affirmative, and the number of affirmative ballots must amount to eleven, to effect an election of Fellows or Foreign Honorary Members.

6. Each section of the Academy is empowered to present lists of persons deemed best qualified to fill vacancies occurring in the number of Foreign Honorary Members or Associate Fellows allotted to it; and such lists, after being read at a stated meeting, shall be referred to the Council for Nomination.

CHAPTER X.

Of Amendments of the Statutes.

1. All proposed alterations of the statutes, or additions to them, shall be referred to a committee during the interval between two stated meetings, and shall require for enactment a majority of two thirds of the members present, and at least eighteen affirmative votes.

2. Standing Votes may be passed, amended, or rescinded, at any stated meeting, by a majority of two thirds of the members present. They may be suspended by a unanimous vote.

CHAPTER XI.

Of Literary Performances.

1. The Academy will not express its judgment on literary or scientific memoirs or performances submitted to it, or included in its publications.

STANDING VOTES.

1. Communications of which notice has been given to the Secretary shall take precedence of those not so notified.

2. Resident Fellows who have paid all fees and dues chargeable to them are entitled to receive one copy of each volume or article printed by the Academy, on application to the Librarian personally or by written order, within two years from the date of publication.

3. Resident Fellows may borrow and have out from the Library six volumes at any one time, and may retain the same for three months, and no longer.

4. Upon special application, and for adequate reasons assigned, the Librarian may permit a larger number of volumes, not exceeding twelve, to be drawn from the Library, for a limited period.

5. Works published in numbers, when unbound, shall not be taken from the Hall of the Academy, except by special leave of the Librarian.

6. The annual assessment upon Resident Fellows shall be five dollars, until otherwise ordered.

7. The annual meeting shall be holden at half past three o'clock, P. M. The other stated meetings at half past seven o'clock, P. M.

8. A meeting for receiving and discussing scientific communications shall be held on the second Tuesday of each month, excepting the three summer months.

RUMFORD PREMIUM.

In conformity with the last will of Benjamin Count Rumford, granting a certain fund to the American Academy of Arts and Sciences, and with a decree of the Supreme Judicial Court for carrying into effect the general charitable intent and purpose of Count Rumford, as expressed in his said will, the Academy is empowered to make from the income of said fund, as it now exists, at any annual meeting, an award of a gold and silver medal, being together of the intrinsic value of three hundred dollars, as a premium, to the author of any important discovery or useful improvement in light or in heat, which shall have been made and published by printing, or in any way made known to the public, in any part of the continent of America, or any of the American islands; preference being always given to such discoveries as shall, in the opinion of the Academy, tend most to promote the good of mankind; and to add to such medals, as a further premium for such discovery and improvement, if the Academy see fit so to do, a sum of money not exceeding three hundred dollars.

FELLOWS.

CLASS I.

Mathematical and Physical Sciences.

Section I.

Mathematics.

Ezekiel B. Elliott,	Boston.
Benjamin A. Gould, Jr.,	Cambridge.
John B. Henck,	Dedham.
Thomas Hill,	Waltham.
Benjamin Peirce,	Cambridge.
John D. Runkle,	Dedham.
Thomas Sherwin,	Boston.
Joseph Winlock,	Cambridge.

Section II.

Practical Astronomy and Geodesy.

George P. Bond,	Cambridge.
J. Ingersoll Bowditch,	Boston.
Charles Henry Davis,	Cambridge.
William Mitchell,	Nantucket.
Miss Maria Mitchell,	Nantucket.
Robert Treat Paine,	Boston.
C. H. F. Peters,	Clinton, N. Y.

Section III.

Physics and Chemistry.

Joseph Hale Abbot,	Beverly.
John Bacon, Jr.,	Boston.
John H. Blake,	Boston.
William F. Channing,	Boston.
Thomas Edward Clark,	Williamstown.
Josiah P. Cooke,	Cambridge.
William P. Dexter,	Boston.
Charles W. Eliot,	Cambridge.
Moses G. Farmer,	Boston.
Augustus A. Hayes,	Boston.
Albert Hopkins,	Williamstown.
Eben N. Horsford,	Cambridge.
Joseph Lovering,	Cambridge.
Francis Peabody,	Salem.
Frank H. Storer,	Boston.

Section IV.

Technology and Engineering.

James F. Baldwin,	Boston.
Simeon Borden,	Fall River.
Edward C. Cabot,	Boston.
Henry L. Eustis,	Cambridge.
James B. Francis,	Lowell.
Nathan Hale,	Boston.
James Hayward,	Boston.
Charles Jackson,	Boston.
John C. Lee,	Salem.
William R. Lee,	Boston.
Charles S. Storrow,	Lawrence.
William H. Swift,	Boston.
John H. Temple,	Boston.
Daniel Treadwell,	Cambridge.
Morrill Wyman,	Cambridge.

CLASS II.

Natural and Physiological Sciences.

Section I.

Geology, Mineralogy, and Physics of the Globe.

Francis Alger,	South Boston.
Thomas T. Bouvé,	Boston.
Edward Hitchcock,	Amherst.
Jonathan P. Hall,	Boston.
Charles T. Jackson,	Boston.
Henry D. Rogers,	Boston.
William B. Rogers,	Boston.
Charles U. Shepard,	Amherst.
Josiah D. Whitney,	Northampton.

Section II.

Botany.

Jacob Bigelow,	Boston.
George B. Emerson,	Boston.
Asa Gray,	Cambridge.
Benjamin D. Greene,	Boston.
John A. Lowell,	Boston.
John L. Russell,	Salem.
Charles James Sprague,	Boston.
Edward Tuckerman,	Amherst.

Section III.

Zoölogy and Physiology.

Louis Agassiz,	Cambridge.
Thomas M. Brewer,	Boston.
Henry Bryant,	Boston.
Samuel Cabot, Jr.,	Boston.
Henry J. Clark,	Williamstown.
Silas Durkee,	Boston.
Augustus A. Gould,	Boston.
Samuel Kneeland, Jr.,	Boston.
Charles Pickering,	Boston.
D. Humphreys Storer,	Boston.
David Weinland,	Cambridge.
Henry Wheatland,	Salem.
Jeffries Wyman,	Cambridge.

Section IV.

Medicine and Surgery.

Samuel L. Abbot,	Boston.
Luther V. Bell,	Charlestown.
Henry J. Bigelow,	Boston.
Henry I. Bowditch,	Boston.
Benjamin E. Cotting,	Roxbury.
George Hayward,	Boston.
Oliver W. Holmes,	Boston.
James Jackson,	Boston.
John B. S. Jackson,	Boston.
Henry C. Perkins,	Newburyport.
Charles G. Putnam,	Boston.
Edward Reynolds,	Boston.
Horatio R. Storer,	Boston.
Charles E. Ware,	Boston.
John Ware,	Boston.
John M. Warren,	Boston.

CLASS III.

Moral and Political Sciences.

Section I.

Philosophy and Jurisprudence.

William Allen,	Northampton.
Francis Bowen,	Cambridge.
Rufus Choate,	Boston.
Benjamin R. Curtis,	Pittsfield.
Mark Hopkins,	Williamstown.
Heman Humphrey,	Amherst.
Charles G. Loring,	Boston.
Joel Parker,	Cambridge.
Theophilus Parsons,	Cambridge.
George Putnam,	Roxbury.
Lemuel Shaw,	Boston.
William A. Stearns,	Amherst.
James Walker,	Cambridge.
Daniel A. White,	Salem.

Section II.

Philology and Archæology.

Albert N. Arnold,	Westborough.
Charles Beck,	Cambridge.
Epes S. Dixwell,	Cambridge.
Cornelius C. Felton,	Cambridge.
Charles Folsom,	Cambridge.
William W. Goodwin,	Cambridge.
Benjamin A. Gould,	Boston.
William Jenks,	Boston.
George M. Lane,	Cambridge.
George Livermore,	Cambridge.
George R. Noyes,	Cambridge.
Chandler Robbins,	Boston.
James Savage,	Boston.
Nathaniel B. Shurtleff,	Boston.
Evangelinus A. Sophocles,	Cambridge.
Samuel Swett,	Boston.
William Wells,	Cambridge.
Joseph E. Worcester,	Cambridge.

Section III.

Political Economy and History.

Nathan Appleton,	Boston.
Thomas G. Cary,	Boston.
Caleb Cushing,	Newburyport.
George E. Ellis,	Boston.
Edward Everett,	Boston.
Levi Lincoln,	Worcester.
J. L. Motley,	Boston.
Francis Parkman,	Boston.
Willard Phillips,	Cambridge.
Josiah Quincy,	Boston.
John Reed,	Bridgewater.
Jared Sparks,	Cambridge.
Richard Sullivan,	Cambridge.
Henry W. Torrey,	Cambridge.
Robert C. Winthrop,	Boston.

Section IV.

Literature and the Fine Arts.

Charles F. Adams,	Boston.
William T. Andrews,	Boston.
George S. Boutwell,	Groton.
Francis J. Child,	Cambridge.
Samuel A. Eliot,	Cambridge.
Nathaniel L. Frothingham,	Boston.
John C. Gray,	Boston.
Richard Greenough,	Boston.
Charles C. Jewett,	Boston.
Henry W. Longfellow,	Cambridge.
Francis C. Lowell,	Boston.
James Russell Lowell,	Cambridge.
Octavius Pickering,	Boston.
George Ticknor,	Boston.
Edward Wigglesworth,	Boston.

ASSOCIATE FELLOWS.

CLASS I.

Mathematical and Physical Sciences.

SECTION I.

Mathematics.

Charles Avery,	Clinton, N. Y.
Alexis Caswell,	Providence, R. I.
William Chauvenet,	Annapolis, Md.
Charles Davies,	New York.
Jeremiah Day,	New Haven, Conn.
Charles Gill,	Flushing, L. I.
J. S. Hubbard,	Washington, D. C.
William Smyth,	Brunswick, Maine.
Theodore Strong,	New Brunswick, N. J.

SECTION II.

Practical Astronomy and Geodesy.

Stephen Alexander,	Princeton, N. J.
Alexander D. Bache,	Washington, D. C.
W. H. C. Bartlett,	West Point, N. Y.
J. H. C. Coffin,	Annapolis, Md.
William H. Emory,	Washington, D. C.
James D. Graham,	Washington, D. C.
Elias Loomis,	New York.
O. M. Mitchel,	Cincinnati, Ohio.
Charles Wilkes,	Washington, D. C.

SECTION III.

Physics and Chemistry.

Wolcott Gibbs,	New York.
Joseph Henry,	Washington, D. C.
T. S. Hunt,	Montreal, Canada.
W. A. Norton,	New Haven, Conn.
Charles G. Page,	Washington, D. C.
Benjamin Silliman,	New Haven, Conn.
Benjamin Silliman, Jr.,	New Haven, Conn.

SECTION IV.

Technology and Engineering.

J. J. Abert,	Washington, D. C.
Richard Delafield,	Washington, D. C.
Dennis H. Mahan,	West Point, N. Y.
S. F. B. Morse,	Poughkeepsie, N. Y.
James Renwick,	New York.
Sylvanus Thayer,	New York.
Joseph G. Totten,	Washington, D. C.

CLASS II.

Natural and Physiological Sciences.

Section I.

Geology, Mineralogy, and Physics of the Globe.

Charles Cramer,	St. Petersburg, Russia.
James D. Dana,	New Haven, Conn.
Edward Desor,	Neufchatel, Switz.
John C. Fremont,	Mariposa, California.
Arnold Guyot,	Princeton, N. J.
James Hall,	Albany, N. Y.
Sir William E. Logan,	Montreal, Canada.

Section II.

Botany.

Francis Boott,	London.
Moses C. Curtis,	Society Hill, S. C.
Chester Dewey,	Rochester, N. Y.
George Engelmann,	St. Louis, Mo.
Thomas Nuttall,	Lancashire, Eng.
Charles W. Short,	Louisville, Ky.
William S. Sullivant,	Columbus, Ohio.
John Torrey,	New York.

Section III.

Zoölogy and Physiology.

John Bachman,	Charleston, S. C.
Spencer F. Baird,	Washington, D. C.
John C. Dalton, Jr.,	New York.
S. Stehman Haldeman,	Columbia, Pa.
John E. Holbrook,	Charleston, S. C.
J. P. Kirtland,	Cleveland, Ohio.
John L. LeConte,	Philadelphia.
Joseph Leidy,	Philadelphia.
St. Julien Ravenel,	Charleston, S. C.

Section IV.

Medicine and Surgery.

Isaac Hays,	Philadelphia.
Reuben D. Mussey,	Cleveland, Ohio.
Joseph Roby,	Baltimore, Md.
William Sweester,	Burlington, Vt.
George B. Wood,	Philadelphia.

CLASS III.

Moral and Political Sciences.

Section I.

Philosophy and Jurisprudence.

C. B. Haddock,	Hanover, N. H.
Laurens P. Hickok,	Schenectady, N. Y.
Horace Mann,	Yellow Springs, Ohio.
Alonzo Potter,	Philadelphia, Pa.
Francis Wayland,	Providence, R. I.

Section II.

Philology and Archæology.

S. P. Andrews,	New York.
George P. Marsh,	Burlington, Vt.
Alpheus S. Packard,	Brunswick, Maine.
Edward Robinson,	New York.
Edward Salisbury,	New Haven, Conn.
Theodore D. Woolsey,	New Haven, Conn.

Section III.

Political Economy and History.

Angel Calderon de la Barca,	Madrid, Spain.
Francis Lieber,	New York.

Section IV.

Literature and the Fine Arts.

William C. Bryant,	New York.
Joseph G. Cogswell,	New York.
Washington Irving,	New York.
Hiram Powers,	Florence.

FOREIGN HONORARY MEMBERS.

CLASS I.

Mathematical and Physical Sciences.

Section I.

Mathematics.

John C. Adams,	Cambridge, Eng.
George B. Airy,	Greenwich.
Sir William R. Hamilton,	Dublin.
Hansen,	Seeberg.
Le Verrier,	Paris.
Sir John W. Lubbock,	London.
Ostrogradsky,	St. Petersburg.
Giovanni Plana,	Turin.

Section II.

Practical Astronomy and Geodesy.

Argelander,	Bonn.
Encke,	Berlin.
Sir John F. W. Herschel,	London.
Peters,	St. Petersburg.
William H. Smyth,	London.
Struve,	St. Petersburg.

Section III.

Physics and Chemistry.

Biot,	Paris.
Sir David Brewster,	St. Andrews, Scot.
Dumas,	Paris.
Michael Faraday,	London.
Liebig,	Munich.
Mitscherlich,	Berlin.
Regnault,	Paris.
Heinrich Rose,	Berlin.

Section IV.

Technology and Engineering.

Charles Babbage,	London.
Fourneyron,	Paris.
Robert Stephenson,	London.
Vicat,	Paris.

CLASS II.

Natural and Physiological Sciences.

Section I.

Geology, Mineralogy, and Physics of the Globe.

Elie de Beaumont,	Paris.
Humboldt,	Berlin.
Sir Charles Lyell,	London.
Sir Roderick I. Murchison,	London.
Quételet,	Brussels.
Ritter,	Berlin.
Adam Sedgwick,	Cambridge, Eng.
De Verneuil,	Paris.

SECTION II.

Botany.

Decaisne,	Paris.
DeCandolle,	Geneva.
Elias Fries,	Lund.
Sir William J. Hooker,	Kew.
John Lindley,	London.
Martius,	Munich.
Mohl,	Tübingen.

SECTION III.

Zoölogy and Physiology.

Karl E. von Baer,	St. Petersburg.
Theodor L. W. Bischoff,	Giessen.
Ehrenberg,	Berlin.
Milne-Edwards,	Paris.
Richard Owen,	London.
C. Th. von Siebold,	Munich.
Tiedemann,	Frankfort on the Main.

SECTION IV.

Medicine and Surgery.

Andral,	Paris.
Sir Benjamin C. Brodie,	London.
Louis,	Paris.
Rayer,	Paris.
Rokitansky,	Vienna.

CLASS III.

Moral and Political Sciences.

SECTION I.

Philosophy and Jurisprudence.

Cousin,	Paris.
Mittermaier,	Heidelberg.
Archbishop Whately,	Dublin.
William Whewell,	Cambridge, Eng.

SECTION II.

Philology and Archæology.

Boeckh,	Berlin.
Bopp,	Berlin.
Bunsen,	Bonn.
Eyriès,	Paris.
Pascual de Gayangos,	Madrid.
Grimm,	Berlin.
Lepsius,	Berlin.
Duke di Serradifalco,	Palermo,
Thiersch,	Munich.

SECTION III.

Political Economy and History.

Guizot,	London.
George Grote,	London.
Sir Francis Palgrave,	London.
John Stuart Mill,	London.

SECTION IV.

Literature and the Fine Arts.

Gino Capponi,	Italy.
Joaquim J. da Costa de Macedo,	Lisbon.