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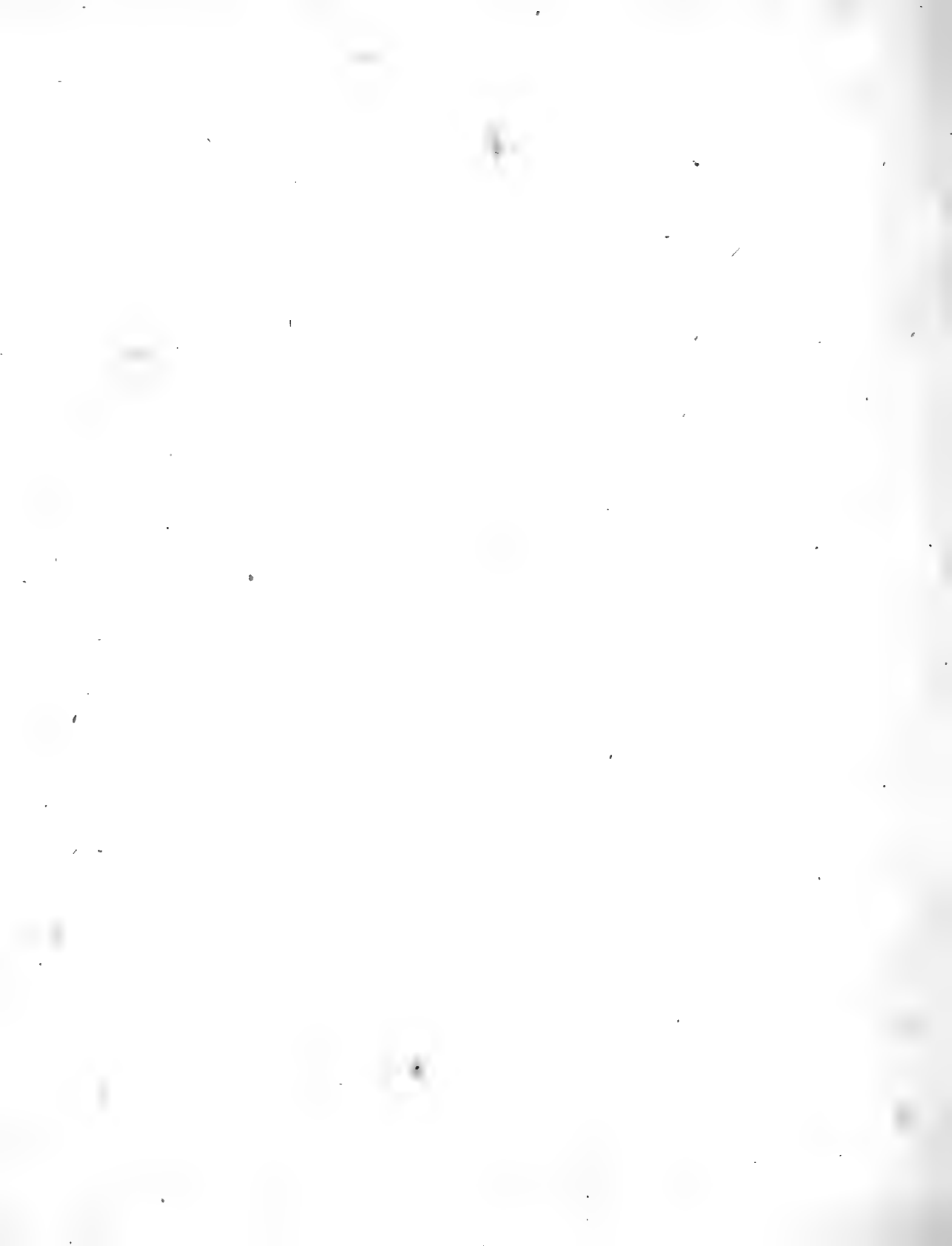
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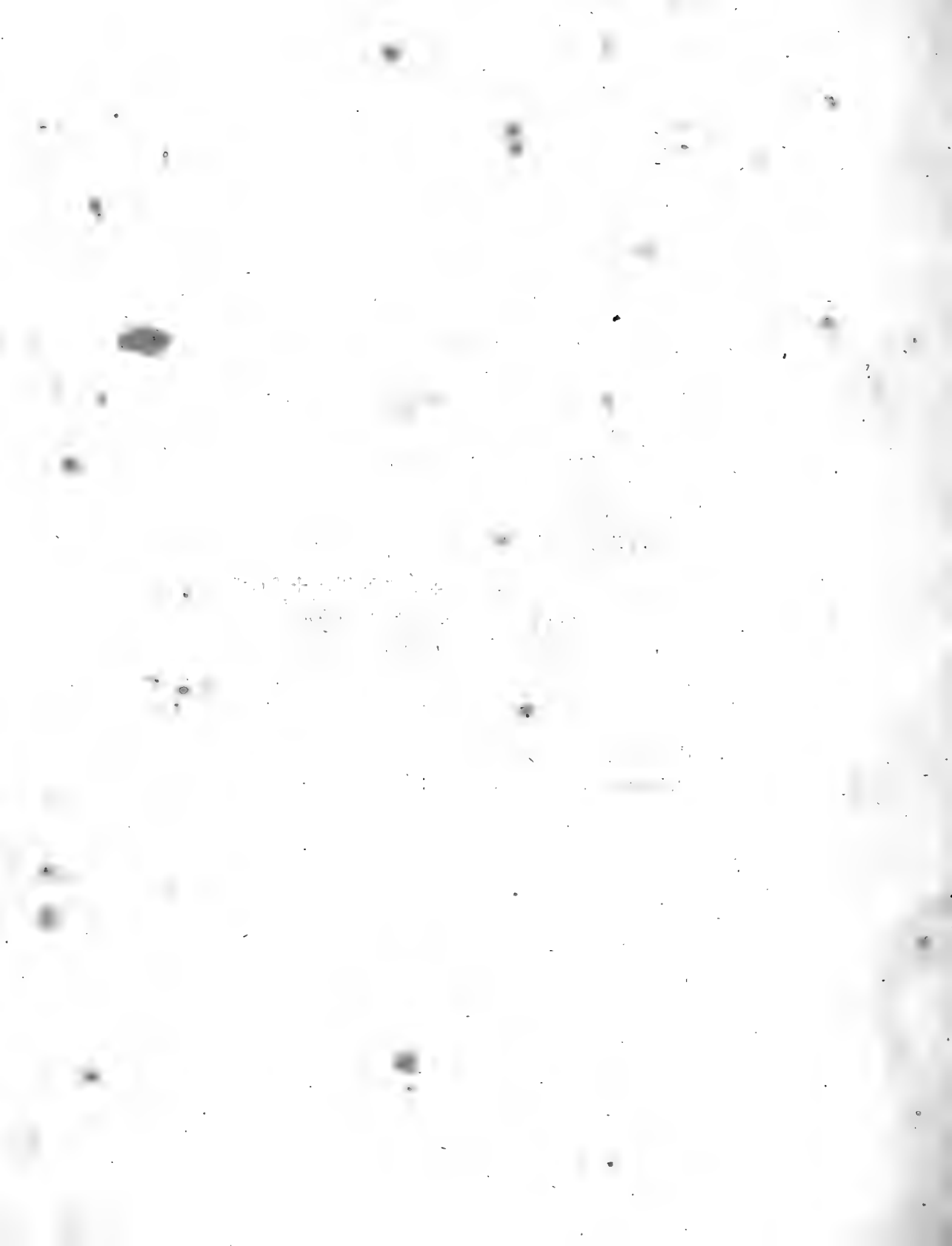




## ERRATA.

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- p. 148, in the middle of the last line but one, for  $=1$  read  $=\frac{1}{p^{\frac{m}{r}}}$
- p. 154, line 4, for  $(\frac{m}{r}-n-2)d$ , read  $(\frac{m}{r}-n-2)d$
- p. 157, last line, for identical, read identical.
- p. 159, line 3, for  $(Qz + Rz^2 + Sz^3 + Tz^4 + \&c.)^{\frac{m}{r}}$   
 read  $(x + Qz + Rz^2 + Sz^3 + Tz^4 + \&c.)^{\frac{m}{r}}$
- p. 167, line 6, for  $1ds + d^2$ , read  $2ds + d^2$
- p. 169, lines 2, 3 and 4, for  $\overline{Abc\&c. + aBc\&c.} + \&c.$  read.  
 $\overline{Abc\&c. + aBc\&c. + \&c.} + \&c.$
- p. 181, line 4, for  $pq$  read  $pQ$
- p. 198, first line, for  $-k_2$ , read  $+k_2$



ACCOUNT  
OF SOME  
*CHALYBEATE PREPARATIONS*  
IN THE  
PHARMACOPŒIA REGIS & REGINÆ IN HIBERNIA.  
By ROBERT PERCEVAL, M. D.  
PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF DUBLIN.

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MANY years ago, a Physician of deserved eminence in the South of Ireland, remarked to me, that the Tinctura Saturnina of the London Pharmacopœia 1746, had been advantageously employed in the treatment of consumptive\* and hectic cases. The same effect was, some time afterwards, confirmed by the report of one of the most experienced and celebrated practitioners in this city, since deceased. In the  
B 2 preparation

\*In the treatment of consumptive diseases the older physicians held Chalybeates in high estimation. The practice has, for some years past, been revived in these countries, where, in such complaints, Griffith's medicine has been extensively employed, and so far as I am capable of judging, with much success. Faber's Quinta Essentia Ferri, for which a Formula is given in Bennet's Theatrum Tabidorum, is nothing more than an operose preparation of acetate of Iron.

preparation of the Tinctura Saturnina, a tincture is extracted by rectified spirit from a mixture of acetate of Lead and sulphat of Iron. Although, from the play of affinities and the solubility of the resulting salts, it appears to the Chemist that this preparation derives its principal efficacy from an acetate of Iron produced by double elective attraction; yet as some of the acetate of Lead appears to escape decomposition,\* a process (if I mistake not) mentioned by Glauber, occurred to me as much preferable. This consists in extracting a tincture from a mixture of equal weights of acetate of Kali and sulphat of Iron. Such a medicine has been prepared in Dublin since the year 1787 or 1788, and has been found an elegant, agreeable and useful Chalybeate preparation.\*

If the tincture be made with common rectified spirit, it grows turbid by keeping, and deposits an oxyd of Iron. I found that this does not happen when Alcohol † is employed; and accordingly furnished a formula, for the specimen of the Dublin Pharmacopœia, printed in the year 1794, in which Alcohol is directed to be used. Some time afterwards it was observed ( I believe, first, by Mr. Watts, an intelligent and correct Apothecary in this city) that a tincture, retaining its transparency on keeping, may be extracted by rectified spirit  
from

\* The Tinctura Saturnina affords an insoluble precipitate by the addition of marine acid.

† A teaspoonful or two may be conveniently taken in asses milk.

‡ That is, vinous spirit of spec. gravity ,815.—This explanation is necessary, as from the less restrained use of the term, in the Pharmacopœia of the Edinburgh College no inconsiderable degree of confusion has affected directions for Pharmaceutical preparations, particularly of that now treated of.

from the same proportion of sulphat of Iron, if double the quantity of acetate of Kali be employed. As Alcohol is seldom to be met with except in the Laboratories of Experimental Chemists, this mode of preparing the medicine came into general use, and it was therefore thought proper to retain it in the Pharmacopœia, published by the Dublin College. It must be observed, however, that the tincture contains not only acetate of Iron, but also acetate of Kali; this is evinced by examining the extract that remains after the spirit is evaporated, which from the predominance of the salt last mentioned, is whitish, whereas the extract of the tincture by Alcohol is of a beautiful crimson colour, and appears to be a very pure acetate of Iron, more perfectly neutralised than most other of the metallic salts. The Alcohol tincture contains more Iron than the tincture by rectified spirit with double acetate of Kali. A drachm measure of this last afforded gr.  $\frac{1}{8}$  of prussiate of Iron by precipitation with a pure prussiate of Kali, which scarcely turned blue on the addition of an acid. The same quantity of Alcohol tincture afforded gr.  $\frac{23}{8}$  of prussiate of Iron.\* In both cases, marine acid was added to separate any prussiate of Iron which the redundant prussiate of Kali might have dissolved. That the tincture does not contain sulphat of Iron, is proved by its not affording a precipitate when a solution of muriate of Barytes is added. This tincture by Alcohol is inserted among the Præparata extemporalia of the Pharmacopœia; from an ounce measure may be obtained by evaporation, with a gentle heat, about  
10 grains

\* This result is the mean of two experiments.

10 grains of metallic salt, which does not crystallize, but first assumes the consistence of wax; and then dries, transparent, of the colour before mentioned.

In order to determine the state of oxydation in which Iron dissolves most easily in the acid of Vinegar,

Ten grains of the following substances, viz. Carbonate of Iron, Pharm. Dub. (A)\*, Oxydum ferri rubrum, Pharm. Dub. (B), Iron filings (C), scales of Iron (D), were digested with a heat varying from 90 to 150 degrees for four days, each in two drachms measure of acetic acid, spec. gravity 1065, procured by distillation of acetate of Copper. The solutions (designated by the letter annexed to the substance used in the experiment) presented the following appearances:

- |   |                    |
|---|--------------------|
| A. Deep claret colour, somewhat viscid—no residuum. |                    |
| B. Light red—residuum weighed . . . . .             | Gr. $8\frac{3}{4}$ |
| C. Reddish amber colour—residuum . . . . .          | $6\frac{3}{4}$     |
| D. Light amber tinge—residuum . . . . .             | $9\frac{1}{2}$     |

All the residua were washed with distilled water, and dried before weighing, with a heat of about 150.

Hence it appears, that the carbonate of Iron is perfectly soluble in acetic acid, whilst but a small portion of the red oxyd dissolves. Accordingly I have found that the sulphat of Iron exposed to such a degree of heat as converted it in part into red oxyd was less fit for the preparation of the Tinctura acetatis

\* This is obtained by decomposing sulphat of Iron by carbonate of Soda.

acetatis ferri.—On this account care should be taken that in drying the mixed salts, according to the processes in the Dublin Pharmacopœia, the heat should not be increased beyond the degree there specified.

The deposition which takes place in the tincture drawn by rectified spirit I supposed might depend on the Iron having attracted oxygen either from the atmosphere or from the water which forms part of the rectified spirit, and thus becoming less soluble in the acetic acid, and conceived that by exposing the mixture to air, so as to satisfy this attraction, the acid would take up such a quantity only of the oxyd as it would afterwards retain in a state of permanent solution. The exposure of the mixed salts to air was accordingly directed in the specimen printed in 1794, with the intention of more effectually preventing the decomposition of the Alc. tincture. Repeated experiments have, since that time, convinced me, that this precaution is unnecessary,\* and even detrimental if the mixture be exposed too long to air, especially in the higher temperatures; the reason of this may be inferred from the experiments above-mentioned, which prove that Iron may be so oxydated as to become almost altogether insoluble in acetic acid.

Finding that the tincture in rectified spirit grows turbid in phials stopped so as to exclude the air, I am now inclined to impute the deposition of the oxyd to the reaction of the water contained in the diluted spirit upon the acetic acid of the  
martial

\* Provided the Alcohol be of the specific gravity before mentioned.

martial salt. Thus, as in the case of the more rapid decomposition of sulphat of Mercury, nitrate of Bismuth, and muriate of Antimony, the acid by its superior affinity for water may deposit a considerable part of the oxyd it formerly held in solution. This opinion appears confirmed by the following experiments:

1st. The *Tinctura Acetatis ferri cum Alcohol*, Pharm. Dub. which does not affect the colour of Litmus paper, if it be diluted with water immediately reddens it.\* The experiment succeeds uniformly if the moistened paper, in both instances, be immediately dried. If the paper dipped in the undiluted Alcohol tincture be exposed some minutes to air, a very slight tinge of red is perceptible, probably in consequence of the extended surface of the Alcohol attracting moisture from the atmosphere.

2d. If the Alcohol tincture be evaporated to an extract and this be dissolved in water, the solution reddens Litmus paper, and after some time deposits an oxyd. It must be however remarked, that the Alcohol tincture remains clear for several days when exposed to air in an open glass, and that even when it is diluted with water so as to redden Litmus, it retains its transparency.

3d. The tincture with rectified spirit, which has grown turbid in close vessels reddens Litmus. The deposited oxyd is so minutely divided, that it is extremely difficult to obtain the liquor clear by filtration.

4th. If

\* This happens when 3 parts by measure of water are added to 20 of tincture, and more strikingly when equal parts of tincture and water are mixed.



4th. If the salts be mixed in the proportion of Tinctura Acetatis ferri cum Alcohol, Pharm. Dub. and distilled water used instead of Alcohol, the liquor is at first clear, but on standing for some hours it becomes turbid, and at length thickens so as to resemble a jelly. If it be then diluted with an equal quantity of water, it deposits the oxyd copiously; The supernatant liquor reddens Litmus paper strongly.

Hence we may explain why, by increasing the proportion of the acetate of Kali, which has a strong attraction for water, so as to leave this salt superabundant, the tincture in rectified spirit becomes permanent; the water of the rectified spirit being engaged with the salt, is prevented from acting upon the acetic acid of the acetate of Iron, and thus separating it from the oxyd.

An acetate of Iron may be directly procured by digesting precipitated Carbonate of Iron with acetic acid. The solution is of a deep crimson colour. Although the acid be digested, for several days, with more carbonate than it will dissolve, the liquor is still acid. Hence it is not subject to decomposition when mixed with water. I have also mixed it with rectified or even proof spirit, and the mixtures have retained their transparency for several months.

The acetate of Iron is decomposed by heat; acetic acid may therefore be procured by distilling a mixture of equal weights of acetate of Kali and sulphat of Iron; the salts, when mixed deliquesce so as to render it difficult to charge the retort; but by adding sulphat of Kali, reduced to powder in sufficient quantity, the mass acquires consistence,

and may be introduced into the retort in small pellets. From an ounce of acetate of Kali and the same quantity of sulphat of Iron and of sulphat of Kali, were obtained grs. 348 of acetic acid, spec. gravity grs. 1040, by distillation with a lamp heat.

### TARTAR OF IRON.

Tartar dissolves the oxyd of Iron, and forms with it a triple salt as with the oxyd of Antimony. Precipitated carbonate of Iron was found to answer best; when boiled with Tartar and water in the proportion of the Dublin Pharmacopœia, the salt is obtained in a mass of concreted spicular crystals of an olive colour. This attracts humidity from the air. Its flavour is rather sweetish than sour; the solution however destroys the colour of Litmus.

### TINCTURA MURIATIS FERRI.

Having prepared this tincture in the proportions of the London Pharmacopœia, with precipitated carbonate of Iron, I found, that in some instances, when rectified spirit was mixed with the evaporated muriate, crystals of green muriate of Iron deposited, which the spirit did not dissolve. The strength of the tincture was consequently variable. This observation suggested the process of *Tinctura muriatis ferri cum oxydo rubro*, which is now inserted amongst the *Præp. Extemp.* of the Dublin Pharmacopœia. The muriatic solution

tion is of an orange red, and does not crystallize when spirit is added.

Instead of evaporating it to a certain weight, which is a troublesome operation, spirit is added so as to bring the liquor to a certain specific gravity, which is the standard of the strength of the medicine.

... ..

... ..

# AN ESSAY

ON THE

## PRESENT STATE OF ASTRONOMICAL CERTAINTY,

WITH REGARD TO THE QUANTITY OF THE EARTH'S MAGNITUDE, THE DISTANCE OF THAT PLANET FROM THE SUN, AND THE ABSOLUTE LIMIT OF THE SMALLEST POSSIBLE INTERVAL FROM THE SUN TO ANY ONE OF THE FIXED STARS.

BY THE REV. J. A. HAMILTON, D. D. DEAN OF CLOYNE.

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OBSERVATORY, ARMAGH.

TO ascertain the dimensions and distances from each other, of the various bodies that compose our solar system, is a problem which, we find, has exercised the ingenuity of Astronomers, from the period of the earliest records we have, of the application of trigonometrical calculations to the improvement of their useful and sublime science. To determine the various questions involved in this enquiry, an actual knowledge of the distance of the earth from the sun, is first required; an element of great importance in this, and, indeed, in many other branches of astronomical calculation. As the works of Ptolemy make no mention of any Chaldean or Indian attempts at the solution of this problem, it is probable that none such existed in his time, as there can be no doubt, that

that were there any such upon record, they would have been deposited in the celebrated library of Alexandria, and would, of course, have been noticed in his great work. This discovery, however, was very early attempted by two eminent Astronomers of the Greek School, who, each of them, suggested a different method of determining the distance of the earth from the sun, both highly ingenious and strictly geometrical, but practically insufficient, from their requiring observations of such minuteness and accuracy, that not even the improved state of modern optical instruments can enable us to attain to the precision they demand. A necessary step to the most direct and certain solution, of this nice question, is to determine the angular quantity of the difference of the sun's apparent place in the Heavens, as seen at the same instant, from the centre and the surface of the earth, usually called the angle of the sun's parallax; for it is well known to Astronomers, that this quantity is equal to the angle under which the earth's semidiameter is seen from the sun; and that, were *this angle*, and the measure of the mean semidiameter of the earth, also given; from these data, by the help of plain trigonometry, the distance of the sun, and, of course, that of every primitive planet belonging to our system, may be readily determined. But this angle is too small for direct observation; a very close approximation to the discovery of it, has been made by various acute and well-conceived, though indirect methods. The parallactic angle of the planet Mars, the theory of gravitation, and, above all, the two recent observations of the transits of the planet Venus over the sun's disk,

disk, have been made subservient to this purpose, and, indeed, have reduced any remaining uncertainty about the quantity of this angle, within very narrow limits; so that, in fact, it may be considered with almost actual certainty, that the angle of the sun's horizontal parallax, at the mean distance from the earth, lies between the limits of  $8''.65$ , and  $8''.75$ .

To enable persons, who are not in the habit of making astronomical calculations, to judge of the accuracy to which the distance of the earth from the sun has been hitherto determined, I have arranged the following short table, which will shew at one view, within what bounds, our present knowledge on this subject is comprised, and to what errors we are still liable. It may, perhaps, also, from a view of the uncertainty that still hangs over this subject, suggest to those who are qualified for such undertakings, to obviate the remaining imperfections, and thus attain to still higher degrees of precision, in ascertaining this important element of astronomical knowledge.

A TABLE

*A Table of the various possible distances of the Earth from the Sun, according to the present limits of the best observations that have been made of the horizontal parallaxes of the Sun, and the mean semidiameters of the Earth.*

HORIZONTAL PARALLAXES OF THE SUN.

<i>Semidiameters of the Earth in British miles.</i>	<i>Three thousand, nine hundred, and</i>	Miles.	8". 6.	8". 7.	8". 8.
		45	94.618.000.	93.531.000.	92.467.000.
46	642.	554.	491.		
47	666.	578.	514.		
48	690.	602.	537.		
49	714.	625.	561.		
50	738.	649.	585.		
51	762.	672.	608.		
52	786.	696.	632.		
53	810.	720.	653.		
54	834.	743.	677.		
55	858.	767.	700.		
56	882.	791.	724.		
57	906.	815.	747.		
58	930.	838.	771.		
59	954.	862.	795.		
60	978.	886.	819.		
61	95.001.000.	909.	843.		
62	025.	932.	866.		
63	049.	955.	889.		
64	073.	978.	914.		
65	097.	94.002.000.	936.		

As



As the assumed quantities (from whence the distances, as given in this table, are calculated) are supposed to extend to any possible degree of uncertainty in either element, it may not be improper to mention on what grounds these limits are severally conceived to be so ascertained. The mean semidiameters of the earth, are deduced from a mean of several very excellent and careful mensurations of degrees of the terrestrial meridians, such as those of Picard and Norwood, in France and England; of Snellius, in Holland; of De Ulloa, De la Condamine, &c. in S. America; Maupertuis and his associates, in Lapland; and the more recent ones of Cassini, General Roy, Lalande, and Lambton. To give a satisfactory view of the actual progress already made, towards ascertaining this element of our calculation, I have subjoined a table of the mean semidiameters of the earth, obtained either by the actual mensuration of degrees near the probable situation of the mean radius of the earth, or else taken from extreme measures reduced to means on the most approved hypothesis of the figure of the earth, and the ratios of its radii, with the names of the mensurators and calculators; from the result of which it will appear, that the accuracy of the determination of the quantity of the earth's semidiameter, lies within the probable limits assigned to it in my table of the possible distances of the earth from the sun.

The deductions in the following table are compared with a mean semidiameter of the earth, deduced from the table of degrees of latitude in French toises, in Vince's Astronomy,

Vol. II. p. 110, calculated upon the hypothesis, that the æquatorial diameter of the earth exceeds the polar, by  $\frac{1}{368}$  of the whole, and that 825,7095 French toises equal a British mile. The mean semidiameter from the table is 3956,95 British miles.



*A Table exhibiting the results of different measures on the Earth's Surface, &c. &c.*

<i>Names of the Measurers.</i>	<i>Place of Measurement.</i>	<i>Time of do.</i>	<i>Authorities.</i>
Maupertuis & Company,	Lapland.	1736,7.	Robinson's Navigation. }
D'Ulloa and Condamine,	South America.	1736,44.	Vince's Astronomy. }
Cassini,	France.	1750.	Robinson's Navigation.
De la Caille,	France.	1750.	Vince's Astronomy.
Boscovitch,	Italy.	1755.	Robinson and Vince.
De la Caille,	Cape of Good Hope.	1752.	Robinson's Navigation.
Mason,	North America.	1766.	Vince's Astronomy.
Dixon,	North America.	1766.	Vince's Astronomy.
Liesganig,	Austria & Hungary.	1784,85.	Phil. Trans. 1791.
General Roy,	England.	1787,88.	Phil. Trans. 1790.
Brigade Major Lambton,	Madras.	1803.	

*Continuation*

*Continuation of the Table, &c.*

<i>Names of the Measurers.</i>	<i>Lat. of middle point.</i>	<i>Measured deg. in toises.</i>	<i>Deg. from Tab. in toises.</i>	<i>Mean Semidia. British miles.</i>
Maupertuis & Company,	66°. 20'. N.	57438. }	57222.	3971,35.
Ulloa and	} 0 0 0	57422. }		
Condamine,		56757.	56747.	3957,7.
Cassini and De la Caille,	49°. 20'. N.	57074. } 57069. }	57070.	3957,08.
De la Caille and Cassini,	45°. 0.	57050. } 57028. }	57026.	3965,3.
De la Caille,	33°. 18'. S.	57037.	56919.	3954,72.
Boscovitch,	43. N.	56972. }	57007.	3954,95.
Mason and Dixon,		56979. }		
Liesganig,	39'. 12'. N.	56888.	56969.	3951,4.
General Roy,	48°. 43'. N.	57086.	57068.	3958,2.
Brigade Major Lambton,	50°. 9'. 30. N.	57075.	57078.	3956,8.
	12°. 32. N.	56762,8.	56770.	3956,5.

The mean semidiameter of the earth from a mean of *all* is 3958,69 British miles, and the mean semidiameter, from a measurement executed under the direction of the French National Institute, which extended from Dunkirk to Barcelona, and was made between the years 1791 and 1798, as reduced by Lalande, is equal to 3958 British miles.\*

With regard to the quantity of the other element in this calculation, namely, the Sun's horizontal parallax, it is to be observed, that the determination of this quantity is most correctly deduced, from a comparison of the *observed* and *calculated* effects of the solar parallax, upon the several phænomena of the transits of the planet Venus over the Sun, especially on the apparent times of the internal and external contacts of the limbs of the planet with those of the Sun. The observations of the external contacts of the Sun's and Venus's limbs, were very carefully and judiciously made at the observatories

\* Mr. Dalby, in an elaborate paper published in the 81st Vol. Philosophical Transactions, read May 19, 1791, gives his determination of the longitude of Dunkirk and Paris, from the triangular measurements made in the years 1787 and 88, by the late General Roy, on the supposition of the earth's being an ellipsoid, whose magnitude is determined by adhering *nearly* to the measured arc of the meridian between Greenwich and Paris, obtained by the aforesaid operations. On which hypothesis it will appear, that the measured degrees of the meridian in middle latitudes, agree, very nearly indeed, to the assumed ellipsoid, whose axes are to each other in the ratio assigned by Sir Isaac Newton, viz. 229 to 230, and gives a mean semidiameter of the earth, of 3956,55 English miles; a quantity, most probably, very near to precision.

servatories of Philadelphia and Norriton, in North America, and are stiled by our learned astronomer, Dr. Maskelyne, "complete and excellent observations;" and compared with those made by skilful persons at the settled observatories in Europe, under favorable circumstances of both weather and latitude; as also with others made at the Cape of Good Hope, the East Indies, and the Island of Otaheite, in the South Seas; in all of which places observations of *either*, or both, the transits of the years 1761 and 1769, were obtained, gives results which, probably, are the best and most accurate which will be got for centuries to come, towards the elucidation of this nice and interesting problem. The following summary of these results, will serve to give a clear and concise view of the degree of accuracy we may count upon, in regard to this element.

*Mean*

*Mean horizontal Parallaxes of the Sun, as deduced from the best observations of the late transits of the planet Venus over the Sun's disk.*

	"
From the American observations of 1761, - - - - -	8,6500
From the American observations of 1769, - - - - -	8,6045
From a Mean of Mr. Short and Dr. Hornsby's best observations,	8,8500
By professor Euler's deductions, - - - - -	8,6800
By those of Mr. Pingré, - - - - -	8,8000
Mr. Lexel, - - - - -	8,6300
Mr. Sejour, - - - - -	8,8100
Mr. Lalande, - - - - -	8,6000
A mean of these eight deductions gives - - - - -	<u>8,703.</u>

For the sun's mean horizontal parallax, which is very near the single result obtained by Dr. Maskelyne, from a comparison of the observations made at Otaheite, and Wardhus, viz. 8",72.

From

From a view of the table of the possible distances of the earth from the sun, it will appear, that with a given parallax, each difference of an English mile in the semidiameter of the earth, will occasion a difference of about 24,000 English miles in the distance, and that the semidiameter remaining the same, the difference of a tenth of a second in the horizontal parallax, alters the distance of the earth from the sun above *one million of miles*: hence, we may conclude, the immense distance of the fixed stars from our planet, as no one of them has yet been discovered to be affected by any sensible parallax; notwithstanding, that to enable us to detect any such apparent change of place in a fixed star, as is called *a parallax*, we can, by the earth's describing in one year an orbit round the sun of nearly 190 millions of miles in diameter, in the course of six months, observe a fixed star's distance from the zenith, at a station that is no less than 190 millions of miles distant from that at which we observed its zenith distance six months before. But, as no sensible change of a star's zenith distance is observable on this account, it is evident, that the whole diameter of the great orb of the earth's annual motion round the sun, subtends no discernible angle, as seen from the *nearest fixed star*. If a fixed star had a sensible parallax of even one second, still, the distance of that star from the sun, would be above 400,000 times the distance of the earth from the sun. And, if a fixed star had a sensible diameter of one second, and also a sensible parallax of one second, then, its actual dimensions would equal the radius of the orb of the sun's distance from the earth.

earth. Thus, by the doctrine of parallaxes, when they are *sensible*, we find the absolute distances of the heavenly bodies; and when they are even *insensible*, we obtain from them, a sort of negative information, which determines, that bodies so circumstanced, must, at least, in their remoteness, exceed certain limits, which we can easily assign. For thus much is *certain*, that as no one of the fixed stars has any sensible parallax, the distance of the nearest of them must exceed twice the distance of the earth from the sun, multiplied by 206,264, a distance which will be more distinctly conceived by actually so multiplying any of the distances given in the table, than by a mere inspection of the product. The product of such a multiplication, supposing the double distance of the earth from the sun to be in round numbers, 190 millions of miles, will consist of fourteen figures. This multiplier\* will give nearly the same number of miles for the nearest of the fixed stars, as may be deduced from the following correct analogy, supposing the same diameter of the annual orb, as above stated, and a parallax in the fixed star of one second.

As the tangent of  $1''$  : radius :: 190 millions of miles : distance = to 39191000000000 British miles!

\* This multiplier is the seconds in an arch equal to Radius.

FARTHER



# FARTHER CONSIDERATIONS

ON THE

COMPARATIVE OBSERVATIONS OF THE DIFFERENCES OF RIGHT  
ASCENSION OF THE MOON'S ENLIGHTENED LIMB WITH  
THE SUN'S CENTRE, AND WITH STARS UNDER  
DIFFERENT MERIDIANS;

TOGETHER WITH THE

ACTUAL RESULTS OF A GREAT NUMBER OF SUCH OBSERVATIONS, MADE IN VARIOUS  
YEARS, AT THE RESPECTIVE OBSERVATORIES OF GREENWICH AND ARMAGH.

By THE REV. ARCHIBALD HAMILTON, D. D. M. R. I. A. DEAN OF CLOYNE.

READ, Nov. 3, 1806.

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OBSERVATORY, ARMAGH, MAY 1, 1806.

HAVING now, for above ten years, been in the practice of either observing myself, or of causing to be observed by my assistant, the moon's meridional passages compared with the most suitable of those fixed stars, whose places are so accurately settled by our excellent astronomer royal, Dr. Maskelyne, and being annually furnished with those accurate and valuable observations, made and published under his inspection, I have been thus provided with complete materials for ascertaining the merit of the method I formerly submitted to the Royal Irish Academy, for determining the longitudes of

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places by a comparison of the true differences of the difference of AR. of the  $\nu$ 's enlightened limb on the meridian from one or more stars, with which it has been also compared on the same day, under the different meridians, whose longitudinal distances from each other it is required to determine.

I have, in consequence, made a considerable use of these materials; and from a number of careful and repeated investigations, I am enabled to decide that this method is capable of the highest degree of accuracy; is easily put into practice by persons who are furnished with only a good time-keeper, and a portable transit instrument of no very high power or great size; and which, with a simple apparatus, may be set up in a few hours, under even a bell tent or other slight observatory: and from these considerations it appears, that this method is peculiarly adapted to the use of scientific persons, who may chance to be employed on voyages, either of commerce or discovery. When I formerly presented to the Academy a paper on this subject, I was not so well aware of \*the practical facility of this method, or of the degree of accuracy, of which it was capable in practice; I spoke and wrote on it, of course, with more diffidence, and as rather suited to the communications of astronomers, in the neighbouring

\* I have been strongly confirmed in my opinion of its *practical facility* by the successful application of a small transit instrument of about six inches focal distance, an achromatic object glass, twenty times mag. power, and system of three par. wires, used occasionally at my glebe residence under a meridian 30<sup>o</sup> of time E. of the observatory of Armagh.

houring observatories of Europe, than to distant situations and less expert hands.

I am now convinced that, by attending to the \* method of observation, suggested by Dr. Maskelyne, and with reasonable practice, any person who has a moderate turn for making astronomical observations, *may*, with a portable transit instrument of three feet length, and from 30 to 50 times magnifying power, furnished with a system of five fine wires, and a clock, whose rate is carefully ascertained, *make* these observations so accurately, that he will soon, from a mean of the five wires, obtain the apparent difference of the AR. of the moon's enlightened limb and a star, true to about one-tenth of a second of time.†

E 2

If

\* It may not be useless here, to refer such persons as may be induced to pursue this method of observing the differences of AR. of the heavenly bodies by the transit instrument and time-piece, to the note at the end of the Greenwich observations of passages of stars, for the year 1795, where they will find some very delicate and useful observations on the niceties of astronomical observations by the clock and transit instrument; and, among others, the following precept, on the method of observing, introduced by Dr. Bradley, which Dr. Maskelyne strongly inculcates the necessity of first *duly understanding*, and then, *closely adhering to*. "We should observe with all our attention, when the star comes near the wire, and *fix* (as if we could mark down) the apparent places of the star in the field of the telescope, at the *two beats of the clock*, immediately *preceding and following* the transit of the star across the wire, and *thence* estimate and note down the proper second and tenth answering to the actual transit across the wire. If we are not quick in fixing the place of the star, at the time of the beat, we shall be apt to assign it too backward a place in the telescope, and consequently reckon the time of the transit too great. A good ear seems, in this kind of observation, to be almost as useful as a good eye."

† When the moon has gained 48' of AR. in time, while the earth has revolved once on its axis, a change of AR. of 2' of such time indicates that 1<sup>h</sup>. or 15<sup>o</sup>. of the  
the

If this method for the longitude is applied to determine the relative positions of meridians, considerably distant from each other, it will be necessary to attend the more particularly to all the corrections of the apparent difference of the differences of AR.; and also to the obtaining of a correct lunar rate for the mid-interval of the observations. To accomplish this part of the process with due precision, it were much to be wished, that the AR.'s of the moon, for noon and midnight, were to be strictly calculated to the nearest second; and in the nautical almanac columns of these AR.'s, given for portions of sydereal time. Till this be done, it will be desirable for those, who wish for particular accuracy in the results of their observations, to turn the  $\delta$ 's longitudes, as given to the nearest second, in p. v. of each month in the nautical almanac, into AR.'s; which, though perhaps too tedious and laborious, to be done in general for several observations, might, however, be readily undertaken for one valuable and important one.

As the correct knowledge of the moon's rate at the time of her mid-interval, between the different places of observation is essential, where the estimate longitude is considerably uncertain, then, the operation for getting the rate at the mid-interval, must be repeated with the first obtained longitude, and the process renewed with the more correct rate, thus elicited.

the terrestrial æquator have revolved on the earth's axis.  $1^\circ$ . for each 8 seconds of AR. so gained by the  $\delta$ . A degree in  $54\frac{1}{2}$ . of lat. is  $\equiv$  to 32,700 toises nearly; so that in this lat. a possible error of observation of  $\frac{1}{8}$  of a second is equal to an error of 400 toises, or less than half an Irish mile in the longitude.

cited. As a correct *horary rate* must be investigated, it may save some trouble, to omit raising this rate to the quantity of AR. corresponding to  $12^h$ , and use the *horary rate obtained* as a member of the final analogy for the longitude. In this case, the tables of logistic logarithms will supersede the use of the table of assistant logarithms given in my first paper on this subject.\* It is also proper to observe, that a mode of correcting the *observed* difference of the differences of the AR. of the moon and star under different meridians, has been suggested to me, by my learned friend, the professor of astronomy in Trinity College, Dublin, which is sufficiently accurate and universal; it is, in fact, only a different mode of effecting the purpose of my table 1. in the above-mentioned paper, and either method may be applied. Previous to submitting to the Academy the results of my numerous comparisons of the observed differences of AR. of the  $\gamma$ . the stars, and the sun, for to obtain the difference of longitude of the observatories

\* It will be observed, that Mr. Brinkley applies his correction of the observed difference to the longitude immediately deduced from the entire observed difference, by subtracting from the longitude thus obtained, the whole observed difference of the differences in sydereal time, of which he says, "this method of correction is universal, and may be explained thus:—

"In the time the moon increases her AR. by the observed difference (D) of the differences of AR. of  $\gamma$  and  $\ast$  each meridian describes an angle in time A = equal to the angular distance of the meridians (L)  $\div$  D. But, as horary increase of AR. : D.  $\therefore 1^h$  : A' and A' being reduced to  $\ast$ sydereal time, gives A: and  $L = A - D$  or if L be taken = to  $A' - D$  reduced to sydereal time, it will be sufficiently accurate."

\* For the horary increase being calculated to *one hour of solar time*, the result will come out, a portion solar time also, and therefore to be reduced to sydereal time.

observatories of Greenwich and Armagh, I shall give an example at length, of the deduction of the longitude in each method; and also a short table of the actual apparent differences of AR. of the principal fixed stars, observed on the same days at Greenwich and Armagh, that every reader may thus judge of the eligibility of each different method, and, also, clearly see the degree of precision to be expected from such observations, in which various observers, different time-pieces, and transit instruments, generally of different powers, are necessarily concerned, when made with due degrees of care and skill in the adjustments, application and use of such instruments.

EXAMPLE.

## EXAMPLE.

October 26, 1803.—The observed difference of the differences of AR. of the  $\nu$ 's enlightened limb, and  $\alpha$  Aquarii at Greenwich and Armagh observatories, was  $59''$ ,38. S. T. Correction of observed differences from T. 1. —  $2''$ ,10. leaving the corrected difference of differences  $57''$ ,28. = to  $14'$ ,19". in measure. The  $\nu$ 's change of AR. in  $12^h$ . at the rate of the mid-interval of the observations, was  $6^\circ$ . 30". and her horary rate  $32'$ .30".

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*Solution by change of AR. in  $12^h$ . and assistant Logarithms.*

Assistant Logarithms of change of $\nu$ , AR. in $12^h$ .	-	-	-	-	9.7337.
Prop. Log. of considered difference of differences $14'$ . 19".					1.0994.
					<hr style="width: 100%;"/>
Prop. Log. of $26'$ . $26''$ . long. W.					0.8331.

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*Solution by horary rate and proportional Logarithms.*

Ar. Comp. Prop. Log. of $32'$ . 30".	-	-	-	-	9.2566.
Prop. Log. of 1 hour,					0.4771.
Prop. Log. of considered difference of differences					1.0994.
					<hr style="width: 100%;"/>
Prop. Log. of $26'$ . $26''$ . long. W.					0.8331.

*Solution*

*Solution by logistic Logarithms, and Mr. Brinkley's correction.*

Ar. Comp. of logistic Logarithm of  $\delta$ 's horary rate, - - 9.7337.  
 Logistic Logarithm of the entire observed difference of differences, 0.6065.  
            
0.3402.

Logistic Logarithm of 27'. 24", 7 approximate longitude.  
                                   59, 38 Mr. Brinkley's correction.  
            
 26'. 25", 32 longitude W.

*A Table*



*A Table of the differences of the difference of AR. of fixed Stars, as observed, on or about the same days, at the Observatories of Greenwich and Armagh, in the years 1802, 1803, expressing only the seconds and tenths.*

1802.

	Observed differences at Armagh.	Names of the Stars.	Observed differences at Greenwich.	Difference of differences of AR. Greenwich.
January.				
12,	53 <sup>m</sup> ,07.	$\alpha$ Andromedæ. } $\gamma$ Pegasi. }	52,8.	— 0 <sup>o</sup> ,27.
17,	53,6	$\alpha$ Lyræ. } $\alpha$ Aquilæ. }	53,66.	+ 0,06.
February				
10,	53,75.	$\alpha$ Lyræ. } $\alpha$ Aquilæ. }	53,51.	— 0,24.
12,	45,33,	Rigel. } $\beta$ Tauri. }	45,6.	+ 0,27.
27,	30,9.	Aldebaran. } Capella. }	30,75.	— 0,15.
March.				
3, 4,	24,09.	Rigel. } Syrius. }	24,14.	+ 0,05.
9,	56,49.	Capella. } Rigel. }	56,68.	+ 0,19.

	Observed differences at Armagh.	Names of the Stars.	Observed differences at Greenwich.	Difference of differences. Greenwich.
March.				
14,	15,45.	Procyon. } Pollux. }	15,5. } 15,4. } 45.	0
April.				
13,	15,24.	Procyon. } Pollux. }	15,36.	+ 0,12.
13,	38,63.	Pollux. } Regulus. }	38,50.	- 0,13.
May.				
8,	1,08.	Spica Virgs. } Regulus. }	1,2	+ 0,12.
15,	51,55.	Spica Virgs. } Arcturus. }	51,85.	+ 0,3.
17,	50,0.	$\beta$ Leonis. } Spica Virgs. }	49,81.	- 0,19.
27,	15,03.	Procyon. } Pollux. }	15,24.	+ 0,21.
July.				
13,	19,63.	Antares. } $\alpha$ Herculis. }	19,7.	+ 0,07.
13,	7,56.	$\alpha$ Herculis. } $\alpha$ Ophiuci. }	7,42.	- 0,14.
August.				
11,	13,58.	$\gamma$ Aquila.* } $\alpha$ Capricorni. }	13,38.	- 0,20.

	Observed differences at Ar-magh.	Names of the Stars.	Observed differences at Green-wich.	Difference of differences. Green-wich.
August.				
23,	16,62.	$\gamma$ Aquilæ. } $\alpha$ Aquilæ. }	16,42.	- 0,20.
26,	16,32.	$\gamma$ Aquilæ. } $\alpha$ Aquilæ. }	16,66.	- 0,34.
Septem.				
7.	28,06	$\alpha$ Aquilæ. } $\beta$ Aquilæ. }	7th. 27,9. 8th. 28,0.	} Mean - 0,07.
11.	30,28.	$\alpha$ Aquilæ. } $\alpha$ Aquarii. }	30,04. - ,04. f. rate at	
17.	28,94.	$\beta$ Aquilæ } 2 $\alpha$ Capricorni. }	28,98.	+ 0,04.
17.	42,79.	2 $\alpha$ Capricorni. } $\beta$ Tauri. }	42,76.	- 0,03.
28.	44,8.	$\gamma$ Aquilæ. } $\beta$ Aquilæ. }	44,6.	- 0,2.
28.	13,38.	$\gamma$ Aquilæ. } 2 $\alpha$ Capricorni. }	13,54.	+ 0,16.
October.				
10.	52,71.	$\alpha$ Andromedæ. } $\gamma$ Pegasi. }	52,72.	+ 0,01.
15.	52,88.	$\beta$ Aquilæ. } $\alpha$ Orionis. }	53,03.	+ 0,2.
Decemb.				
1.	30,18.	$\alpha$ Aquilæ. } $\alpha$ Aquarii. }	30,08.	- 0,1.

	Observed differences at Armagh.	Names of the Stars.	Observed differences at Greenwich.	Difference of differences. Greenwich.
December				
22.	55,01.	$\alpha$ Lyræ. } $\alpha$ Aquilæ. }	54,72.	— 0,29.
June omitted.				
10.	51,46.	Spica Virg. } Arcturus. }	51,66.	+ 0,2.
Sum of the Greenwich + 2,34.			Sum of the Greenwich — 2,49.	

1803.

				Greenwich.
January.				
2,	54,42.	$\alpha$ Arielis. } $\alpha$ Ceti. }	54,44	+ 0,02.
12,	57,20.	$\alpha$ Aquilæ. } $\gamma$ Pegasi. }	56,92	— 0,28.
March.				
3.	55,37.	Capella. } Rigel. }	54,95	— 0,42.
5,	58,08.	Castor. } Procyon. }	57,84	— 0,24.
3,	46,39.	Rigel. } $\beta$ Tauri. }	46,77	+ 0,38.
8,	55,3.	Capella. } Rigel. }	55,0	— 0,30
9.	46,4.	$\beta$ Tauri. } Rigel. }	46,7	+ 0,3.

	Observed differences at Armagh.	Names of the Stars.	Observed differences at Greenwich.	Difference of differences. Greenwich.
March.				
9.	37,43.	$\beta$ Tauri. } Syrius. }	37,18.	- 0,25.
29.	16,0.	Procyon. }	16,08.	+ 0,08.
31.	16,02.	Pollux. }		+ 0,06.
April.				
5.	15,78.	Procyon. } Pollux. }	16,04.	+ 0,26.
May.				
6.	15,92.	Procyon. } Pollux. }	16,08.	+ 0,16.
June.				
25.	50,9.	Spica Virgs. } Arcturus. }	50,99.	+ 0,09.
28.	50,9.	Spica Virgs. } Arcturus. }	51,0.	+ ,10
July.				
10.	56,1.	Arcturus. } Aldebaran. }	55,8.	- ,30.
August.				
6.	7,54.	$\alpha$ Herculis } $\alpha$ Ophiuci. }	7,49.	- ,05.

Sept. 5. Mr. Troughton ground down the Pivots of Greenwich T. Inst<sup>mt</sup> by Hand.

11.	15,65.	Procyon. } Pollux. }	16,16.	+ ,51.
27.	28,22.	$\alpha$ Aquilæ. } $\beta$ Aquilæ. }	28,0.	- ,22.
October.				
6.	16,66.	Procyon. } Pollux. }	16,06	- ,6.

Oct. 12. The axes of G. T. Inst<sup>mt</sup> being found imperfect were ground true in a Lathe.

	Observed differ- ences at Ar- magh.	Names of the Stars.	Observed differ- ences at Green- wich.	Difference of differ- ences. Green- wich.
October.				
22.	16,58.	$\gamma$ Aquilæ. } $\alpha$ Aquilæ. }	16,6.	+ ,02.
22.	27,94.	$\alpha$ Aquilæ. } $\beta$ Aquilæ. }	28,0.	+ ,06.
22.	13,88.	$\gamma$ Aquilæ. } 2 $\alpha$ Capricorni. }	14,04.	- ,16.
22.	57,30.	$\alpha$ Aquilæ. } 2 $\alpha$ Capricorni. }	57,44.	+ ,14.
26.	29,23.	Fomalhaut. } $\alpha$ Andromedæ. }	29,38.	+ ,15.
Nov.				
4.	44,64.	$\gamma$ Aquilæ. } $\beta$ Aquilæ. }	44,5.	- ,14.
21.	12,41.	Fomalhaut. } $\alpha$ Pegasi. }	12,58.	+ ,17.
21.	5,19.	$\alpha$ Aquarii. } Fomalhaut. }	5,22.	+ ,03.
23.	42,7.	$\alpha$ Andromedæ. } $\gamma$ Pegasi. }	42,6.	- ,10.
Dec.				
4.	50,34.	Spica Virgs. } Arcturus. }	50,34.	0
27.	52,7.	Capella. } Rigel. }	52,53.	- ,17.

NOTE.—It will be observed, that since the last repair of the axis of the Greenwich T. inst. the difference of the observed differences of AR. of any two stars never amounts to two-tenths of a second, so that if one-tenth of a second be allowed as the probable error of observation and counted as will appear from the sum of the + and — differences in the opposite directions, the observed places of the several stars will be found to agree to half-a-tenth of a second in each place. The sum of the + differences at Greenwich is, 57, and of the —, 57. The sum of the + differences in 1802 is 2,34, and of the — 2,49.

*A view of the mean and extreme Results, of the difference of differences of AR. of the  $\nu$  and the same fixed Stars, observed on the same days at the observatories of Greenwich and Armagh, to each of which if  $4''.2$  are added, the sum will be the difference of longitude of the two observatories ; taken in the year 1795.*

Days.	Results.	Days.	Results.	Days.	Results of Ex. Observations.	Mean of Extreme Observations in their results.
Jan.		Oct.		Jan.		
3.	26'.25"	25.	26'.21"	29.	26'.15",3	26'.25",7
Feb.						+ 4,2
14.	26'.22"	26.	26'.28"	28.	26'.16"	26'.29",9. Lon. West.
March.				March		
30.	26'.27",5	29.	26'.26",3	1.	26'.13"	
		Nov.				* <i>M. Results</i> very less than 10" from the Mean.
31.	26'.22",3	24.	26'.26",3	28.	26'.42"	
July.		Dec.		July.		* <i>Ex. Results</i> very more than 10" from the Mean, or about 10"
1.	26'.29"	29.	26'.30"	25.	26'.35"	
Aug.			End of Mean Results	Oct.		
26.	26'.26"			5.	26'.18",3	
27.	26'.27"		Mean of these. 26'.25",88 + 4,35	27.	26'.35"	
Sep.			26'.30",23 Lon. West.	Dec.		
28.	26'.26"			2.	26'.31"	



*Observations for the year 1797.*

July	1 Limbs.	July.	2 Limbs.	
3.	26.14,7	17.	32 <sup>0</sup> / <sub>3</sub>	
Sep.		Nov.		Mean Result of these 26.25 <sup>0</sup> / <sub>78</sub>
28.	26.17,7	10.	37 <sup>0</sup> / <sub>7</sub>	To make the Result Syd. T. + 4,35
Dec.		Dec.		Lon. West. 26.30, 13
2.	26.20,0	12.	32 <sup>0</sup> / <sub>3</sub>	

*The reductions of these observations were not reassumed till those of the years 1802 and 1803, which were done in the present year 1806, and give the following results :*

1802.	1 Limbs.	1802.	2 Limbs.	Mean, 1 Limbs in 1802.	
Jan.		May.			
11.	26.20	17.	26.53	26.27.	26.26.
14.	26.13	25.	26.41	26.29 <sup>1</sup> / <sub>2</sub>	26.28.
Feb.		Aug.			
12.	26.15	11.	26.36 <sup>1</sup> / <sub>2</sub>	26.30.	26.33.
		Sept.			
15.	26.20.	17.	26.34 <sup>1</sup> / <sub>2</sub>	26.29.	26.21.

1802.	1 Limbs.	1802.	2 Limbs.	Mean, 1 Limbs in 1802.	
March.		Sep.			
13.	26.20.	17.	26.34. $\frac{1}{4}$ .	26.33 $\frac{1}{2}$ .	26.23.
May.					
6.	26.16.	17.	26.35.0.	26.29.	26.36.
		Oct.			
7.	26.20.	9.	26.19 $\frac{1}{2}$ .	26.32 $\frac{1}{2}$ .	
Nov.					
8.	26.19 $\frac{1}{3}$ .	15.	26.22.	26.23 $\frac{1}{2}$ .	
8.	26.14 $\frac{1}{3}$ .	19.	26.30.	26.25 $\frac{1}{3}$ .	
Dec.					
5.	26.19.		26.24 $\frac{1}{2}$ .		

The mean Result of these 20 Observations is,  $26^{\circ}.25^{\prime}.32$   
 $+ 4, 35$   


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Lon. West.  $26^{\circ}.29^{\prime}.67$

The whole number of comparisons this year 35. The mean Result of the whole of which is  $26^{\circ}.25^{\prime}.33$   
 $+ 4, 35$   


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Lon. West.  $26^{\circ}.29^{\prime}.68$

The whole number of comparisons reduced in the year 1803 was 32. The mean Result of which is  $26^{\circ}.26^{\prime}.3$   
 $+ 4, 35$   


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 $26.30.65$

The foregoing results were all obtained from comparisons of the difference of differences of *AR.* of the  $\text{D}$  enlightened limb and a star. The following are the results of all the similar observations, obtained of the difference of the differences of *AR.* of the  $\text{D}$ 's enlightened limb from the  $\text{C}$ 's centre, reduced from the mean of its passages over the 5 wires of the *T. Insts.* of Armagh and Greenwich, in the year 1803.

—•••••—

*Difference of  $\text{C}$ 's and  $\text{D}$ 's enlightened Limb.*

Feb.	4.	26'.20'',5.	} The mean result of all these differences of $\text{C}$ , and $\text{D}$ 's enlightened limb.		26'.26'',6.
March	30.	26'.23'',0.		} + 4. 35.	
June	28.	26'.23'',0.		Lon. West.	26'.30''/95.
July	11.	26'.36'',0.	} M. results from inc. for } syd. time. }	1795.	26'.30'',23.
Oct.	22.	26'.35'',0.		1797.	26'.30'',13.
				20 observations in 1802.	26'.29'',67.
				The whole in 1802.	26'.29'',68.
	28.	26'.23'',0.	The whole in 1803.	26'.30'',65.	
The correct Lon. W. deduced from a mean of all, is 26'.30'',22.					

*In the year 1804, there were but 18 good sets of comparative observations of the difference of differences, of  $\Delta$  and stars AR's, on the meridians of the observatories of Greenwich and Armagh, which being reduced, gave the following results for the Longitude.*

26', 28'', 1		
15, 0		
32, 7		
27, 0		
33, 2		
40, 7		
29, 8		
21, 0		
30, 5		
27, 2		
9, 6		
40, 9		
35, 1		
33, 8		
35, 1		
22, 6		
23, 0		
9, 3		
<hr style="width: 100%;"/>		
Seconds 494, 6	Lon. from a mean of all these,	26'. 27'', 45
	For syd. time.	+ 4. 35
		<hr style="width: 100%;"/>
		26. 31, 80

If the four extreme observations should be rejected, the Lon. W. will be 26'. 31'', 05.

ON SIR ISAAC NEWTON'S FIRST SOLUTION OF THE PROBLEM FOR FINDING THE RELATION BETWEEN RESISTANCE AND GRAVITY, THAT A BODY MAY BE MADE TO DESCRIBE A GIVEN CURVE; AND THE SOURCE OF ERROR IN THAT SOLUTION POINTED OUT.

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IT is well known, that Newton's investigation of this problem, as published in the first edition of the Principia,\* is erroneous. In the subsequent editions, the illustrious author has given an accurate solution, by an entirely different method, and without adverting to the former solution. John Bernouilli seems to have been the first who pointed out the erroneous conclusion in the first edition.† Nich. Bernouilli imagined he had discovered the source of error in the Newtonian solution. His opinion seems to have been generally acquiesced in till lately, when the celebrated Lagrange, in his ingenious work, entitled "Theorie des Fonctions analytiques," remarked, that Newton's solution is accurate in the part in which N. Bernouilli had thought it erroneous. Indeed had the error been such as was pointed out by N. Bernouilli,

\* Lib. II. Prob. 3.

† Mem. Acad. Scien. 1711, & Tom. I. opera Bernouilli.

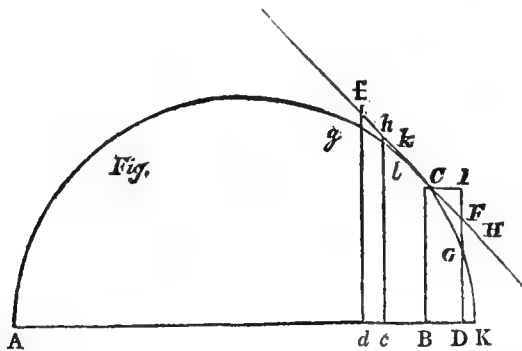
Bernouilli, nothing would have been easier than to have made the necessary correction; and it would not have been requisite for Newton to have invented that solution which he has given in the second and third editions of the Principia, and which is much more intricate than the former would have been when so corrected.

Lagrange, in the above-cited work, has given Newton's solution somewhat simplified, deducing the same conclusion as Newton, but does not attempt to point out the precise error. He then gives a second solution, which he considers as proceeding upon the same principles as the solution of Newton, and by which he obtains the same result. He points out the precise error of his second solution, and concludes, that the error in the solution of Newton is of the same kind.

Now it may be remarked, that the process of Newton is entirely different in all its steps from that of Lagrange. Therefore they have no common error: but as they give the same result, the error in each must admit of being traced to a common source. What that common source is, M. Lagrange has not shewn. And it still appeared an object of some importance, to enquire into the precise error of the Newtonian solution. The conclusion, deduced by that solution, is confessedly wrong; and, therefore, error must exist in some of its steps, and be assignable without reference to any other solution. To point out that error, is the principal object of this paper. It will be found to have originated from an erroneous application of the method of prime and ultimate ratios. It will also appear, that, had not this error occurred, the

the process would have been very intricate, and it would have been difficult to have obtained the conclusion required. This makes it highly probable, that Newton himself discovered the precise error; and, on account of the subsequent difficulty, abandoned this mode of solution for that which he afterwards gave.

The Newtonian solution is here given in the words of the author, as well as two of the solutions of Lagrange. This seemed necessary for making intelligible the remarks on these solutions. This paper concludes with a solution deduced entirely from the method of limits and series.



“ Prob.\* Tendat uniformis vis gravitatis directe ad pla-  
 “ num horizontis, sitque resistentia ut medii densitas et  
 “ quadratum velocitatis conjunctim: requiritur tum medii  
 “ densitas in locis singulis, quæ faciat ut corpus in data  
 “ quavis linea curva moveatur, tum corporis velocitas in  
 “ iisdem locis.

“ Sit

\* Edit. Prin. 1687, pag. 260.

“ Sit  $AK$  planum illud plano schematis perpendicularare;  
 “  $ACK$  linea curva;  $C$  corpus in ipsa motum; et  $FCf$  recta  
 “ ipsam tangens in  $C$ . Fingatur autem corpus  $C$  nunc pro-  
 “ gredi ab  $A$  ad  $K$  per lineam illam  $ACK$ , nunc vero regredi  
 “ per eandem lineam; et in progressu impediri a medio, in  
 “ regressu æque promoveri; sic ut in iisdem locis eadem  
 “ semper sit corporis progredientis et regredientis velocitas.  
 “ Æqualibus autem temporibus describat corpus progre-  
 “ diens arcum quam minimum  $CG$ , et corpus regrediens ar-  
 “ cum  $Cg$ ; et sint  $CH$ ,  $Ch$  longitudines æquales rectilineæ,  
 “ quas corpora de loco  $C$  exeuntia, his temporibus, absque  
 “ medii et gravitatis actionibus describerent: et a punctis  
 “  $C$ ,  $G$ ,  $g$  ad planum horizontale  $AK$  demittantur perpendi-  
 “ cula  $CB$ ,  $GD$ ,  $gd$ , quorum  $Gd$  ac  $gd$  tangenti occurrant in  
 “  $F$  et  $f$ . Per medii resistantiam fit ut corpus progrediens,  
 “ vice longitudinem  $CH$  describat solummodo longitudinem  
 “  $CF$ ; et per vim gravitatis transfertur corpus de  $F$  in  $G$ :  
 “ adeoque lineola  $HF$  vi resistantiæ et lineola  $FC$  vi gravi-  
 “ tatis simul generantur. Proinde (per Lem. 10. Lib. I.)  
 “ lineola  $FG$  est ut vis gravitates et quadratum temporis  
 “ conjunctim, adeoque (ob datam gravitatem) ut quadratum  
 “ temporis et lineola  $HF$  ut resistantia et quadratum tempo-  
 “ ris, hoc est ut resistantia et lineola  $FG$ . Et inde resistantia  
 “ fit ut  $HF$  directe et  $FG$  inverse, sive ut  $\frac{HF}{FG}$ . Hæc ita se ha-  
 “ bent in lineolis nascentibus. Nam in lineolis finitæ mag-  
 “ nitudinis hæ rationes non sunt accuratæ.

“ Et simili argumento est  $fg$  ut quadratum temporis,  
 “ adeoque ob æqualia tempora æquatur ipsi  $FG$ ; et impul-

“ sus



“ sus quo corpus regrediens urgetur est ut  $\frac{hf}{fg}$ . Sed impulsus  
 “ corporis regredientis et resistentia progredientis ipso motus  
 “ initio æquantur, adeoque et ipsis proportionales  $\frac{hf}{fg}$  et  $\frac{HF}{FG}$   
 “ æquantur; et propterea ob æquales  $fg$  et  $FG$ , æquantur  
 “ etiam  $hf$  et  $HF$ , suntque adeo  $CF$ ,  $CH$  (vel  $Ch$ ) et  $Cf$  in  
 “ progressionem Arithmetica, et inde  $HF$  semidifferentia est  
 “ ipsarum  $Cf$  et  $CF$ ; et resistentia quæ supra fuit ut  $\frac{HF}{FG}$ , est

“ ut  $\frac{Cf-CF}{FG}$ . † \* \* \* \*

“ \* \* \* \* \*

“ Cor. 1. \* \* \* \*

“ \* \* \* \* \*

“ Erit enim  $fC$  ad  $kC$  ut  $\sqrt{fg}$  seu  $\sqrt{FG}$  ad  $\sqrt{kl}$ , et divisim  
 “  $fh$  ad  $kC$ , id est  $Cf-CF$  ad  $CF$  ut  $\sqrt{FG}-\sqrt{kl}$  ad  $\sqrt{kl}$ ;  
 “ hoc est (si ducatur terminus uterque in  $\sqrt{FG}+\sqrt{kl}$ ) ut  
 “  $FG-kl$  ad  $kl+\sqrt{FG \times kl}$  sive ad  $FG+kl$ . Nam ratio prima  
 “ nascentium  $kl+\sqrt{FG \times kl}$  et  $FG+kl$  est æqualitatis. \*

“ \* \* \* \* \*

“ Cor. 2. Unde cum  $2HF$  et  $Cf-CF$  æquantur, et  $FG$   
 “ et  $kl$  (ob rationem æqualitatis) component  $2FG$ ; erit  $2HF$   
 “ ad  $FC$  ut  $FG-kl$  ad  $2FG$ ; et inde  $HF$  ad  $FG$ , hoc est  
 “ resistentia ad gravitatem, ut rectangulum  $CF$  in  $FG-kl$   
 “ ad  $4FG$  quad. \* \* \* \*

“ Cor. 3. Et hinc si curva linea definiatur per relationem  
 “ inter basem seu abscissam  $AB$  et ordinatam applicatam  
 VOL. XI. H “ BC;

† The remainder of the solution only respects the law of variation of the density, and is therefore omitted; as well as the parts of the Corollaries which have not a reference to the general proportion of resistance to gravity.

“ BC; (ut mos est) et valor ordinatim applicatæ resolvatur  
 “ in seriem convergentem: Problema per primos serei termi-  
 “ nes expedite solveretur: \* \* \*  
 “ \* \* \* \* \*  
 “ \* \* \* Si designetur series universaliter  
 “ his terminis  $\mp Qo - Ro^2 - So^3$  &c. erit CF æqualis  $\sqrt{o^2 + Qo^2}$   
 “ \* \* \* FG—kl æqualis  $2So^3$ . \* \* \* Deducendo  
 “ igitur Problema unumquodque ad seriem convergentem,  
 “ et hic pro Q, R, S scribendo terminos serei ipsis respon-  
 “ dentes; deinde etiam ponendo resistantiam medii in loco  
 “ quovis C esse ad gravitatem ut  $S\sqrt{1+Q^2}$  ad  $2R^2$  \*  
 “ solvetur problema. \* \* \*

Now with respect to this solution it may be remarked, that in Cor. 1. it is stated that

$$fC : kC :: \sqrt{fg} \text{ seu } \sqrt{FG} : \sqrt{kl} \text{ et}$$

divisim  $fk : kC$  id est  $Cf - CF : CF :: \sqrt{FG} - \sqrt{kl} : \sqrt{kl}$

But although ultimò  $\sqrt{fg} : \sqrt{FG}$  is a ratio of equality, it does not follow that ultimò  $\sqrt{FG} - \sqrt{kl} : \sqrt{fg} - \sqrt{kl}$  is a ratio of equality. It is easy to see, that ultimò  $fg : kl$  is a ratio of equality; and, therefore, it by no means necessarily follows, from the method of prime and ultimate ratios, that if ultimò  $\sqrt{fg} : \sqrt{FG}$  is a ratio of equality, that ultimò  $\sqrt{FG} - \sqrt{kl} : \sqrt{fg} - \sqrt{kl}$  is also a ratio of equality. Had ultimò  $fg : kl$  not been a ratio of equality, then  $\sqrt{FG} - \sqrt{kl} : \sqrt{fg} - \sqrt{kl}$  must necessarily have been a ratio of equality. Because ultimò  $\sqrt{fg}$ ,  $\sqrt{FG}$ ,  $\sqrt{kl}$ , are all equal, we may represent them by  $ao + bo^2 + \&c.$   $ao + 'bo^2 + \&c.$   $ao + ''bo^2 + \&c.$  where  $o$  may be diminished indefinitely. Then  
 ultimò

ultimò  $\sqrt{fg} - \sqrt{kl} : \sqrt{FG} - \sqrt{kl} :: b - b'' : b' - b''$ . Now there is nothing in the Newtonian solution by which it can be shewn that this ratio is a ratio of equality. It may or may not be so; and, therefore, from this step, the Newtonian investigation ceases to be supported by demonstration.

Let us suppose that ultimò

$$Cf - CF : CF :: m (\sqrt{FG} - \sqrt{kl}) : \sqrt{kl}$$

If  $m$  be found to be unity, then Newton's proportion is accurate; otherwise not.

Proceeding with this corollary, in the manner of Newton, we have

$$Cf - CF : CF :: m (FG - kl) : CG + hl.$$

Also for Cor. 2.

$$2HF : CF :: m (FG - kl) : 2FG$$

$$CF : 2FG :: CF : 2FG$$

Therefore

$$2HF : 2FG :: m (FG - kl) CF : 4FG^2$$

$$\text{And hence Resist. : Grav.} :: mS\sqrt{1+Q^2} : 2R^2$$

But according to the corrected Newtonian solution, as given in the second and third editions of the Principia, as given also by Lagrange, and as is likewise shewn at the end of this paper,

$$\text{Resist. : Grav.} :: 3S\sqrt{1+Q^2} : 4R^2$$

Hence  $m = \frac{3}{2}$ , and therefore ultimò

$$\sqrt{fg} - \sqrt{kl} : \sqrt{FG} - \sqrt{kl} :: 3 : 2,$$

instead of the ratio of equality *assumed* by Newton.

The ultimate ratio of  $\sqrt{fg} - \sqrt{kl} : \sqrt{FG} - \sqrt{kl}$ , or the ratio  $m : 1$  may also be fluxionally investigated as follows:

Let  $x=AB$ ,  $y=BC$ ,  $x'=BD$ , and Resist. : Grav. ::  $r : g$ ,

$$\text{Then } FG = \frac{\ddot{y}}{2x^2}x'^2 + \frac{\dot{y}}{6x^3}x'^3 + \&c.$$

$$kl = \frac{\ddot{y}}{2x^2}x'^2 - \frac{\dot{y}}{6x^3}x'^3 + \&c.$$

$$\text{Or } \sqrt{FG} = \left(\frac{\ddot{y}}{2x^2}\right)^{\frac{1}{2}}x' + \left(\frac{\ddot{y}}{2x^2}\right)^{-\frac{1}{2}}\frac{\dot{y}}{12x^3}x'^2 + \&c.$$

$$\sqrt{kl} = \left(\frac{\ddot{y}}{2x^2}\right)^{\frac{1}{2}}x' - \left(\frac{\ddot{y}}{2x^2}\right)^{-\frac{1}{2}}\frac{\dot{y}}{12x^3}x'^2 + \&c.$$

$$\text{Hence } \sqrt{FG} - \sqrt{kl} = \left(\frac{\ddot{y}}{2x^2}\right)^{-\frac{1}{2}}\frac{\dot{y}}{6x^3}x'^2 + \&c.$$

Now ultimò  $FG : FH :: g : r$ ,

$$\text{Therefore let } FH = \frac{r}{g}FG + aFG^2 + \&c.$$

$$\text{And let } fh = \frac{r}{g}fg + a'fg^2 + \&c.$$

$$\text{Then } Cf = CF + \frac{1}{g}(FG+fg) + aFG^2 + a'fg^2 + \&c.$$

$$\text{Therefore } Cm = x' + \frac{xr}{zg}(FG+fg) + \frac{x}{z}(aFG^2 + a'fg^2) + \&c.$$

$$\text{But } \sqrt{fg} = \left(\frac{\ddot{y}}{2x^2}\right)^{\frac{1}{2}}Cm - \left(\frac{\ddot{y}}{2x^2}\right)^{-\frac{1}{2}}\frac{\dot{y}}{12x^3}Cm^2 + \&c.$$

$$\text{Therefore } \sqrt{fg} = \left(\frac{\ddot{y}}{2x^2}\right)^{\frac{1}{2}}\left(x' + \frac{xr}{zg}(FG+fg)\right) - \left(\frac{\ddot{y}}{2x^2}\right)^{-\frac{1}{2}}\frac{\dot{y}}{12x^3}x'^2 + \&c.$$

$$\text{Consequently } \sqrt{fg} - \sqrt{kl} = \left(\frac{\ddot{y}}{2x^2}\right)^{\frac{1}{2}}\frac{\dot{y}}{6x^3}x'^2 + \&c. = \left(\text{because } \frac{r}{g} = \frac{\dot{y}}{2y^2}\right) \frac{\dot{y}}{2\sqrt{2}y^{\frac{3}{2}}x^2}x'^2 + \&c. \text{ Hence ultimò}$$

$$\sqrt{fg} - \sqrt{kl} : \sqrt{FG} - \sqrt{kl} :: \frac{1}{2\sqrt{2}} : \frac{\sqrt{2}}{6} :: 3 : 2.$$

To

To obtain this conclusion we have used the true values of  $\frac{r}{g}$  as found by the method of series, and also by the method of fluxions. The value of  $\frac{r}{g}$  enables us readily to compute the value of  $\sqrt{fg} - \sqrt{kl}$ ; and it does not appear that there is any other convenient method of obtaining that value. Hence the Newtonian method of solution, proceeding with  $\sqrt{fg} - \sqrt{kl}$ , instead of  $\sqrt{FG} - \sqrt{kl}$ , will require a process too complicated to be pursued with convenience: and it is highly probable, that Newton, revising his solution, discovered the true source of error, and thence was induced to abandon it entirely.

Of this solution of Newton Lagrange observes as follows: "Voici la première solution de Newton reduite en analyse:" (Œuvres de Jean Bernouilli, Tom. I. p. 481.) "Le mobile " étant parvenu à un point quelconque de la courbe, sans la " résistance et la gravité il décrirait dans un temps donné " très-petit, une partie très-petite de la tangente que nous " désignerons par  $\alpha$ ; soit  $\gamma$  le petit espace que la gravité " ferait décrire dans le même temps perpendiculairement à " l'horizon, et  $\rho$  le petit espace dont la résistance diminue " l'espace  $\alpha$  parcouru sur la tangente, il est clair que le " rapport de  $\rho$  à  $\gamma$  sera celui de la résistance à la gravité. " Ainsi le corps, dans le temps qu'il auroit parcouru sur la " tangente l'espace  $\alpha - \rho$ , sera descendu vertualement de la " quantité  $\gamma$ ; par consequent  $\gamma$  sera la flèche de l'arc  $\alpha - \rho$  " Maintenant, si on considère le corps comme partant du " même

\* Theo. des Fonct. analyt. p. 244.

“ même point et rebroussant chemin par décrire en sens  
 “ contraire le même arc de courbe qu’il a parcouru, il faudra  
 “ regarder le résistance comme négative, et par consequent  
 “ comme une force qui accélère le mouvement au lieu de la  
 “ retarder. Ainsi, le corps décrira, dans le même temps  
 “ très-petit, l’espace  $\alpha + \rho$  sur le même tangente dans une  
 “ direction contraire, et descendra en même temps verticale-  
 “ ment de l’espace  $\gamma$ , en vertu de la gravité. Par consequent  
 “  $\gamma$  sera la flèche de l’arc  $\alpha + \rho$ , pris de l’autre côté du part  
 “ de la courbe dont il s’agit. Or, les flèches étant pour les  
 “ arcs infiniment petits, comme les carrés des arcs, ou des  
 “ tangentes, la flèche de l’arc  $\alpha - \rho$ , pris du même côté que  
 “ l’arc  $\alpha + \rho$ , sera  $\gamma \left( \frac{\alpha - \rho}{\alpha + \rho} \right)^2$ ; donc, la différence des flèches  
 “ pour les arcs égaux  $\alpha - \rho$ , pris de part et d’autre du point  
 “ donné de la courbe, sera  $\gamma \left( 1 - \frac{(\alpha - \rho)^2}{(\alpha + \rho)^2} \right) = \frac{4\alpha\gamma\rho}{(\alpha + \rho)^2}$ : nommons  
 “ cette différence  $\delta$ , on aura  $\frac{4\alpha\gamma\rho}{(\alpha + \rho)^2} = \delta$ , et  $\frac{\rho}{\gamma} = \frac{\delta(\alpha + \rho)^2}{4\gamma^2\alpha} = \frac{\delta\alpha}{4\gamma^2}$ ,  
 “ à cause que la petite ligne  $\rho$ , parcourue d’un mouvement  
 “ uniformément accéléré, est infiniment plus petite que la  
 “ ligne  $\alpha$  parcourue dans le même temps d’un mouvement  
 “ uniforme. Tel est raisonnement de Newton, présenté de  
 “ la manière la plus claire; et le résultat que nous venons  
 “ de trouver, s’accorde avec celui du corollaire 2. du pro-  
 “ blemé, où il est visible que les lignes CF et FG sont ce  
 “ que nous avons nommé  $\alpha$  et  $\gamma$ , et que la différence  
 “ FG—Kl est ce que nous avons nommé  $\delta$ .”

He then proceeds to investigate the value of  $\frac{\delta\alpha}{4\gamma^2}$ , and  
 deduces the same conclusion as Newton.

Now

Now it does not immediately appear, that the result from this solution should be the same as the erroneous result of Newton; but a little consideration will make it apparent.  $fg$  is made to disappear in both solutions, by the substitution of  $FG$ , and therefore a common error might be expected in each solution. This is proved as follows: let  $\gamma'$  represent the subtense of the arc  $\alpha + \rho$ . Then  $FG - kl$  or  $\delta$  will be  $\gamma - \gamma' \left(\frac{\alpha - \rho}{\alpha + \rho}\right)^2$  or  $\frac{\alpha^2(\gamma - \gamma') + 2\alpha\rho(\gamma + \gamma') + (\gamma - \gamma')\rho^2}{(\alpha + \rho)^2}$ . This latter quantity, therefore, cannot become ultimately  $\frac{4\alpha\rho}{(\alpha + \rho)^2}$ , unless  $\alpha(\gamma - \gamma')$  vanishes in respect to  $4\gamma\rho$ . Now it may be readily shewn, in a manner similar to that in which the limiting ratio of  $\sqrt{fg} - \sqrt{kl} : \sqrt{FG} - \sqrt{kl}$  was obtained, that ultimately  $\alpha(\gamma - \gamma') = \frac{2}{3}\gamma\rho$ . It is easy to see that  $\rho^2(\gamma - \gamma')$  vanishes in respect to  $\alpha^2(\gamma - \gamma')$ . But that  $\alpha(\gamma - \gamma')$  vanishes in respect  $4\gamma\rho$  is only an assumption.

The other solution of Lagrange, in which the same conclusion is deduced, is the following.

“ La solution de Newton peut être rendue plus simple et plus directe de la manière suivante. En nommant  $u$  la vitesse dans un point quelconque de la courbe,  $u\theta$  est l’espace que le corps parcourait sur la tangente dans le temps  $\theta$ , en faisant abstraction de la gravité et de la résistance. Nommant  $g$  la force absolue de la gravité, et  $r$  celle de la résistance,  $\frac{g\theta^2}{2}$  et  $\frac{r\theta^2}{2}$  seront les espaces parcourus, en vertu de ces forces, dans le même temps  $\theta$ ; ainsi le corps aura parcouru, suivant la tangente, la ligne  $u\theta - \frac{r\theta^2}{2}$ , et suivant l’ordonnée  $y$ , la ligne  $\frac{g\theta^2}{2}$ , dans une direction contraire à celle suivant laquelle cette coordonnée

“ donnée croît. Soit  $A$  l'angle de la tangente avec l'axe des  
 “  $x$ , il en résultera, suivant la direction de l'axe des  $x$ ,  
 “ l'espace  $(u\theta - \frac{r\theta^2}{2}) \cos A$ , et suivant la direction de l'axe  
 “ des  $y$ , l'espace  $(u\theta - \frac{r\theta^2}{2}) \sin A - \frac{g\theta^2}{2}$ . Or,  $y$  étant fonction  
 “ de  $x$ , supposons, avec Newton, que  $x$  devenant  $x+o$ ,  
 “  $y$  devienne  $y+Qo - Ro^2 - So^3 - \&c.$ ; il faudra donc, qu'en  
 “ faisant  $o = (u\theta - \frac{r\theta^2}{2}) \cos A$ , on ait  $Qo - Ro^2 - So^3, \&c. =$   
 “  $(u\theta - \frac{r\theta^2}{2}) \sin A - \frac{g\theta^2}{2}$ , quelle que soit la valeur de  $\theta$ ,  
 “ qu'on suppose très petite.

“ Substituons, dans la seconde équation, la valeur de  
 “  $o$  donnée par la première, et ordonnant les termes par  
 “ rapport aux puissances de  $\theta$ , on aura  $\theta Qu \cos A -$   
 “  $(\frac{Qr}{2} \cos A + Ru^2 \cos A^2) \theta^2 - (Rur \cos A^2 + Su^3 \cos A^3) \theta^3 + \&c. =$   
 “  $\theta u \sin A - (\frac{r \sin A}{2} + \frac{g}{2}) \theta^2$ . Comparant terme à terme, on a  
 “  $Qu \cos A = u \sin A$ ,  $Qr \cos A + 2Ru^2 \cos A^2 = r \sin A + g$ ,  
 “  $Rur \cos A^2 + Su^3 \cos A^3 = 0$ , &c. La première équation  
 “ donne  $\text{tang. } A = Q$ ; substituons cette valeur dans le  
 “ seconde, on a  $2Ru^2 \cos A^2 = g$ , d'où l'on tire  $u^2 = \frac{g}{2R \cos A^2} =$   
 “  $\frac{g(1+Q^2)}{2R}$ ; le troisième donne  $r = \frac{Su^2 \cos A}{R}$ , substituons pour  
 “  $u^2$  et pour  $\cos A$  leurs valeurs, on aura  $r = \frac{gS\sqrt{1+Q^2}}{2R^2}$ , et de-là  
 “  $\frac{r}{g} = \frac{S\sqrt{1+Q^2}}{2R^2}$ , rapport de la résistance a la gravité, comme  
 “ Newton l'avait trouvé. En effet, il est facile de voir que  
 “ cette analyse n'est, au fond, que celle de Newton débar-  
 “ rassée de la considération des deux mouvemens en sens  
 “ contraire, et réduite à la forme la plus simple; mais elle a,  
 “ de plus, l'avantage de faire connaître facilement la source  
 “ de l'erreur, et de donner le moyen d'y remédier.

“ Car, pour peu qu'on examine le calcul que nous venons  
 “ de



“ de faire, en doit voir que, puisque les valeurs de  $o$  et de  
 “  $Qo - Ro^2 - So^3 - \&c.$  sont exprimées en séries qui pro-  
 “ cèdent suivant les puissances de  $\theta$ , il n'est pas permis de  
 “ pousser l'approximation au-delà de cette même puissance  
 “ dans l'équation résultant de l'élimination de  $o$ : d'où il suit  
 “ que le terme que contient  $\theta^3$  dans cette équation, dont  
 “ nécessairement être incomplet; et puisque c'est de ce  
 “ même terme que dépend le rapport cherché de  $\frac{r}{s}$ , on en  
 “ doit conclure que le valeur trouvée de ce rapport est  
 “ inexacte.”

Notwithstanding the remarks of the ingenious author, it is not very clear, that the error of the result in this solution must necessarily be the same as in that of Newton, if the error of the Newtonian solution have been rightly pointed out. These solutions have nothing in common; and, therefore, as they give the same result, the error in each must flow from a common source. In this solution of Lagrange, he computes the increments of the ordinate and abscissa in the time  $\theta$ , by supposing the resistance to act, during that time, in the direction of the tangent; and thus the deviation from the tangent in the time  $\theta$  is expressed by  $\frac{g\theta^2}{2}$ , depending only on the time and force of gravity. In the Newtonian solution,  $fg$  and  $FG$ , the deviations from the tangent in equal times, are taken accurately equal, and therefore made to depend on the force of gravity only. Hence, a common source of error; and these solutions, so entirely different in their progress, might be expected to produce the same result.

M. Lagrange concludes his observations on this problem,

by shewing how his solution, given above, may be made to produce a true result. He obtains the coefficients of  $\theta^3$  in the increments of the abscissa and ordinate, from those of  $o$ , and  $\theta^2$ , by an exceedingly ingenious process; having so deduced  $o$ , and  $Qo - Ro^2 - So^3$ , &c. complete as far as  $\theta^3$ , he exterminates  $o$  as before, and by a comparison of the coefficients (now correct) of  $\theta^3$  he obtains the relation of gravity and resistance.

The ingenuity exhibited in the corrected solution is very great, but it must be confessed that the solution is rather prolix. The author concludes his corrected solution with these words, which may serve as an excuse for adding that which concludes this paper.

“ Comme Newton n’est parvenu à ce dernier résultat, qu’en  
 “ suivant une marche analogue à celle du calcul différentiel,  
 “ nous avons cru qu’il n’était pas inutile de faire voir  
 “ comment la méthode des séries pouvait y conduire, et  
 “ qu’on nous saurait gré d’éclaircir, en même temps un  
 “ point d’analyse sur lequel les plus grand géomètres  
 “ s’étoient trompés, et qui peut intéresser l’histoire de la  
 “ naissance des nouveaux calculs.

THEOREM.

THEOREM.\* If  $BD=o$ , and  $IG=Qo+Ro^2+So^3+\&c.$  Then  
Resistance ( $r$ ) : Gravity ( $g$ ) ::  $3S\sqrt{1+Q^2} : 4R^2.$

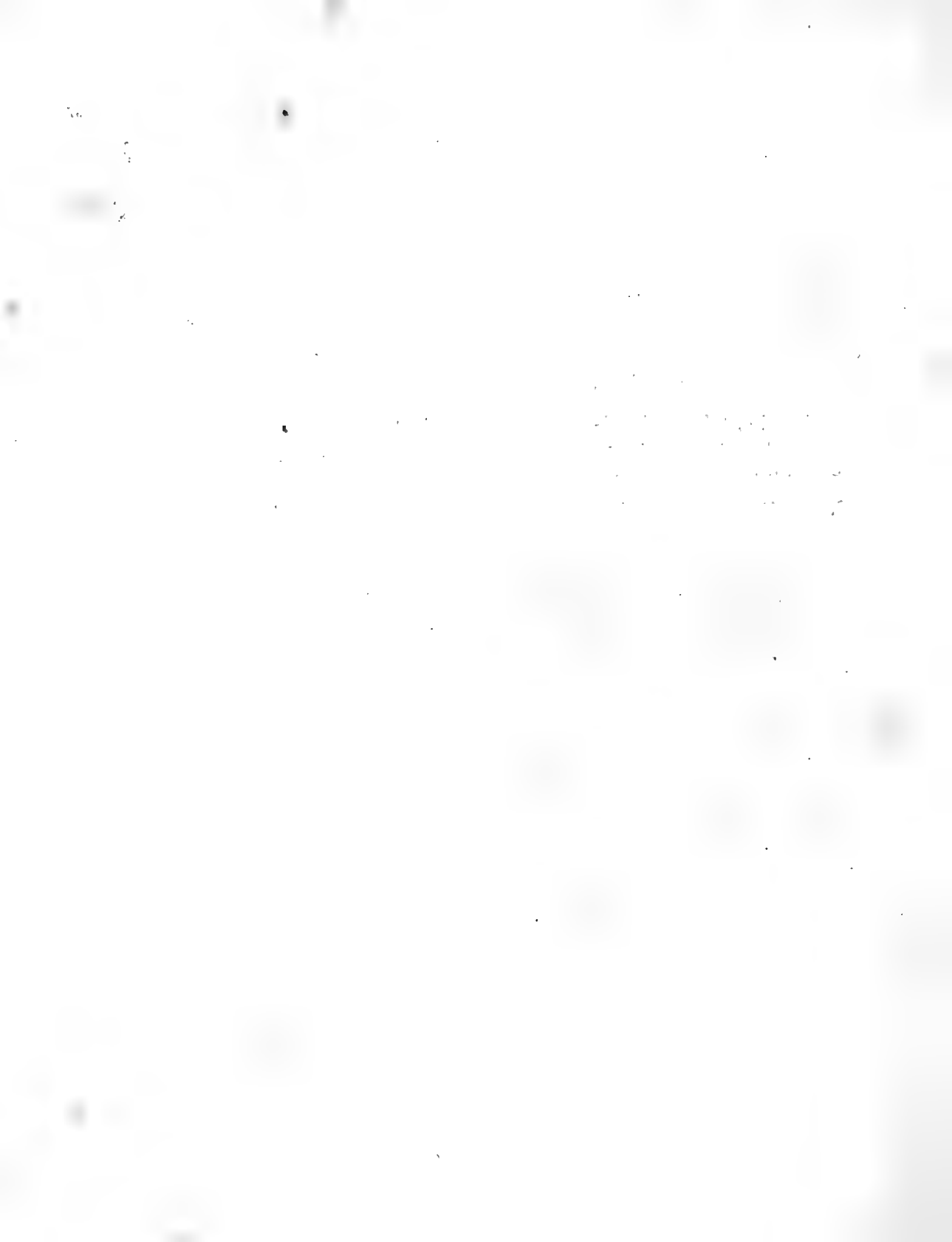
*Dem.* Let  $t$ =time of describing  $CG$ , then the velocity at  $C$  in direction  $CI$ =limit of  $\frac{CI}{t}$ =limit of  $\frac{CI}{\sqrt{FG}} \times \sqrt{\frac{1}{2}g}$ . But Resist. in direction  $CI$  =  $\lim. \frac{\text{dec. vel.}}{t} = \lim. \frac{\text{dec. lim.} \frac{CI}{\sqrt{FG}} \times \frac{1}{2}g}{\sqrt{FG}}$ . Now  $FG=IG-FI=Ro^2+So^3+\&c.$  Therefore limit  $\frac{CI}{\sqrt{FG}} = \frac{1}{\sqrt{R}}$  and dec.  $\frac{1}{\sqrt{R}} = \dagger \frac{3So}{2R^{\frac{3}{2}}}$  &c. therefore  $\lim. \frac{\text{dec.} \frac{1}{\sqrt{R}}}{\sqrt{FG}} = \frac{3S}{2R^2}$ . Hence resist. in direct.  $CI = \frac{3Sg}{4R^2}$  and consequently whole resistance =  $\frac{3Sg}{4R^2} \times \lim. \frac{CF}{CI} = \frac{3Sg}{4R^2} \sqrt{1+Q^2}$  and  $r : g :: 3S\sqrt{1+Q^2} : 4R^2.$   
Q. E. D.

\* Vid. Fig.

† When  $CI$  or  $o$  becomes  $o+\acute{o}$ ,  $IG$  becomes  $Q(o+\acute{o})+R(o+\acute{o})^2+S(o+\acute{o})^3+\&c. =$

}	$(Q+2R\acute{o}+3S\acute{o}^2)o$	Hence when $AB$ is increased by $o$ ,
	$+(R+3S\acute{o}+6T\acute{o}^2)o^2$	Incr. of $Q=2Ro+3So^2+\&c.$
	&c. &c.	Incr. of $R=3So+6To^2+\&c.$
		&c. &c.

Therefore dec.  $\frac{1}{\sqrt{R}} = \frac{1}{\sqrt{R}} - \frac{1}{\sqrt{R+3So+\&c.}} = \frac{1}{\sqrt{R}} \times \frac{3So}{2R} \&c.$



A DESCRIPTION  
OF A  
NEW ANEMOMETER,

By RICHARD KIRWAN, Esq. L. L. D. P. R. I. A. F. R. S. &c. &c.



THAT rain, on whose presence or absence at the different seasons of the year, vegetation, and the success of agriculture, in great measure depend, and also the temperature of the atmosphere, to whose influence both animals and vegetables are subject, arise from, or at least are strictly connected with the various directions and velocities of winds, is well known. Nor has it escaped observation, that the primary cause of the direction of the wind from a given quarter, as well as of the velocity of its progress, is the rarefaction of the atmosphere in that tract towards which it blows. The reason why air does not rush in from all sides towards the rarefied tracts, seems to me to be the inequality of its density in the surrounding tracts; for from that quarter, in which the mercury in the barometer stands highest, the air  
must

must preferably proceed. If the density be equal on all sides, as in some confined tracts, a hurricane happens: hence the advantage of ascertaining and comparing the degrees of its velocity; for those being known, its cause and degrees of rarefaction may with great probability be inferred. Two causes of rarefaction are already known, solar heat, and some internal chemical action, by which a quantity of air is converted into water, and sometimes even into a stony substance; this last being the most sudden and complete, the rarefaction of the neighbouring air arising from it, is by far the most violent, but commonly of a much shorter duration and extent. An accurate measure of the velocity of wind has long been sought by meteorologists: several have been devised on the Continent, but only two, that I know of, in England. That, which I now lay before the Academy, seems to me to be the simplest and best adapted to the purpose. The force of wind, to which the degrees of its velocity are proportional, is measured by that of gravity indicated in pounds and parts of a pound averdupois; the calculation is grounded on the observations of Mr. Smeaton, in the Philosophical Transactions, Vol. LI. p. 165.

2. Mr. Smeaton indeed observes, that the evidence of the velocity is not so great where this exceeds 50 miles, as when 50 or under; yet, from its agreement with other observations, I am inclined to think it fully sufficient.

3. A velocity of 123 feet per second was observed at Petersburgh, an. 1741, 3 Much. 468, that is at the rate of 83,8 miles per hour.

4. According

4. According to Lalande, in his Treatise on Navigation, 42 Roz. Jour. 221. the course of the trade winds is between 6 and 7 miles an hour.

5. Mr. Brice, Philosophical Transactions, 1756, p. 226, observed a storm, whose velocity was 63 miles per hour.

6. A fair wind at sea, is that whose velocity amounts to 20 feet per second, or 13,63 miles per hour. Ibid.

7. Bouguer found the velocity of winter storms to be about 34 miles per hour, and in summer nearly 43. Ibid.

The distance from Holyhead to the Pigeon-house is 70 miles; then supposing the wind to be direct, and its velocity 30 miles per hour, and if we suppose the packet-boat to assume 0,4 of the velocity of the wind, it will arrive at the Pigeon-house in 5,8 hours.

Let  $W$  denote the velocity of wind in the open air, or meeting no opposition;

$D$  = the distance of the place towards which the wind tends;

$N$  the number of hours it requires to traverse that distance;

Then any two of these being known, the other may be found by the following formulas.

Given.	Sought.		}	Thus if $W=30, D=70$
$W. D.$	$N.$	$N = \frac{D}{W}$		then $N = \frac{70}{30} = 2,33$
$W. N.$	$D.$	$D = W N$		$D = 30 \times 2,33 = 70$
$D. N.$	$W.$	$W = \frac{D}{N}$		$W = \frac{70}{2,33} = 30.$

A well sailing ship assumes  $\frac{1}{3}$  of the velocity of the wind.

The best sailing ship 0,4 of the wind's velocity.

*The*

*The above formulas applied to the calculation of a ship's way.*

Given.	Sought.	
0,4 W. D.	N.	$N = \frac{D}{0,4 W}$
0,4 W. N.	D.	$D = 0,4 W N.$
D. N.	0,4 W.	$0,4 W = \frac{D}{N}$

Thus the wind 30, and the distance 70 miles, then the number of hours requisite to traverse that distance will be 5,8 for  $30 \times 0,4 = 12,0$  and  $12)70 = 5,8$  hours.

Again 0,4 W. being 12, and the hours, 5,8, being given, the distance 70 miles, we have  $5,8 \times 12 = 69,6$ . by the second formula.

And, lastly, the number of hours = 5,8, and space in miles = 70 being given, we have 0,4 of the velocity of the wind =  $\frac{70}{5,8} = 12$ ; and dividing this by 0,4, we have the rate per hour of its course in the lower atmosphere.

### EXPLANATION OF THE DRAWING.

Fig. 1. The anemometer, with a vane or weather cock placed on the top, to shew the direction of the lighter winds, which could not be known by the anemometer, on account of the weight of the necessary appendages annexed to it. This is raised of a sufficient height



height above the building, supported by a vertical axis or pole; the lower end of it passes through the roof and ceiling into an apartment below.

Fig. 2. The lower part of the pole or vertical axis *AA*. Fig. 1. more enlarged, to give a better view of the necessary appendages. This pole is made of a slender spar, such as are made use of for strong setting poles for lighters, and handles for boat-hooks, as not being affected by lightning, which iron too often is, and the cause of the destruction of buildings and many lives. To this pole is fastened a frame of light wood by screws, in which the weights are confined, one on the top of another, in grooves, in such a manner as to work up and down with the greatest facility. The weights are connected together by cords, and marked 1. 2. 3. 4. &c.; the space between each, when drawn up by the force of the wind, is about one inch, as may be seen by the drawing, and each weighs one pound averdupois. To the top weight is fastened a line, and passing along the pole to the top, and over a brass pully fixed at the bottom of the square tube, under the sliding rod *B*. Fig. 3. as far as (*a*), and there fastened: in this sliding rod a groove or channel is cut underneath, to receive the line, so as not to impede its passage over the brass rollers *ff*. The line is composed of a number of common sewing threads, laid in different directions, well waxed, and inclosed in a cotton case, to prevent

as much as possible its extension or contraction by the changes of the atmosphere.

- Fig. 3. The wooden pipe or tube two inches square, fastened on the top of the pole *AA*. Fig. 1. open on the side, to shew the manner that the sliding rod *B* passes over the brass rollers *fff*, when the wind is sufficiently strong to lift up one pound by its force on the square surface presented to it, as (*b*) and (*c*), Fig. 4.
4. The wooden pipe or tube, in which are inclosed the sliding rod, rollers, and line, from the effects of the weather.
  5. The wooden frame, made of light wood, one foot square, covered over with very thin sheet brass, strongly painted, and varnished with copal. This frame is fastened to the sliding rod *B*. Fig. 3. by means of a mortice, &c.
  6. An enlarged view of the scale and index, which marks the greatest force of the wind during the absence of the observer, which is attached to the frame confining the weights, as *GH*. Fig. 2.; and being connected with the hand fastened on the top weight (*d*. Fig. 2.) raises the small weight (*e*); and this being counterpoised by another of equal weight, by means of a line passing over a small pully, as represented by this Fig. and also *G*. Fig. 2. occasions the small weight, with its index, to stop at the number of pounds raised by the force of the wind, though they should fall

fall down into their proper places on the wind's abating.

The bottom of the vertical axis or pole *r*. Fig. 2. is sheathed with a steel point, and a socket, which rest on a wooden stand or frame, as at *d*. Fig. 1. so as to turn with ease, and avoid as much as possible any friction.

I have also to remark, that in order to render this simple machine more complete, and answer the purpose of an Anemoscope, as well as an Anemometer, it is only necessary to apply to that part of the pole or axis, which is in the apartment, an index, and attach to the ceiling a thin deal board, or a sheet of pasteboard, with the points of the compass marked thereon.

*A Table shewing the Velocity of the Wind in Miles per Hour, indicated by Avoirdupois Pounds and Parts.*

Miles per hour.	Pounds and Parts.	DENOMINATIONS.	Miles per hour.	Pounds and Parts.	DENOMINATIONS.	Miles per hour.	Pounds and Parts.	DENOMINATIONS.
10	0,492	Pleasant wind.	32	5,067	Storm.	53	13,923	
11	0,615		33	5,386		54	14,464	
12	0,738		34	5,703	Great storm.	55	15,007	
13	0,861		35	6,025		56	15,548	
14	0,984		36	6,394		57	16,089	
15	1,107	Brisk gale.	37	6,763	Very great storm.	58	16,630	
16	1,279		38	7,132		59	17,171	
17	1,451		39	7,501	Violent tempest.	60	17,715	
18	1,623		40	7,873		61	18,403	
19	1,795		41	8,291		62	19,091	
20	1,968	Very brisk gale.	42	8,709	Hurricane.	63	19,779	
21	2,169		43	9,127		64	20,467	
22	2,370		44	9,545	65	21,158		
23	2,571		45	9,963	66	21,846		
24	2,772		46	10,430	67	22,534		
25	2,975	High wind.	47	10,897	68	23,222		
26	3,265		48	11,364	69	23,910		
27	3,555		49	11,831	70	24,602		
28	3,845	Very high wind.	50	12,300				
29	4,135		51	12,841				
30	4,429		52	13,382				
31	4,748							

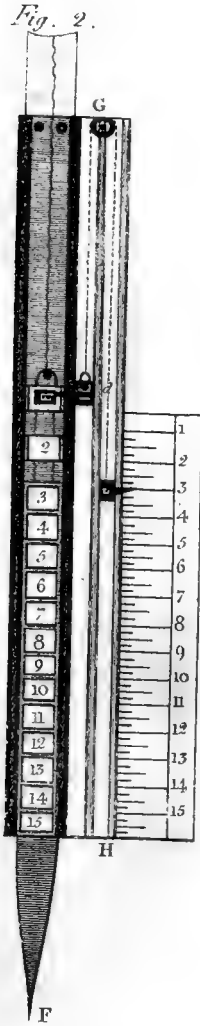
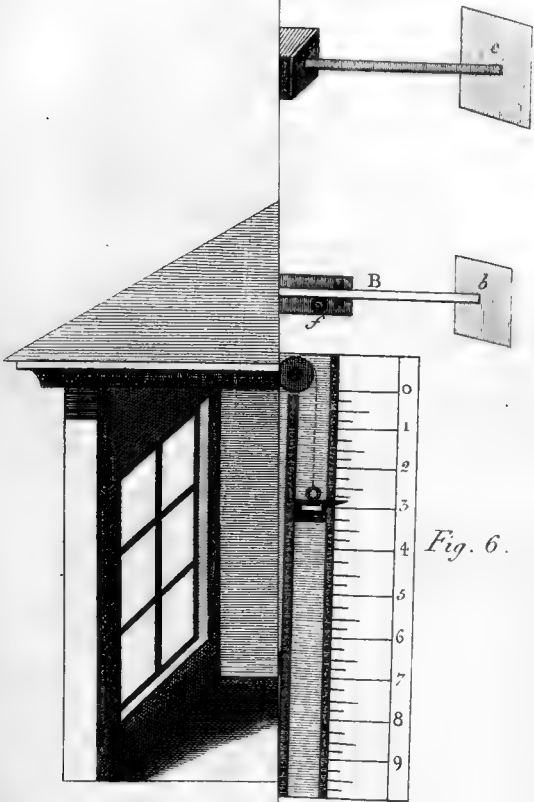


Fig 1

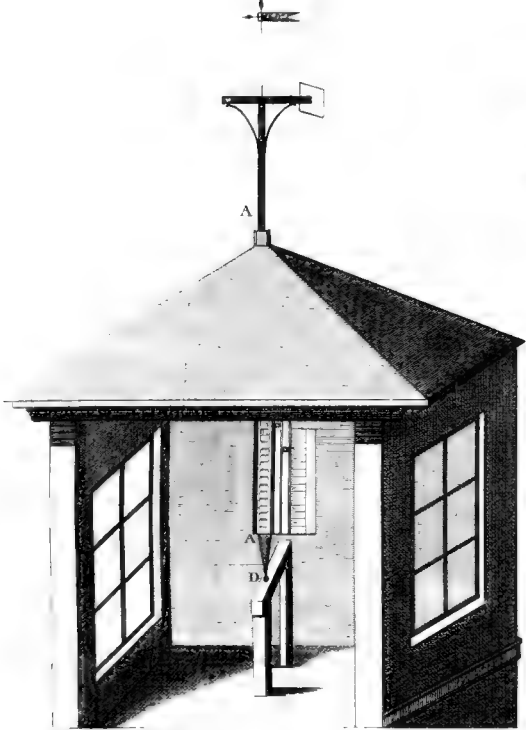


Fig 4

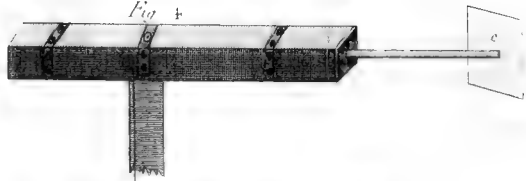


Fig 3

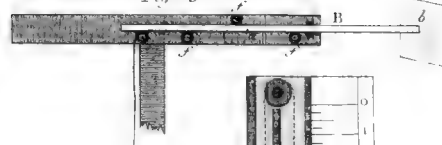


Fig 5



Fig 6

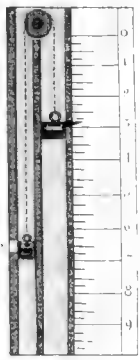
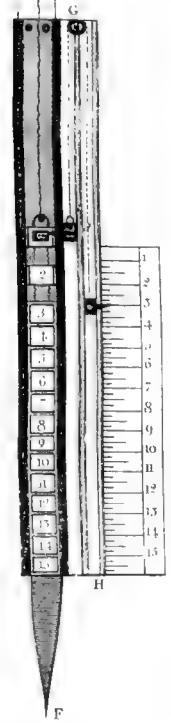


Fig 2



# ER AT DUBLIN,

. &c. &c.

1805.	RAIN.		FORCE OF THE WIND AS INDICATED BY THE ANEMOMETER.							DIRECTION OF THE WIND.	
	HIGHEST	INCHES OF WATER ON A SQUARE FOOT.	Brisk gale, 1 to 2 lbs.	Very brisk, 2 to 3 lbs.	High wind, 3 to 4 lbs.	Very high, 4 to 5 lbs.	Storm, 5 to 6 lbs.	Great storm, 6 to 7 lbs.	Tempest, 7 to 8 lbs.		Violent tempest 8 to 9 lbs.
January . . .	30,44	3,38923		7	2	1	1				Var. SE. to W. S.E. NW.
February . .	30,50	0,86704		2		3					SW. W. SE.
March . . . .	30,45	0,74878		1	1	1					S. SW. W.
April . . . .	30,53	0,98524	1	1	2						NE. E.
May . . . . .	30,63	1,73402			1	1					W.
June . . . . .	30,70	0,82760		1	1						W. by N. to W.
July . . . . .	30,60	0,21684	1	5							SW. W.
August . . .	30,63	0,44340			2						S. W.
September .	30,94	0,73402	1	4		1					W. by S. E. by S. SW. N. to W
October . . .	30,70	0,91632		5	1	2	1				E. to NE.
November .	31,00	0,47291		1							W.
December .	30,65	0,60104		3	2	4	1	2	1		SW. NE. W. W. by N.
MEAN OF THE YEAR. }	30,65	0,93641	3	30	12	13	3	2	1		

## A SYNOPTICAL VIEW OF THE STATE OF THE WEATHER AT DUBLIN,

IN THE YEAR 1805.

BY RICHARD KIRWAN, ESQ, L. L. D. F. R. S. P. R. I. A. &amp;c. &amp;c.

1805.	BAROMETER.				THERMOMETER.			SNOW AND RAIN.			FORCE OF THE WIND AS INDICATED BY THE ANEMOMETER.						DIRECTION OF THE WIND.					
	HIGHEST.	DAY OF THE MONTH.	LOWEST.	DAY OF THE MONTH.	MEAN OF THE MONTH.	GREATEST H. LAT. IN THE MONTH.	GREATEST COLD AT NIGHT IN THE MONTH.	MEAN BETWEEN HEAT & COLD OF THE MONTH.	Days of Thunder and Lightning.	Days of Snow and Ice.	No. of Days of Rain.	INCHES OF WATER ON A SQUARE FOOT.	Drags, gales, 1 to 2 lbs.	Very fresh, 2 to 3 lbs.	High wind, 3 to 4 lbs.	Very high, 4 to 5 lbs.		Storm, 5 to 6 lbs.	Great storm, 6 to 7 lbs.	Tempest, 7 to 8 lbs.	Very high tempest, 8 to 9 lbs.	
January . . .	30.44	9th, var. S. to W. . . . .	23.55	13th, var. S. to W. . . . .	29.731	31,	23,	37.86		6	14	3,38923		7	2	1	1					Var. SE. to W. S.E. NW.
February . . .	30.50	13th, NE. . . . .	29.30	3th, N. . . . .	29.95	53.5	25.5	40.32		12	16	0,86704		2		3						SW. W. SE.
March . . . .	30.15	19th, SE. to E. . . . .	29.71	10th, E. to SE. . . . .	30.09	59,	32,	46.21		2	16	0,74878		1	1	1						S. SW. W.
April . . . . .	30.79	9th, W. to SW. . . . .	29.66	14th, E. . . . .	30.09	63,	34,	49.20		2	15	0,98524		1	1	2						NE. E.
May . . . . .	30.63	31st, E. . . . .	29.47	11th, W. by N. . . . .	30.193	74,	30,	48.82		4	14	1,73102				1	1					W.
June . . . . .	30.70	23, E. . . . .	29.60	10th, SE. to S. . . . .	30.272	71.5	42,	55.50		1	15	0,82760			1	1						W. by N. to W.
July . . . . .	30.50	12th, SW. . . . .	29.54	23rd, W. by N. . . . .	30.164	73.5	48,	61.45	2	1	18	4,21684	1	5								SW. W.
August . . . .	30.63	23d, W. by N. . . . .	29.80	1st & 2d, var. SW. and N. . . . .	30.16	75,	19,	62.29			26	2,41310				2						S W.
September . .	30.94	24th, E. . . . .	29.32	6th, var. E. to E. by S. . . . .	30.216	72,	42,	59.36			14	1,73102	1	4		1						W. by S. E. by S. SW. N. to W.
October . . . .	30.70	1st, NE. . . . .	29.52	25th, SE. to S. . . . .	30.123	64,	53,	49.79		1	18	2,91632		5	1	2	1					E. to NE.
November . . .	31.00	15th, W. . . . .	24.28	30th, W. by N. . . . .	30.13	59,	30,	43.24			9	0,47291		1								W.
December . . .	30.65	17th, W. . . . .	23.90	22d, N. by W. . . . .	29.93	57,	23,	39.60		7	24	2,69164		3	2	4	1	2	1			SW. NE. W. W. by N.
MEAN THROUGHOUT THE YEAR.	30.5		24.28		30.112	64.27	34.7	Mean of the year, 4 <sup>o</sup> 35'	2	26	190	22,93641	3	30	12	13	3	2	1			



WETHER AT DUBLIN,

I. A. &c. &c.

1806.	INCHES OF WATER ON A SQUARE FOOT.	FORCE OF THE WIND AS INDICATED BY THE ANEMOMETER.								DIRECTION OF THE WIND.
		Brisk gale, 1 to 2 lbs.	Very brisk, 2 to 3 lbs.	High wind, 3 to 4 lbs.	Very high, 4 to 5 lbs.	Storm, 5 to 6 lbs.	Great storm, 6 to 7 lbs.	Tempest, 7 to 8 lbs.	Violent tempest 8 to 9 lbs.	
January . . .	2,128126		1	2	4	3	1	3		W. SW. NE.
February . .	1,497570		3	1	1	3	3			NW. to N. E. SE. S.
March . . . .	1,536979		1	2	2	1	1			N. NE. NW.
April . . . .	1,021653		1	1	2					SE. E. W.
May . . . . .	2,758683		4		2	1				E. NE. S.
June . . . . .	0,630556	1	3			1				S. W. SE. NE.
July . . . . .	2,009394	1	3		1					W. by N. S. W. and NE.
August . . .	1,142882		1	4			1			NW. SW. to S.
September .	1,812848		1	3						W. by S. SW.
October . . .	1,497570	1	2	2	1		1			E. S. to N. and S. to W.
November .	3,468058		5	2	1	1		1	1	SW. to S. NW. to N.
December .	2,995141	1	1		3	2	3			NW. SW. to S. and W.
MEAN OF THE YEAR.)	22,502159	4	26	17	17	12	10	4	1	

A SYNOPTICAL VIEW OF THE STATE OF THE WEATHER AT DUBLIN,  
IN THE YEAR 1806.

BY RICHARD KIRWAN, ESQ, L. L. D. F. R. S. P. R. I. A. &c. &c.

1806.	BAROMETER.				THERMOMETER.			SNOW AND RAIN.				FORCE OF THE WIND AS INDICATED BY THE ANEMOMETER.								DIRECTION OF THE WIND.	
	DATE.	DAY OF THE MONTH.	LOWEST.	DAY OF THE MONTH.	MEAN OF THE MONTH.	GREATEST HEAT IN THE MONTH.	GREATEST COLD AT NIGHT IN THE MONTH.	MEAN BETWEEN HEAT & COLD OF THE MONTH.	Days of Thunder and Lightning.	Days of Snow and Ice.	No. of Days (Jan.)	INCHES OF WATER ON A SQUARE FOOT.	Blasts, gale 1 to 2 lbs.	Very brisk, 2 to 3 lbs.	High wind, 3 to 4 lbs.	Very high, 4 to 5 lbs.	Storm, 5 to 6 lbs.	Great storm, 6 to 7 lbs.	Tempest, 7 to 8 lbs.		Violent tempest, 8 to 9 lbs.
January . . .	30,22	2d, var. NW. to N. . . . .	28,92	16th, W. by N. . . . .	29,716	54,	21,50	39,553		9	20	2,128126		1	2	4	3	1	3		W. SW. NE.
February . . .	30,00	28th, var. W. by N. to W. . . . .	29,23	14th, SW. . . . .	29,931	58,	16,	40,41		4	20	1,497370		3	1	1	3	3			NW. to N. E. SE. S.
March . . . .	30,72	5th, 6th, and 7th, NW. to N. . . . .	29,33	14th, var. NE. to N. . . . .	29,90	55,50	24,50	41,70		5	12	1,526979		1	2	2	1	1			N. NE. NW.
April . . . . .	30,70	23d, & 26th, var. NW. to NE. . . . .	29,83	16th var. E. NE. and SE. . . . .	30,303	63,	28,	46,333		3	12	1,024633		1	1	2					SE. E. W.
May . . . . .	30,68	20th, E. by N. . . . .	29,50	14th, NE. . . . .	30,170	70,	39,	52,95			11	2,758683		4		2	1				E. NE. S.
June . . . . .	30,58	1st, E. . . . .	29,70	4th, W. . . . .	30,342	73,	42,	57,89			11	0,630556	1	3			1				S. W. SE. NE.
July . . . . .	30,50	2d, W. by S. . . . .	29,80	28th, E. to NE. . . . .	30,048	76,	48,	60,195	3	2	24	2,009394	1	3		1					W. by N. S. W. and NE.
August . . . .	30,37	4th, W. . . . .	29,42	26th, S. to W. . . . .	30,033	75,	49,	60,01	2		24	1,142882		1	4			1			NW. SW. to S.
September . . .	30,00	16th, W. by S. . . . .	29,80	1th, N. to W. . . . .	30,22	67,50	42,	56,085			13	1,812848		1	3						W. by S. SW.
October . . . .	30,07	7th, var. W. to SW. . . . .	29,04	22d, var. E. to N. . . . .	30,07	64,	31,50	52,633			16	1,497570	1	2	2	1		1			E. S. to N. and S. to W.
November . . .	30,07	1th, W. . . . .	28,88	2d, var. S. to SW. . . . .	29,87	59,	35,	47,135		1	20	3,468038		5	2	1	1		1	1	SW. to S. NW. to N.
December . . .	30,00	2th, W. . . . .	28,84	2d, var. N. NW. to W. . . . .	29,67	53,	34,	43,86		1	20	2,995141	1	1		3	2	3			NW. SW. to S. and W.
MEAN OF THE YEAR			29,357		30,023	64,1	34,12	Mean of the year, 49,16	5	25	208	22,502459	4	20	17	17	12	10	4	1	

# ER AT DUBLIN,

A. &c. &c.

1807.	HIGHEST	NUMBER OF INCHES ON A SQUARE FOOT.	FORCE OF THE WIND AS INDICATED BY THE ANEMOMETER.								DIRECTION OF THE WIND.
			Brisk gale 1 to 2 lbs.	Very brisk gale 2 to 3 lbs.	High wind 3 to 4 lbs.	Very high wind 4 to 5 lbs.	Storm 5 to 6 lbs.	Great storm 6 to 7 lbs.	Tempest 7 to 8 lbs.	Violent tempest 8 to 9 lbs.	
January . . .	31,0	1,73402		3							W. by S. NW.
February . .	30,9	1,37934		6	2			1			W.
March . . . .	30,9	0,31527		1			1				W. NW.
April . . . . .	30,5	0,47291		2	4	2					S. to W. N. to E. W. S.
May . . . . .	30,6	2,99514		5	1	1	1				E. NE. W.
June . . . . .	30,7	1,33993		2	5						E. SE. SW. W. W. by N.
July . . . . .	30,5	1,89116		3	4						S. to W. N. to E. NW.
August . . .	30,4	4,09861		4	4						S. W. N. W. by N.
September .	30,5	5,0444	2	4	2	2					N. NW. S. SW.
October . . .	30,4	3,46805	4	6	5	2					W. NW. S. SW. S. by E.
November . .	30,4	1,73402	4	1	1	3	2				W. NW. E. N. SW.
December .	30,6	2,00939		4	2	1	1	1			SW. S. NW. SE.
MEAN OF } THE YEAR }	30,6	26,48227	10	41	30	12	5	1			

# A SYNOPTICAL VIEW OF THE STATE OF THE WEATHER AT DUBLIN,

IN THE YEAR 1807,

BY RICHARD KIRWAN, ESQ. L. L. D. F. R. S. P. R. I. A. &c. &c.

1807.	BAROMETER.					THERMOMETER.			SNOW AND RAIN.				FORCE OF THE WIND AS INDICATED BY THE ANEMOMETER.							DIRECTION OF WIND.		
	HIGHEST	DAY OF THE MONTH	LOWEST	DAY OF THE MONTH	MEAN OF THE MONTH	GREATEST HEAT OF THE MONTH.	GREATEST COLD AT NIGHT IN THE MONTH.	MEAN BETWEEN HEAT & COLD IN THE MONTH.	Days of Thunder and Lightning.	Days of Snow and Hail.	Days of Frost.	NUMBER OF INCHES ON A SQUARE FOOT.	High gale 1 to 2 lbs.	Very brisk gale 2 to 3 lbs.	High wind 3 to 4 lbs.	Very high wind 4 to 5 lbs.	Storm 5 to 6 lbs.	Great storm 6 to 7 lbs.	Frequent 7 to 8 lbs.		Violent tempest 8 to 9 lbs.	
January . . .	31,00	23th, SW. to W. . . . .	29,08	21st, W. by N. . . . .	30,272	49,	31,	39,96		3	11	1,73402		3								W. by S. NW.
February . . .	30,92	28th, N. to NE. . . . .	29,23	3d, W. . . . .	29,966	57,	25,	40,60		3	13	1,37934		6	2		1					W.
March . . . .	30,95	1st, var. W. to N. NW. . .	29,30	13th, W. to NW. . . . .	30,292	52,	22,50	37,587		11	8	0,31527		1		1						W. NW.
April . . . . .	30,52	9th, W. to S. . . . .	29,25	11th, S. to SW. . . . .	30,126	68,	25,	46,72		3	13	0,47291		2	4	2						S. to W. N. to E. W. S.
May . . . . .	30,64	18th, 19th, E. E. by S. . . .	29,10	6th, E. . . . .	30,047	73,	39,	51,48	1	2	22	2,99514		5	1	1	1					E. NE. W.
June . . . . .	30,70	21st, W. . . . .	29,55	8th, var. S. to E. S. by W. .	30,26	69,	43,	56,585		2	16	1,33993		2	5							E. SE. SW. W. W. by N.
July . . . . .	30,55	8th, E. . . . .	29,70	30th, S. to W. . . . .	30,086	76,	45,	61,53		1	22	1,89116		3	4							S. to W. N. to E. NW.
August . . . .	30,45	17th, var. W. N. SW. E. . .	29,64	13th, var. S. by E. S. SW. .	30,06	76,50	46,	61,10	2	2	23	4,09861		4	4							S. W. N. W. by N.
September . .	30,54	1st, W. . . . .	29,45	25th, SW. . . . .	30,033	68,50	34,	50,045		1	22	5,0444		2	4	2	2					N. NW. S. SW.
October . . . .	30,44	19th, var. SE. S. W. . . .	29,25	21st, E. by N. S. . . . .	30,056	67,50	36,	52,78			22	3,46805		4	6	5	2					W. NW. S. SW. S. by E.
November . . .	30,45	13th, 14th, E. to N. . . . .	29,20	20th, N. to NW. . . . .	29,761	54,	19,	36,795	1	11	16	1,73402		1	1	1	3	2				W. NW. E. N. SW.
December . . .	30,62	21st, N. to W. . . . .	29,00	31st, W. by S. . . . .	30,084	53,	22,	38,89		4	15	2,00939		4	2	1	1	1				SW. S. NW. SE.
MEAN OF THE YEAR.	30,64		29,31		30,087	63,62	32,29	Mean of the year 47,92	4	43	208	26,48227	10	41	30	12	5	1				

# ER AT DUBLIN,

A. &c. &c.

1808.

HIGHEST

AND RAIN.

FORCE OF THE WIND AS INDICATED BY THE ANEMOMETER.

DIRECTION  
OF THE  
WIND.

NUMBER  
OF  
INCHES  
ON A  
SQUARE FOOT.

Brisk gale  
1 to 2 lbs.

Very brisk gale  
2 to 3 lbs.

High wind  
3 to 4 lbs.

Very high wind  
4 to 5 lbs.

Storm  
5 to 6 lbs.

Great storm  
6 to 7 lbs.

Tempest  
7 to 8 lbs.

Violent tempest  
8 to 9 lbs.

January . . . 30,74

0,807604

4

3

3

SW. W. NW.

February . . 31,04

1,418751

3

3

1

NW. W. & W. by S.

March . . . . 30,70

0,827604

1

E.

April . . . . . 30,65

1,488160

2

3

1

SW. W. & W. by S.

May . . . . . 30,43

1,734029

3

4

1

SE. S. W. NE.

June . . . . . 30,55

1,536979

6

1

W. NW. N.

July . . . . . 30,46

3,980384

1

NE. to E.

August . . . 30,55

1,49757

2

3

1

SE. S. SW.

September . 30,56

2,64045

1

S. to SW.

October . . . 30,66

2,53535

1

2

10

5

2

1

S. SW. W. NW. N.

November . . 30,55

2,206946

2

3

5

1

1

1

S. SW. E. N.

December . . 30,65

2,049307

1

2

3

1

S. SW. N. NE.

MEAN OF }  
THE YEAR }

30,62

22,72313

24

25

23

10

3

2

1

# A SYNOPTICAL VIEW OF THE STATE OF THE WEATHER AT DUBLIN,

IN THE YEAR 1808,

BY RICHARD KIRWAN, ESQ. L. L. D F. R. S. P. R. I. A. &c. &c.

1808.	BAROMETER.					THERMOMETER.			SNOW AND RAIN.				FORCE OF THE WIND AS INDICATED BY THE ANEMOMETER.							DIRECTION OF THE WIND.		
	HIGHEST.	DAY OF THE MONTH.	LOWEST.	DAY OF THE MONTH.	MEAN OF THE MONTH.	GREATEST HEAT OF THE MONTH.	GREATEST COLD AT NIGHT IN THE MONTH.	MEAN BETWEEN HEAT & COLD IN THE MONTH.	Days of Thunder and Lightning.	Days of Snow and Frost.	Days it Rained.	NUMBER OF INCHES ON A SQUARE FOOT.	Rock safe 1 to 2 lbs.	Very brisk gale 2 to 3 lbs.	High wind 3 to 4 lbs.	Very high wind 4 to 5 lbs.	Storm 5 to 6 lbs.	Great storm 6 to 7 lbs.	Tempest 7 to 8 lbs.		Violent tempest 8 to 9 lbs.	
January . . .	30,74	9th, 17th & 18th, W. to W by S.	29,05	2d, W. . . . .	30,02	55,	19,	39,075		4	19	0,807604	4	3	3							SW. W. NW.
February . .	31,04	23th, var. E. to SW. . . . .	29,58	2d, var. NW. to W. . . . .	30,37	53,	22,5	39,50		6	17	1,418751	3	3	1							NW. W. & W. by S.
March . . . .	30,70	2d, 5. 6. & 7. NE. E. to W. . . . .	29,56	20th, S. . . . .	30,47	55,	31,	39,65		4	8	0,827604	1									E.
Aprl. . . . .	30,65	9th, NW. to W. . . . .	29,12	5th, SW. to NW. . . . .	30,05	61,5	29,5	43,62		6	19	1,488160	2	3	1							SW. W. & W. by S.
May . . . . .	30,13	18th and 19th, E. to NE. . . . .	29,50	7th, W. to S. . . . .	30,06	70,	43,	55,03		1	21	1,734029	3	4		1						SE. S. W. NE.
June . . . . .	30,55	3th, E. . . . .	29,90	3d, E. to S. . . . .	30,24	71,5	42,	58,32			17	1,536979	6	1								W. NW. N.
July . . . . .	30,16	1st, E. . . . .	29,70	21st, SW. . . . .	30,18	73,	51,	62,39	1		18	3,980384		1								NE. to E.
August . . .	30,55	21st & 22d, E. to N. . . . .	29,70	14th, W. . . . .	30,10	77,	42,	62,38	2		22	1,49757	2	3	1							SE. S. SW.
September .	30,56	17th, E. . . . .	29,30	8th, SW. . . . .	30,00	69,	37,	55,02		1	16	2,64015		1								S. to SW.
October . .	30,66	31st, E. to SE. . . . .	29,00	25th, W. by S. . . . .	30,09	62,	32,	47,52		4	27	2,53333	1	2	10	5	2	1				S. SW. W. NW. N.
November	30,55	1st, E. . . . .	29,92	18th, W. . . . .	30,02	61,	35,	47,81		1	19	2,206916	2	3	5	1		1	1			S. SW. E. N.
December	30,65	15th, N. . . . .	29,20	2d, SW. . . . .	30,06	60,	22,	40,34		10	18	2,019307		1	2	3	1					S. SW. N. NE.
MEAN OF THE YEAR.	30,62		29,37		30,135	64,0	33,83	Mean of the year 49,22	3	37	221	22,72313	24	25	23	10	3	2	1			

INVESTIGATIONS RELATIVE TO THE PROBLEM FOR  
CLEARING THE APPARENT DISTANCE OF THE MOON  
FROM THE SUN, OR A STAR, FROM THE EFFECTS OF  
PARALLAX AND REFRACTION, AND AN EASY AND  
CONCISE METHOD POINTED OUT.

BY THE REV. J. BRINKLEY, D. D. F. R. S. & M. R. I. A.  
ANDREWS PROFESSOR OF ASTRONOMY IN THE UNIVERSITY OF DUBLIN.



READ MARCH 7th, 1803.

THE importance of this problem in the practice of the lunar method of finding the longitude at sea, affords a sufficient excuse for the various solutions that have been offered. Seamen require methods both concise, and not embarrassed by distinction of cases; they are often little able or willing to practise any other. Of the two classes into which the solutions of this problem may be divided, the one in which the correction of the distance is given and not the corrected distance itself, is necessarily embarrassed by a distinction of cases, although otherwise concise, as only requiring tables to a few places of decimals. In the other class are found solutions which do not require any distinction of cases; among such solutions, therefore, it should seem those are to be selected which can be most readily adapted to practice

by precluding the necessity or reducing the labour of computing proportional parts, which is the great inconvenience of methods of this class.

Notwithstanding, however, the inconvenience arising from the distinction of cases, some very eminent mathematicians have exerted themselves in investigating the correction of the distance. The first method by Dr. Maskelyne, the methods by Mr. Lyons, Mr. Witchell, and Mr. Cavendish, are of this class, as are also several investigated with his usual ingenuity by M. Delambre,\* one lately given by M. Legendre, † and one by M. Bowditch, of which an account is given by M. Delambre. ‡

The practical conveniences in none of these methods seem to counterbalance the inconveniences, and comparing them with the solutions in which the corrected distance is obtained, several of the latter appear better adapted for general use.

An improvement of Mr. Dunthorne's solution, given in the second edition of the requisite tables, seems to have been the first in which the distinction of cases was avoided, and which was at the same time sufficiently concise to be preferred to the solutions of the other class: yet, in this method, the computation of the parts for seconds was very troublesome. This rule was farther improved by Dr. Maskelyne, in his most useful preface to Taylor's Logarithmic Tables, and those tables, extending to seconds, obviated the inconvenience

\* Conn. de Temps, Ann. 12 & 14.

† Mem. Nat. Inst.

‡ Conn. des Temps, 1808.



venience from proportional parts. But Taylor's tables cannot be very generally diffused, and besides they require too particular attention in using them, to be held in that estimation with seamen which is their due.

Mr. Mendoza, to whose exertions nautical astronomy is much indebted, has given, in a valuable paper in the *Phil. Transactions* for 1797, forty different formulas for computing directly the true distance. Of these, that which he selected as best adapted to practice, affords a very concise and plain method of computation, requiring only the addition of five versed sines. It may be doubted, however, whether it is preferable to Mr. Dunthorne's first method, improved by the substitution of versed sines for co-sines, as was done by Dr. Mackay.\* Mr. Mendoza's method requires an extensive table for an auxiliary angle (equivalent to the auxiliary table in Mr. Dunthorne's method; and in those derived from it,) and the formation of five different arguments, and also to practise it with convenience, a complete table of versed sines, for at least the semicircle. Mr. Mendoza, anxious to improve still farther the solution of the problem, published his very extensive tables, † by which he reduced the method to be equivalent to taking out and adding together three numbers, and not requiring the formation of arguments. His ingenuity and perseverance in forming, computing, and publishing his tables, are deserving of the greatest praise. But on several accounts those tables will

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not

\* A Treatise on the Longitude, &c.

† Tab. 11. Collection of tables for Navigation and Nautical Astronomy.

not supersede the use of methods in which shorter tables are employed, although these methods should be somewhat longer in practice, provided they be equally plain. To many persons the necessary expence of the volume will be an objection, many will consider its bulk inconvenient, and many disliking such extensive tables with double arguments, will even prefer the former method which those tables were intended to facilitate.

The method pointed out in this paper is closely connected with Mr. Dunthorne's own method, and still more closely with that method improved by Dr. Mackay. It has no distinction of cases, requires only short tables with single arguments, no proportional parts except what can be taken out by inspection, and these for only one quantity besides the conclusion. If it be thought somewhat longer in practice than that by the extensive tables of Mr. Mendoza, it is not less plain, and, by the assistance of a table particularly arranged, may perhaps be as quickly computed.

As examples are given, it will be easy for those conversant with the practical part of the subject, to form an accurate opinion concerning the method here proposed.

Besides investigations immediately connected with this method, an investigation is also given of a formula for the correction of the distance.

Let  $H$  = apparent altitude of the sun or star.

$H'$  = apparent altitude of the moon.

$h$  = true altitude of the sun or star.

$h'$  = true altitude of the moon.

- $D$  = apparent distance.  
 $d$  = true distance.  
 $A$  = difference of apparent altitudes.  
 $a$  = difference of true altitudes.  
 $p$  = horizontal parallax } of sun.  
 $r$  = refraction }  
 $p'$  = horizontal parallax } of moon.  
 $r'$  = refraction }

### 1. By Spherical Trigonometry

$\frac{\cos A - \cos D}{\cos H \cos H'} = \frac{\cos a - \cos d}{\cos h \cos h'}$  both these quantities being equal to the versed sine of the angle, contained by the two verticals passing through the sun or star, and the moon.

Hence  $\cos d = \cos a - \frac{\cos h \cos h'}{\cos H \cos H'} (\cos A - \cos D)$

2. There are two convenient ways of computing the latter term. 1. Forming a table for the whole quantity  $\frac{\cos h \cos h'}{\cos H \cos H'}$   
 2. Developing this quantity, and then forming tables for the terms of its expansion. The former is adopted in the method of Mr. Dunthorne, and its improvement, and in fact in that of Mr. Mendoza; the latter in the method here proposed.

3. Mr. Dunthorne finds the natural number answering to the  $\text{Log. } \frac{\cos h \cos h'}{\cos H \cos H'} + \text{Log. } (\cos A - \cos D)$ \* which number subtracted

\* Mr. Vince, in his Treatise on practical Astronomy, p. 55, instead of computing  $\text{Log. } (\cos A - \cos D)$  uses  $\text{Log. } \sin \left(\frac{D+A}{2}\right) + \text{Log. } \sin \left(\frac{D-A}{2}\right) + \text{Log. } 2$ . This is rather more convenient than Mr. Dunthorne's method, as we avoid finding the Logarithm of a number, but this advantage is somewhat lessened by it being necessary to form the arguments  $\frac{D+A}{2}$  and  $\frac{D-A}{2}$

tracted from the cosine of  $a$ , gives the cosine of  $d$ . The cosine of an arch greater than  $90^\circ$  being negative, occasions here a distinction of cases. If we use versed instead of co-sines, as Dr. Mackay has done, and put  $\frac{\cos h \cos h'}{\cos H \cos H} = N$  we shall have  $v. \sin d = v. \sin a + N (v. \sin D - v. \sin A)$  where no distinction of cases occur. But there are still inconveniences in this method so improved. An extensive table, with a double argument, is required for the value of  $\log. N$  (Tab. 9 of the requisite tables) and also logarithmic tables to six or seven places requiring proportional parts. But even with these inconveniences the method, on account of its plainness and conciseness, is valuable, and scarcely yields to any one that has been given.

4. Instead of performing the multiplication by aid of logarithms, it may be done by the assistance of natural sines, and the conclusion reduced to versed sines. Thus, let  $2 \cos M = N$ , Then  $\cos d = \cos a - 2 \cos M (\cos A - \cos D) = \cos a - \cos (A + M) - \cos (A - M) + \cos (D + M) + \cos (D - M)$

Or reducing this equation to versed sines by substituting for cosine,

$$v. \sin d = v. \sin a - v. \sin (A + M) - v. \sin (A - M) + v. \sin (D + M) - v. \sin (D - M)$$

This is one of Mr. Mendoza's formulas; but he prefers a similar one in which the sum of the altitudes occur instead of the difference; the former being somewhat more easily computed than the latter. The inconvenience of this method of multiplying, arises from the formation of the arguments.

The

The advantage arises from the simplicity of the conclusion, in reducing the problem to the taking out of five versed sines. As the angle  $M$  is always nearly  $60^\circ$ , it is obvious the table of versed sines required by this method must extend to the semicircle.

5. The quantity  $\frac{\cos h \cos h'}{\cos H \cos H'} (\cos A - \cos D)$  may be computed by the expansion of  $\frac{\cos h \cos h'}{\cos H \cos H'}$ . Because  $h = H + p \cos H - r$  and  $h' = H' + h' \cos H' - r'$  we readily obtain by Taylor's theorem.

$$\frac{\cos h}{\cos H} = \frac{\cos(H + p \cos H - r)}{\cos H} = 1 - \sin 1'' (p \sin H - r \tan H) - \frac{1}{2} \sin^2 1'' (p \cos H - r)^2 \text{ \&c.}$$

$$\frac{\cos h'}{\cos H'} = 1 - \sin 1'' (p' \sin H' - r' \tan H') - \frac{1}{2} \sin^2 1'' (p' \cos H' - r')^2 \text{ \&c.}$$

$$\frac{\cos h \cos h'}{\cos H \cos H'} = 1 - \sin 1'' \left\{ \frac{p' \sin H' - r' \tan H'}{p \sin H - r \tan H} \right\} - \frac{1}{2} \sin^2 1'' \left\{ \frac{(p' \cos H' - r')^2}{+r^2} \right\}$$

Now because the refraction varies nearly as the cotangent of the altitude, and at  $45^\circ = 57''$ ,  $3^*$  let

$$r' = 57'', 3 \cot H' - \delta'$$

$$r = 57'', 3 \cot H - \delta$$

then

$$\frac{\cos h \cos h'}{\cos H \cos H'} = 1 - \sin 1'' \left\{ \frac{p' \sin H' + p \sin H - 114'', 6}{+ \delta' \tan H' + \delta \tan H} \right\} - \frac{1}{2} \sin^2 1'' \left\{ \frac{(p' \cos H' - r')^2}{+r^2} \right\}$$

This

\* M. Laplace has proved independently of any hypothesis on the constitution of the atmosphere, that at all heights above  $10^\circ$ , the refraction varies accurately as the cotangent of the altitude (*Mecanique Céleste*, Tom. iv. p. 269). The tables at the end of this paper are however computed from the tables of refraction, in the requisite tables.

This quantity may with much convenience be put into five small tables.\*

The first table may give  $\sin 1'' (p' \sin H' - 114'', 6)$  the argument will be  $p' \sin H'$  the parallax in altitude answering to the complement of the moon's altitude.

The second table will give  $\frac{1}{2} \sin^2 1'' (p' \cos H - r')^2$  and the argument will be the correction of the moon's altitude.

The third table gives  $\sin 1'' \delta \tan H + \frac{1}{2} r^2 \sin^2 1''$  and the argument will be the height of the star. This table is only to be used when a star is observed.

The fourth table is to be used when the sun is observed, and gives  $\sin 1'' \left\{ \frac{p \sin H}{\delta \tan H} \right\} + \frac{1}{2} r^2 \sin^2 1''$  and the argument is the altitude of the sun.

The fifth table gives  $\sin 1'' \delta' \tan H'$  and the argument is the altitude of the moon.

Let  $\alpha, \beta, \gamma, \varepsilon$ , represent the quantities given by these tables which are always positive, and then we have

$$\cos d = \cos a - (1 - \alpha - \beta - \gamma - \varepsilon) (\cos A - \cos D)$$

Or lastly,

$$\begin{aligned} v. \sin d = & v. \sin D - v. \sin A - (\alpha + \beta + \gamma + \varepsilon) (v. \sin D - v. \sin A) \\ & + v. \sin a. \end{aligned}$$

The computation of the above formula will be rendered very plain and short, by a table of versed sines to  $120^\circ$ , † which table, including the addition for seconds, will not contain

\* See the tables at the conclusion of this paper, in which all the numbers may be taken out by inspection, and which have all single arguments.

† By using the difference of the altitudes in the above formula, instead of the sum the limit of this table is that of the distance.

contain more than 20 or 25 pages. A table also by which the moon's parallax\* may be taken out by inspection, will greatly assist this as well as every other method, and for this method it should be arranged in the manner of tables of sines and cosines, so that the parallax answering to the complement of the moon's altitude, may be found by the side of the parallax itself. But the parallax for any altitude, and for its complement, are so readily found by help of the very valuable table of proportional logarithms in the requisite tables, that the want of the abovementioned table can scarcely be offered as an objection to the practice of this method: particularly when it is considered that the use of proportional logarithms must be familiar to all who use the lunar method, being necessary in a subsequent part of the operation.

The product  $(\alpha + \beta + \gamma + \iota)$  ( $v. \sin D - v. \sin A$ ) will easily be had by a table of logarithms to five places, and indeed to those to whom contracted decimal multiplication is familiar, it will be scarcely worth while to have recourse to a table of logarithms. The odd seconds in  $D$  should be reserved, and as  $H$  &  $H'$  should be only put down to the nearest minute, seconds will only be used for  $v. \sin a$  and  $v. \sin d$ .

6. Mr. Dunthorne's table for the value of  $\log N$  (the 9th of the requisite tables) is of considerable extent, and requires, that it may be used with convenience, to be even farther

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extended

\* For low altitudes it seems absolutely necessary to use separate tables for parallax and refraction, instead of a table for the correction of the moon's altitude, on account of the variations of the refraction ascertained by the changes in the barometer and thermometer. Refraction is sometimes changed by  $\frac{1}{2}$  of its mean quantity.

extended than it is in the latter editions of the requisite tables. But from the value of  $N$ , which has been here given, this table may be reduced to tables of the same conciseness and convenience as those that are above given for  $N=1$ .

Thus the common logarithm of the value of  $N$  above given

$$= \frac{\sin 1''}{m} \left\{ p' \sin H' + p \sin H \right\} - \frac{\sin^2 1''}{2m} \left\{ (p' \cos H' - r)^2 \right\}$$

where  $m = 2,03025$

This quantity admits of being put into tables of the same form as those above-mentioned.

Mr. Mendoza's 10th table also may be put into tables of a similar convenient form, supposing his 9th table, instead of containing the correction of the moon's altitude, to contain only the parallax in altitude, and to be arranged in the manner above-mentioned.

For let  $M$  be the angle taken out in that table then  $\cos(60^\circ + M) = \frac{1}{2} N$

Whence is deduced

$$M = \frac{1}{\sin 60^\circ} \left\{ p' \sin H' + p \sin H \right\} + \frac{\sin 1''}{\sin 60^\circ} \left\{ \frac{1}{2} (p' \cos H' - r)^2 \right\}$$

7. The practical rule from the formula given in the last article but one, may be briefly stated as follows:

*Practical Rule.*

1. Find, by help of a table, the parallax answering to the moon's altitude, and to the complement of the altitude. The latter will be the argument of tab. 1. Or

Compute them by adding the proportional log. of the horizontal parallax to the arithmetical comp. of the log. cos. and  
log.



log. sin. of alt., the sums will be the prop. logs. of the respective parallaxes.

2. Moon's par.—moon's refrac.=corr. of alt. Take diff. of (corr. of altitude + star's or sun's refraction + moon's alt.) and star's altitude (or sun's alt. + par.) This diff. is the diff. of true altitudes. Find also diff. of app. altitudes.

3. When the sun is observed, add together the numbers in tab. 1, 2, 4, and 5. When a star is observed add the numbers in tab. 1, 2, 3, and 5, log. of this sum (its index being always 3 + number of figures) + log. (v. sin observed dist.—v. sin diff. of observed altitudes), rejecting 10 from the index = log. of a number to be subtracted from the above diff. of versed sines.

4. The remainder + v. sin diff. of true altitudes = v. sin of true distance.

Observations. No distinction of cases occur. No proportional parts but such as are taken out by inspection. The versed sines may considered as whole numbers, the radius being (1,000,000). In taking out the versed sines of the observed distance, the seconds may be reserved and added to the conclusion. Also in finding the log of (v. sin observed dist.—v. sin diff. ob. alt.) the two last figures may be considered as cyphers.

For those conversant in contracted decimal multiplication, the third precept may stand as follows.

3. When the sun is observed, take the sum of the numbers in tab. 1, 2, 4, and 5. When a star, the sum of the numbers in tab. 1, 2, 3, and 5. Find also the excess of the

versed sine of the observed distance, above the versed sine of the difference of observed altitudes. The figures in the above-mentioned sum must be increased to five, if necessary, by prefixing cyphers. Place the first figure of the sum under the third figure of the excess from the right hand, the second figure under the fourth figure of the excess, &c. thus inverting the figures of the sum. The product found according to the method of contracted decimal multiplication, is to be subtracted from the excess.

Example

## Example I.

Sun's alt.  $19^{\circ} 4''$  } observed distance  $103^{\circ} 29' 27''$   
 Moon's alt.  $41 6$  } horizontal parallax  $58 35$   
 Diff. ob. alt.  $22 2$

Prop. Log.  $58 35$   $4875$   $4875$   
 $41^{\circ} 6' A C \cos$   $1229$   $\sin 1822$   
 $\hline 6104$   $\hline 6697$   $38' 30''$  arg. tab. 1.

parallax in alt.  $44' 9''$   
 Moon's ref.  $1 5$   
 $\hline$   
 Corr. alt.  $43 4$   
 $41 6$   
 Sun's refrac.  $2 44$   
 $\hline 41 51 48$   
 Sun's alt+ par.  $19 4 8$   
 $\hline$   
 diff. true alt.  $22 47 40$   $\hline 10739$

$145$   
 Tab. 1  $10497$   
 Tab. 2  $78$   
 Tab. 4  $19$   
 Tab. 5  $0$   
 $\hline$

v. sin  $103^{\circ} 29'$   $1233162$  Log.  $10739$   $8.03100$   
 v. sin  $22 2$   $73034$  Log.  $1160100$   $6.06446$   
 $\hline 1160128$  Log.  $12460$   $4.09546$   
 $12460$

$\hline 1147668$  Without Logarithms.  
 v. sin  $22^{\circ} 47' "$   $78024$   $11601$   
 $40$   $74$   $93701$   
 $\hline 1225766$   $\hline 11601$   
 $812$   
 v. sin  $103 2 52$   $35$   
 $27$   $10$   
 $\hline 103 3 19$  true dist.  $\hline 12458$

Example

Example II.

Star's ob. alt.  $11^{\circ} 17'$  } distance  $43^{\circ} 35' 42''$   
 Moon's ob. alt.  $9\ 38$  } horizontal parallax  $54\ 42$   
 diff. ob. alt.  $1\ 39$

Prop. Log.  $54\ 42$   $5173$   $5173$   
 A C cos  $9\ 38$   $0062$  sin  $7764$   
 $5235$   $1,2937$   $9\ 9''$  arg. tab. 1.

parallax in alt.  $53' 54''$   
 Moon's refrac:  $5\ 26$   
 Corr. alt.  $48\ 28$   
 Star's refrac.  $4\ 40$  Tab. 1  $44$   
 Moon's alt.  $9\ 38\ 0$  Tab. 2  $2061$   
 $10\ 31\ 8$  Tab. 3  $100$   
 $11\ 17$  Tab. 5  $11$   
 diff. true alt.  $0\ 45\ 52$   $2227$

v. sin  $43^{\circ} 35'$   $275628$  Log.  $2227$   $7,34772$   
 v. sin  $1\ 39$   $415$  Log.  $275200$   $5,43965$   
 $275213$  Log.  $613$   $2,78737$   
 $613$

$274600$  Without Logarithms.  
 v. sin  $0^{\circ} 45'$  "  $86$   $2752$   
 $52$   $3$   $72220$   
 $274689$   $550$   
 v. sin  $43\ 30\ 19$   $55$   
 $42$   $6$   
 $43\ 31\ 1$  true dist  $2$   
 $613$

8. The above formula will also serve for an easy investigation of an expression, for the correction of the distance.

We have  $\cos a - \cos d = (1 - e \sin 1'') (\cos A - \cos D)$ ,

putting  $\alpha + \beta + \gamma + \delta = e \sin 1''$

Let  $a = A + b$  &  $d = D + x$ .

Then  $\cos a = \cos A - b \sin 1'' \sin A - \frac{b^2}{2} \sin^2 1'' \cos A$ ;

$\cos d = \cos D - x \sin 1'' \sin D - \frac{x^2}{2} \sin^2 1'' \cos D$ ;

Hence

$x \sin D - b \sin A + (x^2 \cos D - b^2 \cos A) \frac{1}{2} \sin 1'' = -e (\cos A - \cos D)$

From which equation we obtain

$x = b \frac{\sin A}{\sin D} - \frac{e (\cos A - \cos D)}{\sin D} - \frac{1}{2} \sin 1'' \cot D \left( \frac{b \sin A - e (\cos A - \cos D)}{\sin D} \right)^2$   
 $+ \frac{1}{2} \sin 1'' b^2 \frac{\cos A}{\sin D}$ .

and because

$b \sin A + \frac{1}{2} \sin 1'' b^2 \cos A = b \sin \left( A + \frac{b}{2} \right)$

also  $\cos A - \cos D = 2 \sin \left( \frac{A+D}{2} \right) \sin \left( \frac{D-A}{2} \right)$

we have, sufficiently near the truth

$x = \frac{b \sin \left( A + \frac{b}{2} \right) - 2e \sin \left( \frac{A+D}{2} \right) \sin \left( \frac{D-A}{2} \right)}{\sin D} (c) - \frac{1}{2} \sin 1'' c^2 \cot D$

In this formula  $c$  is easily computed by the assistance of proportional logarithms, logarithmic tables, to four or five places of figures, and tables for the value of  $e$  similar to the table for  $N$ . The term  $\frac{1}{2} \sin 1'' c^2 \cot D$  may be had by a table sufficiently convenient. This method of finding the correction of the distance is shorter than those in the requisite tables, and than that of M. Legendre in the Memoirs of the National Institute. It is, notwithstanding the difference

in

in the method of investigation, in effect, the same as the second formula of M. Delambre.\* And it is not probable that a formula for the correction of the distance more convenient in practice, can be found. But the attention necessary to be given to the signs of the quantities renders it less convenient, than the method in which the corrected distance is obtained.

\* *Conn. des Temps, pour Ann. 14, p. 31, &c. &c.*

The argument is the parallax answering to the complement of the apparent altitude of the moon.

Tab. I.

" of arg.	arg. ' & "	" of arg.
5	1	25
10	2	316
15	3	
19	4	606
24	5	897
29	6	1188
34	7	1479
39	8	1770
44	9	2061
48	10	2352
53	11	2643
58	12	2934
63	13	3224
68	14	3515
73	15	3806
78	16	4097
83	17	4388
88	18	4679
93	19	4970
97	20	5261
102	21	5552
107	22	5843
112	23	6133
116	24	6424
121	25	6715
126	26	7006
131	27	7297
135	28	7588
140	29	7879
145	30	8170
150	31	8461
155	32	8752
160	33	9043
165	34	9333
169	35	9624
174	36	9915
179	37	10206
184	38	10497
189	39	10788
194	40	11079
199	41	11370
204	42	11661
209	43	11952
213	44	12242
218	45	12533
223	46	12824
228	47	13115
233	48	13406
238	49	13697
242	50	13988
247	51	14279
253	52	14570
257	53	14861
262	54	15151
267	55	15442
272	56	15733
276	57	16024
281	58	16315
286	59	16606
291	60	16896
	61	17187
	62	17478

The argument is the correction of the moon's apparent altitude.

Tab. II.

arg. "	"
1	0
2	0
3	0
4	1
5	1
6	1
7	2
8	2
9	3
10	4
11	5
12	6
13	7
14	8
15	10
16	11
17	12
18	13
19	15
20	17
21	18
22	19
23	21
24	23
25	26
26	28
27	30
28	32
29	35
30	38
31	40
32	43
33	46
34	49
35	52
36	55
37	58
38	61
39	64
40	68
41	71
42	74
43	78
44	82
45	86
46	90
47	94
48	98
49	102
50	106
51	110
52	114
53	118
54	123
55	128
56	131

The argument is the apparent altitude of the sun.

Tab. IV.

arg. O'	"
3.0	67
15	59
30	53
3.45	48
4.0	45
30	38
5.0	33
6.0	27
7.0	22
8.0	20
9.0	19
10.0	18
15.0	17
20.0	19
25.0	20
30.0	21
35.0	24
40.0	27
50.0	33
60.0	37
70.0	41
80.0	42
90.0	43

The argument is the star's apparent altitude.

Tab. III.

arg. O'	"
3.0	65
15	57
30	51
3.45	46
4.0	42
30	35
5.0	30
6.0	23
7.0	18
8.0	15
9.0	13
10.0	11
15.0	6
20.0	4
25.0	2
30.0	0
90.0	0

The argument is the apparent altitude of the moon.

Tab. V.

arg. O'	"
3.0	55
15	48
30	43
3.45	39
4.0	36
30	30
5.0	26
6.0	20
7.0	16
8.0	13
9.0	11
10.0	10
15.0	6
20.0	4
25.0	2
30.0	0
90.0	0

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MEMOIR,  
ON  
USEFUL GRASSES,

BY  
W. RICHARDSON, D. D.

COMMUNICATED BY  
DR. DAVENPORT.



*Read on Monday, March 6th, 1803.*

THE branch of botanical knowledge which is limited to the natural history of the grassy tribe, bears but a very small proportion to the immense field included within the insatiable grasp of the modern professors of that science; who count upon their catalogue 80,000 different plants, while they suppose the grasses taken by themselves amount only to 150.

An attempt, therefore, to reduce that comparatively small number still lower, and to bring the attention of the ROYAL IRISH ACADEMY upon a portion of it, not exceeding the tenth or twelfth part of the whole number of grasses, will probably excite surprise.

My object, however, will, I hope, plead my excuse: I have no other view than to be *practically* useful, and to assist the Agriculturist in selecting such grasses as, from some

years' diligent attention to the subject, I know will repay his labour in their cultivation.

Of these few, and of these only, I shall proceed to detail the NATURAL HISTORY, the QUALITIES, the HABITS, and the USES; previously taking the liberty to make some general observations on the subject.

In studying the œconomy of Nature in her three separate kingdoms, the ANIMAL, VEGETABLE, and MINERAL, according to the distribution of ARISTOTLE, we find her principle of arrangement perpetually counteracted by Man, who cannot, in any one of these kingdoms, avail himself of her bounty without exerting himself to undo what she has done.

The principle of Nature seems to be, to *mix* every thing; while Man, before he can *use*, must *separate*.

In the mineral kingdom, we scarcely know a distinct homogeneous material: every thing is a compound, and should the metals be quoted as exceptions, yet we rarely find even these in their distinct metallic form.

Hence the necessity for chemical ingenuity. Man wishes to make his use of the component parts separately, and the chemist, by his *analysis*, reduces the mass into its constituent elements.

In the animal kingdom, Nature throws all her subjects together indiscriminately, notwithstanding obvious incompatibilities; yet still, when left to herself, preserving all her species; compensating weakness and inability to resist, by facilitating  
means

means of escape, and bestowing superior powers of propagation.

In this state, Man would derive little benefit from the numerous tribes surrounding him, his person even would not be secure. He has therefore exerted himself perseveringly from time immemorial; he has waged a destructive war against the most formidable, to their extermination, or, at least, the expulsion from his dominions of some species; and, where a milder disposition enables him, he has domesticated others; thus reducing the free denizens of nature to a small number.

In the vegetable kingdom, he has pursued nearly the same line and with the same industry; he has discovered and selected those adapted to his use, and has exerted his ingenuity in finding out how that use may be most effectually obtained.

What is Agriculture but the SCIENCE of cultivating *exclusively*, and to the best advantage, such grains or vegetables as are necessary to the sustenance of man or his domestic animals? His general process is simple: he gives the selected grain exclusive possession of his ground, first exterminating all rivals, and then wages unremitting war against all competitors that Nature, according to her invariable practice, persists in obtruding on him.

By the continuation of this process for some thousand years, and by perpetually sowing his *domesticated* seed, (as I may call it) Man has done more than he expected, as he has actually improved the species. For who can doubt that our grains

are meliorated since the days of TRIPTOLEMUS, when we see that, by skilful attention, our fruits and culinary vegetables are improved in our day ?

To the grassy tribe, Man has not been so attentive. Grass has very rarely been a *primary* object with him ; even when he sows it, he generally prepares his ground for a crop of grain, along with which he sows his grass-seed as a secondary object, leaving the young tendril to be over-shadowed for a summer by the more sturdy favourite.

The regular continuation of grass *by seed*, I fancy, has never been steadily practised. Hence no improvement of the species, which, of course, remains as it came from the hand of Nature.

A little attention to the natural history of the grassy tribe, *collectively*, will soon discover the cause why this branch of the agricultural department has been attended to with less care, and cultivated with less success than, perhaps, any other part of that useful science.

The esculent grains are all annuals ; they require attention and protection but for a short period, being of rapid growth and soon able to contend to advantage with most of their rivals ; while the few of the coarser sorts that remain are soon wed out, and the ground left to the exclusive possession of the grain that was sown.

With grass the case is, in every respect, different : It is of slow growth—long very diminutive—never coming to perfection (that is, ripening its seed) the first year—indistinguishable  
from

from rival grasses which Nature invariably sows along with it; and likely to be soon choaked by rising weeds which, being mostly annuals and of rapid growth, soon overpower it.

When we attempt to obtain a crop of any one grass by itself, we find the trouble of weeding and keeping it distinct from other grasses sufficiently great, even in the experimentalist's diminutive plots; on a large scale it could not be encountered.

The Farmer, therefore, has the alternative, either of sowing his grass by itself in spring, and, when necessary, weeding (as we call it) with the scythe, repeated mowing being fatal to weeds, while young grass, though certainly injured by the operation, is never destroyed—

Or, he must sow his grass-seed with his grain, by way of protection; and this mode he generally prefers, as, by the former, he loses a year's produce.

From these difficulties and impediments it follows, that the agriculturist (at least in my country) generally relies upon Nature for clothing his ground, rarely troubling himself to inquire what are the grasses that rise spontaneously, or to consider whether it would not be more for his interest to sow better kinds.

Let us then, before we have recourse to experience, try the question, *a priori*; let us endeavour to get a lesson from Nature herself, and, by watching her steps, find out what seem to be her favourite grasses, and what species she is most ready  
to

to bring forward when the agriculturist has cleared the way for her, by leaving his surface unoccupied.

It is probable that, among these spontaneous obtrusions of Nature obviously indigenous to our soil, we shall be able to select those which it will be the interest of the farmer to cultivate, and which are most likely to repay his labours.

In pursuit of this object, I have for some years been in the habit of carefully examining, through the spring, my fields that I had ploughed the preceding year, watching the spontaneous grasses as they appeared, selecting the most promising, those

*Quæ læta et fortia surgunt,*

and carefully transplanting them into plots prepared for the purpose.

I had thus an opportunity, when by their panicles they shewed their species, of ascertaining the respective qualities and comparative merits of the grasses that seemed indigenous to our soil.

I then formed distinct plots for each species, and, by letting their crops ripen, was enabled to judge of their value for the purpose of hay, and, when regularly mowed, the luxuriance of the *aftergrass* of each.

Not secure that the powers of regeneration would be exactly the same when kept down by repeated browsing in an early stage, and when mowed but *ouce* in a state of ripeness, pressed other plots of the same varieties with the scythe, as often as it would catch their sole; and, from the number of  
times

times they could each bear to be mowed, conceived I could estimate their powers of regeneration upon which their value, for the purpose of grazing, must greatly depend.

Nor did I confine my inquiries and experiments to the grasses I discovered myself; but when I read or heard of a grass supposed to be valuable, I exerted myself to procure some of its seed, formed plots of it, and subjected it to the same experiments; as also any other grasses which I found growing spontaneously in meadows or sequestered places inaccessible to cattle; and which, though not so obtrusive as the first description, yet seemed to hold out some reasonable prospect of value.

The result of my observations for four or five years, I shall now lay before the ROYAL IRISH ACADEMY; hoping the importance of the subject will compensate for its apparent want of dignity, and that an epitome of every thing I have discovered, or have been able to collect in the grass department, that can be of use to the practical farmer, will be received with indulgence.

I shall commence by enumerating the grasses I find occupying my collectaneous plots, into which I had transplanted them before I knew their species:

Of these, the *Dactylis glomerata* was the most vigorous, and would have been more numerous had I not learned to distinguish them in an early stage by their crimped leaf.

The *Holcus lunatus* comes next, and was always luxuriant; then the *Lolium perenne*, very numerous; the *Poa trivialis*,  
equally

equally abundant; several of the *Anthoxanthum odoratum*; a few of the *Cynosurus cristatus*; and, as April advanced, the *Agrostis stolonifera*, our Irish *Fiorin*, had contributed many.

The following grasses were not so obtrusive, yet obviously indigenous to our soil, as I find them in all our natural meadows; the *Festuca pratensis* seemed the most common; next the *Avena flavescens*; then the *Poa pratensis*; after these came the *Alopecurus pratensis*; then the *Phleum pratense*—these two, and especially the last, more rarely.

To these twelve grasses I have long paid particular attention, giving each of them several distinct plots, that I might subject them to different experiments. The judgment I formed of their respective qualities and comparative merits, from the result of these experiments, I shall now proceed to detail, arranging them in the order they seem to me to be entitled to according to their several values,

#### AGROSTIS STOLONIFERA.

1st. I should commence with this grass, admitted to be our *Irish Fiorin*, which I considered as far more valuable than any other grass; and I persist in this opinion, notwithstanding the recent condemnation of it by Mr. ARTHUR YOUNG, who stigmatizes it with the opprobrious name of *Red Robbin*; pronouncing peremptorily, that “All kinds of cattle would starve, rather than touch its herbage.”

Now, one reason, among many others, induces me to per-  
sist



sist in extending its propagation myself, and in recommending its cultivation to others, which is *the decided preference given by my horses, sheep, and cows to it, whether green or in hay, above all other grasses.*

But I have of late so fully detailed the curious properties and valuable qualities of this native grass of ours, in different essays on the subject, that I shall not enter into a repetition of what I have already published, but proceed to the grass I consider as next in value, the

## II. DACTYLIS GLOMERATA.

By placing our common *Cocksfoot* so high in rank, I shall excite surprise; for though this grass be mentioned respectfully by some writers, yet I do not recollect any of them that recommend its cultivation, nor did I ever hear of its being sown for use; I do not even find its name in any of the random mixtures that agricultural book-makers are so fond of giving us.

When we examine the question *a priori*, we shall find the chief qualities that give value to a grass are three—*earliness*, *quantity* of produce, and *powers* of regeneration when cut or eaten down.

Therefore, in establishing the value of what I may almost call a *new grass*, it is necessary to inquire how it stands, when examined with a view to each of these points separately.

As to earliness, the *Cocksfoot* is, in sward, on a footing with

our most forward grasses. Its panicles come out one day after the *Rye Grass*, and eight or nine after the *Alopecurus*; yet it is ready for mowing before either of them, as it must be cut in an early stage of its inflorescence, when I found it made good hay and fragrant also, though unmixed with the *Anthoxanthum Odoratum*.

The next point of view in which the comparative merits of grasses are to be tried, is *quantity of produce*. Here simple inspection enables us to pronounce the *Dactylis* to be the most luxuriant of our grasses.

Another point of comparison remains, of great importance in meadow grasses, but of infinitely more when they are used for grazing. I mean *powers of reproduction*, when cut or eaten down.

In meadows, this is readily decided by inspection, for the pale green leaves of the *Cocksfoot* are easily distinguished from the others, and soon attain double their length after being mowed. The great fleece of after grass we observe in gentlemen's pleasure grounds is generally composed of *Dactylis*; for here, cattle being excluded, it is permitted to exert its full powers of reproduction.

From this observation which we make in pleasure-grounds not broken up for very many years, we can pronounce upon another important quality, that of holding long possession of the ground: since it appears that the *Cocksfoot*, though originally spontaneous, is able to contend for the possession with advantage, against its perpetually obtruding competitors.

The

The great powers of reproduction possessed by the *Dactylis* are not confined to one cutting only. I have ascertained that this grass stands repeated mowing very nearly as well as the *Alopecurus*, and somewhat better than the *Festuca pratensis*. Now these three regenerate oftener than any other grasses with which I am acquainted.

It is more difficult to determine the comparative value of grasses in pasture than in meadow; for the cattle destroy the distinctive marks; and, in a uniform sole, we cannot tell which of the grasses composing it, contributes most to the sustenance of the stock.

Here again we must speculate *a priori*; and, from our previous knowledge of the qualities of the several grasses, conjecture at their comparative value, when used in pasture.

Having, therefore, proved that *earliness*, *luxuriance*, and *powers of reproduction* are possessed by the *Cocksfoot*, I know no other questions to be asked but—Is it nutritive? and, Are cattle fond of this grass?

The first question cannot be answered until we shall have carried our agricultural exertions and attention so far as to give to separate fields distinct and exclusive crops of our favourite grasses.

Nor is it easy to decide upon the fondness of cattle for a grass never cultivated separate from others; yet I think I can give a presumptive proof that cattle eat the *Cocksfoot* indiscriminately, and, at least, shew no dislike to it.

It is fifteen years since any part of my lawn has been broken

up, while parts of it have been under grass for twenty-two, and others, for thirty years; during all the latter part of which time it had been fed upon by sheep.

My desire to know what species of grasses occupied a sole of so long standing, induced me, two years ago, to let my lawn run to meadow.

When the panicles began to shew, I found *Dactylis* in abundance in all parts of the ground; and, soon after it was mowed, I found the pale leaves of this grass, as usual, outstripping the others every where.

Now, as I had never observed a panicle of *Dactylis* in my lawn, when in pasture, among the brown stems of the *Cynosurus cristatus* (always rejected by cattle) which disfigure our fields so much, nor could distinguish the *Dactylis* by its crimped leaf or any other marks, we have demonstration that it was consumed equally with my other grasses; and since its *earliness*, *luxuriance*, and strong *powers of reproduction*, are already fully established, we cannot doubt that, while the lawn was pastured, the *Dactylis* contributed more largely than any other to the maintenance of my stock.

The excellence of this grass is well known in AMERICA, where it is distinguished by the same name given to it in some parts of England, *Orchard Grass*, an apposite name, as it bears the shade of trees better than any other grass except the *Irish Fiorin*.

### III. FESTUCA PRATENSIS.

The next grass in order of value, I imagine, is the *Festuca pratensis*. In strength and luxuriance, it much resembles the *Dactylis*, but it is full three weeks later; yet its powers of reproduction are so great that its aftermath is most abundant; and it seems by no means so soft as that of the *Alopecurus*, or even *Dactylis*, neither collapsing, like the former, when left long on the ground, nor embrowning so soon as the latter.

This grass is so strong, that its hay is coarse, unless it be mowed like the *Dactylis* in an early stage of its inflorescence; so that, where hay is the primary object, a crop of seed must be given up; but, as this *Festuca* produces much seed, a small portion set apart would supply the farmer with seed in abundance.

The *Festuca pratensis* holds possession of the ground strongly. I have still, after standing seven years, an exclusive crop of it, with very little weeding.

### IV. ALOPECURUS PRATENSIS.

It may excite surprise that I have not yet mentioned *Fox-tail*, (*Alopecurus pratensis*) generally esteemed our most valuable grass. I myself once entertained a very high opinion of it, and paid particular attention to it.

Even still, for the purpose of grazing, I think it equal, perhaps superior to any other; for, in earliness and powers of reproduction,

reproduction, the *Alopecurus* is rather superior to the *Dactylis*; and though its sward be not quite so luxuriant, yet it is far more delicate.

Three years ago I had stated, that both CURTIS and DICKSON had called this grass too coarse, but that I had found it rather fine, and too much disposed to lodge.

Attentive observation of its sward, and repeated experiments upon its hay, have convinced me that, notwithstanding its high reputation and *characteristic name*, yet that the meadow *Foxtail* is unfit for *hay*.

Its seed stems bearing the panicle, are tall and very few, so as to bear no proportion to the immense mass of soft root-leaf of which its hay will be composed; but it is well known that the nutritious and saccharine parts of our hay are confined almost exclusively to the stem, while the soft root-leaf, little better than a *caput mortuum* when dry, shrinks, withers, and wastes almost to nothing, in the operation of hay-making.

As I advanced from theory to practice, from my diminutive experimentalists plots to more extended portions of my farm, I endeavoured to save and keep distinct, exclusive parcels from each species of grass of which I entertained good expectations.

I was much shocked to find, when I examined my parcels after some interval, that my *Foxtail* hay was quite soft and greatly collapsed. Heavy rains came on soon afterwards; and, as my parcels were small, I had considerable difficulty in saving any of them, but I succeeded with them all except the  
*Alopecurus*

*Alopecurus*, which, on July 26th, was quite rotten and thrown on the dung-hill.

#### V. LOLLIIUM PERENNE.

*Rye-grass* has been always more esteemed by others than by me, yet of late it has risen greatly in my opinion.

The good qualities of this grass are, that it is very early, and its hay-crop *exclusively stalk*; whence, no doubt, it comes that *Rye-grass* hay is believed to be more nutritious than any other grass.

This received opinion is strongly confirmed by my friend, GENERAL TROTTER, Commandant in Charlemont, who assures me that his Artillery horses thrive better while the *Rye-grass* hay lasts, but, when it is expended, he can perceive a change.

The *Lollium perenne* holds a steadier possession of the ground than any grass I know, and from every observation I can make, seems more indigenous to our Irish soil than any other.

I form this judgment of the *Rye-grass* both from my finding it so frequently in my collectaneous plots, and also from my finding it more abundant than any other grass in my lawn, when turned to meadow, after being pastured from fifteen to thirty years.

On the other hand, the crop of *Rye-grass* is very thin, and its aftermath light and poor; nor are its earlier powers of re-  
production

production nearly equal to those of the *Dactylis* and *Alopecurus*; for my *Rye-grass* would not catch the scythe a second time, before June 21st, while the other two were equally forward a third time on the 26th: whence, and also from its thinness, I consider *Rye-grass* as very unprofitable for pasture, though the superior quality of its hay may compensate for the defect in quantity.

#### VI. *HOLCUS LANATUS.*

Of this grass, commonly called *White Grass*, I have always entertained a better opinion than I generally find expressed in our agricultural books. Some of the best crops my experimental plots have produced were of *Holcus lanatus*.

It is not so late as the *Festuca pratensis*, and its powers of reproduction, though inferior to those of the *Alopecurus* and *Dactylis*, are by no means deficient.

The *White Grass* is decidedly indigenous to our soil, and among our most obtrusive grasses, yet it is in some respects very delicate. Its seed always failed with me when sown after August 29th; and I once absolutely lost, and, on another occasion, materially injured crops of *Holcus lanatus*, by mowing their after-grass in December, while my *Alopecurus*, *Dactylis*, and *Festuca*, have been mowed for seven years, at the same season, without sustaining any injury.

#### VII. *POA*



## VII. POA PRATENSIS.

I now proceed to the *smooth stalked meadow grass*, universally well spoken of, and in many respects deservedly; its soil shews the first verdure in spring, just before the *alopecurus*, but the latter outrips it and covers the ground with a more luxuriant sward:

The *Poa pratensis* is by no means deficient in any of the qualities I have stated, as essential to the value of the grass; its aftergrass is good, it regenerates quickly, and the sole seems close and kindly.

This does not appear to be an obtrusive grass, as I never found a single root in any collectaneous plots, yet it is obviously indigenous, as I find it in abundance in all my natural meadows, especially in dry ground.

## VIII. AVENA FLAVESCENS.

I once recommended this grass strongly, as producing a nicer sward for hay than any other grass, it looks better even than the rye grass, the stalk not quite so wiry, and two or three short leaves on each stalk give it a very rich appearance; the stalks too are more abundant than those of the rye grass.

Still the *Avena flavescens* is deficient in two very important points; it is much later than I once imagined, and it is totally deficient in after grass.

Notwithstanding the *Poa pratensis* and *Avena flavescens*, more especially the former, possess some very good qualities ; I decline recommending *either*, as they are both deficient in a property of much importance to the farmer, who means, when he lays down his ground, not to break it up for some years.

Neither of these grasses hold long possession of the ground ; with all the powerful aid I gave them, they were scarcely able to retain their hold of it, and without my interference, by frequently weeding out their competitors, it was plain that they would soon have disappeared.

#### IX. PLEUM PRATENSE.

*Timothy grass* is sometimes recommended for producing a strong and valuable crop of hay, as I have repeatedly found myself when I cut it early in its inflorescence, this is absolutely necessary from its great coarseness.

Yet I think a crop of this grass by no means compensates for its *lateness* and total want of after-grass, its powers of re-production being inferior to those of any other grass, or rather none at all, for, after mowing, it makes no more attempt to rise again than a crop of corn, indeed it seems to resemble the grain more than the grass tribe.

Timothy grass is very common in AMERICA, and said with us to be a foreign grass, yet I have seen it in meadows where it could not have been sown ; it obviously is not a  
grass

grass for our moist country, while we have several others in a state of perpetual vegetation; perhaps in a warmer climate a valuable crop of it might be forced up before the great droughts set in.

I once conceived the *Pleum pratense* held long possession of its ground, because I found many stalks of it where I had sowed it ten years before, but on more careful examination I perceived it merely *existed*, scarcely contributing to the meadow crop.

For these reasons I have long declined cultivating Timothy grass and cannot recommend it.

#### X. BROMUS MOLLIS.

This is one of the most common and obtrusive grasses we have, it is known to farmers by the name of *goose grass*, its panicle resembles a head of oats.

The *Bromus mollis* gives a very early and luxuriant crop of hay, it must be cut like other strong grasses, while in flower, or it becomes too coarse, its after-grass is not deficient, but unfortunately this grass is *an annual*, as the unexperienced farmer often discovers to his cost, when after exulting in a magnificent crop of hay, he next year cannot find a single stalk of his admired Brome grass.

Even under this disadvantage, one valuable property of this grass enables us to make use of it on some occasions,

P 2 which

which is, that the *Bromus mollis* produces an abundant crop of the most prolific and hardy seed I know.

It is the only grass seed I have tried which will grow after a potatoe crop; when we sow other grasses, even in September, though they should vegetate for a while, yet the first sharp frost destroys the young tendril, while the bromus does not sustain the slightest injury.

Hence in laying down our grounds with grass, when the seed we have selected to clothe our ground with fails, either totally or partially, the hardy bromus will supply its place, and if the patches of naked stubbles be slightly loosened even with a rake or harrow, and this seed sown, the farmer will still have good meadow the ensuing year, and in the one following, though the *bromus* be gone, we never fail to find the sole well covered.

My friend, the Honourable and Reverend Charles Knox, has devised a mode of turning this grass to profit, which *a priori* seems very plausible.

Residing in a blake and rather a wild country, good hay is not easily procured, and oats are an article of prime necessity; thus circumstanced, Mr. Knox proposes to sow *bromus mollis* with his oats, and the year following to mow its crop for hay; secure also of an abundant *aftermath*.

The third year he recommences the same routine, thus securing the two articles he stands most in need of, and avoiding a too severe pressure upon his ground, he exactly follows VIRGIL'S directions.

Alternis item tonsas cessare novales  
Et segnem patiere situ durescere campum.

Should the *Bromus mollis* turn out an improving crop, the practice must prove an admirable one; at all events, the experiment is well worth trying.

### XI. FESTUCA FLUITANS.

I proceed to the *Festuca fluitans*, a grass possessing some excellent qualities, yet I must confess I have not hitherto been able to avail myself of them.

It is known sometimes by the name of *drain grass*, and is to be found only in the very wettest situations; this is the grass which so often choaks and closes up our drains by its thick matted strings and stolones; it converts shallow waters into green morasses, and is the principal agent in the formation of the rich alluvial soil we find upon draining such morasses, and also in the frequently overflowed meadows contiguous to languid rivers.

Cows and horses are remarkably fond of the *Festuca fluitans*, children call it *honey grass* from a gluey saccharine matter that exudes through the leaves and adheres to their surface, they draw this across their tongues to catch the sweet.

I tried to make hay of it, but the sward from the scythe was so succulent and soft that it soon collapsed and could not be saved like other grass.

In

In winter its powers of vegetation are very great; on the 1st. of December, a little boy of mine stole the whole crop from my irrigated plot for his rabbits, yet by the first of March the plot had recovered a fleece; I know not any other grass that could have made such an effort.

However desirable so rich a green food might be deemed in that ungenial season, the places where the *Festuca fluitans* is found, are generally so flooded in winter, as to make its crop inaccessible, and were we to transfer it to our irrigated grounds, from which we can occasionally let off the water, we shall find few of them able to afford a sufficient supply in summer to this most decided aquatic.

From these difficulties I have given up the cultivation of this excellent grass; I state its good qualities, hoping that others may exert their ingenuity with more success.

## XII. FESTUCA OVINA.

I cannot avoid saying something of this grass of late come into fashion in ENGLAND, but which has not, to my knowledge, been yet cultivated in IRELAND.

I tried the *Festuca ovina* for two years, but in the third, though I assisted it by weeding, yet it lost possession of its plot.

The panicles of this grass are few and low, neither these nor the sward ever rising so high as to catch the scythe, of course the *Festuca ovina* can only be used in pasture, and then  
its

its value must depend much on its powers of regeneration, which I suspect have never been tried or observed with attention.

Not considering my trial of this grass sufficient, I wished to know it better, and wrote to England for some seed, but was informed it was all gone, being sold off at a guinea a bushel; I should have thought it very difficult to collect even one bushel from such diminutive and thinly scattered panicles.

The *Festuca ovina* as appears upon simple inspection, and as is announced by its name, is a grass fit for sheep exclusively, of course must be sowed in extensive tracts, and an immense quantity therefore of seed will be required, for it would be extreme folly to mix it with other grass seed, and thus overpower by the introduction of stronger competitors a diminutive plant, which I was not able to protect from the coarser grasses and weeds that obtruded themselves spontaneously.

I speak with less confidence of the *Festuca ovina* than of any other grass; my experiments upon it having been more curtailed; nor does it afford opportunity for observation in its natural state; I suspect, indeed, that it never has been studied with that degree of patience and attention that would justify the pronouncing positively upon its merits; the advocates for this grass would do well to give it a cool and fair trial; my condemnation of it is founded on speculation *à priori*.

I have

I have now enumerated all the grasses with which I am acquainted, that hold out any reasonable probability of repaying the labour and expence of cultivation. I have included a few, from which I have but slight hopes; yet as these also have their partizans, I have brought them forward, chusing to leaving the question relative to their merits open for further examination and future experiment.

I proceed to some other species of grass often recommended as valuable in modern agricultural books, but of which I entertain a different opinion, and upon these having had ample opportunity for experiment and observation, I shall venture to pronounce a condemnation without hesitation.

### XIII. POA TRIVIALIS

I commence with the *rough stalked meadow grass*, to which I have paid more attention than to any other grass, seduced by the plausible appearances it often held out.

For instance, lively and luxuriant tufts in my collectitious plots, which I have already mentioned, frequently prove *Poa trivialis*—our rich moist bottoms are full of its panicles in their season—the thick and almost indistinguishable mass thrown up by irrigating a natural sole, shews more vigorous panicles of *Poa trivialis* than of any other grass. In raw grounds I have found its little spontaneous tufts stool, and enlarge to a diameter of eight or nine inches, by sending  
out



out horizontal shoots with two diverging points like the antenna of an insect.

Yet, from these promising verdant sods, not a single blade arises which cattle could bite. Towards June, a croud of hungry hair like panicles arise, forming wretched meadows, and fit for nothing else; as to after-grass, the *Poa trivialis* never makes the slightest attempt to throw up any.

For seven or eight years I have never been without distinct plots of this grass, which shew a miserable contrast with other (even the condemned) grasses; I have tried *root* and *seed* plots of it under irrigation, without success, though here I expected much from it; but I have already said too much on the subject of a grass that does not possess a single good quality which I have been able to discover.

#### XIV. CYNOSURUS CRISTATUS.

Of the *Crested dog's tail* I shall say little, satisfied with what is admitted by one of the writers, who throws a portion of its seed into the mixture he recommends to farmers.

This gentleman admits that the *Cynosurus cristatus* has little blade—that its seed stalks are too hard for cattle—that it has scarcely any after-grass; he should have told what are the qualities for which he recommends it.

That he has given a fair character of the *Crested dog's tail*, I have proved by repeated experiments; in the North of Ireland, we know its panicles but too well, under the name

of *windle straws*. I attempted to force this grass, by manure, into something better, but the result was, that I made its stalk absolutely ligneous.

#### XV. ANTHOXANTHUM ODORATUM.

*Sweet scented meadow grass*—supposed to be that which gives fragrance to our newly cut hay; no doubt it has a very sweet smell, but neither this quality, nor its earliness, for its panicle appears ten or twelve days before any other of our indigenous grasses, compensate for the miserable thinness of its crop, the want of luxuriance in its blade, and its total deficiency in after-grass.

#### POA ANNUA.

A most obtrusive little reptile, rapidly attaining its dwarfish maturity, and soon throwing out its stunted panicles; these it seems to produce every month in the year, except January.

This grass is so low and flat, that cattle can reach nothing but these panicles; yet as the *Poa annua* omits *stolones*, it soon occupies much of a raw surface; but it seems unable in a thick sole, to contend with the stronger grasses. With astonishment I have seen a premium offered for saving the seed of this grass.

I have now gone over the list of *all* the grasses, which, from my researches and experiments, I judge to deserve the attention

attention of the agriculturist; I have repeatedly given distinct plots in my garden to each of these, and also many other grasses which I do not see any use in bringing notice upon; every one of the former, and also several of the latter, I have tried in my farm, on a larger scale, and I likewise have observed them carefully in their natural state, whether emerging from a raw and naked surface, or crowded together in a green sole, or in the thick sward of a meadow.

I have also paid the same attention to the four concluding grasses, which I venture to condemn, feeling it necessary to be sure of my ground before I hazarded an opinion different from that of so many writers on the subject.

I do not presume to say that I have enumerated *all* the grasses worthy of cultivation; but merely those with which I have been able to make myself acquainted.

Who can tell what Nature may have yet in store for us, even in our own country? or what discoveries a watchful attention to the subject may make? I myself am vain of having brought into notice a neglected grass of our own, which proves to be of superlative value.

Until further additions shall be made to our stock of grasses, let us endeavour to improve our knowledge of those we have, that we may apply them to use, in such manner as will enable us to derive the greatest advantage from the qualities with which Nature has endowed them.

I have hitherto attempted to trace the natural history and properties of our several grasses taken singly; I shall now

examine them *collectively*, whether mixed by Nature according to her irresistible propensity; or thrown together by Man judging *a priori* what mixture of seed will afford the most valuable produce.

The separate values of our most common indigenious grasses being ascertained, we are enabled to form a pretty good estimate of the value of the *compound* formed by their mixture; for it is not likely that an individual grass will carry into that compound, any qualities which it did not possess in its solitary state.

I shall commence with the mixtures formed by Nature, and examine what are the grasses with which, by her own effort, she generally clothes our surface; or in other words, forms a *sole* upon ground she shortly before had found naked.

Should these obtrusive grasses appear to be of valuable kinds, Man has no occasion to interfere, Nature does his whole business herself; and when he shall have taken from his ground as many crops as he thinks it will bear, he has only to leave it to Nature, and she will restore a verdant and productive surface.

Should, on the other hand, the grasses most ready to obtrude themselves, and outstrip the others in taking possession of our vacant surface, appear to be of inferior quality and scanty produce, when taken individually, the agriculturist, if he be wise, will interfere, and in his turn outstrip these

these paltry intruders, and give an antecedent possession to more esteemed grasses, by carefully sowing their seed.

The grasses that seem most forward to occupy and clothe our surface, I invariably find to be, the *Poa trivialis*, and the *Poa annua*; the *Agrostis stolonifera* (our Fiorin) no doubt points up diminutive shoots before either of them, and already (January 20th.) they are beginning to appear; but this grass is of itself utterly unable to contend for possession without the aid of Man, or some process like irrigation, injurious to its competitors; without these it barely preserves its existence.

The *Anthoxanthum* appears to come next, then the *Cynosurus cristatus*, the *Lolium perenne* (Rye Grass) seems the most obtrusive of our valuable grasses, and appears in abundance; but even when we attempt to give *Rye Grass* exclusive possession, by sowing its seed, it forms a very poor sole, while the *Holcus lanatus* and *Dactylis glomerata* rising in strong solitary tufts rather disturb than improve the sole.

Thus we find that the four grasses most likely to obtrude themselves, are the very four which I have assigned my reasons for condemning; yet notwithstanding their want of value, and the *certainty* that we shall have them, whether we sow them or not; some, or most of them are found in every mixture I meet with recommended to farmers in agricultural books.

The agriculturist must now determine for himself, whether he will lay down his ground with *one* favourite grass exclusively;

clusively; or in imitation of Nature he will mix *several varieties*.

Should meadow be his primary object, there can be little doubt it is better for him to limit himself to *one* species, because there is a certain period in the growth of every grass (its state of inflorescence) at which it attains its highest perfection, and of course should be mowed at that time; but if we mix seed, as the season of this *Acme* varies much in the different grasses, we must mow when some of them have not attained, and others are past their most valuable state.

Yet I am confident that by a careful attention to these periods, and an accurate knowledge of the natural history of each grass, its excellencies and its defects; a few mixtures may be devised, in which the redundant qualities of one grass might supply the deficiencies of another; so that the *compound* would be more valuable than either separately, by possessing the best properties of each, and at the season of their mutual perfection.

Upon these principles I shall venture to recommend two or three mixtures which I believe have not occurred to any one before.

The first is *Dactylis* with *Lolium perenne* (Rye Grass), the former shews the panicles one day later than the latter, and it comes into flower about four days later; the periods are thus sufficiently near, and the earliest is that which can afford to stand longest.

The

The immense sward of the *Dactylis* abounding with leaf, and rather soft stalks, must be corrected and improved by the wiry stalks of the Rye Grass, superior in quality, but very deficient in quantity; a meadow from this mixture should be mowed (*communibus annis*) about June 14th.

A great benefit from this mixture would be found in the after-grass, the strong powers of regeneration possessed by the *Dactylis*, would abundantly compensate for the languid after-growth of the *Rye Grass*.

The next mixture I suggest—*Rye Grass* with *Alopecurus pratensis*—is founded nearly on the same principles, the *Foxtail* flowers eleven days before the *Rye Grass*; but its stalks bear so small a proportion to its leafy sward, that there will be little loss in keeping it waiting until the other comes to full perfection, and the extreme softness of the leafy produce of the *Foxtail*, will be better corrected by suffering the *Rye Grass* stalks to become harder; I therefore would not mow this meadow until June 21st.

The same reasons hold as in the former case, with respect to after-grass; I can devise no other mode of making the soft, though luxuriant, sward of my quondam favourite *Foxtail* into hay that would be fit for use.

In the next mixture that occurs to me, *Rye Grass* with *Festuca pratensis*, the periods of inflorescence differ still more, the *Festuca* being about 16 days later than the other; but the coarseness of this grass making it necessary to cut it as soon as the flower appears, and as it is then, of course, rather  
soft,

soft, I conceive the hay would be improved by letting the stalks of the Rye Grass acquire somewhat more hardness than in either of the former cases ; the arguments from after-grass the same as before.

I am sorry to say, that in recommending these mixtures, I am speculating *a priori*; I twice tried them in experiment, and each time failed ; first the Rye Grass seed happened to be bad, and did not come up again ; I was overpowered by a mixture of *Bromus mollis*, which somehow obtruded itself, and disabled me from forming any judgment on the success of the experiment.

I must also speculate *a priori* on another very important subject ; the selection of the grasses best adapted to *grazing farms*, should the agriculturist, when laying down his ground, look forward to pasture as his primary object.

Here, too, as well as in his meadows, he will find the advantage of anticipating Nature, and pre-occupying his grounds with the grasses most likely to answer his purpose.

In the selection of these he cannot be long in doubt, which to prepare ; *earliness*, *luxuriance*, and quick powers of *regeneration* when cut, or eaten down ; being the chief qualities he requires.

Now in each of these *separately*, the *Dactylis* and *Alopecurus* excel all other grasses ; and I am confident a mixture of the two would succeed well, as the delicate blade of the *Foxtail* would correct the coarseness of the *Cocksfoot*.

The



The *Festuca pratensis* seems to come next in value; this grass, no doubt, fails in earliness, but some amends is made by the excellence of its winter sward, which exhibits a freshness and verdure, superior to either of the others, and bears the severity of weather much better.

These three grasses also possess an advantage of great importance, where grounds are not likely to be broken up for a long time; they seem better able to contend for the possession, and actually hold it longer, than any others I am acquainted with.



ON  
BILIOUS CHOLIC  
AND  
CONVULSIONS IN EARLY INFANCY.

BY  
JOSEPH CLARKE, M. D.

HONORARY FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS, DUBLIN,  
AND M. R. I. A.

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*Read on May, 1st, 1809.*

THE frequency and fatal tendency of Cholick and Convulsions, during the first three or four months of infancy, have long made them objects of my most serious attention.

After many years deliberation I have been led step by step, and not without many apprehensions, to adopt a practice in these diseases not generally recommended by writers, and which appears to me to have saved many lives. What I have to propose differs so widely from the treatment heretofore pursued, that I doubt whether I should have had courage to submit my observations to public notice, had not the admirable work of Doctor James Hamilton, on the utility

and administration of purgative medicines, made its appearance. This author has illustrated in a masterly manner, the effects of torpor in the bowels in St. Vitus's dance, and several other diseases hitherto deemed nervous, and has proved the necessity and propriety of such unusual quantities of purgative medicine, that what I have to propose must appear the less marvellous.

The bowel complaints of infants, previous to dentition, have been described in medical works, under the various appellations of "inward fits," costiveness and wind, gripes and green stools. To this catalogue, I am disposed to add in gradation, Bilious Cholic and Convulsions. All these appear to me stages of the same disease, and to be more or less connected with the free or restrained discharges of the bowels.

Infants, whose bowels discharge *copiously* four, five or six times in twenty-four hours, in general sleep a great deal, and appear perfectly at ease, provided they are well supplied with suck. With evacuations much under what I have stated, and especially if not *copious*, a variety of uneasiness will shew itself, which, if neglected, will sooner or later terminate in a smart attack of Cholic, and this again, if not speedily alleviated, in Convulsions.

It is not a little singular that infants, subsisting on food which yields but little solid contents, compared with the food of adults, should require such large and frequent alvine discharges to keep them in health.

I have

I have on a former occasion \* expressed an opinion, that a large proportion of these discharges is bilious, and I have now to add, after sixteen years close attention to the subject, that in Cholick and Convulsions, nothing but a brisk expulsion of the contents of the bowels is likely to afford permanent relief. To effect such expulsion is frequently a task of the utmost difficulty, and requires remedies of the most powerful nature.

When an infant is seized with violent screamings, and refuses to suck, drawing its lower extremities occasionally towards the abdomen, the existence of Cholick may be safely inferred. On enquiry the infant may be reported to have had frequent stools, but on *inspection* they will generally be found scanty, often green.

A dose or two of Castor Oil, or a common purgative Enema, will often remove slight attacks of this nature. It is in general after the failure of such measures, that a Physician's advice is required. My practice of late, in urgent cases, is to order twelve grains of Calomel to be rubbed with an equal quantity of refined sugar, and divided into twelve parts. One to be given immediately in a little of the nurse's suck, and in an hour after, a tea spoonful of Castor Oil. And alternately Calomel and Castor Oil are directed to be repeated every hour until the bowels are freely purged and the infant obtains relief. I have frequently found that before

\* See Transactions of Royal Irish Academy, Vol. vi. p. 3.

before my visit, on the succeeding day, ten or twelve doses of each have been given, and retained in the stomach. The general effect is many motions, but on inspection not more than one or two copious. The relief from pain is often considerable, the Convulsions have ceased and the infant resumed its former habit of sucking. I then direct the powder and oil to be repeated every third or fourth hour, more or less frequently, according to the degree of ease the infant appears to have obtained, and the freedom of its discharges.

On my third visit the bowels have generally discharged a prodigious quantity of green, and apparently *acrid* bile, and hence I have denominated the Cholic *bilious*. In the course of recovery, the quantity of evacuation seldom fails to astonish the attendants, who cannot well comprehend whence it can all be derived. The relief obtained is uniformly proportioned to the quantity discharged.

After the third day a Calomel Powder is given, perhaps night and morning, until the fourth or fifth, and Castor Oil now and then, when the infant is uneasy. Where the frequent repetition of Oil nauseates the stomach, or where it produces, at the end of twenty-four hours, very little effect, I substitute a desert spoonful of infusion of Senna sweetened, and warmed with fifteen or twenty drops of Tincture of Jalap.

I have lately kept up the purging plan somewhat longer than heretofore, from having seen an infant of six weeks old relapse into convulsions after continuing two days apparently

rently in perfect health. During the relapse, nothing would pass through the bowels, and it died in great agony. On inspecting the abdominal viscera, the day after its death, the whole alimentary canal was found empty; nothing like obstruction any where, but considerable marks of superficial inflammation, more especially on the small intestines.

Although energetic measures, such as I have described, will usually succeed in affording relief at the end of forty-eight or sixty hours; yet I was once under the necessity of continuing the administration of purgatives for an entire week. For seven days and seven nights, an infant, of six weeks old, had, on an average, a convulsive fit every hour. These began on the eighth day after inoculation for Cow-pock. For some days it was difficult to persuade the parents that the convulsions were not produced by the inoculation. In proportion, however, as I found the bowels to resist the operation of Physic, in the same degree, was I convinced that they were the seat of disease. Notwithstanding all the exertions that I, and a respectable practitioner in consultation, could make by alternating Calomel with fluid physic of various kinds, we obtained but scanty evacuations during the week. At length the bowels yielded freely, and in the course of the second week, amply repaid the deficiencies of the first. At the end of two years, I had the satisfaction of learning from this infant's father, that it then enjoyed perfect health. Warm bathing, fomentations to the abdomen and purgative injections into the rectum were employed in this case, as in  
all

all bad cases of the kind ; but I never fail to inculcate, that these are temporizing measures, intended merely to alleviate pain, and gain time for the operation of physic, which alone deserves our confidence. The cow-pock in this case observed a slow, but regular course.

Sympathy for the afflicted, has, on more occasions than one, induced me to consent to a trial of Dalby's carminative, which is a warm opiate, and a favourite medicine with many, in all bowel complaints. Both from theory and practice, I am convinced, it is a bad remedy in such cases. After very profuse evacuations from the bowels, it will sometimes produce comfortable effects, by allaying tenesmus, expelling flatulence, &c. &c.

Bilious Cholic appears to me to be more prevalent in the Summer months, and during one season than another. I certainly met more bad cases in the Summer of 1804, than ever occurred to me in one year, and I was so fortunate as not to lose one.

I consider the disease dangerous in proportion to the torpor of the bowels, and consequent difficulty of forcing a passage through them. My anxiety and exertions uniformly increase as this difficulty appears greater, and it affords me sincere satisfaction to be able to state, that a great majority of such cases terminate favourably.

In the last case of convulsions which occurred, the infant was twelve days old. It had been uneasy from its birth, and had taken Castor Oil frequently. It awoke from sleep in  
violent



violent convulsions, and immediate dissolution was so strongly threatened, that the nearest practitioner was sent for, from fear that it might not live until my arrival.

From three o'clock in the afternoon of one day, until noon next day, this infant took ten doses of Calomel, each containing a grain and a half, and an equal number of tea spoonfuls of Castor Oil, with decided relief. In the course of the ensuing three days, nearly as much more purgative medicine was given. So that in four days it consumed half a drachm of Calomel, and between three and four ounces of Castor Oil. It is now well, and continues to be nursed by its mother.

I am aware that prejudices have existed against the practice recommended, and may possibly still exist. To infants in health, I make no doubt, such doses of physic would do much mischief; but where torpid bowels cannot be roused into action, and irritating matter expelled by gentle means, what alternative has the most rational Physician? can he stand by and see his patient sink under painful and terrific disease, because a prejudice exists against the exhibition of strong physic in infancy? Every practitioner who has been in the habit of employing mixtures of Rhubarb and Magnesia, solutions of Manna in Fennel Water, Egg-shells, Musk, Volatile Alkali, Opium and Blisters, the remedies formerly in use, can be at no loss to form an opinion of the proportion of convulsive cases in early infancy, which recovered under such treatment.

In the beginning of my practice, and so long as I pursued the beaten track, recovery from convulsions in early infancy was a rare occurrence.

Now the case is happily reversed, and death is a rare occurrence.

*Ruiland-square* }  
*May 1st. 1809.* }

# ESSAYS

ON

## POWERS AND THEIR DIFFERENCES.

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READ, NOVEMBER 6, 1809.

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### THE FIRST ALGEBRAICAL ESSAY.

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### THE BINOMIAL THEOREM.

#### INTRODUCTION.

**BY** the Binomial Theorem, we obtain a simple and general formula, which represents either the result of a constant multiplication of a Binomial quantity by itself, or some Root of such product, or the reciprocal of either of these. All the cases are concisely expressed by the exponential notation. In the first case the exponent or Index is an affirmative whole number, in the second case the exponent is an affirmative Fraction, and in the last case, in which the Theorem represents a Quotient, the exponent is either a negative Fraction, or a negative Integer. In the first of these, the series is often called a power as opposed to a Root, although "a power" is a general

term now used to represent all the cases I have mentioned. The Binomial Theorem extends to all of them with that generality which could never be attained by going through the arithmetical operations denoted by the Indices or Exponents.

Thus if  $\frac{m}{r} = \frac{+n}{r}$ , then,  $\sqrt[r]{p+x \times p+x \times p+x \times \&c. .}$  to  $n$  terms

or  $\sqrt[r]{p+x}^{\frac{n}{r}}$  and  $\sqrt[r]{p+x \times p+x \times p+x \times \&c.}$  to  $n$  terms or  $\sqrt[r]{p+x}^{-\frac{n}{r}}$  will be represented by the following General Theorem ;

$\sqrt[r]{p+x}^{\frac{m}{r}} = p^{\frac{m}{r}} + \frac{m}{r} x p^{\frac{m}{r}-1} + \frac{m(m-1)}{1 \cdot 2} x^2 p^{\frac{m}{r}-2} + \&c.$  a Demonstration of this

Theorem, which is the subject of the following Essay, was the result, a few years ago, of pursuing the excellent mathematical course, which is delivered by the Rev. Dr. Magee, in the University of Dublin.

Although Sir Isaac Newton discovered, so early as the year 1669, this Theorem for the extraction of Roots of powers by the method of Infinite Series, yet it does not appear that he had ever discovered a proof of the truth of the Theorem, and notwithstanding the Fluxional Demonstrations which later mathematicians had given, it was long observed, that an algebraical rule might more justly be proved by the principles of algebra. Of the above series particular cases only, have, as yet, been algebraically demonstrated, and the other cases have been usually inferred by Induction. Sir Isaac Newton first considered Roots as powers. In all cases he represented the

the Index in a Fractional Form, and where the Index was really a Fraction, he applied with success the same form which already had served when the power had an Integral exponent. That this Induction however is not a legitimate proof, will appear from distinguishing the particular cases which are comprehended under this general mode of notation.

When the Index of a power of a Binomial is an affirmative whole number, that power is produced by repeatedly multiplying the Binomial quantity by itself so often as shall make the number of multiplications to be less by one than are the units in the Index of the power: and it follows from the arrangements of common multiplication, that the power of a Binomial quantity whose Index is the whole number  $m$ , as  $\overline{1+x}^m$  will have the following Form, viz.  $1+mx+Cx^2+Dx^3+Ex^4+\&c.$   
 $+Zx^m$ . The Index of such a power, as well as every other quantity in numbers, can be represented after the manner of a Fraction as  $m=\frac{rm}{r}$ . But, if the Index is really a Fraction, the power cannot have arisen as above from a continued multiplication of the Binomial quantity by itself, since a multiplication can no more be repeated a Fractional than a negative number of times. The analogy, therefore, which is founded on the consideration of  $\overline{1+x}^{\frac{m}{r}}$  under the above notion of powers, will be insufficient to determine even the Form of a

power of a Binomial quantity in the case of a Fractional or a negative Index; and until we shall have by some means

discovered the law of the series which is equal to  $\sqrt[m]{1+x}$ , we shall call it the  $r^{\text{th}}$  Root of the  $m^{\text{th}}$  power of  $\sqrt{1+x}$ , instead of

calling it the  $\frac{m}{r}$  power of  $\sqrt{1+x}$ , or a power of  $1+x$  whose Index is the Fraction  $\frac{m}{r}$ . And even considering the quantity

$\sqrt[m]{1+x}$  in this point of view as the  $r^{\text{th}}$  root of  $\sqrt[m]{1+x}$ , it has been usual to assume an infinite series of the above Form,

$1 + \frac{m}{r}x + cx + dx + \&c. = \sqrt[m]{1+x}$ ; but it should first be made to appear why no Fractional Index shall be found in the series,

or why in the  $r^{\text{th}}$  power of the infinite series, the powers of  $x$  which are higher than  $m$  will break off. In deducing the law of the indices of the powers of  $x$ , I shall not attempt to

express a finite quantity  $\sqrt[m]{1+x}$  by a series having an infinite number of terms, which attempt must appear to be impossible, nor in truth shall I assume a polynomial expression for

any part of the quantity  $\sqrt[m]{1+x}$ , until I shall prove that such expression will have arisen from a previous extraction of Roots.

As to the Coefficients of  $x$ , it will be sufficient to shew from the extraction of Roots that the Coefficient of the second term

term is  $\frac{m}{r}$ , since the remaining Coefficients can from hence be discovered by algebraical operations more simple than the extraction of Roots. The Coefficient of the second Term, and the Indices of the Terms, will be the subject of the following Chapter; and I shall reserve for the Second Chapter, the Law of the remaining Coefficients.

CHAP.

## CHAP. I.

*Of the Law of the Indices of the Terms in the Binomial Theorem.*

IF  $r$  is any affirmative whole Number, the following will be a General Rule for extracting the  $r^{\text{th}}$  Root of  $\sqrt[r]{1+x^m}$  or of  $1+mx+Cx^2+Dx^3+Ex^4+\&c.+Zx^m$ .

Subduct the  $r^{\text{th}}$  power of the first member of the Root (which first member of the Root we know to be an unit) from the given power, divide the remainder by  $r$  times the  $r-1^{\text{th}}$  power of the first member, the first term of the quotient is the second member of the Root.

Subduct from the given power the  $r^{\text{th}}$  power of the Binomial found, conceived as the first member of the Root, and divide the remainder by  $r$  times the  $r-1^{\text{th}}$  power of the Binomial found, the first term of the quotient is the third member of the Root.

Subduct from the given power the  $r^{\text{th}}$  power of the Trinomial found, conceiving the Trinome found to be the first member



member of the Root, divide the remainder as before, then conceive the first, second, third, and fourth members found, to be a Quadrinomial, &c.

This Rule follows from the nature of Involution, for, if you subduct the  $r$  power of the first member of the Root from the  $r$  power of a Binomial; the remainder will be  $r$  times the  $r-1$  power of the first member of the Root multiplied simply by the second member, + plus certain multiples of powers of the first member, having a lower number than  $r-1$  for their Index, and having certain powers of the second member for their Cofactors.

Although this method of extracting Roots supposes that from the power of  $1+x$  whose Index is the Integer  $m$ , there are successively taken the powers of Polynomials having the integer  $r$  for the Index of the powers, yet to demonstrate the law of the Indices of the terms in the Root, it will not be necessary to suppose the actual Coefficients of integral powers of polynomials to be determined, but merely the relation of indeterminate Coefficients to be known, which will appear from the following Law.

If to a multinomial of  $n$  terms, or to  $1 + bx + cx^2 + dx^3 + \&c. + sx^{n-1}$ , there be added a term containing the next higher dimension of  $x$  as  $tx$ , then the  $n+1$  term of the  $r$  power of the new multinomial exceeds the  $n+1$  term of the  $r$  power of the multinomial of  $n$  terms, by  $r$  times the member added, and the  $n$  first

first terms in both the powers are the same. For  $n$  being the Index of the term added, it will enter no term of the  $r$  power before the  $n+1$ , and there it is multiplied (from the nature of Involution) by the product of  $r$  multiplied by the  $r-1$  power of the first member of the Root, or by the product of  $r$  into unity.

EXAMPLE.

$$\begin{aligned}
 & \overline{\overline{1+bx+cx^2+\&c.+sx^{n-1}+tx^n}}^r = \\
 \left\{ \begin{aligned}
 & \overline{1+bx+\&c.+sx^{n-1}}^r = 1+Bx+Cx^2+\&c.+Sx^{n-1}+Tx^n+\&c. \\
 & +r \times tx \times \overline{1+bx+\&c.+sx^{n-1}}^{r-1} = \quad \quad \quad +rtx+\&c. \\
 & +\&c. = \quad \quad \quad +\&c.
 \end{aligned} \right. \\
 & = \overline{1+Bx+Cx^2+\&c.+Sx+(T+rt)x+\&c.}
 \end{aligned}$$

PROP. In the  $r$  Root of the  $m$  power of the quantity  $\overline{1+x}$ , that is in  $\overline{1+x}^{\frac{m}{r}}$ , there will be found no Fractional powers of the second member of the Binomial quantity, and the Indices of the powers of  $x$  in the successive terms will be the series of natural numbers.

Where

Where the Index of the power of a Binomial is a positive integer, this Law will appear from the arrangements of common multiplication: That the Law is the same where the Index is an affirmative or negative Fraction, will follow from the rule which I have given for extracting the  $r^{\text{th}}$  Root of the  $m^{\text{th}}$  power of a Binomial, viz. by shewing that if from  $1+x$  or from  $1+mx+Cx^2+Dx^3+Ex^4+\&c.+Zx^m$  you subduct 1, in the remainder, the simple dimension of  $x$  is the lowest, and the second member of the Root is  $\frac{m}{r}x$ . That by subducting  $1+\frac{m}{r}x$  from the given power, in the remainder the second dimension of  $x$  is the lowest and the next member of the Root is of two dimensions. That by subducting  $(1+\frac{m}{r}x)+cx^2$  in the remainder all the dimensions before the third will be destroyed, and the new term is of three dimensions. That by subducting  $(1+\frac{m}{r}x+cx^2)+dx^3$  from the given power, in the remainder all the dimensions below the fourth will be destroyed and so on, ad libitum. This will now be shewn by demonstrating that such Coefficients in the Subtrahends are equal to the corresponding Coefficients in the given power, since  $r$  times the member added to the polynomial, is their common excess above equals.

DEMONSTRATION. The first member of the power being Unit, the Subduction of 1 and the division of the first term of the remainder by  $r$  gives  $\frac{m}{r}x$  for the second member of the Root; by subducting again the  $r$  power of the Binomial quantity  $1 + \frac{m}{r}x$  from the given power, the two first terms of the power are destroyed, for by the above method of extraction of Roots, the second member of the Binomial was derived by dividing the second member of the series by  $r$ , and this is again multiplied by  $r$  in the second member of the  $r$  power of the Binomial found, therefore the first and second terms of the  $r$  power of the Binomial found being subducted respectively from the first and second terms of the given series, the first dimension of  $x$  will not appear in the remainder, and therefore the next term is of two dimensions. The two first terms of the  $r$  power of the Trinomial are the same as those of that of the Binomial found. But from the above nature of Involution, the third term of the  $r$  power of the Trinomial is greater than the third term of the  $r$  power of the Binomial by an excess which is the third term of the Root multiplied by  $r$ , and from the above nature of extraction of Roots, the third term of the given series is also greater than the third term of the  $r$  power of the Binomial found, by an excess which is also the third term of the

Root

Root multiplied by  $r$ . Therefore the third term of the  $r$ <sup>th</sup> power of the Trinomial and the third term of the given series have the same excess above the third term of the  $r$ <sup>th</sup> power of the Binomial, and therefore are equal. Therefore after the subduction, the three first terms will be exterminated, and the next member is of three dimensions.

EXAMPLES.†

Given power is  $1 + x^m = 1 + mx + Cx^2 + Dx^3 + \&c.$

Subduct  $1$

---

\*  $mx + \&c.$   
 $r)mx(\frac{m}{r}x$

Given power is  $1 + mx + Cx^2 + Dx^3 + \&c.$

Subduct  $1 + \frac{m}{r}x = 1 + mx + cx + \&c.$

---

\* \*  $rcx^2 + \&c.$   
 $r)rcx^2(cx^2$

Given power is  $1 + mx + Cx^2 + Dx^3 + \&c.$

Subduct  $(1 + \frac{m}{r}x) + cx^2 = 1 + mx + (c + rc)x^2 + dx^3 + \&c.$

---

\* \* \*  $rdx^3 + \&c.$   
 $r)rdx^3(dx^3$

U 2

In

† N. B. In this and in the subsequent Example, the small Roman letters,  $c$ ,  $d$ , &c.  $t$ ,  $v$ , &c. which are used in the Subtrahends, are to be distinguished from the small Italics,  $c$ ,  $d$ , &c.  $t$ ,  $v$ , &c. which are substituted in the Remainders.

DEMONSTRATION. The first member of the power being Unit, the Subduction of 1 and the division of the first term of the remainder by  $r$  gives  $\frac{m}{r}x$  for the second member of the Root; by subducting again the  $r$  power of the Binomial quantity  $1 + \frac{m}{r}x$  from the given power, the two first terms of the power are destroyed, for by the above method of extraction of Roots, the second member of the Binomial was derived by dividing the second member of the series by  $r$ , and this is again multiplied by  $r$  in the second member of the  $r$  power of the Binomial found, therefore the first and second terms of the  $r$  power of the Binomial found being subducted respectively from the first and second terms of the given series, the first dimension of  $x$  will not appear in the remainder, and therefore the next term is of two dimensions. The two first terms of the  $r$  power of the Trinomial are the same as those of that of the Binomial found. But from the above nature of Involution, the third term of the  $r$  power of the Trinomial is greater than the third term of the  $r$  power of the Binomial by an excess which is the third term of the Root multiplied by  $r$ , and from the above nature of extraction of Roots, the third term of the given series is also greater than the third term of the  $r$  power of the Binomial found, by an excess which is also the third term of the Root

Root multiplied by  $r$ . Therefore the third term of the  $r$ <sup>th</sup> power of the Trinomial and the third term of the given series have the same excess above the third term of the  $r$ <sup>th</sup> power of the Binomial, and therefore are equal. Therefore after the subduction, the three first terms will be exterminated, and the next member is of three dimensions.

## EXAMPLES. †

$$\text{Given power is } 1 + x^m = 1 + mx + Cx^2 + Dx^3 + \&c.$$

$$\text{Subduct } 1$$

$$* \quad mx + \&c.$$

$$r)mx(\frac{m}{r}x$$

$$\text{Given power is } 1 + mx + Cx^2 + Dx^3 + \&c.$$

$$\text{Subduct } 1 + \frac{m}{r}x = 1 + mx + cx + \&c.$$

$$* \quad * \quad rcx^2 + \&c.$$

$$r)rcx^2(cx^2$$

$$\text{Given power is } 1 + mx + Cx^2 + Dx^3 + \&c.$$

$$\text{Subduct } (1 + \frac{m}{r}x) + cx^2 = 1 + mx + (c + rc)x^2 + dx^3 + \&c.$$

$$* \quad * \quad * \quad rdx^3 + \&c.$$

$$r)rdx^3(dx^3$$

v 2

In

† N. B. In this and in the subsequent Example, the small Roman letters,  $c$ ,  $d$ , &c.  $t$ ,  $v$ , &c. which are used in the Subtrahends, are to be distinguished from the small Italics,  $c$ ,  $d$ , &c.  $t$ ,  $v$ , &c. which are substituted in the Remainders.

In general if the  $n$  first terms of the  $r$  power of a multinomial of  $n$  terms derived in this way be equal to the  $n$  first terms of the given series (as has been proved to the Case of the Trinomial), and the excess of the  $n+1$  term of the given series above the  $n+1$  term of the said  $r$  power of the multinomial of  $n$  terms, be made according to the above method of Extraction to be equal to  $r$  times the new member of the Root, (this new member to be added to the former multinomial). Then, in subducting from the given power the  $r$  power of the new multinomial, the  $n$  first terms are the same as before, and the  $n+1$  term of the  $r$  power of the new multinomial will be equal to the  $n+1$  term of the series. For both of those terms exceed the  $n+1$  term of the  $r$  power of the former multinomial by  $r$  times the term added. Hence, in the remainder the  $n+1$  first terms will be destroyed, and the Index of  $x$  will be higher by an Unit in the new member of the Root than in the preceding member, and therefore  $x^{n+1}$  will be the  $n+2$  term if  $x^n$  be the  $n+1$  term of the Root (as we have supposed) which will appear by the following General Example, viz.

GENERAL



GENERAL EXAMPLES

$$\begin{aligned} \text{Given power } \frac{1+x}{r} &= 1 + mx + Cx^2 + \&c. + Sx^{n-1} + Tx^n + \&c. \\ \frac{1 + \frac{m}{r}x + \&c. + sx^{n-1}}{r} &= 1 + mx + Cx^2 + \&c. + Sx^{n-1} + tx^n + \&c. \\ \text{Remainder} &= * * * * * (T-t)x^n + \&c. \\ & \qquad \qquad \qquad (T-t)x = rtx \end{aligned}$$

$$\begin{aligned} \text{Given power } \frac{1+x}{r} &= 1 + mx + \&c. + Sx^{n-1} + Tx^n + Vx^{n+1} + \&c. \\ \frac{1 + \frac{m}{r}x + \&c. + sx^{n-1} + tx^n}{r} &= 1 + mx + \&c. + Sx^{n-1} + (t+rt)x^n + vx^{n+1} + \&c. \\ \text{Remainder} &= * * * * * (T-t+rt)x^n + (V-v)x^{n+1} + \&c. \\ & \qquad \qquad \qquad (V-v)x = rvx \end{aligned}$$

In the former of these Remainders  $T-t=rt$ , and hence in the latter Remainder  $T=t+rt \therefore T-t+rt=0$ , Therefore the Coefficient of every power of  $x$  whose Index is not greater than  $n$  will be destroyed, and the lowest Index in the latter Remainder is  $n+1$ , therefore the Law  $x^0, x^1, x^2, x^3, \&c. x^n, x^{n+1}$  will be the General Law of the several terms of the Root.

To

To elucidate this Example, by applying it to the Extraction of Roots of numbers, we shall extract the square root of 1.331, or of the cube of 1.1, where  $x = \frac{1}{10}$  and 1.331 is arranged according to the Indices of powers in the Decimal series, and may thus be otherwise expressed  $1 + \frac{3}{10} + \frac{3}{100} + \frac{1}{1000}$ . Now  $m$  being = 3, and  $r = 2$ , we shall apply the foregoing Example as follows :

$$\begin{array}{r}
 \text{Given Power } (1 + \frac{1}{10})^3 = 1 + \frac{3}{10} + \frac{3}{100} + \frac{1}{1000} \\
 \underline{1} \\
 \text{Remainder} \quad * \quad \frac{3}{10} + \&c. \\
 \quad \quad \quad 2) \frac{3}{10} (\frac{3}{2} \times \frac{1}{10}
 \end{array}$$

$$\begin{array}{r}
 \text{Given Power } \sqrt[3]{1 + \frac{1}{10}} = 1 + 3 \times \frac{1}{10} + 3 \times \frac{1}{100} + \frac{1}{1000} \\
 \underline{1 + \frac{3}{2} \times \frac{1}{10}} \\
 \text{Remainder} \quad * \quad * \quad \frac{3}{4} \times \frac{1}{100} + \&c. \\
 \quad \quad \quad 2) \frac{3}{4} \times \frac{1}{100} (\frac{3}{8} \times \frac{1}{100}
 \end{array}$$

$$\begin{array}{r}
 \text{Given Power } \sqrt[3]{1 + \frac{1}{10}} = 1 + 3 \times \frac{1}{10} + 3 \times \frac{1}{100} + \frac{1}{1000} \\
 \underline{1 + \frac{3}{2} \times \frac{1}{10} + \frac{3}{8} \times \frac{1}{100}} \\
 \text{Remainder} \quad * \quad * \quad * \quad \frac{1}{8} \times \frac{1}{1000} + \&c. \\
 \quad \quad \quad 2) \frac{1}{8} \times \frac{1}{1000} (\frac{1}{16} \times \frac{1}{1000}
 \end{array}$$

Hence  $\sqrt[3]{1 + \frac{1}{10}} = 1 + \frac{3}{2} \times \frac{1}{10} + \frac{3}{8} \times \frac{1}{100} - \frac{1}{16} \times \frac{1}{1000}$ , &c. and putting for  $\frac{3}{2} \times \frac{1}{10}$ ,  $\frac{3}{8} \times \frac{1}{100}$ ,  $-\frac{1}{16} \times \frac{1}{1000}$ , &c. the Decimals, 0.15, 0.00375,

-0.0000625, &c. we have  $\sqrt[3]{1 + \frac{1}{10}} = 1.1536$  &c. and this is the result which

which would be derived by extracting the Square Root of 1.331 by the known method which depends upon trial.

In like manner, we extract the Cube Root of  $1 + \frac{4}{1000}$  or of 1.4641, which may be otherwise expressed  $1 + \frac{4}{10} + \frac{6}{100} + \frac{4}{1000} + \frac{1}{10000}$ , viz.

Given Power is  $1 + \frac{4}{10} + \frac{6}{100} + \frac{4}{1000} + \frac{1}{10000}$

$$\begin{array}{l} 1 \qquad \qquad \qquad = 1 \\ \text{Remainder} = \frac{4 \times \frac{1}{10} + \&c.}{3) 4 \times \frac{1}{10} (\frac{4}{3} \times \frac{1}{10}} \end{array}$$

Given Power is  $1 + 4 \times \frac{1}{10} + 6 \times \frac{1}{100} + 4 \times \frac{1}{1000} + \frac{1}{10000}$

$$\frac{1 + \frac{4}{3} \times \frac{1}{10}}{3} = \frac{1 + 4 \times \frac{1}{10} + \frac{1}{3} \times \frac{6}{100} + \frac{6}{27} \times \frac{4}{1000}}{3}$$

$$\begin{array}{l} \text{Remainder} = \frac{\frac{2}{3} \times \frac{1}{100} + \&c.}{3) \frac{2}{3} \times \frac{1}{100} (\frac{2}{9} \times \frac{1}{100}} \end{array}$$

Given Power is  $1 + 4 \times \frac{1}{10} + 6 \times \frac{1}{100} + 4 \times \frac{1}{1000} + \frac{1}{10000}$

$$\frac{1 + \frac{4}{3} \times \frac{1}{10} + \frac{2}{9} \times \frac{1}{100}}{3} = \frac{1 + 4 \times \frac{1}{10} + 6 \times \frac{1}{100} + \frac{1}{27} \times \frac{4}{1000} + \&c.}{3}$$

$$\begin{array}{l} \text{Remainder} = \frac{\frac{4}{27} \times \frac{1}{1000} + \&c.}{3) \frac{4}{27} \times \frac{1}{1000} (\frac{4}{81} \times \frac{1}{1000}} \end{array}$$

Therefore  $1 + \frac{4}{1000} = 1 + \frac{4}{3} \times \frac{1}{10} + \frac{2}{9} \times \frac{1}{100} + \frac{1}{27} \times \frac{4}{1000} + \&c.$  and substituting for the Fractions the equivalent Decimals, we shall have the above expression = 1.135&c. the same which would result from the usual mode of extracting the Cube Root of a number by trials.

I have applied the general Example to the extraction of the Square and Cube Roots, merely to elucidate the method by which

which I have deduced the Law of the Indices in the algebraical operations, and not for the purpose of giving a general rule for numerical extraction of Roots. For, I have supposed certain arrangements in  $\overline{1+x}^m$  which will not always apply to  $1+\frac{x}{10}$ , since the dispositions by decimal places in numbers, and those of the letters in algebra are usually different. In the latter case the characters or letters are indeterminate, and therefore no powers but those which are homologous are capable of coalescing under the same coefficient. In the Involution and Evolution of numbers, the members are multiples of terms in the decimal series of powers, the Indices of which powers are indeed in arithmetical progression like the Indices of  $x$  in the algebraical formula, but the multiples are denoted by the digits, although, if the algebraical arrangements were followed, they would be denoted by numbers or coefficients, which may themselves contain powers of 10. Hence the powers of the second member of the Root, and the coefficients of those powers, which are kept distinct in the algebraical arrangement, will coalesce into one number in the numerical notation, and the necessary preservation of places and distances will prevent the members of a power of a Binomial number from being arranged according to the Indices of the second member of the Root. Thus  $\overline{1+\frac{x}{10}}^5$  according to the natural places, or the numerical arrangements of the powers in the decimal series, is 1.61051; or  $1 + \frac{5x}{10} + \frac{10x^2}{100} + \frac{10x^3}{1000} + \frac{5x^4}{10000} + \frac{x^5}{100000}$ .

But

But according to the algebraical disposition of the terms,  $\sqrt[5]{1+\frac{x}{10}}$  would be thus expressed  $1+5 \times \frac{x}{10}+10 \times \frac{x^2}{100}+10 \times \frac{x^3}{1000}+5 \times \frac{x^4}{10000}+\frac{x^5}{100000}$ .

The general Example will apply to the latter disposition, but if we use the former arrangement the Extraction of the Square Root will depend upon trial.

COR. I. We have hitherto considered the Indices of  $x$  in

the  $r$  Root of  $\sqrt[r]{1+x}$ , or in  $\sqrt[r]{1+\frac{x}{p}}$ ; but if the Binomial is  $p+x$ , by resolving it into  $p \times (1+\frac{x}{p})$ , the same proof will extend to the Law of the Indices of the second member; and therefore

$$\begin{aligned} \left(1+\frac{x}{p}\right)^{\frac{m}{r}} &= 1+\frac{m}{r}\frac{x}{p}+c\frac{x^2}{p^2}+\&c. \text{ Hence we shall have } \sqrt[r]{p+x}=p \times \left(1+\frac{x}{p}\right)^{\frac{m}{r}} \\ &= p+\frac{m}{r}x p^{\frac{m}{r}-1}+c\frac{m}{r}\frac{m-1}{r}x^2 p^{\frac{m}{r}-2}+\&c. +tx\frac{m}{r}p^{\frac{m}{r}-n}+\&c. = p+\frac{m}{r}xp+c\frac{m}{r}p+\&c. +txp+\&c. \end{aligned}$$

In the last step of this proof I have supposed the equality of  $\frac{p}{p^n}$  and  $p^{\frac{m}{r}-n}$ , which perhaps may require a Demonstration when  $\frac{m}{r}$  is a Fraction. If the Indices of  $p$  in the Dividend and Divisor were Integers, it would follow from notation that the subduction of the Index of the Divisor from that of the Dividend should denote a Division; viz. if  $m$  and  $nr$  be Integers,

we shall have  $\frac{p^m}{p^{nr}}=p^{m-nr}$ ; and hence we shall prove that the subduction of the Index of  $p$  in the Divisor from the Index of  $p$  in the Dividend will effect a Division, although  $p$  should

have a Fractional Index, for since  $\frac{p^m}{p^{nr}} = p^{\frac{m-nr}{r}} \therefore \sqrt[r]{p^m} = \sqrt[r]{p^{\frac{m-nr}{r} + nr}} = \sqrt[r]{p^{\frac{m-nr}{r}}} \sqrt[r]{p^{nr}}$

that is  $\frac{p^{\frac{m}{r}}}{p^n} = p^{\frac{m-nr}{r}} = \text{or} = p^{\frac{m}{r}-n}$ . Thus although we cannot con-

sider the Dividend  $p^{\frac{m}{r}}$ , whose Index is the Fraction  $\frac{m}{r}$ , to have been produced by a number of multiplications as in the case where the Index is an Integer, yet the same Law of Division through the subduction of the Indices is shewn to apply in the one case as well as in the other, by considering the Divi-

dend and Divisor under the form of the  $r$  Roots of powers of  $p$  whose exponents are Integers; we effect this by the known method of reducing the Radicals to the same Denomination which is the necessary step for their Multiplication or Division.

COR. II. From the Cases where  $\frac{m}{r}$  is affirmative, we shall by algebraical Division be able to prove that the Law of the Terms will be the same when the Index of the power is negative. In this case we have the negative power  $\frac{1}{p+x} = p^{-\frac{m}{r}}$

$$\frac{1}{(p+x)^{\frac{m}{r}}} = \frac{1}{p^{\frac{m}{r}} + \frac{m}{r}xp + \frac{m}{r} \frac{m-1}{2} x^2 p^{\frac{m}{r}-2} + \dots} = 1 - \frac{m}{r} \frac{x}{p} + \frac{m}{r} \frac{m-1}{2} \left(\frac{x}{p}\right)^2 - \dots = 1 - \frac{m}{r} \frac{x}{p} + \frac{m}{r} \frac{m-1}{2} \left(\frac{x}{p}\right)^2 - \dots$$

$$p^{-\frac{m}{r}} x p + \left(\frac{m}{r} \frac{m-1}{2} - c\right) x^2 p + \dots$$

COR.

COR. III. We have now deduced the Law of the Indices of the terms from the extraction of Roots, and from hence also the Coefficients of the second and third terms where the Index of the power is a Fraction will be known from the cases of Involution, wherein the Index of the power being an affirmative Integer, the dependence of the Coefficient on the Index is known.

Thus  $rb = m$  therefore  $b = \frac{m}{r}$  and in negative powers  $0 - \frac{m}{r} = -\frac{m}{r}$

Also  $rc = C - c = \frac{m-m}{1.2} - \frac{r-r}{1.2} b^2$  therefore  $c = \frac{m-mr}{1.2.r^2}$

and in negative powers  $\frac{m}{r^2} - c = \frac{2m-m^2+mr}{1.2.r^2} = \frac{m+mr}{1.2.r^2}$

Having now proved that  $\sqrt[p+x]{\frac{m}{r}}$  will be of the same form, whether the Index is affirmative or negative, I shall hereafter, for the sake of convenience, put  $\frac{m}{r}$  instead of  $\pm \frac{m}{r}$ , and then the general Index  $\frac{m}{r}$  will denote any positive or negative Fraction or whole Number.

If  $\frac{m}{r}$  is a surd, we can find rational numbers which will approach it as near we please, and although we cannot con-

clude from the rules which I have given that  $\sqrt[p+x]{\frac{m}{r}}$  will be of the above form, when  $\frac{m}{r}$  is a surd, since no such arithmetical process as Involution, Evolution, or Division, can in that case be understood, yet the above forms will apply to the powers which have the approximate value of  $\frac{m}{r}$  for an Index.

## CHAP. II.

*Of the Co-efficients of the Terms in the Binomial Theorem.*

FROM the following proposition two corollaries are easily deduced, which La Croix has proved by expanding a complex differential formula, which he has made to depend on the co-efficients of the terms in the Binomial Theorem. (See his Diff. Meth. vol. 3. pag. 7.) But as I shall shew an immediate transition to the unciæ of powers from those corollaries, I shall simply demonstrate them by means of the following independent proposition.

I shall first observe that the terms of an arithmetical series are usually represented as Binomials, whose first members are the constant basis of the progression, and whose second members are the variable multiples of the common difference: but we shall avoid any complex substitutions, if we make the next lesser term of the arithmetical series the first member, and the common difference to be the second member of the Binomial.

PROP. If  $o, p, q, r, s, \&c.$  are the terms of an arithmetical series whose common difference is  $d$ , then will  $p+d, q+d, r+d, s+d, t+d, \&c.$  be respectively equal to the corresponding terms of the series,  $o, p, q, r, s, \&c.$  If we take the differences of the  $\frac{m}{r}$ <sup>th</sup> powers of the Binomials, and the differences of these differences, or the second differences, &c. the



the first members of the  $n$  differences of the  $\frac{m}{r}$  powers of the Binomials, are the  $(\frac{m}{r}-n)$  powers of terms in arithmetical progression, with a constant co-efficient, viz.  $\frac{m}{r}d$ .  $(\frac{m}{r}-1)d$ .  $(\frac{m}{r}-2)d$ . &c.  $(\frac{m}{r}-n+1)d$ . viz.

THE POWERS OF NUMBERS IN ARITHMETICAL PROGRESSION.

$$\begin{aligned} o^{\frac{m}{r}} &= p + d^{\frac{m}{r}} = p^{\frac{m}{r}} + \frac{m}{r}dp^{\frac{m}{r}-1} + Cd^2p^{\frac{m}{r}-2} + \&c. \\ p^{\frac{m}{r}} &= q + d^{\frac{m}{r}} = q^{\frac{m}{r}} + \frac{m}{r}dq^{\frac{m}{r}-1} + Cd^2q^{\frac{m}{r}-2} + \&c. \\ q^{\frac{m}{r}} &= r + d^{\frac{m}{r}} = r^{\frac{m}{r}} + \frac{m}{r}dr^{\frac{m}{r}-1} + Cd^2r^{\frac{m}{r}-2} + \&c. \\ r^{\frac{m}{r}} &= s + d^{\frac{m}{r}} = s^{\frac{m}{r}} + \frac{m}{r}ds^{\frac{m}{r}-1} + Cd^2s^{\frac{m}{r}-2} + \&c. \\ s^{\frac{m}{r}} &= t + d^{\frac{m}{r}} = t^{\frac{m}{r}} + \frac{m}{r}dt^{\frac{m}{r}-1} + Cd^2t^{\frac{m}{r}-2} + \&c. \\ t^{\frac{m}{r}} &= \&c. \end{aligned}$$

FIRST DIFFERENCES.      SECOND DIFFERENCES.

$$\begin{aligned} \frac{m}{r}dp^{\frac{m}{r}-1} + Cd^2p^{\frac{m}{r}-2} + \&c. & \quad \frac{m}{r}d. (\frac{m}{r}-1) d q^{\frac{m}{r}-2} + \&c. \\ \frac{m}{r}dq^{\frac{m}{r}-1} + Cd^2q^{\frac{m}{r}-2} + \&c. & \quad \frac{m}{r}d. (\frac{m}{r}-1) d r^{\frac{m}{r}-2} + \&c. \\ \frac{m}{r}dr^{\frac{m}{r}-1} + Cd^2r^{\frac{m}{r}-2} + \&c. & \quad \frac{m}{r}d. (\frac{m}{r}-1) d s^{\frac{m}{r}-2} + \&c. \\ \frac{m}{r}ds^{\frac{m}{r}-1} + Cd^2s^{\frac{m}{r}-2} + \&c. & \quad \frac{m}{r}d. (\frac{m}{r}-1) d t^{\frac{m}{r}-2} + \&c. \\ \frac{m}{r}dt^{\frac{m}{r}-1} + Cd^2t^{\frac{m}{r}-2} + \&c. & \end{aligned}$$

DEMONSTRATION.

DEMONSTRATION.—The first differences of the  $\frac{m}{r}$ <sup>th</sup> powers of the Binomials are derived by taking away the first members of those powers, for this is to subduct the  $\frac{m}{r}$ <sup>th</sup> powers of the next lesser Binomials. The second differences of the  $\frac{m}{r}$ <sup>th</sup> powers of the Binomials (or the differences of the first differences) will be equal to the sums of the separate differences of the separate members of the first differences, which members being the powers of terms in an arithmetical series, the indices of which powers are  $\frac{m}{r}-1, \frac{m}{r}-2, \frac{m}{r}-3, \&c.$  the first differences of these will be known from the first differences of the  $\frac{m}{r}$ <sup>th</sup> powers: For, if  $p^{\frac{m}{r}} - q^{\frac{m}{r}} = \frac{m}{r}dq^{\frac{m}{r}-1} + Cd^2q^{\frac{m}{r}-2} + \&c.$  then will  $p^{\frac{m}{r}-1} - q^{\frac{m}{r}-1} = (\frac{m}{r}-1)dq^{\frac{m}{r}-2} + Cd^2q^{\frac{m}{r}-3} + \&c.;$  and  $p^{\frac{m}{r}-2} - q^{\frac{m}{r}-2} = (\frac{m}{r}-2)dq^{\frac{m}{r}-3} + Cd^2q^{\frac{m}{r}-4} + \&c.$

But there are wanting none except the highest members of the expressions for the first differences, in order to obtain the highest members of the expressions for the second differences, and none except the highest members of the  $n-1$ <sup>th</sup> differences in order to obtain the highest members of the  $n$ <sup>th</sup> differences, for the differences of the highest members contain higher powers than the differences of the lower members.

Since then, the highest members of the first differences of the  $\frac{m}{r}$ <sup>th</sup> powers are  $\frac{m}{r}d$  multiplied by the powers of numbers

bers in arithmetical progression, whose Index is  $\frac{m}{r}-1$ , and since the highest members of those  $\frac{m}{r}-1$  powers are  $(\frac{m}{r}-1)d$  multiplied by powers whose index is  $\frac{m}{r}-2$ . Therefore the highest members of the second differences will be the common multiplier  $\frac{m}{r}d. (\frac{m}{r}-1)d$  multiplied by powers whose Index is  $\frac{m}{r}-2$ . Again the highest members of the differences of the  $\frac{m}{r}-2$  powers of numbers in arithmetical progression are  $(\frac{m}{r}-2)d$ . multiplied by the powers whose Index is  $(\frac{m}{r}-3)$ . Therefore the highest members of the third differences of the  $\frac{m}{r}$  powers =  $\frac{m}{r}d(\frac{m}{r}-1)d.(\frac{m}{r}-2)d$ . multiplied by the  $\frac{m}{r}-3$  powers of numbers in arithmetical series.

GENERAL EXAMPLE.

The  $n-1$  differences.

$$\frac{m}{r}d. (\frac{m}{r}-1)d \dots \&c. (\frac{m}{r}-n-2) d \frac{m}{r}^{\frac{m}{r}-n-1} + \&c.$$

$$\frac{m}{r}d. (\frac{m}{r}-1)d \dots \&c. (\frac{m}{r}-n-2) d \frac{m}{r}^{\frac{m}{r}-n-1} + \&c.$$

$$\&c.$$

The  $n$  differences or the differences of the  $n-1$  differences.

$$\frac{m}{r}d. (\frac{m}{r}-1) d \dots \&c. (\frac{m}{r}-n-2) d. (\frac{m}{r}-n-1) d \frac{m}{r}^{\frac{m}{r}-n} + \&c.$$

$$\&c.$$

In

In general, if the highest members of the  $n-1$ <sup>th</sup> differences of the  $\frac{m}{r}$ <sup>th</sup> powers of the terms of the arithmetical series of Binomials be (as has been shewn in the first, second, and third differences)  $= \frac{m}{r}d. (\frac{m}{r}-1)d. \&c. (\frac{m}{r}-n-2)d$  multiplied by the powers of numbers in arithmetical progression whose index is  $\frac{m}{r}-n-1$ , then, the highest members of the  $n$ <sup>th</sup> differences will be equal to the common co-efficient multiplied by the highest members of the differences of  $\frac{m}{r}-n-1$ <sup>th</sup> powers of terms in arithmetical series,  $= \frac{m}{r}d. (\frac{m}{r}-1)d. (\frac{m}{r}-2)d. \&c. (\frac{m}{r}-n-2)d. (\frac{m}{r}-n-1)d.$  multiplied by the  $\frac{m}{r}-n$ <sup>th</sup> powers of numbers in arithmetical progression.

Thus in the Examples the quantities

$$\frac{m}{r}dt^{\frac{m}{r}-1},$$

$$\frac{m}{r}d.(\frac{m}{r}-1)dt^{\frac{m}{r}-2},$$

$$\frac{m}{r}d.(\frac{m}{r}-1)d.(\frac{m}{r}-2)dt^{\frac{m}{r}-3},$$

$$\frac{m}{r}d.(\frac{m}{r}-1)d.\&c.(\frac{m}{r}-n-1)dt^{\frac{m}{r}-n}$$

are found in the series of the first members of the first, second, third, and  $n$  orders of differences of the  $\frac{m}{r}$ <sup>th</sup> powers of the terms in the arithmetical series, in which  $t$  is a term, and  $d$  the common difference.

COR.

COR. I. If instead of  $o, p, q, r, \&c.$  the terms of the arithmetical series be supposed  $x+o, x+p, x+q, x+r, \&c.$  then the first members of the  $n$  differences of the  $\frac{m}{r}$  powers will be  $\frac{m}{r}d, (\frac{m}{r}-1)d, (\frac{m}{r}-2)d, \&c. (\frac{m}{r}-n+1)d$  multiplied by the  $\frac{m}{r}-n$  powers of Binomials in the arithmetical progression  $x+o, x+p, x+q, \&c.$  and if the terms in each difference are made to proceed according to the powers of  $x$ , the highest member of each of the  $n$  differences will be constant, and equal to  $\frac{m}{r}d, (\frac{m}{r}-1)d, (\frac{m}{r}-2)d \&c. (\frac{m}{r}-n+1) dx^{\frac{m}{r}-n}$ .

COR. II. The second differences of the Squares, the third differences of the Cubes, and in general the  $n$  differences of the  $n$  powers of numbers in arithmetical progression will be constant and equal to the product of the digits from the Index to unity, multiplied by the  $n$  power of the common difference of the arithmetical series, or  $= 1.2.3. \&c. n \times d^n$ . For, each order of differences being made up of the separate differences of the separate members of the preceding order, and the indices of the members diminished by unit being the highest indices in the differences of those members, when those indices are equal to cypher, the members will be constant in which cypher is the Index of the terms. In each difference

the constant members of the preceding order of differences are destroyed, therefore in the <sup>th</sup>  $n$  differences the first terms alone will remain, and the indices being  $=n-n$  the powers will be equal to unit. Therefore the <sup>th</sup>  $n$  differences of the  $n$  powers are reduced to the constant quantity  $nd.(n-1)d.(n-2)d.&c..3.d.2d.1d=1.2.3.&c..(n-2).(n-1).n \times d^n$ .

Sir Isaac Newton's Binomial Theorem may be deduced from a simple algebraical Equation, derived from those Corollaries and from what has been shewn of the form of  $\overline{x+q}^{\frac{m}{r}}$ , by substituting merely the terms of an arithmetical series for  $q$ , viz.

$$\overline{x+q}^{\frac{m}{r}} = x^{\frac{m}{r}} + bqx^{\frac{m}{r}-1} + cq^2x^{\frac{m}{r}-2} + dq^3x^{\frac{m}{r}-3} + \&c. + tq^n x^{\frac{m}{r}-n} + \&c.$$

$$\overline{x+4}^{\frac{m}{r}} = x^{\frac{m}{r}} + b4.x^{\frac{m}{r}-1} + c.4^2x^{\frac{m}{r}-2} + d.4^3x^{\frac{m}{r}-3} + \&c. + t.4^n x^{\frac{m}{r}-n} + \&c.$$

$$\overline{x+3}^{\frac{m}{r}} = x^{\frac{m}{r}} + b.3x^{\frac{m}{r}-1} + c.3^2x^{\frac{m}{r}-2} + d3^3x^{\frac{m}{r}-3} + \&c. + t.3^n x^{\frac{m}{r}-n} + \&c.$$

$$\overline{x+2}^{\frac{m}{r}} = x^{\frac{m}{r}} + b.2x^{\frac{m}{r}-1} + c.2^2x^{\frac{m}{r}-2} + d.2^3x^{\frac{m}{r}-3} + \&c. + t.2^n x^{\frac{m}{r}-n} + \&c.$$

$$\overline{x+1}^{\frac{m}{r}} = x^{\frac{m}{r}} + b.1.x^{\frac{m}{r}-1} + c.1^2x^{\frac{m}{r}-2} + d.1^3x^{\frac{m}{r}-3} + \&c. + t.1^n x^{\frac{m}{r}-n} + \&c.$$

Here the <sup>th</sup>  $n$  powers of the natural numbers multiplied by  $t$  will be the co-efficients of  $x^{\frac{m}{r}-n}$ , and since the terms which  
contained

contained the first, second, third, &c. to the  $n-1$  powers of the natural numbers will not be found in the  $n$  differences of those series, (the  $n$  differences of powers whose Index is less than  $n$ , being differences of common differences,) therefore the first members in all the  $n$  differences of the  $\frac{m}{r}$  powers of  $x+4, x+3, x+2, \&c.$  will be  $= t$  multiplied by the  $n$  differences of the  $n$  powers of natural numbers  $\times x^{\frac{m}{r}-n}$  or (by Cor. 2.)  $= t \times 1.2.3. \&c. n \times x^{\frac{m}{r}-n}$ . But (by Cor. 1.) those common first members  $= \frac{m}{r} \cdot (\frac{m}{r}-1) \cdot (\frac{m}{r}-2) \cdot \&c. (\frac{m}{r}-n+1) x^{\frac{m}{r}-n}$ . therefore  $t \times 1.2.3. \&c. n \times x^{\frac{m}{r}-n} = \frac{m}{r} \cdot (\frac{m}{r}-1) \cdot (\frac{m}{r}-2) \cdot \&c. (\frac{m}{r}-n+1) \times x^{\frac{m}{r}-n}$ .  $\therefore t = \frac{\frac{m}{r} \cdot (\frac{m}{r}-1) \cdot (\frac{m}{r}-2) \cdot \&c. (\frac{m}{r}-n+1)}{1. 2. 3. \&c. n}$ .

Therefore  $x + q^{\frac{m}{r}} = x^{\frac{m}{r}} + \frac{m}{r} q x^{\frac{m}{r}-1} + \frac{m \cdot (\frac{m}{r}-1)}{1. 2} q^2 x^{\frac{m}{r}-2} + \&c. +$

$\frac{m \cdot (\frac{m}{r}-1) \cdot \&c. (\frac{m}{r}-n+1)}{1. 2. \&c. n} q^n x^{\frac{m}{r}-n} + \&c. \quad \text{Q. E. D.}$

NOTE. In proving the Binomial Theorem above, I have equated the two expressions for the common first members of all the  $n$  differences of the  $\frac{m}{r}$  powers. For, the differences themselves are indetical, being changed only in form without altering

altering the value of  $x$ , and the highest powers of  $x$  being the same in both those expressions, if we divide by those powers, then the common first members are the only members in both which do not contain negative powers of  $x$ , and therefore the common first members in both expressions are identical.

Newton, in his letter of the 13th of June, 1676, to Mr. Oldenburg, the Secretary to the Royal Society of London, has expressed the Binomial Theorem in the following form,

viz.  $\overline{P+PQ}^{\frac{m}{n}} = P^{\frac{m}{n}} + \frac{m}{n}AQ + \frac{m-m}{2n}BQ + \frac{m-2n}{3n}CQ + \frac{m-3n}{4n}DQ + \&c.$   
 where  $P+PQ$  signifies a quantity of which some Root, or some dimension, or some Root of a dimension is to be investigated, also  $P$  denotes the first term of that quantity,  $Q$  the remaining terms divided by the first, and  $\frac{m}{n}$  the numeral Index of the dimension of  $P+PQ$ , whether that dimension be a whole or a broken quantity, affirmative or negative, and  $A, B, C, D, \&c.$  are used for the terms found in the progress of the operation, that is  $A$  for the first term  $P^{\frac{m}{n}}$ , and  $B$  for the second term  $\frac{m}{n}AQ$ , &c. See Commercuim Epistolicum, No. XLVIII.

In the 45th Proposition of the First Book of the Principia, Newton gives the same Theorem in the following Terms, viz.  $\overline{T-X}^n = T^n - nXT^{n-1} + \frac{n-1}{2}X^2T^{n-2} \&c.$  and also in the 93d Proposition of the same Book, he gives the following expres-

sion, viz.  $\overline{A+O}^{\frac{m}{n}} = A^{\frac{m}{n}} + \frac{m}{n}OA^{\frac{m-n}{n}} + \frac{m-m}{2n^2}O^2A^{\frac{m-2n}{n}} \&c.$



De Moivres Multinomial Theorem will easily follow from the Binomial Theorem of Newton, which was given above: for, in  $(Qz + Rz^2 + Sz^3 + Tz^4 + \&c.)^{\frac{m}{r}}$  the co-efficient of  $x^{\frac{m}{r}-n}$  is

$$\frac{\frac{m}{r} \cdot (\frac{m}{r} - 1) \cdot \&c. (\frac{m}{r} - n + 1)}{1 \cdot 2 \cdot \&c. \cdot n} \times (Qz + Rz^2 + Sz^3 + Tz^4 + \&c.)^n,$$

and in  $(Qz + Rz^2 + Sz^3 + Tz^4 + \&c.)^n$  the co-efficient of  $(Qz)^{n-d}$  is  $\frac{n \cdot (n-1) \cdot \&c. (n-d+1)}{1 \cdot 2 \cdot \&c. \cdot d} \times (Rz^2 + Sz^3 + Tz^4 + \&c.)^d$

And in  $(Rz^2 + Sz^3 + Tz^4 + \&c.)^d$  the co-efficient of  $(Rz^2)^{d-e}$  is  $\frac{d \cdot (d-1) \cdot \&c. (d-e+1)}{1 \cdot 2 \cdot \&c. \cdot e} \times (Sz^3 + Tz^4 + \&c.)^e$

Therefore in  $(x + Qz + Rz^2 + Sz^3 + Tz^4 + \&c.)^{\frac{m}{r}}$

the co-efficient of  $x^{\frac{m}{r}-n} \times (Qz)^{n-d} \times (Rz^2)^{d-e} \times (Sz^3)^{e-f} \times \&c.$

will be  $\frac{\frac{m}{r} \cdot (\frac{m}{r} - 1) \cdot \&c. (\frac{m}{r} - n + 1)}{1 \cdot 2 \cdot 3 \cdot \&c. \cdot n} \times \frac{n \cdot (n-1) \cdot \&c. (n-d+1)}{1 \cdot 2 \cdot 3 \cdot \&c. \cdot d} \times$

$\frac{d \cdot (d-1) \cdot \&c. (d-e+1)}{1 \cdot 2 \cdot 3 \cdot \&c. \cdot e} \times \frac{e \cdot (e-1) \cdot \&c. (e-f+1)}{1 \cdot 2 \cdot 3 \cdot \&c. \cdot f} \times \&c.$

Now, for  $z^{n-d} \times z^{2(d-e)} \times z^{3(e-f)} \times \&c.$  put  $z^{(n+d+e+f+\&c.)}$

and simplify the co-efficient, and you will have this general expression for any term :

$$\frac{\frac{m}{r} \cdot (\frac{m}{r} - 1) \cdot (\frac{m}{r} - 2) \cdot \&c. \dots \&c. (\frac{m}{r} - n + 1)}{1 \cdot 2 \cdot \&c. (n-d) \times (1 \cdot 2 \cdot \&c. (d-e) \times 1 \cdot 2 \cdot \&c. (e-f))} \times$$

$$\frac{m}{r} - n \times Q^{n-d} \times R^{d-e} \times S^{e-f} \times \&c. \times z^{(n+d+e+f+\&c.)}$$

The

The multinomial Theorem has been generally expanded in the following form, viz.

$$\begin{aligned}
 (x + Qz + Rz^2 + Sz^3 + \&c.)^{\frac{m}{r}} = \\
 x^{\frac{m}{r}} + \frac{m}{r} x^{\frac{m}{r}-1} Qz + \frac{m}{r} \cdot \frac{(m}{r}-1)}{1 \cdot 2} x^{\frac{m}{r}-2} Q^2 z^2 + \frac{m}{r} \cdot \frac{(m}{r}-1)}{1 \cdot 2} \cdot \frac{(m}{r}-2)}{3} x^{\frac{m}{r}-3} Q^3 z^3 + \&c. \\
 + \frac{m}{r} x^{\frac{m}{r}-1} Rz^2 + \frac{m}{r} \cdot \frac{(m}{r}-1)}{1 \times 1} x^{\frac{m}{r}-2} QRz^3 + \&c. \\
 + \frac{m}{r} x^{\frac{m}{r}-1} Sz^3 + \&c. \\
 + \&c.
 \end{aligned}$$

Now, in this expression, the first quantity that is expanded is  $\overline{x + Qz}^{\frac{m}{r}}$ , and then  $\frac{m}{r} \times \overline{x + Qz}^{\frac{m}{r}-1} \times (Rz^2 + Sz^3 + \&c.)$ , and afterwards  $\frac{m}{r} \cdot \frac{(m}{r}-1)}{1 \cdot 2} \times \overline{x + Qz}^{\frac{m}{r}-2} \times (Rz^2 + Sz^3 + \&c.)^2$ , and so on.

But the arrangement which would follow from the Demonstration which I have given, would be the following, viz.

$$\begin{aligned}
 (x + Qz + Rz^2 + Sz^3 + \&c.)^{\frac{m}{r}} = \\
 x^{\frac{m}{r}} + \frac{m}{r} x^{\frac{m}{r}-1} (Qz + Rz^2 + Sz^3 + \&c.) \\
 + \frac{m}{r} \cdot \frac{(m}{r}-1)}{1 \cdot 2} x^{\frac{m}{r}-2} (Qz + Rz^2 + Sz^3 + \&c.)^2 \\
 + \frac{m}{r} \cdot \frac{(m}{r}-1)}{1 \cdot 2} \cdot \frac{(m}{r}-2)}{3} x^{\frac{m}{r}-3} (Qz + Rz^2 + Sz^3 + \&c.)^3 \\
 + \frac{m}{r} \cdot \frac{(m}{r}-1)}{1 \cdot 2} \cdot \frac{(m}{r}-2)}{3} \cdot \frac{(m}{r}-3)}{4} (Qz + Rz^2 + Sz^3 + \&c.)^4 \\
 + \&c.
 \end{aligned}$$

According

According to this arrangement, the  $\frac{m}{r}$  power of the above Multinomial, will be thus expanded, viz.

$$\begin{aligned}
 (x + Qz + Rz^2 + Sz^3 + \&c.)^{\frac{m}{r}} = \\
 x^{\frac{m}{r}} + \frac{m}{r} x^{\frac{m}{r}-1} Qz + \frac{m}{r} x^{\frac{m}{r}-2} Q^2 z^2 + \frac{m}{r} x^{\frac{m}{r}-3} Q^3 z^3 + \frac{m}{r} x^{\frac{m}{r}-4} Q^4 z^4 + \&c. \\
 + \frac{m}{r} \cdot \frac{m-1}{1 \cdot 2} x^{\frac{m}{r}-2} Q^2 z^2 + \frac{m}{r} \cdot \frac{m-1}{1 \times 1} x^{\frac{m}{r}-2} QRz^3 + \frac{m}{r} \cdot \frac{m-2}{1 \times 1} x^{\frac{m}{r}-2} Q^2 S z^4 \\
 + \frac{m}{r} \cdot \frac{m-1}{1 \cdot 2} x^{\frac{m}{r}-4} R^2 z^4 + \&c. \\
 + \frac{m}{r} \cdot \frac{m-1}{1 \cdot 2} \cdot \frac{m-2}{3} x^{\frac{m}{r}-3} Q^3 z^3 + \frac{m}{r} \cdot \frac{m-1}{1 \cdot 2} \cdot \frac{m-2}{1} x^{\frac{m}{r}-3} QRz^4 + \&c. \\
 + \frac{m}{r} \cdot \frac{m-1}{1 \cdot 2} \cdot \frac{m-2}{3} \cdot \frac{m-3}{4} x^{\frac{m}{r}-4} Q^4 z^4 + \&c.
 \end{aligned}$$

De Moivre has given the Multinomial Theorem in the Philosophical Transactions of 1697. His proof, however, from the doctrine of combinations extended only to integral powers which are produced by repeated multiplications; but Newton's Theorem having now been demonstrated, and the Multinomial Theorem having from thence been derived, it will follow that the latter Theorem is as general as the former, whether  
the

the Index of the power be an Integer, a Fraction, or even a Surd, as will easily appear from the observation which I have already made at the end of the former Chapter.

# ESSAYS

ON

## POWERS AND THEIR DIFFERENCES.

BY FRANCIS BURKE, Esq. &c. &c.

### THE SECOND ALGEBRAICAL ESSAY.

*On finding, per Saltum, the several Orders of Differences.*

#### INTRODUCTION.

THE Formulæ for finding, *per Saltum*, the several orders of differences of quantities in a series, have been usually deduced from a repeated algebraical subduction. Thus, if the successive quantities are  $a, b, c, d, e, \&c.$  the first differences are  $a-b, b-c, c-d, d-e, \&c.$ ; and the second differences, or the differences of the first differences, are,  $a-2b+c, b-2c+d, c-2d+e, \&c.$ ; and the third differences  $a-3b+3c-d, b-3c+3d-e, \&c.$ ; and, the coefficients being produced like the uncixæ of the powers of  $(1-x)^n$ , the  $n$  differences are  $a-nb+\frac{n(n-1)}{1.2}c-\frac{n(n-1)(n-2)}{1.2.3}d+\&c, b-nc+\frac{n(n-1)}{1.2}d-\frac{n(n-1)(n-2)}{1.2.3}e$   
 $+\&c, \&c.$  And if the quantities are  $a^m, b^m, c^m, d^m, \&c.$   
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the <sup>th</sup>  $n$  differences are found by the same operations, and are

$$a - nb + \frac{n(n-1)}{1 \cdot 2} c - \frac{n(n-1)(n-2)}{1 \cdot 2 \cdot 3} d + \&c, \quad b - nc + \frac{n(n-1)}{1 \cdot 2} d - \frac{n(n-1)(n-2)}{1 \cdot 2 \cdot 3} e +$$

&c, &c. in which the successive quantities in the series of powers are made also to enter into the expression for the differences of the powers. The method of Fluxions, although a particular case of the method of differences, cannot from the above Formulæ be immediately deduced, since those Formulæ suppose the successive quantities to be known: whereas, in the method of Fluxions, no account is to be taken of the successive values of variable quantities, and to express the several orders of Fluxions of powers, we have no other notation than by expressing them in terms of the Fluxions of the Roots. Therefore, putting Q instead of  $a - b$ , and R for  $a - 2b + c$ , and, for the first of the third differences, or  $a - 3b + 3c - d$  putting S, &c. &c., if we would represent in terms of

these the <sup>th</sup>  $n$  differences of the powers, or such parts of them as are constant, we would enlarge the analogy which has been observed, in some cases, to hold between differences and Fluxions. And this is the object of the following Essay, in which the 5th Proposition and the differential Problems will include the very useful and general Formula, for the co-efficients in the method of finding Fluxions per Saltum, as discovered by the Rev. Dr. Brinkley, the Professor of Astronomy, in the University of Dublin. See the 7th vol. of "The Transactions of the Royal Irish Academy," p. 327.

ESSAY

## E S S A Y II.

## CHAP. I.

## PROP. I.

AS a principle in the proof of the Binomial Theorem, it has been already demonstrated, that the  $n$ <sup>th</sup> differences of the  $n$ <sup>th</sup> powers of numbers in arithmetical progression will be constant and equal to the common difference of the Roots multiplied by the product of the digits from unity to the Index of the power. But, as this shall be a principle in the following Propositions, I shall demonstrate it here in more particular terms than could be admitted in the proof of the more general Proposition from which it was deduced as a Corollary.

Let  $p, q, r, s, t, \&c.$  be the terms of an arithmetical series, whose common difference is  $d$ , then  $q+d, r+d, s+d, t+d, v+d, \&c.$  will be respectively equal to the corresponding terms of the former series,  $p, q, r, s, t, \&c.$  since each Binomial has for its first member the next lesser term of the series, and for its second member, the common difference; and the first members of the  $n$ <sup>th</sup> powers of those Binomes being the  $n$ <sup>th</sup> powers

powers of the first members of the Roots, will be the  $n^{\text{th}}$  powers of the next lesser terms of the series, viz.

	<b>FIRST DIFFERENCES.</b>
$p^n = \overline{q+d}^n = q^n + ndq^{n-1} + Cdq^2{}^{n-2} + \&c.$	$ndq^{n-1} + Cdq^2{}^{n-2} + \&c.$
$q^n = \overline{r+d}^n = r^n + ndr^{n-1} + Cdr^2{}^{n-2} + \&c.$	$ndr^{n-1} + Cdr^2{}^{n-2} + \&c.$
$r^n = \overline{s+d}^n = s^n + nds^{n-1} + Cds^2{}^{n-2} + \&c.$	$nds^{n-1} + Cds^2{}^{n-2} + \&c.$
$s^n = \&c.$	

Hence, if we take away from the  $n^{\text{th}}$  powers of the Binomials the first members of those powers, we shall have taken from them the  $n^{\text{th}}$  powers of the next lesser terms of the arithmetical series, and the remainders are the first differences of the  $n^{\text{th}}$  powers of the Binomes. Therefore the  $n-1^{\text{th}}$  differences of the remainders are the  $n^{\text{th}}$  differences of the  $n^{\text{th}}$  powers, but those remainders involve only lesser powers of the first members of the Binomes, which first members are in the same arithmetical series, and the highest of those powers are the  $n-1^{\text{th}}$  powers of the terms of that arithmetical series, the coefficient of these powers being  $n \times d$ .

Therefore in the case where the Index  $n$  is equal to 2, the second differences of the squares will be common, for they are the first differences of the terms of an arithmetical series multiplied



multiplied by  $2d$ , the co-efficient of the second term. Therefore, the second differences of the squares  $= d \times 2d$ .

$p^2 = q^2 + 2dq + d^2$	FIRST DIFFERENCES.
	$2dq + d^2$
$q^2 = r^2 + 2dr + d^2$	
	$2dr + d^2$
$r^2 = s^2 + 2ds + d^2$	
	$1ds + d^2$
$s = \&c.$	

The third differences of the cubes will be the second differences of their first differences; i. e. of the remainders, after taking the highest members away. But substituting 3 for  $n$ , the second differences of the remainders  $= 3d$  multiplied into the second differences of the squares, since the second differences of the one powers  $= 0$ . Therefore the third differences of the cubes  $= d \times 2d \times 3d$ .

$p^3 = q^3 + 3dq^2 + 3d^2q + d^3$	FIRST DIFFERENCES.
	$3dq^2 + 3d^2q + d^3$
$q^3 = r^3 + 3dr^2 + 3d^2r + d^3$	
	$3dr^2 + 3d^2r + d^3$
$r^3 = s^3 + 3ds^2 + 3d^2s + d^3$	
	$3ds^2 + 3d^2s + d^3$
$s = \&c.$	

In general, when the proposition is proved of all the powers whose Index is less than  $n$ , (as it has been proved of the second and third powers), in this manner also the case of the  $n$  powers will be deduced, viz. The  $n-1$  differences of the

the remainders, or the  $n^{\text{th}}$  differences of the given powers, will be the  $n-1^{\text{th}}$  differences of  $n$  times the  $n-1^{\text{th}}$  powers, which are the highest members in those remainders: for the  $n-1^{\text{th}}$  differences of the members containing lower powers, will be the differences of common differences, and therefore = 0. If then (as we have shewn in the second and third powers) the  $n-1^{\text{th}}$  differences of the  $n-1^{\text{th}}$  powers be =  $1d.2d\dots n-1d$ , the  $n^{\text{th}}$  differences of the  $n^{\text{th}}$  powers =  $1d.2d\dots n-1d \times nd$  or =  $1.2.3\dots n-1.n \times d$ .

PROP. II.

If there are  $n$  number of arithmetical series, whose common differences are respectively  $a, b, c, d, \&c.$  let all the different corresponding terms of the several series be multiplied together, the  $n^{\text{th}}$  differences of the products will be constant and equal to  $1.2.3\dots n \times abcd \&c.$

For, let  $A, B, C, D, \&c.$  be the correspondent terms of the different series, the products will then be

$$\begin{aligned} & \overline{3a+A} \times \overline{3b+B} \times \overline{3c+C} \times \overline{3d+D} \times \&c. \\ & \overline{2a+A} \times \overline{2b+B} \times \overline{2c+C} \times \overline{2d+D} \times \&c. \\ & \overline{a+A} \times \overline{b+B} \times \overline{c+C} \times \overline{d+D} \times \&c. \\ & \quad A \times \quad B \times \quad C \times \quad D \times \&c. \end{aligned}$$

And

And those factors being multiplied, the products will be

$$\begin{aligned}
 &3^n \times abcd \ \&c. + 3^{n-1} \times \overline{Abc \ \&c. + aBc \ \&c. + \&c. + ABCD \ \&c.} \\
 &2^n \times abcd \ \&c. + 2^{n-1} \times \overline{Abc \ \&c. + aBc \ \&c. + \&c. + ABCD \ \&c.} \\
 &1^n \times abcd \ \&c. + 1^{n-1} \times \overline{Abc \ \&c. + aBc \ \&c. + \&c. + ABCD \ \&c.} \\
 &\hspace{15em} + ABCD \ \&c.
 \end{aligned}$$

The highest terms in those products are the  $n$ <sup>th</sup> powers of the natural numbers with the constant co-efficient  $abcd \ \&c.$  which is the product of all the common differences. The subsequent terms are the inferior powers of the natural numbers, with certain constant co-efficients. But in the  $n$ <sup>th</sup> differences, all the inferior powers are exterminated, the terms which are the differences of common differences being  $=0$ . Therefore, the  $n$ <sup>th</sup> differences of the contents are the  $n$ <sup>th</sup> differences of their highest members, or the  $n$ <sup>th</sup> differences of the  $n$ <sup>th</sup> powers of the natural numbers with the constant co-efficient,  $abcd \ \&c.$  or  $= 1.2.3\dots n \times abcd \ \&c.$

PROP. III.

The series  $1, \frac{n+1}{1}, \frac{(n+1).(n+2)}{1.2}, \frac{(n+1).(n+2).(n+3)}{1.2.3}, \ \&c.$  will have the  $n$ <sup>th</sup> differences of its terms common and equal to unit, (which is the definition of triangular numbers of the  $n$ <sup>th</sup> order):  
For

For if we take as an example of the preceding proposition, the contents, &c.  $\times$  &c.  $\times$  &c. &c.

$$4 \times 5 \times 6 \dots (n+3)$$

$$3 \times 4 \times 5 \dots (n+2)$$

$$2 \times 3 \times 4 \dots (n+1)$$

$$1 \times 2 \times 3 \dots n$$

in which the different arithmetical progressions are the natural series, and also A, B, C, D, or the corresponding terms are the natural series 1, 2, 3, &c. to  $n$ . One of

the contents  $= 1.2.3 \dots n$ , which is equal to the  $n$ <sup>th</sup> differences of the contents. Therefore, if we divide the quantities  $1.2 \dots n$ ,  $2.3 \dots (n+1)$ ,  $3.4 \dots (n+2)$ ,  $4.5 \dots (n+3)$ , &c. by  $1.2 \dots n$

unity will be equal to the  $n$ <sup>th</sup> differences of the quotients  $1$ ,  $\frac{n+1}{1}$ ,  $\frac{(n+1).(n+2)}{1 \cdot 2}$ ,  $\frac{(n+1).(n+2).(n+3)}{1 \cdot 2 \cdot 3}$ , &c.

#### PROP. IV.

If the  $q$ <sup>th</sup> powers of the natural numbers, and the  $r$ <sup>th</sup> powers of the corresponding triangular numbers which admit two orders of differences, and the corresponding  $s$ <sup>th</sup> powers of the triangular numbers having three orders, &c. be all multiplied as follows:  $1^q \times 1^r \times 1^s \times \&c.$

$$2^q \times 3^r \times 4^s \times \&c.$$

$$3^q \times 6^r \times 10^s \times \&c.$$

$$\&c. \times \&c. \times \&c. \times \&c.$$

And

And if we take the differences of those products, they will have as many orders of differences as  $q + 2r + 3s + \&c.$  and the last of those will be constant and  $= \frac{1 \times 2 \times 3 \times 4 \times \&c. \dots (q + 2r + 3s + \&c.)}{1^q \times 1.2^r \times 1.2.3^s \times \&c.}$

For, the several powers of contents being multiplied by each other, in the horizontal lines in which they correspond together, viz.

$$\begin{array}{c}
 \left. \begin{array}{l} \text{The } q \text{ powers of} \\ \text{the contents,} \end{array} \right\} \begin{array}{l} 1.2.3\dots g \\ 2.3.4\dots(g+1) \\ 3.4.5\dots(g+2) \\ \&c. \end{array} \\
 \left. \begin{array}{l} \text{Multiplied by the } r \\ \text{powers of the cor-} \\ \text{responding contents} \end{array} \right\} \begin{array}{l} 1.2.3\dots h \\ 2.3.4\dots(h+1) \\ 3.4.5\dots(h+2) \\ \&c. \end{array} \\
 \left. \begin{array}{l} \text{And by the } s \text{ powers} \\ \text{of the contents,} \end{array} \right\} \begin{array}{l} 1.2.3\dots k \quad \times \&c. \\ 2.3\dots(k+1) \times \&c. \\ 3.4\dots(k+2) \times \&c. \\ \&c. \quad \times \&c. \end{array}
 \end{array}$$

the results of the multiplication will be as follows,

$$\left\{ \begin{array}{l} 1.2\dots g \times 1.2\dots g \times \&c. \text{ till repeated } q \text{ times, } 1.2\dots h \times \&c. \text{ till repeated } r \text{ times,} \\ 2.3\dots(g+1) \times 2.3\dots(g+1) \times \&c. \dots\dots 2.3\dots(h+1) \times \&c. \dots\dots \\ 3.4\dots(g+2) \times 3.4\dots(g+2) \times \&c. \dots\dots 3.4\dots(h+2) \times \&c. \dots\dots \\ \&c. \quad \times \&c. \quad \times \&c. \dots\dots \&c. \quad \times \&c. \dots\dots \end{array} \right.$$

$$\left. \begin{array}{l} \times 1.2.3 \dots k \quad \times 1.2.3 \dots k \quad \times \&c. \text{ Till repeated } s \text{ times, } \times \&c. \\ \times 2.3.4\dots(k+1) \times 2.3.4\dots(k+1) \times \&c. \dots\dots \times \&c. \\ \times 3.4.5\dots(k+2) \times 3.4.5\dots(k+2) \times \&c. \dots\dots \times \&c. \\ \times \&c. \quad \times \&c. \quad \times \&c. \dots\dots \times \&c. \end{array} \right\}$$

In which the Involution producing a repetition of contents, each of which has several factors, the series resulting from the multiplication of the powers of the corresponding contents

will now be the contents of as many arithmetical series as  $gq + hr + ks + \&c.$  which sum putting equal to  $n$ , the  $n$ <sup>th</sup> differences of the products of the corresponding terms of  $n$  arithmetical series, which (by the second Prop.) =  $1.2.3..n$ , will be the  $n$ <sup>th</sup> differences of the products of the powers of the contents. But, (from Prop. 3.) if we divide those products of the powers of the contents by  $\overline{1.2.3...g}^q \times \overline{1.2.3...h}^r \times \overline{1.2.3...k}^s + \&c.$  we shall have the products of the powers of the corresponding terms of the different series of triangular numbers, whose orders are  $g, h, k, \&c.$  Therefore the  $n$ <sup>th</sup> differences of these will be  $1.2.3...n$ , divided by  $\overline{1.2.3...g}^q \times \overline{1.2.3...h}^r \times \overline{1.2.3...k}^s \times \&c.$  ∴

$$= \frac{1.2.3.4 \dots n}{\overline{1.2.3...g}^q \times \overline{1.2.3...h}^r \times \overline{1.2.3...k}^s \times \&c.}$$

## LEMMA.

The quantities in any series can be expressed in a multinomial form in terms of triangular numbers and of the first of the several orders of differences of the quantities: viz. let  $P$  be the first quantity taken in a series, and let  $Q, R, S, \&c.$  be the first of the several differences whose orders are one, two, three, &c.; the following general formulæ will express the preceding and subsequent quantities in the series, viz.

GENERAL

GENERAL FORMULÆ.

$$P + nQ + \frac{n(n+1)}{1 \cdot 2}R + \frac{n(n+1)(n+2)}{1 \cdot 2 \cdot 3}S \ \&c. = n^{\text{th}} \text{ preceding quantity}$$

$$\begin{array}{r} \&c. + \&c. + \&c. + \&c. + \&c. + \&c. \\ P + 3Q + 6R + 10S + \frac{(n+1)(n+2)}{1 \cdot 2}D + \&c. \\ P + 2Q + 3R + 4S + \&c. + (n+1)D + \&c. \\ P + Q + R + S + \&c. + D + \&c. \end{array}$$

P = the first of the given quantities.

$$\begin{array}{r} P - Q \\ P - 2Q + R \\ P - 3Q + 3R - S \\ \&c. - \&c. + \&c. - \&c. + \&c. \end{array}$$

$$P - nQ + \frac{n(n-1)}{1 \cdot 2}R - \frac{n(n-1)(n-2)}{1 \cdot 2 \cdot 3}S \ \&c. = n^{\text{th}} \text{ succeeding quantity.}$$

For, since in those formulæ, the co-efficients of Q have their differences equal to unit, and the co-efficients of R, their second differences, = 1, &c. if for P, Q, R, &c. in the formulæ, we substitute Q, R, S, &c. respectively, we shall have the first differences of the quantities; and by substituting R, S, T, &c. we have the second differences, &c. Therefore, P being

2 A 2

the

the first quantity of the series of assumed formulæ, Q is the first of the differences of the first order, R, the first of the second order of differences of the assumed quantities, &c. Therefore, the law of the assumed formulæ is the same with that of the series whose orders began with Q, R, S, &c. Therefore all the formulæ in the series are rightly expressed as well as P.

NOTE. When the given series has no constant order of differences, the expression for preceding quantities, viz.  $P+Q+R+S+\&c.$  will be an infinite series, I have therefore given the above proof, by shewing that the differences of the assumed, and those of the given quantities, are identical, since the proof which is usually given by a summation beginning from the last order of differences, can only be applied where there is such a constant order of differences to be found.

PROP. V.

If P is one of the quantities in a series admitting several orders of differences, the first of the differences in the first, second, third, &c. orders of differences of those quantities being Q, R, S, &c. putting  $(p-d) + (d-e) + \&c. = p$ , and  $(p-d) + 2(d-e) + 3(e-f) + \&c.$  or  $p+d+e+f+\&c. = n$ . In all the  $n$  <sup>th</sup> differences of the  $\frac{m}{r}$  <sup>th</sup> powers of those quantities in the Lemma, the co-efficient of  $P^{\frac{m}{r}-p} \times Q^{p-d} \times R^{d-e} \times S^{e-f} \times \&c.$  will



will be constant or the same in all the differences of that order, and will be =

$$\frac{1 \cdot 2 \cdot 3 \cdot 4 \dots n}{1^{p-d} \times 1.2^{d-e} \times 1.2.3^{e-f} \times \&c.} \times \frac{\frac{m}{r} \cdot (\frac{m}{r}-1) \cdot (\frac{m}{r}-2) \dots (\frac{m}{r}-p+1)}{1.2.3 \dots p-d \times 1.2.3 \dots d-e \times 1.2.3 \dots e-f \times \&c.}$$

For, if we expand the  $\frac{m}{r}$ <sup>th</sup> powers of the polynomial quantities in the above Lemma, by the multinomial theorem,

In  $(P + Q + R + S + \&c.)^{\frac{m}{r}}$

we have  $P^{\frac{m}{r}-p} \times Q^{p-d} \times R^{d-e} \times S^{e-f} \times \&c.$

with a co-efficient  $\frac{\frac{m}{r} \cdot (\frac{m}{r}-1) \cdot (\frac{m}{r}-2) \cdot (\frac{m}{r}-3) \dots (\frac{m}{r}-p+1)}{1.2.3 \dots p-d \times 1.2.3 \dots d-e \times 1.2.3 \dots e-f \times \&c.}$

Also in  $(P + 2Q + 3R + 4S + \&c.)^{\frac{m}{r}}$

we have  $P^{\frac{m}{r}-p} \times 2^{p-d} Q^{p-d} \times 3^{d-e} R^{d-e} \times 4^{e-f} S^{e-f} \times \&c.$

with the same co-efficient.

And in  $(P + 3Q + 6R + 10S + \&c.)^{\frac{m}{r}}$

we have  $P^{\frac{m}{r}-p} \times 3^{p-d} Q^{p-d} \times 6^{d-e} R^{d-e} \times 10^{e-f} S^{e-f} \times \&c.$

with the same co-efficient, &c.

But by the preceding proposition the  $n$ <sup>th</sup> differences of

$$1^{p-d} \times 1^{d-e} \times 1^{e-f} \times \&c.$$

$$2^{p-d} \times 3^{d-e} \times 4^{e-f} \times \&c.$$

$$3^{p-d} \times 6^{d-e} \times 10^{e-f} \times \&c.$$

&c.

will be constant and equal to  $\frac{1 \cdot 2 \cdot 3 \dots n}{1^{p-d} \times 1.2^{d-e} \times 1.2.3^{e-f} \times \&c.}$

Therefore,

Therefore, in the  $n$  differences of the  $\frac{m}{r}$  powers, we have  $P^{\frac{m}{r}-p} \times Q^{p-d} \times R^{d-e} \times S^{e-f} \times \&c.$  with the constant co-efficient

$$\frac{1 \cdot 2 \cdot 3 \dots n}{1^{p-d} \times 1.2^{d-e} \times 1.2.3^{e-f} \times \&c.} \times \frac{\frac{m}{r} \cdot (\frac{m}{r}-1) \cdot (\frac{m}{r}-2) \dots (\frac{m}{r}-p+1)}{1.2.3..p-d \times 1.2.3\dots d-e \times 1.2.3..e-f \times \&c.}$$

The several formulæ laid down in the following Chapter are deduced from Prop. 4. and the Lemma, in like manner as the general co-efficient now given, by means of the multinomial theorem, which I have stated in the first Essay, wherein the uncixæ of powers were deduced from the differences of powers of numbers, which, having a common difference, are in an arithmetical progression.

CHAP. II.

*Problems for finding, per Saltum, all the constant parts in the Differences of any order.*

PROB. I.

ALL the constant parts in the  $n$  differences of the  $\frac{m}{r}$  powers of quantities not increasing uniformly, will be

$$\left. \begin{aligned} \frac{m}{r} P^{\frac{m}{r}-1} D_n + \frac{1.2.3 \dots n}{1 \times 1.2.3 \dots (n-1)} QD_{n-1} \\ + \frac{1.2.3 \dots n}{1.2 \times 1.2.3 \dots (n-2)} \times RD_{n-2} \\ + \&c. \end{aligned} \right\} \times \frac{m}{r} \cdot \left(\frac{m}{r}-1\right) P^{\frac{m}{r}-2}$$

$$\left. \begin{aligned} + \frac{1.2.3 \dots n}{1.2 \times 1.2.3 \dots (n-2)} Q^2 D_{n-2} \\ + \frac{1.2.3 \dots n}{1 \times 1.2 \times 1.2.3 \dots (n-3)} QRD_{n-3} \\ + \&c. \end{aligned} \right\} \times \frac{m}{r} \cdot \left(\frac{m}{r}-1\right) \cdot \left(\frac{m}{r}-2\right) P^{\frac{m}{r}-3} + \&c.$$

which may be also expressed in the following form, by beginning with the constant parts in which P has the lowest index,

viz.  $\frac{m}{r} \cdot \left(\frac{m}{r}-1\right) \dots \left(\frac{m}{r}-n+1\right) P^{\frac{m}{r}-n} Q^n$

$$+ \frac{n(n-1)m}{1.2} \frac{m}{r} \cdot \left(\frac{m}{r}-1\right) \dots \left(\frac{m}{r}-n+2\right) P^{\frac{m}{r}-n+1} \times Q^{n-2} \times R$$

$$+ \frac{n \cdot (n-1) \cdot (n-2)}{1.2.3} \frac{m}{r} \cdot \left(\frac{m}{r}-1\right) \dots \left(\frac{m}{r}-n+3\right) \cdot P^{\frac{m}{r}-n+2} \times Q^{n-3} \times S + \&c.$$

the

the diversity of form arising only from the different arrangement of the terms in the  $\frac{m}{r}$ <sup>th</sup> powers of the multinomials.

DEMONSTRATION. The  $\frac{m}{r}$ <sup>th</sup> powers of the expressions deduced from the Lemma (the co-efficients being understood) will be of this form, viz.

$$\begin{aligned}
 & P^{\frac{m}{r}} \\
 & + QP^{\frac{m}{r}-1} + RP^{\frac{m}{r}-1} + SP^{\frac{m}{r}-1} + TP^{\frac{m}{r}-1} + VP^{\frac{m}{r}-1} + \&c. \\
 & \quad Q^2P^{\frac{m}{r}-2} + QRP^{\frac{m}{r}-2} + (QS+R^2)P^{\frac{m}{r}-2} + (QT+RS)P^{\frac{m}{r}-2} + \&c. \\
 & \quad \quad + Q^3P^{\frac{m}{r}-3} + Q^2RP^{\frac{m}{r}-3} + (Q^2S+QR)P^{\frac{m}{r}-3} + \&c. \\
 & \quad \quad \quad + Q^4P^{\frac{m}{r}-4} + Q^3RP^{\frac{m}{r}-4} + \&c. \\
 & \quad \quad \quad \quad + Q^5P^{\frac{m}{r}-5} + \&c. \\
 & + D_n P^{\frac{m}{r}-1} + \&c. \\
 & + (QD_{n-1} + RD_{n-2} + SD_{n-3} + \&c.) \times P^{\frac{m}{r}-2} + \&c. \\
 & + (Q^2D_{n-2} + QRD_{n-3} + R^2D_{n-4} + \&c.) \times P^{\frac{m}{r}-3} + \&c. \\
 & + (Q^3D_{n-3} + Q^2RD_{n-4} + Q^2SD_{n-5} + QRD_{n-5} + \&c.) \times P^{\frac{m}{r}-4} + \&c. \\
 & + (Q^4D_{n-4} + Q^3RD_{n-5} + \&c.) \times P^{\frac{m}{r}-5} + \&c.
 \end{aligned}$$

By prefixing to the powers of the letters Q, R, S, &c. the same powers of their variable co-efficients, or of the triangular numbers

numbers, and prefixing the constant co-efficients of the terms in the  $\frac{m}{r}$ <sup>th</sup> powers of a multinomial, we shall have the  $\frac{m}{r}$ <sup>th</sup> powers of the successive quantities in the Lemma; in the  $n$  differences of these, all the terms are exterminated, in which, such powers of the triangular numbers are multiplied together, that the number of orders which the triangular numbers admit, being multiplied by the indices of the powers, and the products being added together, the aggregate is less than  $n$ , viz. when the indices  $p-d$ ,  $d-e$ ,  $e-f$ , &c. are such that  $(p-d) + 2(d-e) + 3(e-f) + \&c.$  is less than  $n$ , the co-efficients of  $Q^{p-d} \times R^{d-e} \times S^{e-f} \times \&c.$  will in the  $n$  differences be exterminated; but when that sum is equal to  $n$ , the co-efficients of those quantities will be constant, and are known from Prop 5.

Hence, all that can be constant in the first differences will be  $\frac{m}{r} P^{\frac{m-1}{r}} Q$ ; in the second differences,  $\frac{m}{r} P^{\frac{m-1}{r}} R + Q^2 \frac{m}{r} \cdot (\frac{m-1}{r}) P^{\frac{m-2}{r}}$ ; the constant members found in the third differences will be,  $\frac{m}{r} P^{\frac{m-1}{r}} S + \frac{3.2.1}{1 \times 1.2} QR \frac{m}{r} \cdot (\frac{m-1}{r}) P^{\frac{m-2}{r}} + \frac{3.2.1}{1.2.3} Q^3 \frac{m}{r} \cdot (\frac{m-1}{r}) \cdot (\frac{m-2}{r}) P^{\frac{m-3}{r}}$  the constant members found in the fourth differences will be,  $\frac{m}{r} P^{\frac{m-1}{r}} T + \frac{4.3.2.1}{1 \times 1.2.3} QRS \left\{ \frac{m}{r} \cdot (\frac{m-1}{r}) P^{\frac{m-2}{r}} + \frac{4.3.2.1}{1.2 \times 1.2} Q^2 R \frac{m}{r} \cdot (\frac{m-1}{r}) \cdot (\frac{m-2}{r}) P^{\frac{m-3}{r}} \right.$   
 $\left. + \frac{4.3.2.1}{1.2 \times 1.2} R^2 \frac{m}{r} \cdot (\frac{m-1}{r}) \cdot (\frac{m-2}{r}) \cdot (\frac{m-3}{r}) P^{\frac{m-4}{r}} Q^4 \right.$

and so on, for the higher orders of differences.

PROB. II.

If in a series of Quotients one of which is  $\frac{p}{P}$  the dividends admit several orders of differences, of which the differences corresponding to  $p$  in the several orders, are  $q, r, s, t, \&c. d_n, \&c.$  and in like manner, if of the differences of the divisors, those which in the several orders correspond to  $P$ , are  $Q, R, S, T, \&c. D_n, \&c.$  Then, all the constant parts in the  $n^{th}$  differences of the terms of the series of quotients are,

$$\begin{aligned}
 & d P_n^{-1} + \frac{1.2.3\dots n}{1.2.3\dots n} p D_n \\
 & \quad + \frac{1.2.3\dots n}{1 \times 1.2.3\dots(n-1)} q D_{n-1} \\
 & \quad + \&c. \left. \vphantom{\frac{1.2.3\dots n}{1.2.3\dots n}} \right\} \times -1 \times P^{-1-1} \\
 & + \frac{1.2.3\dots n}{1 \times 1.2.3\dots(n-1)} p Q D_{n-1} \left. \vphantom{\frac{1.2.3\dots n}{1 \times 1.2.3\dots(n-1)}} \right\} \times -1 \times (-1-1) P^{-1-2} + \&c. \\
 & + \&c.
 \end{aligned}$$

For, if the  $-1^{th}$  power of  $\overline{P+Q+R+S+\&c.}$  (which is of the same form as above, only substituting  $-1$  for  $\frac{p}{r}$ ) be multiplied by  $\overline{p+q+r+s+\&c.}$  and the several multiplications of the terms be performed, according to the powers of  $P$ , taking also into account the places of the members of the multinomial multiplier. In the place of the quantities included in the several lines in the proof of the preceding Problem, we shall now have the quantities, in the following expression, contained

contained in the several braces, and the quote (without regarding the co-efficients) is of this form,

$$\begin{aligned}
 & (p+q+r+s+t+\&c.+d_n+\&c.)P^{-1} \\
 & \left. \begin{aligned}
 & pq+pR+pS+pT+\&c.+pD_n+\&c. \\
 & +qQ+qR+qS+\&c.+qD_{n-1}+\&c. \\
 & +rQ+rR+\&c.+rD_{n-2}+\&c. \\
 & +sQ+\&c.+sD_{n-3}+\&c. \\
 & +\&c.+\&c.
 \end{aligned} \right\} P^{-1-1} \\
 & \left. \begin{aligned}
 & pQ^2+pQR+p(QS+R^2)+\&c.+p(QD+RD_{n-1}+\&c.)+\&c. \\
 & +qQ^2+qQR+\&c.+q(QD+RD_{n-2}+\&c.)+\&c. \\
 & +rQ^2+\&c.+r(QD+RD_{n-3}+\&c.)+\&c. \\
 & +\&c.+\&c.
 \end{aligned} \right\} P^{-1-2} \\
 & \left. \begin{aligned}
 & +pQ^3+pQR^2+\&c.+p(QD^2+QRD_{n-2}+\&c.)+\&c. \\
 & +qQ^3+\&c.+q(QD^2+QRD_{n-3}+\&c.)+\&c. \\
 & +\&c.+\&c.
 \end{aligned} \right\} P^{-1-3}
 \end{aligned}$$

If  $d_v$  is put for any of the differences,  $q, r, s, \&c.$  or in general for the first among the  $v$ <sup>th</sup> differences of the dividends,  $d_v$  being always of one dimension, and its order being  $v$ , the product of its Index and order is  $v$ ; therefore, putting  $v+(p-d)+2(d-e)+3(e-f)+\&c.$  or  $v+p+d+e+\&c.=n$ , when

the constant co-efficients of the  $-1$ <sup>th</sup> power are expressed, and when each quote is represented in the above form, by ex-

pressing the powers of the triangular numbers which are the variable co-efficients of  $d_v$ , Q, R, &c. as in Prop. 5, the following quantity will be found, viz.

$$\frac{n.(n-1).(n-2)..3.2.1}{1.2..v \times \overline{1^{p-d}} \times \overline{1.2^{d-e}} \times \overline{1.2.3^{e-f}} \times \&c.} \times \frac{-1.-2.-3...-p}{1.2.3...p-d \times 1.2.3...d-e \times \&c.}$$

$\times P^{-1-p} \times d_v \times Q^{p-d} \times R^{d-e} \times \&c.$  will be constant in all the <sup>th</sup>  $n$  differences of the quotes. Thus, the several quantities of this kind which will be constant in all the <sup>th</sup> 4 differences of the terms of the series of quotients, are viz.

$$\left. \begin{matrix} {}^tP^{-1} & -pT \\ & -4qS \\ & -6rR \\ & -4sQ \end{matrix} \right\} \times P^{-2} \left. \begin{matrix} +(8pQS+6pR^2) \\ +24qQR \\ +12rQ^2 \end{matrix} \right\} \times P^{-3} \left. \begin{matrix} -36p^2QR \\ -24Q^3 \end{matrix} \right\} \times P^{-4} + 24p^4P^{-5}$$

PROB. III.

Let there be any series of products, the successive factors admitting several orders of differences, viz. Let one of the products be  $A \times B \times C \times D \times \&c.$  and in the series of factors to which A belongs, let the differences corresponding to A, in the several orders, be  $a_1, a_2, a_3, \&c. a_n, \&c.$  And of the series of factors to which B belongs, let the differences corresponding to B, in the several orders, be  $b_1, b_2, b_3, \&c. b_n, \&c.$  And in like manner, also, of the series of factors to which C belongs, let the differences corresponding in the several orders



orders be  $e_1, c_2, c_3, \&c. e_n, \&c. \&c.$  All the constant parts

in the  $n$  differences of the contents will be, viz.

$$(a_n BCDE \&c. + Ab_n CDE \&c. + ABc_n DE \&c. + \&c.)$$

$$+n(a_{n-1}b_1 CDE \&c. + a_1 b_{n-1} CDE \&c. + \&c.)$$

$$+ \frac{n \cdot n-1}{1 \cdot 2} (a_{n-2} b_2 CDE \&c. + a_2 b_{n-2} CDE \&c. + \&c.)$$

$$+ \&c.$$

$$+n \cdot (n-1) (a_{n-2} b_1 c_1 DE \&c. + a_1 b_{n-2} c_1, DE \&c. + \&c.) + \&c.$$

$$+ \frac{n \cdot (n-1) \cdot (n-2)}{1 \times 1 \cdot 2} (a_{n-3} b_2 c_1 DE \&c. + \&c.) \quad + \&c.$$

$$+ \&c. \quad + \&c.$$

For, instead of the powers in Prop. V. we shall now have a series of products in which the factors are of the forms  $A + a_1 + a_2 + \&c.$   $B + b_1 + b_2 + \&c.$   $C + c_1 + c_2 + \&c.$  and in which products, from the nature of multiplication, the combinations of differences are multiplied into all the other first terms but their own, &c. And, of the triangular numbers, which in the successive contents of this form, are the co-efficients of those differences,  $a_1, a_2, \&c. b_1, b_2, \&c. \&c.$  whenever the combinations are such, that the sum of the orders of differences which the triangular numbers admit is equal to  $n$ , the

$n$  differences of the members containing these combinations will be constant. And if  $g+h+i+\&c.=n$ , in all the  $n$  differences we have the following quantity, viz.

$$\frac{1 \cdot 2 \cdot 3 \cdot 4 \cdot \dots \cdot n}{1 \cdot 2 \cdot 3 \cdot \dots \cdot g \times 1 \cdot 2 \cdot 3 \cdot \dots \cdot h \times 1 \cdot 2 \cdot 3 \cdot \dots \cdot i \times \&c.} \times (a \ b \ c \ \&c. \times ZYX \&c. + ABC \&c. \times z \ y \ x \ \&c. + \&c.)$$

NOTE.

NOTE. Besides the constant quantities expressed in the above several formulæ, the actual differences will consist also of certain variable quantities, except in the following cases, in which the actual differences themselves will be constant.

PROB. IV.

Let the greatest number of orders which a series will admit be  $g$ , and let the constant differences be  $a$ . Let the greatest number which another series will admit be  $h$ , and constant difference be  $b_h$ . And let another series admitting  $i$  orders have a constant difference  $c_i$ , &c. Then if  $g+h+i+\&c=n$ , of the contents of the corresponding terms in all those series the actual differences of the  $n^{\text{th}}$  order will be constant quantities,

and are =  $\frac{1 \cdot 2 \cdot 3 \cdot 4 \cdot \dots \cdot n}{1 \cdot 2 \cdot 3 \dots g \times 1 \cdot 2 \cdot 3 \dots h \times 1 \cdot 2 \cdot 3 \dots i \times \&c.} \times a_g \times b_h \times c_i \times \&c.$

For, in the contents of the form  $(A + \&c. + a_g) \times (B + \&c. + b_h) (C + \&c. + c_i) \times \&c.$  the product of all the constant differences, or  $a_g \times b_h \times c_i \times \&c.$  will be the common co-efficients of the products of the highest orders of the triangular numbers in the successive expressions deduced from the Lemma, and the  $n^{\text{th}}$  differences of the products of those numbers are constant

by Prop. IV. But the  $n^{\text{th}}$  differences of the terms containing all except the highest orders are exterminated, the sum of the orders

orders of the factors being less in those terms than  $n$ , therefore the  $n$  differences of the contents will be the  $n$  differences of their highest members, and therefore equal to

$$\frac{1 \cdot 2 \cdot 3 \cdot 4 \cdot \dots \cdot n}{1 \cdot 2 \cdot 3 \cdot g \times 1 \cdot 2 \cdot 3 \cdot h \times 1 \cdot 2 \cdot 3 \cdot i \times \&c.} \times a_g \times b_h \times c_i \times \&c.$$

PROB. V.

Also, if any series have  $m$  number of orders, let  $d$  be the last difference, the  $n$  powers of the quantities of that series will have as many orders as  $n \times m$ , and the constant differences

$$= \frac{1 \cdot 2 \cdot 3 \dots (mn-1) \cdot mn}{1 \cdot 2 \cdot 3 \dots m^n} \times d^n \quad \text{For here } g+h+i+\&c.=m \times n, \text{ and}$$

$$a_g \times b_h \times c_i \times \&c.=d \times d \times \&c.=d^n$$

EXAMPLE.

If of the roots, the differences of the second order be all equal to  $R$ , the cubes have their sixth order constant and =  $\frac{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6}{1 \cdot 2^3} \times R^3 = 90R^3$ . And this would follow from Problem

the first, for in the sixth differences of the  $\frac{m}{r}$  powers, we have the following term, viz.  $\frac{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6}{1 \cdot 2^3 \times 1 \cdot 2 \cdot 3} R^3 \times \frac{m}{r} \cdot (\frac{m}{r} - 1) \cdot (\frac{m}{r} - 2) P^{\frac{m}{r} - 3}$  and

(if  $\frac{m}{r} = 3$ , and third and successive differences of the root = 0) =  $90R^3$ .

If

If for the powers of Q, R, S, &c. we substitute the powers of the first, second, third, &c. fluxions of  $x$ , the above will be the formulæ for the several orders of fluxions of  $x^{\frac{m}{r}}$ . For, the fluxions of  $x$  are parts of the actual differences, no notice of the remaining parts being necessary to be taken. And if, in the formulæ for the differences of the powers, we substitute for the difference of the roots the fluxion of the root + the rejected part of the actual difference of the root, the powers of the fluxion of the root will be similar to those of the differences of the root, with the same co-efficients; the remaining powers of the fluxion of the root are not to be noticed, as involving the members rejected in deriving the fluxion of  $x$  from its actual differences.

# ESSAYS

ON

## POWERS AND THEIR DIFFERENCES.

BY FRANCIS BURKE, Esq. &c. &c.

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### THE THIRD ALGEBRAICAL ESSAY.

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*On finding Divisors of Equations.*

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#### INTRODUCTION.

SIR I. NEWTON has given no proof of the method of finding divisors, which he has delivered in his “Universal Arithmetic.” But, in his second example for finding a binomial divisor, the proposed is  $6y^4 - y^3 - 21y^2 + 3y + 20$ , and the quantity with which the division is to be tried, is  $y + \frac{4}{3}$ , or, which he says is the same thing,  $3y + 4$ . And here Saunderson supposed, that the expression of the general form  $x + \frac{e}{f}$  was adopted by Newton, lest the divisor  $fx + e$  should admit a simple divisor, or its terms admit a common measure. But this supposition cannot hold when the rule has set out with supposing the given quantity to have been previously divided

by all its simple divisors, in which case no compound divisor can have a simple divisor, for such would be also a simple divisor of the quantity proposed. If, as in the example  $2x-b$ , Newton had merely considered the quantity in the relation of a divisor, he would not first represent the divisor in the form  $x-\frac{b}{2}$  and thence  $2x-b$ . For, from division alone it would not follow, that, if the sub-multiple found should divide the proposed, so should also the multiple. Therefore, Newton, in the examples  $y+\frac{4}{3}$ ,  $a-\frac{5}{6}$ , &c. must have deduced those expressions from the nature of fractional roots, as they enter the factors of an original equation, where from  $y+\frac{4}{3}=0$  follows  $3y+4=0$ . The case of a divisor of one dimension, in which the co-efficient of the highest term is unit, has been proved from the nature of equations by M'Laurin. In the following Chapter, I shall give a demonstration for every case, by distinguishing between integral, fractional, and surd roots.

If an equation admits of no rational divisor of one or of two dimensions, the rules which have been usually given are inadequate to discover a binomial or trinomial divisor which might serve for investigating roots. But since equations of higher than two dimensions may often appear as trinomials, of a form which is similar to that of quadratic equations, and thus be capable of a similar resolution, a statement of the rules which would extend to the finding of such divisors may be practically advantageous.

Besides

Besides, if it happens that several binomials or trinomials are only apparently deducible by the method, we may find a criterion for discovering those which shall not really succeed in the division, if we try whether the quote, which should result from that division, is discoverable in the same manner as the divisor. For this purpose it will be of use to discover a general rule for a polynomial divisor, and the series of numbers which apparently gives us the divisor, will point out to us the series of factors which should give us the quote; from whence, by the method of differences, or a numerical subtraction, we shall avoid the repeated operations of a trial by algebraical division.

These, and some other advantages, are the practical objects of this Essay, for which the Reader is referred to the second Chapter. In the first Chapter, the general theory of the rule is laid down: it is deduced from the nature of an equation, which is a different view of the subject from that which is usually given by authors.

## CHAP. I.

*The general Theory from whence the Rules for finding Divisors of Equations are deduced.*

**I**F there is given any equation, as  $m x^7 + P x^6 + Q x^5 + R x^4 + S x^3 + T x^2 + V x + W = 0$ , by substituting for the unknown letter  $x$ , any given quantity  $A$ , we shall have a result which is the absolute term of a transformed equation, whose roots are individually those of the given equation diminished by  $A$ . For, if we substitute  $y + A$  for  $x$ , we shall have  $m(y + A)^7 + P(y + A)^6 + Q(y + A)^5 + R(y + A)^4 + S(y + A)^3 + T(y + A)^2 + V(y + A) + W = 0$  and when the powers of the binomials are expanded, the last terms of those powers will be the similar powers of  $A$ , and will contain no dimensions of  $y$ . Hence  $m A^7 + P A^6 + Q A^5 + R A^4 + S A^3 + T A^2 + V A + W$ , the sum of those members which contain no dimension of  $y$ , will be the absolute term in an equation in which  $y + A = x$  and  $y = x - A$ .

If for the unknown letter there be severally substituted the terms of a decreasing arithmetical series, 3, 2, 1, 0, -1, -2, -3, the results are the several absolute terms of transformed equations, whose roots are those of the given equation, respectively diminished by the substituted quantities; and since the



the roots are successively diminished by quantities in a decreasing arithmetical series, they are successively diminished by lesser numbers, and therefore in each transformed equation the roots will be greater than in the preceding, by the common difference of the substituted numbers. But where the highest term of the equation has a co-efficient, there are fractional roots, whose denominators, if rational, are some of the numeral divisors of  $m$ . For, the product of the roots with the signs changed is  $\frac{W}{m}$ ; and since those fractional roots must differ in the successive transformed equations by the common difference of the substituted numbers, if the difference of the substituted numbers be reduced to the same denominators with the fractions, the numerators of the fractional roots will differ by the numerators of the fractional expressions for the difference, that is by the common difference, multiplied by the root's denominator, which denominator, in the case of rational roots, is an integral divisor of the highest term.

Amongst the rational and irrational divisors of those quantities,  $(128m + 64P + 32Q + 16R + 8S + 4T + 2V + W)$ ,  $(m + P + Q + R + S + T + V + W)$ ,  $(W)$ ,  $(-m + P - Q + R - S + T - V + W)$ , &c. &c. there should be as many arithmetical series as is the number of dimensions of the equation; for, so many roots are successively diminished from the nature of the operation. But only the terms of the rational series, and the rational products or contents of the irrationals, can be found among  
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the rational divisors, viz. if the roots of the given equation be  $\frac{-a}{D}$ ,  $\frac{-b}{D}$ ,  $\frac{-c}{D}$ , &c. and  $\Lambda$  is any substituted term, the corresponding terms in the different series of the increasing numerators of the roots will, with their signs changed, be found among the corresponding terms of the decreasing series of divisors, which terms, by putting  $D$  generally for any denominator, will be  $A \times D + a$ ,  $A \times D + b$ ,  $A \times D + c$ , &c. ; and the products or contents of these, will be  $A^n \times D^n + A^{n-1} \times D^{n-1} \overline{a+b+c+\&c.} + A^{n-2} \times D^{n-2} \overline{ab+ac+\&c.} + A^{n-3} \times D^{n-3} \overline{abc+abd+\&c.+\&c.} + abcde \&c.$  ; and here all the powers of the substituted number, descending from the number of dimensions of the polynome required, are connected with the different combinations of the numerators of  $n$  number of roots with their signs changed, that is with the numerators of the co-efficients of a polynomial divisor of the proposed equation, their common denominator being the product of the denominators of  $n$  roots, since the numerators of such co-efficients are made up of members each of which is a product of the numerators of roots, with their signs changed, multiplied into all the rest of the  $n$  denominators but their own.

When the substituted numbers are the terms of an arithmetical series, we shall have their powers multiplied, in the successive results, by the several co-efficients of the divisor required, and if we take the differences of such results, and the

the differences of those differences, &c. as often as the index of the highest power denotes, the co-efficients which are connected with the inferior powers will be exterminated, and the highest co-efficients alone will be involved in the last differences, with the constant differences of the powers. For, all the  $n$  differences of the  $n$  powers of numbers in arithmetical progression are constant and  $= 1 \times 2 \times 3 \times 4 \dots (n-1) \cdot n \times d^n$

A general statement of Newton's rules for finding divisors can be easily deduced from the foregoing observations, as follows :

Substitute successively for  $x$  in the proposed, the terms of an arithmetical series, 3, 2, 1, 0, -1, -2, -3, until the number of terms is greater than the index of the divisor required; place the numbers resulting from the substitution with all their divisors, as well affirmative as negative, opposite to the correspondent terms of the substituted series; take the differences of those divisors, and the differences of their differences, &c.; if the differences of any series of divisors be common, when the number of orders of differences taken is equal to  $n$  or the index of the polynome sought, that difference being divided by the last difference of the  $n$  powers of the terms of the natural series or by  $1.2.3\dots n$ , the quotient should be a divisor of the highest term of the proposed, and if so should be made the common denominator of the co-efficients

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of the polynomial divisor, or the co-efficient of the highest term of that divisor. Subduct the divisors of the above results from the powers of the correspondent terms of the arithmetical series ( $n$  being the index of the powers) multiplied into the last found numeral divisor of the highest term. Thus you will have subducted the divisors from their own first members: hence there will be found only the  $n-1$  powers for the highest powers in the remainders, and the  $n-1$  differences of the remainders will be constant, and being divided by  $1.2.3\dots n-1$ , the quote is the numerator of the co-efficient of the second term with the signs changed, (for the signs of the co-efficients are changed by the subduction of the divisors from their own first members). Subduct the last found numerator, with the sign changed, multiplied into the correspondent powers of the natural numbers whose index is  $n-1$ , from the first remainders. If the order of differences of these or of the second remainders be constant when the number of orders is equal to  $n-2$ , that difference being divided by  $1.2.3\dots n-2$ , the quote is the numerator of the third co-efficient with the sign changed:

In general, if the numerator of a co-efficient with the sign changed, whose distance from the first term is  $m-1$ , be derived from the last differences of the  $m-1$  remainders, divided by  $1.2.3\dots(n-m-1)$  as we have shewn where that distance is

is

is 1 or 2; in like manner the numerator of a co-efficient with the sign changed, whose distance from the first is  $m$ , will be derived from the last differences of the remainders which are deduced from the former remainders by subducting from them the numerator of the co-efficient last found, with the sign changed, multiplied into the powers of the correspondent terms of the natural series, the index of which powers is  $n-m-1$ .

If  $1.2.3\dots n \times D$  is the  $n^{\text{th}}$  difference of the divisors of the absolute term, or if  $D$  is otherwise sought among the numeral divisors of the highest term of the proposed, and if the last differences of the first, second, third, &c. remainders, be viz.  $1.2.3\dots n-1 \times -p$ ,  $1.2.3\dots n-2 \times -q$ ,  $1.2.3\dots n-3 \times -r$ , &c. The polynomial divisor of  $n$  dimensions will be  $x^n + \frac{p}{D}x^{n-1} + \frac{q}{D}x^{n-2} + \frac{r}{D}x^{n-3} + \&c.$  or  $Dx^n + px^{n-1} + qx^{n-2} + rx^{n-3} + \&c. + abcd \&c. = 0$

NOTE. The quantities called remainders are the divisors subducted from the sum of their own members already discovered. The numerator of the required co-efficient must be made to stand in the highest place in those expressions whose differences are to be taken, and this is effected as above by taking away the higher powers which were connected with the preceding co-efficients.

An abridged mode of finding divisors may be more simply deduced from the general expression, in the same manner as Gravesand has done in his example for the cubical divisor. For, the following being the form of the divisor, viz.

$$A^n \times D^n + A^{n-1} \times D^{n-1} \overline{a+b+c+\&c.} + A^{n-2} \times D^{n-2} \overline{ab+ac+\&c.} + \&c... + A \times D \overline{abc\&c.+acd\&c.+ \&c.+abcde\&c.}$$

If we therefore begin the operation by subducting the sum of the first and last members, or  $A^n \times D^n + abcde \&c.$  ( $A^n \times D^n$  being found as before, and  $abcde \&c.$  being found opposite to cypher) and, if we then divide the remainder by  $A$ , we shall thus have depressed the indices of the powers of the substituted numbers by 2, and therefore the differences to be taken will be fewer. Hence, in the case of a divisor of three dimensions, or a divisor of four dimensions, whose second term is wanting, the quotes or depressed remainders are in arithmetical series, and thus, two co-efficients are discovered together, the second co-efficient being the common difference of the arithmetical series, and the penultimate being the term of that series which should correspond to cypher. This term, however, is not immediately discoverable opposite to cypher, and although in the cubical divisor it is always to be known, being the basis of the arithmetical series, yet the term is not really expressed, (for the divisor  $abcde \&c.$  being subducted from itself would leave cypher, and as this corresponds to the substitution of cypher, the division of the remainder by the substituted

substituted quantity, or of cypher by cypher, will give any finite quotient, and the number being indeterminate is understood till it is discovered by continuing the law of the series.) But in finding divisors of higher dimensions where those depressed remainders or quotes are not in arithmetical series, and where, in order to obtain arithmetical series, the differences of the quotes are to be taken, no such quotes can be understood, and therefore the substitution cannot then be continued beyond cypher. But if we substitute the terms of the natural series, from the index of the polynome to unit, when the arithmetical series shall be obtained from the higher order of differences of the quotes or depressed remainders, the term opposite to cypher is found by continuing the law of the differences, and thence the law of the series for one step farther. From those principles, as in the following rule, we discover two co-efficients of the divisor at once.

Substitute for the unknown letter in the proposed the terms of the natural series, descending from the index of the divisor required to unity; adding the divisors opposite to cypher to the divisors of the highest term, multiplied into the  $n$  powers of the natural numbers, let the sums be respectively taken from the divisors of the results of substitution of such corresponding natural numbers; divide the remainders by those corresponding substituted numbers, and if the difference of the quotes be common, when the number of orders is  $n-2$ , the common difference divided by  $1.2.3.\dots n-2$  is the numeral co-efficient of the second term of the divisor of  $n$  dimensions;

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let  $k$  be the extreme quote corresponding to 1, and  $-k_1, -k_2, -k_3, \&c.$  the extreme differences of those quotes of the first, second, third, &c. orders, by continuing the differences beginning with the penultimate differences, we shall continue the terms of the series, and the term opposite to cypher will be found  $k+k_1+k_2+k_3+\&c.$ ; and because the member which alone is not multiplied by the substituted number in the quotes, is the co-efficient of the penultimate term of the divisor, that co-efficient should be the term found opposite to cypher.

In general, the co-efficient whose distance from the first is  $m$ , along with the co-efficient whose distance from the last is also  $=m$ , will be derived, in like manner as above, from the quotes which result from dividing by the corresponding substituted numbers, the remainders, after the quotes in the preceding step are diminished by the co-efficient whose distance from the last is  $m$ , and by the product of the co-efficient whose distance from the first is the same, multiplied into the powers of the correspondent natural numbers, whose index is  $n-2m$ .

If the last differences of the quotes in the first, second, &c. steps, be  $1.2.3\dots\overline{n-2p}$ ,  $1.2.3\dots\overline{n-4q}$ , &c.; and if, in the series of the first, second, &c. quotes or depressed remainders, the terms opposite to cypher be  $k+k_1+k_2+\&c.$   $l+l_1+l_2+\&c.$  &c. the polynomial divisor is  $Dx^n+px^{n-1}+qx^{n-2}+\&c.+(l+l_1+\&c.)x^2+(k+k_1+\&c.)x+abcd\&c.$

CHAP.



CHAP. II.

*The practical Application of the foregoing general Rules.*

FOR an example of the method of finding divisors, let the proposed equation be  $18x^7-15x^6-12x^5+10x^4-108x^3+90x^2+42x-35=0$ , and let the roots be diminished by the terms of the natural series:

3	24310	13, 34, 442, 55, 715, 1870,	13, $3\sqrt{3+\sqrt{-7}}$ , &c.
2	665	7, 19, 133, 5, 35, 95,	$7, 2\sqrt{3+\sqrt{-7}}$ , &c.
1	-10	1, 10, 10, -1, -1, -10,	$1, \sqrt{3+\sqrt{-7}}$ , &c.
0	-35	-5, 7, -35, 1, -5, +7,	$+5, \sqrt{3+\sqrt{-7}}$ , &c.
-1	110	-11, 10, -110, -1, 11, -10,	$-11, -\sqrt{3+\sqrt{-7}}$ , &c.
-2	-1615	-17, 19, -323, 5,	
-3	-43010		

Thus, to find a divisor of one dimension :

$$\begin{array}{r}
 13 \quad 6 \quad 3 \times 6 - 13 = 5 \\
 7 \quad 6 \quad 2 \times 6 - 7 = 5 \\
 1 \quad 6 \quad D=6 \quad 1 \times 6 - 1 = 5 \quad p = -5 \\
 -5 \quad 6 \quad 0 \times 6 + 5 = 5 \\
 -11 \quad 6 \quad -1 \times 6 + 11 = 5
 \end{array}$$

The divisor is  $x - \frac{5}{6}$  or which is the same thing,  $6x - 5 = 0$ .

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To find a divisor of two dimensions :

$$\begin{array}{r}
 34 \\
 19 \\
 10 \\
 7 \\
 10
 \end{array}
 \begin{array}{r}
 15 \\
 9 \\
 3 \\
 3 \\
 -3
 \end{array}
 \begin{array}{r}
 6 \\
 6 \\
 6 \\
 6 \\
 -3
 \end{array}
 \begin{array}{l}
 \\
 \\
 D = \frac{6}{1.2} = 3 \\
 \\
 \end{array}
 \begin{array}{r}
 9 \times 3 - 34 = -7 \\
 4 \times 3 - 19 = -7 \\
 1 \times 3 - 10 = -7 \\
 0 \times 3 - 7 = -7 \\
 1 \times 3 - 10 = -7
 \end{array}
 \begin{array}{r}
 0 \\
 0 \\
 0 \\
 0 \\
 0
 \end{array}
 \begin{array}{l}
 p = 0 \\
 \\
 \\
 \\
 \\
 \end{array}
 \begin{array}{r}
 -7 - 3 \times 0 = -7 \\
 -7 - 2 \times 0 = -7 \\
 -7 - 1 \times 0 = -7 \\
 \\
 \\
 \end{array}
 \begin{array}{l}
 q = 7 \\
 \\
 \\
 \\
 \\
 \end{array}$$

The divisor is  $x + \frac{7}{3}$  or  $3x + 7 = 0$ .

To find a divisor of three dimensions :

$$\begin{array}{r}
 442 \\
 133 \\
 10 \\
 -35 \\
 -110
 \end{array}
 \begin{array}{r}
 309 \\
 123 \\
 45 \\
 75 \\
 \\
 \end{array}
 \begin{array}{r}
 186 \\
 78 \\
 -30 \\
 108 \\
 \\
 \end{array}
 \begin{array}{l}
 \\
 108 \\
 108 \\
 108 \\
 \\
 \end{array}
 \begin{array}{r}
 27 \times 18 - 442 = 44 \\
 8 \times 18 - 133 = 11 \\
 1 \times 18 - 10 = 8 \\
 0 \times 18 + 35 = 35 \\
 -1 \times 18 + 113 = 92
 \end{array}
 \begin{array}{r}
 33 \\
 3 \\
 -27 \\
 -57 \\
 \\
 \end{array}
 \begin{array}{l}
 30 \\
 30 \\
 30 \\
 30 \\
 \\
 \end{array}
 \begin{array}{r}
 44 - 9 \times 15 = -91 \\
 11 - 4 \times 15 = -49 \\
 8 - 1 \times 15 = -7 \\
 35 - 0 \times 15 = 35 \\
 92 - 7 \times 15 = 77
 \end{array}
 \begin{array}{r}
 -42 \\
 -42 \\
 -42 \\
 -42 \\
 -42
 \end{array}$$

$$D = \frac{108}{1.2.3} = 18 \qquad p = \frac{-30}{1.2} = -15 \qquad q = 42, r = -35$$

The divisor is  $x^3 - \frac{15}{18}x^2 + \frac{42}{18}x - \frac{35}{18}$  or  $18x^3 - 15x^2 + 42x - 35 = 0$

To find a divisor of four dimensions, according to the general statement of Gravesand's method, or the abridged mode which was given above :

$$\begin{array}{r}
 55 \\
 5 \\
 -1 \\
 1 \\
 -1 \\
 5
 \end{array}
 \begin{array}{r}
 50 \\
 6 \\
 -2 \\
 2 \\
 -6 \\
 \\
 \end{array}
 \begin{array}{r}
 44 \\
 8 \\
 -4 \\
 8 \\
 \\
 \end{array}
 \begin{array}{r}
 36 \\
 12 \\
 -12 \\
 24 \\
 \\
 \end{array}
 \begin{array}{r}
 24 \\
 24 \\
 24 \\
 \\
 \\
 \end{array}
 \begin{array}{r}
 55 - (81 + 1) = -27 \\
 5 - (16 + 1) = -12 \\
 -1 - (1 + 1) = -3 \\
 1 - (0 + 1) = 0
 \end{array}
 \begin{array}{r}
 -27 \\
 -12 \\
 -3 \\
 0
 \end{array}
 \begin{array}{r}
 \text{Divide by substituted numbers.} \\
 \\
 \\
 \\
 \end{array}
 \begin{array}{r}
 -9 \\
 -6 \\
 -3 \\
 0
 \end{array}
 \begin{array}{r}
 -3 \\
 -3 \\
 -3 \\
 0
 \end{array}
 \begin{array}{r}
 -9 - 0 = -9 \\
 -6 - 0 = -6 \\
 -3 - 0 = -3 \\
 \\
 \\
 \end{array}
 \begin{array}{r}
 -9 \\
 -6 \\
 -3 \\
 \\
 \\
 \end{array}
 \begin{array}{l}
 \text{Divide by substituted numbers.} \\
 \\
 \\
 \\
 \end{array}
 \begin{array}{l}
 q = -3 \\
 \\
 \\
 \\
 \end{array}$$

$$D = \frac{24}{1.2.3.4} = 1$$

The divisor is  $x^4 - 3x^2 + 1 = 0$

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In like manner, to find a divisor of six dimensions, if the substituted terms were begun with 6, 5, 4, 3, 2, &c. the corresponding results would give the series of divisors, 136745, 45182, 11495, 1870, 95, &c.

136745	—	$(3 \times 6^6 + 7)$	=	—3240	Divide by substituted terms the 4th difference of the quotients, $\left  \begin{smallmatrix} 0 \\ 1 \\ 0 \end{smallmatrix} \right.$	—540				
45182	—	$(3 \times 5^6 + 7)$	=	—1700		—200	—60	—12	0	
11495	—	$(3 \times 4^6 + 7)$	=	—800		—200	—140	—48	—12	0
1870	—	$(3 \times 3^6 + 7)$	=	—320		—108	—92	—36	—12	0
95	—	$(3 \times 2^6 + 7)$	=	—104		—52	—56	—34	—12	0
						—22				
$0 + 12 - 36 + 56 - 52 = -20$										

$k + k_1 + k_2 + k_3 + k_4 = 0 + 12 - 34 + 22 - 20 = 0$  and  $p = 0$

—540	—	$(0 + 0)$	=	—540	Divide by substituted terms:	—90			
—340	—	$(0 + 0)$	=	—340		—68	—22	—4	
—200	—	$(0 + 0)$	=	—200		—50	—18	—4	
—108	—	$(0 + 0)$	=	—108		—36	—14	—4	
—52	—	$(0 + 0)$	=	—52		—26	—10	—4	
						—6			
$—20$									

$l + l_1 + l_2 = -4 + 6 - 20 = -18, q = \frac{-4}{1.2} = -2.$

The divisor is  $3x^6 - 2x^4 - 18x^2 + 7 = 0.$

Thus, from 13, 7, 1, —5, —11, we have derived the divisor  $6x - 5 = 0$ , and from the numbers 34, 19, 10, 7, 10, we have the divisor  $3x^2 + 7 = 0$ . But as these are binomial divisors, and as the usual rules extend only to divisors of one, two, and three dimensions, from them the equation does not appear to admit a trinomial divisor. However, according to the rules for finding a divisor of four dimensions, from the numbers

55, 5, -1, 1, -1, 5, we have a trinomial divisor  $x^4 - 3x^2 + 1 = 0$ , whose roots can be discovered by resolving a quadratic equation. Also the divisor  $18x^3 - 15x^2 + 42x - 35 = 0$ , which is deduced from the numbers 442, 133, 10, -35, &c. is the only quadrinomial derived by the particular rules. But, by the general rules, from the numbers 1870, 95, -10, 7, -10, 95, we find the quadrinomial  $3x^6 - 2x^4 - 18x^2 + 7 = 0$ , which is reducible to a cubic.

A divisor of five dimensions is found from the numbers 715, 35, -1, -5, &c. and although, in this example, from the two first divisors we may investigate the others by help of division, yet the rule discovers them immediately, and in an equation having no divisors of such low dimensions, the usual rules would be inadequate to the discovery of the others.

Sometimes no divisor of a given number of dimensions can be found, which shall succeed in the division, viz. when the content of so many roots is not found among the rational divisors of the absolute term. However, the content of yet a greater number of roots may be rational, and among all the divisors, rational and irrational, there will be always as many arithmetical series as there are roots, for all the roots are necessarily diminished, as we have shewn, from the nature of transformation.

When some of the divisors of the absolute terms of the given equation are odd, and others even, we can, *prima facie*,  
reduce

reduce to narrower limits the divisors of the other absolute terms which stand opposite to the even substituted numbers ; let the even divisors alone be compared with the even divisors of the absolute term of the given equation, and the odd alone with the odd. For,  $abcde$  &c. or the divisor of the absolute term of the given equation, being subducted from  $A^n \times D^n + \&c. + A \times \overline{Dabc} \&c. + \overline{bcd} \&c. + \&c. + abcde$  &c. or from the divisors of the absolute term corresponding to  $A$ , the remainder should be divisible by  $A$ . Hence, that the even remainders may correspond to even substituted terms, the divisors to be compared should be together even, or together odd ; for, the sum or difference of an odd and an even number cannot be even, and therefore cannot be divisible by an even number.

Thus, in Newton's example, (which shall be given immediately) 14, which is opposite to cypher, cannot be compared with 19, which stands opposite to 2 ; nor 7, opposed to cypher, with —38, opposed to 2.

From the above general statement, we are enabled, *a priori*, (as soon as we shall have obtained those numeral divisors whose differences afford arithmetical series) to try, without the trouble of division, whether polynomes can from thence be deduced, which shall really divide. For, if an equation can be divided by any compound divisor, it will also be divisible by the quotient, or by the polynome whose index is the difference of the indices of the equation, and of the compound

divisor. And, in a similar manner as by the general rule we deduced a divisor from the series of contents of the numerators of some roots, the signs of those roots being changed, so should the quote be discoverable from the series of contents of the remaining roots, with their signs changed. Therefore, when we have found a series of numeral divisors which have a constant order of differences, if such coincidence with the rule be not casual, the numeral co-factors of those divisors should also coincide with the rule for finding a polynomial divisor whose index is the complement of that of the index of the polynome sought, to that of the given equation. The highest co-efficient of the new polynome should be the highest co-efficient of the given equation divided by the highest co-efficient of the polynome required, and the co-efficients of the second terms of both polynomes should constitute a sum equal to the co-efficient of the second term of the equation.

Thus, in Newton's example,  $3y^5 - 6y^4 + y^3 - 8y^2 - 14y + 14$ , substitute for  $y$  the terms of the arithmetical series:

Results of Substitution:	170	34, 10, 17,	5,	5	5	7	8	6	6	17	55	98	132
2	-38	19, 1, -38,	-2,	-2	-1	-1	2	6	6	-38	-43	-34	132
1	-10	10, -2, 5,	-1,	-1	-1	-3	2	6	6	5	-9	-34	-12
0	14	7, 1, 14,	2,	2	2	-4	1	6	1.2.3 = 1	14	13	-22	-12
-1	10	10, 10, 1,	1,	1	1	1	1	1	1	1	13	-22	-12
		Numeral divisors:		Take third differences of the divisors:						Take third differences of the divisors:			

Here the divisors 34, 19, 10, 7, 10, multiplied by the corresponding divisor 5, -2, -1, 2, 1, give the respective absolute terms 170, -38, -10, 14, 10. Now, since the divisors

divisors 34, 19, 10, 7, 10, give us  $3y^2+7$ , if such is a true divisor, the co-factors 5,  $-2$ ,  $-1$ , 2, 1, should supply (as they do) a trinomial whose highest co-efficient is unit.

But although the second series 10, 1,  $-2$ , 1, 10, would apparently give the divisor  $3y^2-6y+1$ , yet the co-factors 17,  $-38$ , 5, 14, 1, will give us no cubical divisor, those co-factors not having the third differences common: therefore we reject the series 10, 1,  $-3$ , 1, 10, as casual, and not arising from the nature of the operation.

To reject those numbers 10, 1,  $-2$ , 1, 10, Newton continues that series, according to the required law, by continuing the terms of the arithmetical series of the remainders. Now, of the series 10, 1,  $-2$ , 1, 10, 25, the new term 25, is found not to divide  $-190$ , which results from the substitution of  $-2$ . But the method which is above given detects the fortuitous divisors, without the trouble of continuing them, which is a particular advantage, if the fortuitous series should not break off for the several terms. The co-factors are immediately pointed out by the numeral divisors to be tried, and besides the greater facility of numerical subduction than of the division of algebraical quantities, it is also advantageous that the above can be tried when the numerical divisors are first discovered to have a constant order of differences, but algebraical division can only be tried when all the co-efficients of the polynome are completed.

In substituting the terms of the natural series, one of the terms being cypher, the process of involution is easier, not only because of the smallness of the numbers, but also the same process of involution will serve for the substitution of affirmatives and negatives. For, in general, in an arithmetical series, when the next terms to cypher, or the two lowest terms, are the same, but with contrary signs, all the terms below cypher are the same with those above it, excepting the difference of sign. If an affirmative quantity be substituted for  $x$ , and if we make one sum of the terms in which the indices are even, and another sum of the terms in which the indices are odd, both sums, added together, will be the result of the substitution of the affirmative, and the sum of the terms containing even powers, less by the sum of the terms containing the odd powers, will be the result of the substitution of the same quantity, with a negative sign.

Yet we would not always substitute the same number of affirmative and negative terms. For, if all the terms of the given equation are affirmative, we shall have lesser results by substituting negatives for  $x$ : for the roots being all negative, if we diminish them by negative quantities, we shall bring them nearer to cypher. And if the terms are alternately affirmative and negative, the roots being all affirmative, we should diminish them by affirmative quantities. If the roots of the equation are great, and the absolute term thereof considerable, by considerably diminishing those roots, that is,  
by



by substitution of large numbers, we may diminish the results; but if the absolute term is not great, the smaller the numbers substituted, the less the results: and this, with the facility of involving small numbers, would make us to prefer the substitution of the natural numbers near cypher.

When the roots are integral, by substituting the terms of the natural series, (which contains all integral numbers), we may be able, by mere substitution, to discover those roots: for, when the root is substituted for the unknown, the result is equal to cypher, since the absolute term of the transformed is equal to cypher when the root is diminished by a quantity equal to itself. When there are fractional roots, we might diminish the roots by an arithmetical series of fractions, and find results equal to cypher, but the substitution of these, and the ridding the terms of denominators, would be the same as to multiply the roots, and then substitute the natural numbers. Thus also, when all the roots have a common factor, we might substitute multiples of natural numbers, or use the natural numbers multiplied by that common factor; but since the results of substitution or the absolute terms, which are the products of the roots with their signs changed, would, in the transformed, be all divisible by the  $n^{\text{th}}$  power of the common factor, after this division, the result would be the same as if we had first divided the roots by their common factor, and substituted the natural numbers themselves.

The

The particular method of Newton will be easily understood, after the general rules which have been delivered above. I shall conclude this Essay with transcribing the rules for finding divisors, which he has given in his "Universal Arithmetic." His method, in the first of the following passages, will be applicable, as we have seen, to the rational divisors of one dimension; that in the second, will extend to the rational quadratic divisors, or divisors of two dimensions; the third of those passages gives us a general view of the method of finding divisors of  $n$  dimensions, the demonstration of which has been given in the former Chapter of this Essay; the concluding paragraph will appear from the observations which I have made in the foregoing page. I shall state all those passages in the original Latin, which is clearer, perhaps, than any English translation could be, on the subject.

Si quantitas postquam divisa est per omnes simplices divisores manet composita, & suspicio est eam compositum aliquem divisorem habere, dispone eam secundum dimensiones literæ alicujus quæ in eâ est, & pro litera illa substitue sigillatim tres vel plures terminos hujus progressionis arithmeticæ, 3, 2, 1, 0,  $-1$ ,  $-2$ , ac terminos totidem resultantes una cum omnibus eorum divisoribus statue e regione correspondentium terminorum progressionis, positis divisorum signis tam affirmativis quam negativis. Dein e regione etiam statue progressionem arithmeticas quæ per omnium numerorum divisores percurrunt pergentes a majoribus terminis ad minores eodem

eadem ordine quo termini progressionis 3, 2, 1, 0, —1, —2, pergunt, & quarum termini differunt vel unitate vel numero aliquo qui dividit altissimum terminum propositæ quantitatis. Si qua occurrit ejusmodi progressio, iste terminus ejus qui stat e regione termini 0 progressionis primæ, divisus per differentiam terminorum, & cum signo suo annexus literæ præfatæ, componet quantitatem per quam divisio tentanda est.

Si nullus occurrit hac methodo divisor, vel nullus qui dividit propositam quantitatem, concludendum erit quantitatem illam non admittere divisorem unius dimensionis. Potest tamen fortasse, si plurium sit quam trium dimensionum, divisorem admittere duarum. Et si ita, divisor ille investigabitur hac methodo. In quantitate illa pro litera substitue, ut ante, quatuor vel plures terminos progressionis hujus 3. 2. 1. 0. —1. —2. —3. Divisores omnes numerorum resultantium sigillatim adde & subduc quadratis correspondentium terminorum progressionis illius ductis in divisorem aliquem numeralem altissimi termini quantitatis propositæ, & summas differentiasque e regione progressionis colloca. Dein progressionem omnes collaterales nota quæ per istas summas differentiasque percurrunt. Sit  $\overline{+}C$  terminus istiusmodi progressionis qui stat e regione 0 progressionis primæ,  $\overline{+}B$  differentia quæ oritur subducendo  $\overline{+}C$  de termino proxime superiori, qui stat e regione termini 1 progressionis primæ,  $A$  prædictus termini altissimi divisor numeralis, &  $l$  litera quæ in quantitate proposita est, & erit  $A//\underline{+}B/\underline{+}C$  divisor tendendus.

Si

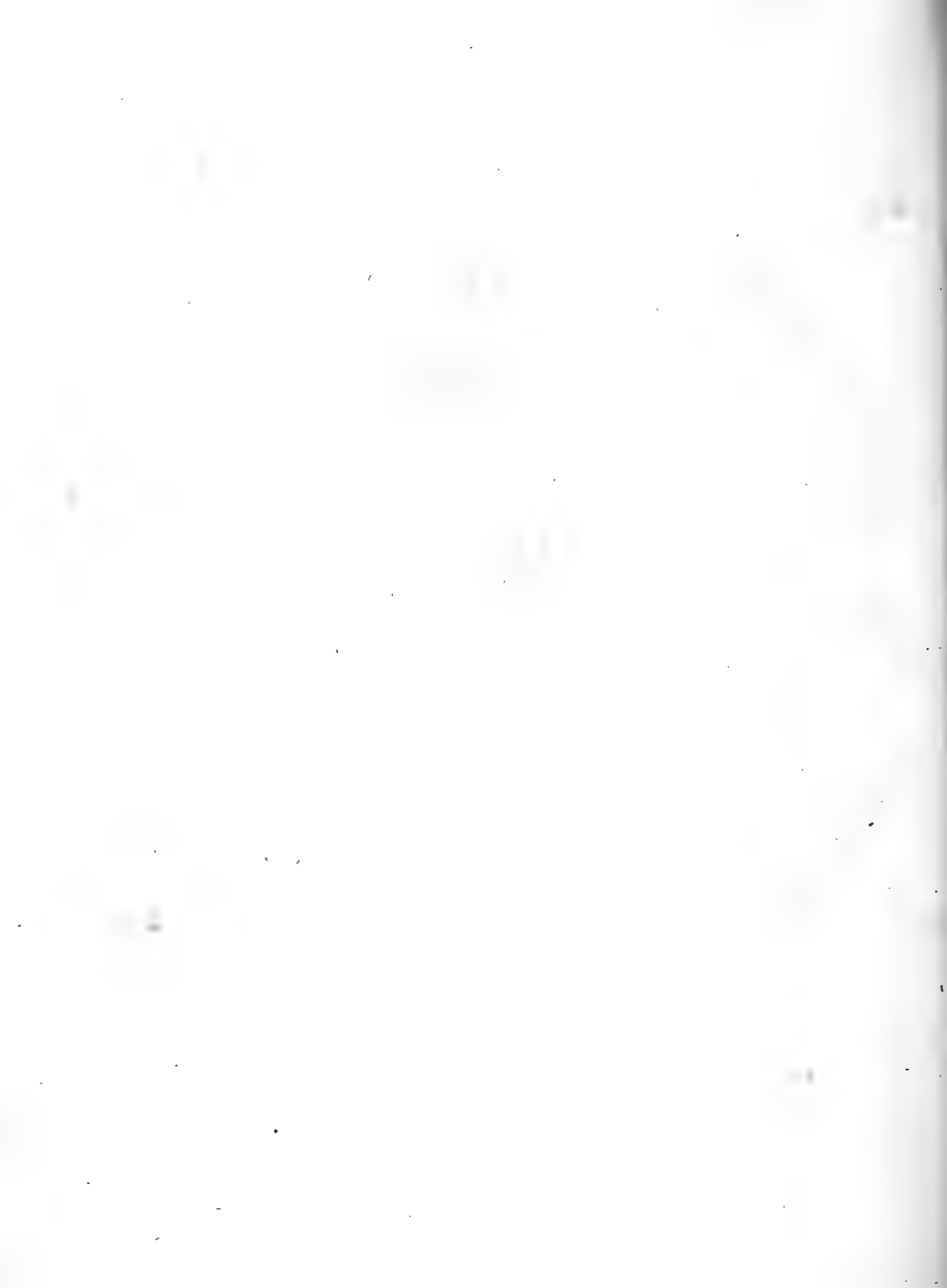
Si nullus inveniri potest hoc pacto divisor qui succedit, concludendum est quantitatem propositam non admittere divisorem duarum dimensionum. Posset eadem methodus extendi ad inventionem divisorum dimensionum plurium, quærendo in prædictis summis differentiisque progressionem non arithmeticas quidem sed alias quasdam quarum terminorum differentia primæ, secundæ, tertiæ, &c. sunt in arithmetica progressionem.

Ubi in quantitate proposita duæ sunt literæ, & omnes ejus termini ad dimensiones æque altas ascendunt; pro una istarum literarum pone unitatem, dein per regulas præcedentes quære divisorem, ac divisoris hujus comple deficientes dimensiones restituendo literam illam pro unitate.

POLITE LITERATURE.

VOL. XI.

B



## ERRATA.

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- | Page | Line       |   |
|------|------------|---|
| 16   | — 1        | at top, for <i>are displeasing</i> , read <i>it is displeasing</i> .    |
| 18   | — 2        | from bottom, for <i>non ti timo</i> , read <i>non ti temo</i> , &c.     |
| 19   | — 1        | from bottom, for <i>Pussignol</i> , read <i>L'ussignol</i> .            |
| 45   | — 13       | from top, for <i>is found</i> , read <i>is formed</i> .                 |
| 83   | — 16       | from top, for <i>with blood</i> , &c. read <i>with the blood</i> , &c.  |
| 155  | — 5        | from bottom, for <i>proudencc</i> , read <i>prudence</i> .              |
| 159  | — 8        | from top, for <i>abstactedly</i> , read <i>abstractedly</i> .           |
| 184  | — 7        | from top, for <i>substraction</i> , read <i>substratum</i> .            |
| 188, | last line, | for <i>p̄ti duosque laborē</i> , read <i>et duos perferre laborēs</i> . |

1914

The first of these is the fact that the  
the population of the world is increasing  
at a rapid rate. At the same time the  
resources of the earth are being rapidly  
depleted. This is due to the fact that  
the population is increasing so rapidly  
that the resources of the earth are being  
depleted at a faster rate than they are  
being replaced. This is a serious  
problem and one that must be solved  
if we are to have a future for our  
species.



OF  
H A P P I N E S S.

BY RICHARD KIRWAN, ESQ. L. L. D. P. R. I. A. F. R. S. &c.

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CHAP. I.

*Definitions and general Observations.*

READ NOVEMBER, 13th, 1809.

1. **HAPPINESS**, strictly understood, denotes that state in which pleasure is unceasingly perceived unmixed with pain, as Misery is that state in which pain is durably suffered unmixed with pleasure.

It is distinguished from pleasure only by the utter exclusion of pain, with which mere *pleasure* is frequently accompanied, preceded, or followed. *Pleasure* is applicable only to perceptions, but happiness is attributable only to states, or to such individuals on whom those perceptions are impressed uninterrupted by pain.

2. Happiness is susceptible of various degrees, according to the *number, intensity, duration and complexity* of the plea-

asures that constitute it; however the *number* of co-existing pleasures contributes to happiness only when they are moderate. A *single* pleasure, if intense, prevents attention to every other; thus the overwhelming pleasures arising from the sublimity or pathos, of poetry, oratory or music, render us, while in their vigour, insensible to the exquisite versification of the poet, the elaborate elegance of the orator, and to the fascinating melody of the composer.—But (3.) when the strength of these emotions is somewhat abated, then the pleasures they produce, and those arising from the structure of their exciting causes, are simultaneously perceived.

4. *Intense* pleasures are those that engross the entire attention, and thus render us insensible to every other perception of inferior intensity.

5. *Moderate*, are those that attract it more feebly or partially. Most are susceptible of various degrees; the inferior degrees are called *amusements*; but even the most trifling, if unattended with pain, either corporeal or mental, as in children, contribute to an inferior degree of happiness.

6. The inability to fix attention in any degree in our waking hours, occasions a high degree of misery, known by the name of irksomeness or *ennui*.

7a. Pleasures, whether intense or moderate, are more or less *durable*; the *intense*, except in a few instances\*, are the least; the *moderate* the most so; the former are generally followed

\* These are study, meditation, and composition.

followed by fatigue or pain, the latter are exempt from both : the most durable gradually languish and fade away, and in proportion to this decay the attention bestowed upon them declines and subsides : all are diminished by repetition.

7b. The nature of simple and complex pleasures or pains cannot here be explained, but shall in the sequel. Human life, it must be owned, has in no instance, ever exhibited an unbroken series of such happiness as has been here defined ; many of the perceptions experienced during its continuance are purely painful, and by these, feelings even of the pleasurable kind are too frequently infested, sullied, debased and degraded, a truth of which we are fatally convinced both from experience and from observation.

8. Hence the only happiness of whose attainment we can entertain any rational hope, or discover any instance in the present state of our existence, is of the *mixed kind*, made up indeed of pain and pleasure, but in such proportion, as that upon the whole, on balancing the account, pleasure may be found to predominate either in the comparative number of its perceptions, or in their intensity, or in duration ;\* but if, on settling the account, painful perceptions be found to exceed in those respects, then a life so conditioned must upon the

\* In strictness, that condition may be denominated happy, in which the amount or aggregate of pleasures exceeds that of pain ;—the degree of happiness depends on this excess. Paley's Moral Philos. c. 6. so also Maupertuis and 2 Search. 188.

the whole be deemed to be, or to have been, a scene not of happiness but of *misery*.

9. That on questions naturally arising from the consideration of a subject so complex, intricate and extensive, different opinions should be entertained, may well be expected. Many think that on a general survey of our present existence, *misery* will be found to be the ultimate result of our observations. Some have endeavoured to prove that more happiness is found in the savage than in the civilized state; and others assert it can be found only in the civilized state, and is equally distributed betwixt its different classes, though unequally among the individuals that compose each class; and finally, others think it unequally distributed among these different classes, some asserting its prevalency in the superior, others in the inferior, but granting its inequality among different individuals of each class.

10. To examine the truth or falsehood of these opinions, with such a degree of accuracy as the subject permits, it is necessary that we should enumerate the general sources, both of those pleasures and pains that occur, or may occur, in every state and condition of human life; and then endeavour to trace and estimate the quantity of each in the above-mentioned states and conditions.

11. We must further remark, that all our pleasures and pains are derived to us either *immediately* through the medium of our senses, and hence called *corporeal*, or *mediately* through  
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the imagination, and thence called *ideal*, or totally foreign to, and unconnected with the senses, and thence called *mental*.

12. Farther, the capacity of receiving mental pleasure or pain, differs from those capacities or powers usually attributed to the human mind, namely, *memory*, *understanding* and *will*; for the exercise of none of these is essentially connected with pleasure, nor with pain, though frequently accompanied with either; they proceed in every case from the senses, or the imagination, or from a faculty hitherto unnoticed, which I call *affectibility*.

CHAP:

## CHAP. II.

*Of Corporeal Pleasures and Pains.*

13. **CORPOREAL** pleasures and pains are, not only those which we receive from the senses as just mentioned, but those that affect the whole frame, as *exercise* and *lassitude*, *rest* after fatigue, *incipient* sleep, *refreshment* after long abstinence, *renewed vigour* after sound sleep, *languor* and *sickness*.

14. Of the senses five are commonly reckoned and are well known; but to the pleasures they impart we may add that of the *stomach* on receiving food of which it had long suffered the privation, and of the *fauces* when relieved from thirst—these may be called *internal* senses.

15. All sensual pleasures were probably at first *organic*, that is apparently seated in the organs through whose mediation they are received, though at present only those of *taste*, *smell* and *touch*, and their antagonist pains, are deemed to reside in their respective organs.—But the impressions of vision and of hearing, at present bear no reference to their respective organs, unless excessive or the organs diseased. I say that *at present*, only those of *taste*, *smell* and *touch* and those arising from the gratification of the *internal senses* are organic, for the pleasure of vision, was certainly at first organic,  
since

since the youth whom Chiselden's operation enabled to see, declared he felt a most delicious sensation in his eye; but this pleasure faded away, never more to be recovered; its absence however was amply compensated by the emotion of Joy at the acquisition of a new sense.

17. Mankind in general love pleasure, particularly the organic, more than they fear pain, even when pain precedes the pleasure, but more especially when pleasure precedes, and the consequent pain is in any degree doubtful. Nay, the gratification of the passions of love and revenge and the desire of fame frequently overcome the fear of certain pain, whether preceding or following.

18<sup>a</sup>. Past pleasures, if moderate, are soon forgotten, if intense, their recollection is attended with melancholy or regret, or even with sorrow, grief or remorse, but the recollection of past *pains* or dangers, on the contrary, is pleasing, by contrast with our actual state of freedom from them. As they are generally more intense than pleasures are, they are longer remembered.

18<sup>b</sup>. The intensity of *corporeal* pleasures diminishes in proportion to their duration, but the intensity of corporeal pain increases with its duration. On the contrary, the intensity of *mental* pleasure increases with its duration, and that of mental pain diminishes.

## § 1.

*Of the pleasures of vision and their correlative pains.*

19. **T**HE only visual perceptions essentially pleasureable are those of *light* and *colours*; for they can no more be separated from pleasure than the sweetness of honey from the pleasure it affords. And 1st, *light*, because it sets all the internal organs of vision in motion, and from the moderate motion of these, visual pleasure seems to arise, though it no longer appears seated in the eye itself as it did at first. This motion may be observed in the pupil of the eye, which expands or contracts according as the light is more or less abundant, and excessive light, if long continued, is known to destroy internal organization; hence Milton's expression, *dark with excessive light*. 2dly, pure *colours*, such as those of the prismatic rays, are distinct modes of visual pleasure inseparably inherent in, or rather perfectly identified with them—a pleasure that also seems derived from peculiar gentle motions of the organ; hence scarlet and deep violet are the least pleasing, the former by the violence of its action, and the latter by its debility. Impure colours are less pleasing as including a mixture of opacity, or even displeasing when their mixture produces organic motions that obstruct each other.



other. Purple is pleasing by tempering the intensity of the red, and enlivening the languor of the deep violet.

20. *Variety* is pleasing by supporting attention, which is apt to droop when a single object is long contemplated; hence the pleasure of shews.

Visible objects appear either in motion or at rest; the results of their motion form events.

21. *Proportion*, which is the ratio of similitude discerned betwixt different visible objects, is indeed introduced by vision of the objects which present it, but is not itself a visual, but rather an intellectual object.\*

22. *Beauty*, in its strict literal sense, is a denomination solely applicable to objects that afford pleasure to the sight, independantly of any relation to any thing else—such objects are light and colours. In the most ancient and venerable book now existing, we find this term first applied to the fruit of the fatal tree, its colour being said to be beautiful. But in a somewhat more enlarged sense it is applicable to such forms as most powerfully suggest instinctive sympathetic affections, emotions and sentiments. Such forms constitute *sexual beauty*, which therefore consists in such expression in the frame of each sex as has the strongest tendency to inspire those feel-

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\* What was the original colour of man, whether *black* or *white*, has been attempted to be rendered doubtful; but that it was the *white* seems to me to be satisfactorily inferred from this, that warm climates, even at this day, produce in the *whites* an approximation to blackness, but no change of climate produces in the *blacks* an approximation to whiteness.

ings in the other. But as these impressions are various, both in kind and degree, in the sex on whom they are made, hence the common saying, that *every eye makes a beauty*.

24. In a *still more enlarged sense* all visible forms that excite *admiration* are termed *beautiful*. This admiration may arise from various sources, too numerous to be here enumerated.\* Many, which originally were beheld with pleasing wonder, as watches, &c. now cease to excite any, from our having been long accustomed to them.

25. In a *metaphorical or figurative sense*, many objects not visible are often called *beautiful*; thus we talk of beautiful music, songs, sonatas, and even of beautiful single sounds; beautiful inventions, the beauty of virtue, beautiful allegories, &c. nay even of beautiful theorems in mathematics; as they all, by exciting admiration or approbation, produce pleasure analagous to those of vision.

26. *Grace* denotes the beauty found in motions, gestures or postures; it consists in an expression of refinement, respect, or of any of the milder passions, unlike the hasty, awkward, impetuous motions and unbecoming postures of savages, or of the lower unpolished class of civilized society.

27. The sense of the *sublime* is also a pleasure awakened in us by vision, being excited by objects whose magnitude suggests the existence of a power far exceeding the human: thus lofty mountains, the apparently unbounded expanse of  
the

\* See 1 Blair's Lectures, p. 104.

the ocean, the immense vault of the heavens bespangled with stars, or any other extent in every sense unlimited, when attended to never fail to excite it, and are therefore themselves denominated sublime; it seems to me to consist in an emotion of *astonishment* at the power exerted in the production of such objects.

28. Hence the production of any other effects, suggesting the notion of infinite power, by causing astonishment, may be denominated sublime.\* Terrific objects, so far from contributing to this emotion, seem to me rather to interrupt and suppress it, by exciting another emotion that interests us more nearly.

29. *Grandeur* is an approximation to the sublime, exciting an inferior but analagous emotion; this we experience in beholding the elevation of a balloon, or the magnificent spectacle of a first rate ship of war.

30. Here it may not be amiss to remark, that *magnanimity*, by exciting some degree of surprise, has frequently been confounded with the sublime, and dignified with that appellation: it seems however to be applicable only to sentiments which excite *admiration*, by indicating a frame of mind superior in energy, vigour or fortitude, to that observed in *common mortals*; thus the *illum non populi fasces, non purpura regum—flexit*, &c. of Virgil; the apostrophe of Demosthenes  
justifying

\* Hence Huet was much mistaken in denying the sublimity of Genes. 1. 3. he falsely imagined that simplicity was opposite to the sublime. See x Bib. Choisie, 220.

justifying the unsuccessful battle of Cheronea, the *qu'il mourut* of Corneille are indeed striking instances of magnanimity, but cannot be denominated sublime.

31<sup>a</sup>. The *pains* derived from vision, when not of the sympathetic kind, are but few : namely, that arising from a view of *deformed* objects (and this may easily be avoided) and the *horror* felt on a near approach to precipices ;—and even this ceases in persons long accustomed to such views.

31<sup>b</sup>. The pleasures of the *imagination* are for the most part derived from a mental representation of beautiful objects, attended with pleasing associations ; more rarely from representations of the sublime, frequently from delusive visions of future happiness, or of prosperous events, often from the contemplation of scenes suggested by real or fabulous histories. Its countervailing pains are numerous, and much more intense since they lead to insanity, and often to the most direful superstition.

## § 2.

*Of the Pleasures and Pains conveyed by the sense of Hearing.*

32. THE objects of this sense are sounds, and these when *pure, properly combined, and varied*, afford the highest pleasure we receive through any of the senses; it probably at first appeared seated in the internal organs of the ear, though at present these organs are perceptibly affected only by harsh, over acute, hoarse, ill combined or confused sounds; these last constitute *noise*; the *agreeable* seem transmuted into the sentiments they inspire.

33. Single sounds, when perfectly pure, such as those elicited from glass cups, properly constructed and touched, infuse pleasures that seem to us to participate of the celestial; so also do combined sounds perfectly concordant.

34. The pleasure produced by pure single sounds, seems to arise from the free, gentle, uninterrupted motion of the internal auditory organs; for when excessively *loud*, excessively *low*, as in whispers; or *acute*, as those of some birds; or *grave and deep*, as the bellowing of oxen, thunder, &c. or *stridulous*, as that of oaten pipes and often of hautbois; or *interrupted*, as that of a hoarse human voice; or *shrill*, as that of trumpets; or confused and monotonous, as that of  
drums,

drums, are displeasing ; as the over loud overpower the auditory organs, the over low act upon them too feebly, the over acute strain them,\* and the over grave or deep difficultly excite corresponding motions: yet the sound of trumpets, when properly varied, and that of drums, when exactly measured, are very agreeable.

35. Two or more sounds that produce agitations in the auditory nerves, that do not interrupt each other, but so strictly coalesce as to produce a 3d sound, whether heard jointly or in succession, are highly agreeable ; such are consonants and concords, but those that disturb and interrupt the action of each other on the auditory organs, are called dissonants and discords ; some of these however, when properly managed, produce a pleasing effect, and perhaps all, when introduced on proper occasions.

36. Some men have their organs of hearing so unfortunately constructed, as to receive no impression corresponding with the 3d sound, and consequently no perception of harmony ; these are commonly said to have no ear for music : most of them however, I believe, receive pleasure from the variety and measure of successive sounds, particularly when they excite alacrity.

37. Petrarch relates, he met with a man who was more pleased with the croaking of frogs, than with the dulcet strains of the nightingale.

### 38. Music

\* These Dr. Barney calls *cork-cutting notes*. Hist. Mus. vol. 4. p. 481.

38. Music consists in the agreeable succession whether of single or simultaneous sounds ; the former is called *melody*, the latter *harmony* : it differs from beauty in this that it not only produces pleasing sensations, but excites various sentiments, and occasionally even passions : whereas beauty, except that of the sexes, is incapable of exciting any emotion, but that of admiration. Colours, neither by their succession nor by their simultaneity, produce any distinct pleasure arising therefrom.

39. Music, in as much as it affords *sensational pleasure*, for want of any other appropriate term, is called *beautiful*, as like beautiful objects, it excites admiration : but this analogy is very distant and imperfect ; as those musical passages denominated *beautiful* not only produce admiration, but impress sensations infinitely more intense and forcible, than any that beauty (except the sexual) can inspire.

40. But the principal, and indeed incomprehensible merit of music, consists in its action on the imagination and mental affections, with which no succession of sounds has any conventional nor other conceivable connexion ; in this respect its power seems to partake of the *supernatural*, like that anciently attributed to magic ; and hence the epithet *enchanting* is properly applied to it : in fact the ancients supposed that by music the Moon may be brought down from her sphere, *lunam deducere cantu*, and rocks and wild beasts attracted, *saxa ferasque lyra movit Rhodopeius Orpheus*, and the most fu-

rious passions excited or assuaged. This power is called that of *expression*; when it is in no degree exerted, the strains produced cannot properly be called music, but rather a jumble of sounds.

41. The *magnanimous* emotions and sentiments must, to be supremely pleasing, be expressed with *dignity*,\* the *sublime* with majesty, the gentle and milder with dignity, grace† and elegance,‡ even when worked up to frenzy. The degree with which this power is exerted, constitutes the superior excellence of the composition, and proves the superior genius of the composer.

42. As many passions, emotions and sentiments are nearly allied with each other; for instance, the *majestic* with the *martial*;§ the *tender* with the *plaintive*;¶ the mind would be apt to confound and mistake the strains expressive of the one for those of the other, unless it were guided to the discrimination of each, by words declaring their specific application, and the circumstances that give birth and growth to each sentiment; hence the propriety of the union of poetry and music. Melodies thus introduced are capable of inspir-  
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\* By *dignity* I understand a mode of expression becoming persons of rank and education, or beings of a superior nature, and opposite to *vulgar*, *mean* and *groveling*.

† By *grace* I understand a smooth, gentle, melodious, soothing arrangement of sounds, and opposite to the *uncouth*, *harsh* and *whining*.

‡ *Elegance* denotes selection, in opposition to trite, common place passages. See *il Caro ben perdei*.

§ As son *Regina* & son *Amante*, and *non ti timo in campo Armato*.

¶ *Cara saro fedele*, &c. and *si tutti i Maliniei*, &c.



ing pleasures that penetrate into the inmost recesses of the soul; but such transcendant pleasures are experienced only in operas and oratorios composed by the best masters, duly attended to, and properly executed.

43. *Solos, sonatas* and even *concertos* being destitute of such accompaniment, must, to compensate in some measure for this defect, suggest imaginary scenes productive of emotions or sentiments, and please by well managed contrasts and passages original and striking. Sudden whimsical transitions, destructive of any imaginable scenery, may indeed surprise, as rope-dancers do, but must disgust persons of real taste.

44. *Overtures*, as I was informed by that eminent master, *Sacchini*, must afford some fore-taste of the sentiments contained in the pieces they introduce: This I mention because Rousseau was of a contrary opinion:\* of such overtures that great man has given excellent specimens in those to *Rinaldo*, *Chimene*, and many others.

45. The sentiments expressed by music are chiefly the following:—The *religious*, the *majestic*, the *pompous*, the *haughty*, the *indignant*, the *spirited*, the *martial*, the *terrific*; the *exhilarating*, the *lively*, the *jovial*, the *comic*; the *melancholy*,† the *tender*, the *plaintive*, the *supplicating* (Burney, 494,) the *anxious*, the *horrific*, the *romantic*,‡ the *imitative*.§

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\* Dict. Musique *overture*.

† Brown, page 44 of his Letters on Music, remarks that the melancholy must not approach to deep distress, for then it becomes mean lamentation.

‡ As in the *Bergeries de Couperin*.

§ *As se perde Pussignol*.

It were easy to adduce examples of each of these, if this were the proper place.

46. The sublime is also a sentiment which music can excite in a much higher degree than any visible object: it is produced by an elaborate and magnificent combination of sounds distributed into 6, 8, or at least 4 parts, celebrating the infinite majesty of the Supreme Being: the most perfect specimen of this is exhibited by Handel;—*He is the King of Glory, the Lord God reigneth for ever and ever, hallelujah.*—The most exquisite performance ever produced by man. See the grand chorus of the Messiah.

47. The pleasures of vision and music not being perceptibly organic, are deemed to participate more of a spiritual nature than any other proceeding from the senses, and hence are the only that are mentioned to exist in heaven.

48. The pains impressed through the sense of hearing, besides those mentioned, No. 32 and 34, are chiefly of the sympathetic kind, as those caused by groans, lamentations, mournful ditties void of grace or dignity; though even these, by powerfully agitating sluggish minds, that would otherwise be a prey to ennui, and partly by the inherent pleasure of sympathetic grief, or by reviving the memory of our earliest youth in which they were first heard, or through national prejudices and mistaken pride, still give pleasure, at least to many who have heard nothing better. Grating discords, false tones and incoherent dissonances, universally give pain.

## § 3.

*Of the Pleasures and Pains of the sense of Smelling.*

49. THE pleasures we receive through this sense are, of all others, the most transient, for after a few minutes we either become insensible to them, or are satiated: Some scents are reviving, but not exactly pleasurable.

50. But the painful sensations communicated through the medium of this sense are far more numerous than the pleasures it imparts, and much more intense; for some are so powerful as to occasion instant death.

51. To some of the more moderate, many are reconciled by being long habituated to their endurance.

## § 4.

*Of the Pleasures and Pains of Touch.*

52. The *pleasures* from the touch are so few that they scarce need being mentioned; even that of *warmth* pleases only by the contrast with its antagonist, *cold*; that of *smoothness* is inconsiderable, though its opposite, *roughness*, causes much uneasiness. But the *pains* introduced through this sense, whether internal or external, are by far the most numerous, and occasionally the most intense to which our bodies are exposed. The qualities of the instruments that inflict or occasion pain are frequently applied metaphorically to mental pains, as *pungent*, *sharp* or *acute*, *excruciating*, *burning*, &c. Even *pleasures* that are comparatively held in least estimation are distinguished by terms derived from this sense, as *coarse*, *gross*;\* so also moral objects, as *rough*, *rude*, *rugged* tempers or manners, in opposition to the *polished* and *delicate*, receive these denominations by reference to the touch.

## § 5.

\* By *gross* pleasures are meant those that appear seated in the organs of sense, as those of *smell*, *taste* and *touch*. By refined pleasures I understand those that do not seem organic, as those of vision and those transmitted by the sense of hearing. Mental pleasures, not criminal, as that of revenge, belong also to this class.

## § 5.

*Of the Pleasures and Pains of the Taste.*

53. The pleasures and pains perceived by the taste elude every attempt of enumeration by their unlimited variety. Of the *pleasing*, the sweet is so prominent that it has been metaphorically applied both to beautiful objects and to the most pleasing sounds, and even to moral objects, as *temper*, &c. Of the most disagreeable tastes the *bitter*, the intensely *sour*, the *disgusting*, the *nauseous*, the *vapid* and *insipid* are chiefly distinguished :—these also are applied metaphorically to mental pains, censurable moral conduct, temper and actions ; thus we apply *bitterness* to grief sorrow and remorse ; *sourness* to ill temper ; *disgusting* or *nauseous* to certain offensive indecencies or improprieties ; *vapid* to spiritless ; and *insipid* or *maukish* to tasteless characters or compositions.

54. *Delicacy* and *delicateness*, both denote *refinement*, being derived from the Latin *licium*, the fine thread in a weaver's shuttle. Metaphorically both are applied to exquisite pleasures received through any of the senses, and also to the objects that afford them.

55. *Delicacies* refer principally to such objects as are most relished by the *taste* ; the sensations they impress are called *delicious*,

*delicious*, a term frequently applied to exquisite pleasures of the body, and metaphorically, to those of the mind; and in this sense it stands in opposition to pleasures more *vulgar* and *common*.

56. When *delicacy* is attributed to the *touch* the assimilation to thread is still closer; for as in the literal sense, the finest thread is called *delicate* when smooth, even, and free from asperities, so in a metaphorical sense, the pleasures of most of the senses are called *delicate* in proportion to their *refinement*, in opposition to the *grosser* pleasures of gluttony, inebriation, inhuman shews or sports, indecent dances, barbarian uncouth music, silly amusements, &c.

57. Thus also it is applied to refined language, sentiments and manners, in opposition to the *rough*, *rude*, *coarse*, *blunt* and *unpolished*.

58. Farther, as the finest threads are most easily broken, so weak constitutions, being most easily injured, are called delicate, and so in general are circumstances and objects that require to be cautiously treated and attended to.

59. In prosecution of the above analogies, the purest critical taste in the polite arts is called *delicate*.

## § 6.

*Of agreeable and disagreeable Sensations that affect the whole bodily Frame.*

60. THE most pleasing of these are, 1st, the *general sensation of health* manifested by vivacity and high spirits; secondly, the pleasure of *convalescence*, and that felt on the *cessation of acute pain*. 3dly, *refreshment*, by satisfaction of the painful sensations of hunger and thirst; or 4thly, by *sound sleep*, or by *rest* after fatigue. 5thly, *Somnolency* leading to profound sleep. 6thly, *exercise*.

61. The corresponding uneasiness or pains are first *debility, languor, fainting* and *sickness*. 2dly, *hunger* and *thirst*. 3dly, *vigilance*. 4thly, *labours*. 5thly, *lassitude*.

62. We may observe, that many of these pains are far more intense, durable and numerous than their opposite pleasures, and that the degrees of which each is susceptible are various.

## CHAP. III.

*Of Mental Pleasures and Pains.*

63. **BY** mental pleasures and pains I understand those we receive without the intervention of the external organs of sense; these are numerous, but may be classed according to the capacities or powers (as they are commonly called) of the human mind to which they refer, and from which they appear to flow. These powers may conveniently be reduced to the six following; *Animality*, or the power of receiving sensations (which, not being the immediate source of pleasures or pains, purely mental, is mentioned here only to render the division of human powers more exact and compleat,) *memory*, *imagination*, *understanding*, *will* or the elective power, the *moral sense*, and *affectibility*.

64. It is needless to observe, that these powers are nothing distinct from the soul itself, considered either as a subject in receiving sensations, ideas, emotions, desires and sentiments, or as an agent in willing or judging.

65. The pleasures and pains of *memory* consist in the ideal repetition of sensations originally received by *vision* and *audition* (if I may be permitted to denote by this word the sense  
of



of hearing) accompanied with the sentiments they suggest. See No. 18.

66. *Imagination* is the power of varying, by addition or subtraction, the order and species of ideas of sensations originally received either by the *eye* or the *ear*\*. To ideas of these sensations it seems to me confined, as Mr. Addison first noticed†, of which opinion were also Dr. Reid‡, Dr. Blair§, Dr. Johnson||, and Mr. Home¶; yet professor Stewart\*\* and Mr. Edgworth‡‡ think the imagination may represent perceptions derived from all the senses; to this opinion I should accede, could I allow that we have, at least after a moderate interval, any idea of sensations derived from any of the other senses—at least, as to myself I cannot find that I possess any. Mr. Addison does not mention ideas of sensations received through the sense of hearing, nor does Dr. Johnson; plainly because neither of them had an ear for music.

67. Mr. Stewart allows, that though the greater part of the materials which the imagination combines, are supplied by objects of sight, yet insists that many pleasing images are

Especially borrowed

\* This definition, which appears to me perfectly just, was, as far as I recollect, first given by Dr. Barnes, 1 Mem. Manchester, 382.

† Spectator, vol. 6. No. 411.

‡ On intellectual powers, chap. 4. p. 21. in 8vo.

§ 1 Blair, vol. 1. p. 56.

|| 2 Boswell's Life of Johnson, p. 534, and 3 Boswell, p. 23.

¶ Elements of Criticism, appendix, sec. 13.

\*\* On the Mind, 483, in 8vo.

‡‡ 3. Edgworth on Education, 129.

borrowed from the fragrance of the fields and the melody of the groves; and that even the more gross sensations of taste form the subject of an ideal repast; in support of which, he quotes some lines of a poetical description of the *wonders of the torrid zone*, in nineteen lines of which there are only three that allude indeed to the sense of taste, but denote none in particular; they are the following:

“ Oh let me drain the cocoas bowl,  
 And “ Quick let me strip thee of thy spiny coat (the anana)  
 “ Spread thy ambrosial stores, and feast with Jove.”

Can the reader form any representation of cocoa milk, or of the taste of a pine apple?

68. However it must be owned, that the words *sweet*, *bitter*, *fragrant*, *fetid*, and such like epithets denoting objects of taste or smell, please or disgust us respectively, but they produce these effects, not by exciting corresponding ideas, but by suggesting the recollection that these terms were originally annexed, and are still applicable to sensations highly agreeable or disagreeable, obtained through those senses; as was first remarked by Dr. Berkeley\*, and afterwards by Mr. Burke†, and allowed, though with some limitation, by professor Stewart‡.

69. The terms then that denote the pleasures or pains of the senses of taste, smell or touch afford notions of those  
 pleasing

\* Introd. to Principles of Human Knowledge, § 20. Min. Philos, Dial. 7. § 8.

† Essay on the Sublime, &c. Part 5. § 3. and 4.

‡ Elements of the Philos. of the Mind, p. 502. 8vo.

pleasing or displeasing sensations ; but they cannot represent them, as terms expressive of visual or audible objects do ; thus I may have a mental representation of the house I live in, mount its stair and view its apartments ; I may also mentally repeat the sounds of a song I heard, admired and learned ; but to imagine the taste of the several dishes that form a mental repast, exceeds any power I possess. So I know well what a tooth-ach is, and also what hunger and thirst are ; but I cannot represent these pains, and consequently can form no idea of them according to the exact sense of this word.

70. The representation of sensible objects by the imagination, and the notions that accompany them, frequently occasion emotions or desires, as we experience in reading or hearing histories, poems, romances, novels, &c. but these sentiments belong not properly to the imagination, for though much weaker, they are not ideal, but are as *real* as the objects represented if *actually existing* would themselves excite ; for, as Mr. Stewart well remarks, we are deluded into a *transient belief* of the actual existence of such objects.\* That they are not ideas, is evident from this, that we cannot feel emotions of *joy* or *grief*, &c. merely on hearing those words pronounced, as we can form ideas of a *house* or *tree*, when  
named

\* Elements, p. 142, &c.

named. Emotions cannot be elicited at pleasure ; they must be excited by appropriate descriptions and circumstances.

71. The imagination sometimes acquires the vigour of a sensation as in dreams, poetic transports, and the visions occasioned by mental derangement ; persons in that state, fancy they can see and hear, but never that they touch, smell or taste.—To an imagination thus invigorated I attribute the Scotch second sight, and the fancied *calls* mentioned in 3d Boswell's Life of Johnson, p. 263. See also 2 Crichton, 41, &c.

72. The *pleasures of imagination* arise either from *narratives*, true, or supposed to be so, and at the same time important or curious, properly arranged, and related in language correct, elegant and perspicuous, or even when known to be fictitious, as heroic poems, tragedies and romances, when they do not overleap all bounds of probability, but excite emotions, sublime, grand, marvellous or pathetic. And *novels* and *tales*, whether moral or merely amusing, exhibiting characters and personages of ancient or modern date engaged in adventures comic or serious, that by their novelty and variety attract and enchain our attention, and excite such emotions as the adventures would naturally suggest.

73. Or from *descriptions*, whether brilliant, splendid or picturesque ; or glowing, impressive and impassioned ; or ludicrous, comic, burlesque or sportive.

74. Or

74. Or from fancied *anticipations* of future gratifying events.

75. The *pains* peculiar to the imagination are derived either from an exorbitant estimation of present, or a true or delusive expectation of future evils.

76. The pleasing or displeasing impressions we receive on perusing or contemplating works addressed to the imagination, having some analogy to our relish or disrelish of different kinds of food, has thence obtained the name of *taste*. And as *sensual taste* may be true and just, or vitiated, corrupt and depraved, so may the mental. The analogy might be much farther extended, were this the proper place.

77. *Exercise* is the only pleasure, of which, as it appears to me, the understanding is susceptible. A pleasure so much the more intense as the exercise is more severe. It is attended with the most pleasing emotions of joy, or surprize, when it terminates in the discovery of some general and important truth, or useful invention, or plan of conduct.

78. And on the contrary it is attended with vexation and disappointment, on discovering incidental errors and mistakes, or with severe regret, at having been employed on trifling subjects, or applied to idle or pernicious purposes.

79. Compliance with the dictates of the *moral sense* is attended with self-satisfaction, and with the more exalted pleasure of conformity with the Divine will.

80. The

80. The violation of its dictates, in proportion to its criminality, is avenged by sentiments of self-condemnation, disquiet, sorrow, remorse and fear of punishment either in this life or the next.

81. The pleasures and pains of *affectibility* will be shewn in the next chapter.

## CHAP. IV.

*Of the Pleasures and Pains arising from Affectibility.*

82. *Affectibility*, considered as a distinct source of pleasure or pain, has not, as I conceive, been hitherto sufficiently attended to; hence it is necessary I should explain the notion I form of it.

83. By affectibility then, I understand, that capacity, or passive property of the mind that renders it susceptible of pleasures and pains, distinct and different from those inherent in the perceptions of the senses, memory, imagination, understanding, or moral sense, though constantly preceding or following each of them.

84. Thus, suppose a man pinched with *hunger*, to have food set before him; he is rejoiced. This *joy* is a pleasure surely distinct and different from the satisfaction of his appetite, or the *taste* of his food.

85. Again, suppose his food suddenly snatched from him, he is *vexed*, and this *vexation* is a pain very different from that of *hunger*, or unsatiated appetite.

86. Suppose sight bestowed on a person born blind ; before receiving it, he feels the pleasing *hope* of receiving a new source of pleasure and ardently *desires* it ; on its reception he feels a new *organic* pleasure, and after its reception he is rejoiced at the acquisition ; surely this *hope*, this *desire*, the *organic pleasure* of vision, and the subsequent *joy*, are perceptions very different from each other.

87. It were tedious, and, I hope, superfluous, to shew the distinction of the perceptions that originate in affectibility from the pleasures and pains inherent in those of the imagination and other faculties which have been already mentioned ; but it is proper to observe, that the mind is perfectly passive in their production, and cannot excite them by a mere act of the will, no more than the perceptions of *taste* ; they are therefore caused by the Great Author of Nature, acting differently on different predefined occasions, according to pre-established laws.

88. The pleasing and painful perceptions attributed to affectibility, may, in the point of view in which I here consider them, be reduced to three general heads ; *Emotions*, *desires*, and *sentiments*, all are susceptible of degrees, all are pleasing, or painful, or indeterminate, and when excessive, may be called *passions*.

89. These perceptions are as incapable of being defined as sensations, that is, the perceptions of the senses, tastes, smells, colours,



colours, &c. are known to be, but they may be *described* and discriminated by assigning the general causes and effects that characterise each ; and if mixed and compound, as some of them are, the ingredients of such compounds may be distinguished and developed.

90. In forming such *descriptions* with accuracy and elegance, Dr. Cogan has excelled all preceding writers. To him I am principally, but not invariably indebted for the grounds of those I attempted. His arrangement, though perfectly just with respect to classification, I have not followed ; that not being consistent with the end I had in view.

## § 1.

*Of Emotions.*

91. By emotions I understand those purely mental impressions, that produce a pleasing or displeasing change in the previous state of the mind, but do not of themselves, excite to action.

*Pleasing.*

92. *Joy* denotes the pleasure excited by the attainment, or confident expectation of some desired or desirable event, or 2dly. By escape or delivery from danger, whether felt or apprehended.

93. It is susceptible of various degrees, its highest is *exultation* or *transport*, its lowest *gladness*. Its highest induces a temporary oblivion of every thing else, even of preceding or concomitant pain, whether corporeal or mental if not excessive.

94. When

94. When considerable, it visibly affects the bodily organs, particularly the eyes and countenance; and if accompanied with surprize, it has frequently produced insanity, and sometimes death.

95. Even when moderate it produces *complacency, satisfaction, good humour, alacrity and mirth.*

96. Perceptions of the *sublime, grand and magnanimous.* These are *emotions* quite distinct from the sensible objects that occasion them. Objects *may* indeed be grand and vast beyond our comprehension, but the impression such objects make upon us independently of their perception, is what is properly called the sense of the perception or sense of the *sublime, grand, magnanimous.* See No. 27 and 46.

97. The pleasing emotions excited by objects or sentiments *great and surprizing,* but not surpassing human power, or the energies of the human mind, are analagous but far inferior to the emotion of the sublime. Analogous to these are also the pleasing emotions excited by *wit.*

#### *Displeasing.*

98. *Sorrow* denotes the painful or displeasing emotions we feel at the happening or failure of an *event,* according as either of these is adverse to our interests, desires, wishes,

or

or expectation, or to those of our friends or persons to whom we are well affected.

99. It is susceptible of various degrees; the lowest is *concern*;—*affliction* denotes a higher, and *stupefaction* the highest.

100. *Grief* denotes the painful emotion we feel at the death of those we loved, admired or esteemed; its degrees are proportioned to those of these sentiments.

101. This emotion contains a mixture of the pleasing sentiments entertained for the person whose loss we deplore; in-somuch that we cherish with pleasure the memory of his person and actions, though it be at the same time painful.

102 *Sorrow* contains no such mixture, we feel no pleasure in contemplating the pains or misfortunes of our friends, notwithstanding the assertion of Rochefoucault.

103. *Regret* is not an emotion distinct from sorrow or grief, but denotes some degree of either. Its exciting causes are the same.

104. *Pity* denotes the painful impression we receive on beholding or considering the pains, misfortunes or dangers of others, in proportion to their magnitude, the relation the sufferers bear to us, and our sentiments with respect to them, suggesting a proportionate desire, or at least, wish of relieving their pains, rescuing them from danger, or alleviating their misfortunes. It extends even to the sufferings of brute animals, particularly if mild, innoxious and affectionate, but scarcely

scarcely those that discover no sign of pain, as fish, insects, &c.

105. *Commiseration*, as Dr. Johnson well observed, differs from pity in this, that it includes no desire of relief.\*

106. *Remorse* is the painful emotion which follows the judgment of self-condemnation for the commission of any immoral act or criminal neglect; or more shortly, it is a pain excited by the consciousness of guilt.

107. This pain is more or less violent according as the act or conduct that occasions it was more or less criminal, the frame of mind of the sufferer more or less sensible and tender, or stern, obdurate and insensible.

108. Its lower degrees are frequently unattended to, or patiently submitted to, rather than abandon the criminal pursuit that occasions it; to blunt its pungency it is often attributed to the prejudices of education, or unreasonable scrupulosity. But the highest degree produces the most tormenting agonies, despair, and even suicide.

109. *Repentance* is remorse acknowledged by the sufferer to be just, and therefore accompanied with regret, dislike, detestation or horror of the delinquency that occasions it, in proportion to its criminality or atrocity; a firm resolution of abandoning it in future, and an ardent desire of forgiveness by the person offended, particularly the Supreme Being; and of repairing, if possible, the wrong or injury committed.

110: *Anger*

\* Boswell's Life of Johnson, vol 1. p. 365.

110. *Anger* is a painful emotion excited by a perception of an apparently unjust attack on our person, reputation or property or other rights, or on those of persons with whom we are connected by ties of love, friendship, or esteem. It is slight or aggravated, in proportion to our constitutional irritability, the apparent magnitude of the offence, and the relation the offender stands in towards us; thus we are more hurt by the infidelity of a wife, than by injuries received from a brother or sister; and more by the injustice of these than by that of remoter relatives; more by that of persons whom we have obliged, than of those with whom we are not so connected; more by wrongs suffered from inferiors, than by those committed by superiors; as the sense of the injuries received from superiors is tempered by the respect we owe them: hence the injuries of a father, unless extreme, are more calmly endured.

111. Anger, apparently *calm*, yet still subsisting, is called *resentment*—this too has its degrees; for there are *slight* and also *deep* resentments. Its lowest degree is called *displeasure*.

112. *Indignation* denotes a higher degree of anger, called forth by signal instances of ingratitude, perfidy, disappointment, or wounded pride.

113. *Rage* is the highest and most turbulent degree of anger, excited by the same causes, and embittered by aggravated circumstances, or uncommon irritability.

114. Of

114. Of all emotions *anger* is that which most frequently affects the whole frame; its lowest degree is discernable in the eyes; the higher degrees affect the eyes, lips, voice and eyebrows; and the highest produce convulsions, short breathing, and sometimes death.

115.—Hence being the most turbulent of all emotions, it alone is called *passion* without addition, though all when violent may be so called.

116. But of all passions it most easily subsides and vanishes, when provoked by trifling causes; its excess and injustice become apparent even to the angry person himself, and seem to him to demand some atonement on his part. This sudden recoil is observable in persons of a *benevolent* disposition, who are often the most irritable.

117. But in persons of a *malevolent* disposition, this passion, though apparently calmed, passes into a settled desire of revenge.

118. *Vexation*, when taken in a *passive sense*, is a mental disturbance compounded of two emotions, anger and sorrow: sometimes the one and sometimes the other is prevalent. It is caused by abuses of superior power, disappointments, unexpected delays, unsuccessful endeavours to please, incessant teasing, interruption in some interesting pursuit, &c.

119. In the *active sense*, namely to vex, is to excite such disturbance by abuse of power, litigation, or the various me-

thods of inflicting the pains above mentioned, or unjust legal incapacities.

120. *Shame* is a painful emotion, arising from a consciousness or even a suspicion of having incurred, or fear of incurring the disapprobation, contempt, or exciting disgust in others, particularly those we esteem.

121. It seems also, to have been originally impressed as a restraint on any apparent indecency.

122. *Modesty*, that is, diffidence in one's own abilities to please or succeed in any undertaking, produces an uneasy emotion analagous to shame, when urged to any exertion.

123. *Fear* is a painful emotion, arising from the idea of some impending evil, expected with more or less probability or even suspected.]

124. It is susceptible of various degrees, according to the constitution or sex of the person that feels it, the magnitude of the evil apprehended, its probability and proximity or distance, whether of time or space.

125. Its lower degrees suggest *caution* or *anxiety*. Its higher degrees, namely, *dread* or *terror*, especially if accompanied with *surprize*, produce *consternation* or *stupefaction*, that is, a suspension of all mental powers, and sometimes insanity and suicide. Its higher degrees are manifested on the countenance, and strangely affect and enfeeble the whole frame.

*Indeter-*



*Indeterminate Emotions.*

126. By *indeterminate* emotions I understand those that are pleasing, displeasing, or painful, according to the nature of the objects that excite them : these are *sympathy*, *expectation*, *surprize* and *wonder*.

127. *Sympathy* is an ideal participation of the pleasures or pains of others. It differs from pity 1° in this, that it equally accompanies the pleasures and pains of others, whereas pity is excited only by their pains. 2dly in this, that pity is a painful emotion, and excites a desire of relieving its object; whereas sympathy, even with pain, is a pleasing emotion, and excites no desire of relief;—for we feel it for persons who are incapable of receiving any, as historical or fictitious personages. 3dly, we pity corporeal pains, but we do not sympathize with them\*.—We feel no participation of a tooth-ach or fever, though we pity the sufferer.

128. As corporeal pains are incapable of participation, so are corporeal pleasures ; we may be pleased with those enjoyed by our friends, or even rejoiced, but we cannot sympathize

G 2

pathize

\* This emotion has been so profoundly investigated by Dr. Adam Smith, that he was enabled to deduce from it many important moral phænomena in his Treatise on Moral Sentiments, a work of transcendant merit. A few of his observations I here briefly state.

pathize with them. Yet we may be shocked and even struck with horror, at the sight or even the imagination of the pains suffered by persons to whom we are perfect strangers, or even by the dangers to which they are exposed, not indeed of those that engage in mortal combat, but we sympathize with the courage that urges them to meet such dangers. We strongly commiserate the pains of the wounded.

129. Through the benevolence of the Author of Nature, we strongly participate in the mental pains undeservedly felt by others, because they are in some measure relieved by such participation if we are present, and even in our absence, if the sufferer knows that all well disposed persons would sympathize with him; but as corporeal pains are incapable of such relief, sympathy with them would be useless, and pity even grievous.

130. Mental pleasures receive less increase by participation, and hence our sympathy with them, though considerable, is more moderate. But the participation of others in the pleasures we ourselves enjoy, greatly heightens them, if such pleasures be not essentially exclusive.

131. To this principle we may also ascribe the pleasure we take in the agreement of others in our favourite opinions; for some share of confidence is of the very essence of opinion, and this confidence is increased by the concurrence of others; and on the contrary we are in some degree displeased by contradiction. Hence tyrants force, at least an outward conformity

conformity of opinion with their own ; though conscious that by the application of force they can produce no other effect than hypocrisy or even blasphemy.

132. From sympathy we may also derive the pleasure we receive from lively descriptions of the passions and emotions not only of the milder kind, but even of the irascible, when felt by persons for whom we are interested, whether real or fictitious, such as are presented to us by poets and writers of romances or novels ; in this case the imagination deludes us with a transient belief of their existence,\* while we voluntarily abstract from, or are inattentive to, the circumstances that would destroy the delusion ; the more easily and completely this abstraction is found, the stronger the delusion ; hence theatrical representations exhibited by skilful actors, accompanied with appropriate scenery, and allied with suitable music, are of all others the most impressive and fascinating.

133. *Expectation* is an instinctive emotion, impelling us more or less forcibly, to believe the future existence of any object, its force being proportioned to its supposed certainty, or probability.

Hence

\* Such is the opinion of Professor Dugald Stewart, on the Mind, p. 151. in 8mo, and of Dr. Priestly, Lectures on Oratory, p. 89, 4to. It is strongly opposed by Dr. Johnson in his Preface to Shakespeare, 2d fugitive piece, p. 114. and Professor Scott's Elements of Intellectual Philosophy, p. 248. Both deserve to be consulted.

134. Hence the emotion may be agreeable, pleasing, or delightful; or on the contrary disagreeable or painful, according to the pleasing or displeasing nature of the object expected.

135. This force (or *confidence* as it is commonly called) may be increased beyond the proportion it ought to bear to the probability of the object, by the desires or fear which the object expected inspires; or on the contrary it may be diminished or rendered nearly evanescent by inattention to the real probability of its object, temerity or presumption.

136. The *failure* of an agreeable expectation produces the pain called *disappointment*, more or less afflicting, according to the ardour with which the object expected was desired, and its apprehended probability. On the contrary, the failure of a disagreeable expectation occasions *gladness*, *joy*, or *delight*, according to the magnitude of the evil expected and its probability.

137. The lowest degree of expectation or belief is called *suspicion*. It is founded on low or remote probabilities, and in weak minds even on mere possibilities. It frequently originates in malignity.

138. *Suspense* is that state of mind in which, upon a view of opposite probabilities, or from inattention to their examination, no expectation or belief is formed. It is *painful*, when the importance of the subject is duly felt.

139. *Surprise*

139. *Surprise* is a sudden emotion excited by the perception, discovery or invention of any fact or object inconsistent with our former experience or expectation—or beyond it, when we have any reason to form any. Such are the discoveries of Magnetic, Electric or Galvanic powers; of the principle of Attraction, and many other modern discoveries; the invention of the Steam Engine, &c. the Phenomena of Volcanos, Earthquakes or other extraordinary events.

140. It is *pleasing*, when the exciting objects are extraordinary, curious or interesting, and unattended with danger to ourselves.

*Displeasing*, when its objects are disagreeable or hurtful, or cruel as the unexpected death of a friend, the victory of an enemy, &c. It is susceptible of many degrees.

141. *Wonder* is an emotion analogous to surprise, for we are surprised by the *existence* of an unexpected object; but its *cause* is the object of our wonder. It is either pleasing or displeasing, according to the nature of its object, and is susceptible of many degrees.

142. When *pleasing*, it is associated with approbation of its object, and is called *admiration*. It is excited by the beautiful, the sublime, the grand, the magnanimous, and the affecting.

\* *Discovery* is bringing to light and making known something that did *exist before*, but was concealed from common observation. To *invent* is to produce something that *did not exist before*. Dugald Stewart.

affecting. Or by signal, physical or mental abilities, moral excellence, or power beneficently exerted.

143. Its degrees are proportioned to those of the qualities or abilities that demand it, and the sensibility or affectibility of the person in whom it is excited. Its highest degrees are *astonishment, enthusiastic pleasure, or rapture*; but this is produced only by music. Not only these qualities, but the persons that possess them are objects of admiration.

144. Those that possess superior *intellectual* abilities are called great men, as *Aristotle, Newton, Euler, Locke, Berkeley, Grotius* and *Aquinas*; but those that excel in arts derived from the imagination, are not called *great men* but *great poets, great painters, &c.* Yet as great musicians, such as *Handel* and *Sacchini* (if such be) excite astonishment, and fascinate the senses, I think they too may be called *great men*.

145. When wonder is associated with remorse, or aroused by any dreadful object in a higher degree, it is called *amazement*, and excites horror and stupefaction; its lower degrees produce perplexity and anxiety. Insensibility to remorse is called obduracy; self-possession in perplexing circumstances, is called *presence of mind*.

146. When associated with *reprobation*, it has no particular name, but inspires a proportionate degree of abhorrence, detestation and indignation.

147. When

147. When associated with *simple disapprobation*, it produces, blame, censure or contempt.

147. *Horror* is the shock or emotion we feel at the sight of any terrific object, or on being apprized of some enormous crime. It is, as Dr. Cogan observes, the antipode of *admiration*.

## § 2.

### *Of Desires.*

148. *Desire* is a complicative word denoting uneasiness at the want or absence of an agreeable object, pleasure in contemplating it, and a strong inclination to its attainment; thus it excites to action, and so differs from *emotions*.

149. A *wish* is an imperfect desire, including a slight uneasiness; without any, or at least only a slight inclination to attain its object.

150. Hence we see that desires include both pain and pleasure, and according as either predominates they are either painful or pleasing.

151. A *Desire* including not only an inclination, but a *firm* will or determination to attain its object is called *resolution*,

the general appellation of all fixed determinations of the will, on whatever motive grounded.

152. Desires that tend solely to the gratification of animal wants are called *appetites* : as they do not fall under the head of affectibility, they are foreign to the present enquiry.

153. *Love* is the desire of procuring pleasure to its object, even by the sacrifice, if necessary, of one's own.

154. Its degree may be estimated by that of the pleasure desired, and of that sacrificed to its attainment ; of the pain endured and the obstacles overcome.

155. Love is susceptible of various modifications according to the nature of the objects towards which it is directed.

156. *Parental Love* is that which parents bear to their children. It is founded partly on instinct, a feeling evidently impressed by the Supreme Being, (and which, were there no other, is alone a sufficient proof of his existence) for the preservation of the species ; and partly on the consideration, that they are part of ourselves, owe us respect and obedience, and have with us a community of interest.

157. The love founded on instinct is inversely as the age of the offspring and its power of self-preservation ; but in our species it is never totally extinguished. That founded on selfish consideration may increase with the age of the offspring—it may be obliterated by disrespect, reiterated instances of disobedience, disregard to a common interest, opposition



position to the interest of the parent, or by atrocious crimes ; and conversely it may be increased by the merit of the offspring, and dutiful, affectionate behaviour.

158. *Filial love*, or that of children to their parents is also founded on instinct, but an instinct much weaker than of parents for them. It is increased by the benefits we receive from them ; it is diminished by second marriages, a separation or opposition of interests, or partiality to one of the brethren.

159. *Fraternal love* arises from an instinct still weaker than the foregoing, and partly on the mutual and immediate relation to common parents, (hence it is weaker when one of the parents is different from that of the other,) and partly on a sense of community of interests. It is increased by mutual protection and similarity of character, and diminished by the partiality of either of the parents to one of them, and opposition of interests.

160. *Love of more distant relations* is founded on the same principles, but weakened in proportion to their distance from the common stock.

161. Love founded on consanguinity or alliance or friendship is called *affection*.

162. *Sexual love*, this also arises 1st from an instinct implanted in the constitution of all animals, and more permanently in the human species, destined to perpetuate life ; yet

when confined to mere instinct it can scarcely be called love, for this instinct seeks not the happiness of its object, but rather its own selfish gratification, and hence is deservedly stigmatised by the degrading appellation of *lust*.

163. But 2dly, in civilized nations and generous minds, endowed with sensibility, mental and moral considerations are superadded to the instinctive. A mild, social and affectionate disposition, inferred from external appearance, or known by long and intimate acquaintance, intellectual abilities, entertaining talents, congenial pursuits not unsuitable to the sex, and irreproachable conduct, inspire an *eager desire* of receiving and bestowing every possible and consequently wholly undivided happiness on the person in whom such excellencies are found, and of exciting a similar reciprocal desire in the beloved object.—I say *undivided*, as this desire is necessarily exclusive of all participation, as pleasure imparted to any other would amount to a full proof that the mind was not entirely gained, a possession which nevertheless *love*, truly so called, essentially requires. In this respect it differs from parental and filial affections, which are gratified by the happiness of their respective objects, whatever source it may proceed from, not incompatible with the share of affection they themselves naturally claim.

164. Hence *polygamy* is incompatible with true love, the most refined pleasure of which human nature is capable and the firmest bond of social union.

165. Love

165. Love commences with *admiration*, and if supported by *hope*, advances to fondness; an ardent desire of pleasing; an anxious fear of displeasing the beloved object; inattention to such of its faults (not vices) as do not directly interfere with the hope of its exclusive possession, and the social happiness of the conjugal state. Thus supported, it is pleasing in proportion to its ardour. But if haunted by perplexing doubts; irritated by unexpected obstacles; distracted by jealousy, it then, in proportion to its intensity, either settles in sullen displeasure, or becomes a gloomy, or a vehement and impetuous passion of the most painful and tormenting kind, often verging to, or terminating in insanity or suicide.

166. *Fondness* and *tenderness* are the inseparable attendants of genuine love. *Fondness* denotes the pleasure of beholding the beloved object, and consequently desire of its presence. *Tenderness* consists in an exquisite sensibility to whatever may please, and anxiety to prevent whatever may even be suspected to injure or displease the object of one's love or affection.

167. *Self-love*, in the proper sense of the word, perhaps does not exist, as Mr. Hume has remarked\*, and Mr. Usher†. We find no pleasure in our own society, (if I may so speak,) when debarred of any other, nor willingly think or converse with

\* Treatise on Human Nature, vol. 2. p. 96.

† Theory of the Human Mind, 3 Fugitive Pieces, p. 147.

with ourselves as we do with those we love. Or, if we feel any pleasure, it is in contemplating some other object.

168. However this may be, (for it will bear debate) it is certain that *selfishness* exists; that is, a preference, or at least a bias or inclination to our own pleasure or interest to that of others. It is happily counterbalanced by benevolent instincts, the dictates of the moral sense, the precepts of religion, and in some cases by the fear of punishment, or possibly of degradation in the opinion of others; at least this is what usually happens.

169. *Love of God*, this, though not instinctive, (as his existence is known to us only by instruction or reflection) is of all other affections the most just and natural, and, if universal, would alone be sufficient to produce the happiness of mankind. What more natural and just than to love our real *Father*, the author of every pleasure and comfort we enjoy?

170. This love consists, not in endeavouring to procure him any new pleasure, which is impossible; but in ardent undissembled gratitude for the benefits received from him; vigilant attention to the execution of his commands; confidence in his goodness, and resignation to his will in the most adverse circumstances. This requital he expects from us in the language of the most passionate lover—*Thou shalt love the Lord thy God, with all thy heart, with all thy soul, with all thy strength.*

171. *Desire*

171. *Desire of society*, this also seems instinctive; for from our infancy perfect solitude is shunned with horror. Even the deaf, who cannot communicate with each other or with any one else, prefer company to solitude. The aversion of the savage of Aveyron to society proceeded from original ill-treatment received by him. Yet this desire, as far as it is instinctive, extends only to the society of two or three persons or families; its farther extension arises from reflection on its utility for defence against enemies or wild beasts, or assistance in laborious works. The pleasure received from its enjoyment is *increased* by similarity of language, habits, manners and pursuits; and *diminished* by dissimilarity in those respects.

172. *Desire of communication*, this comprehends colloquial intercourse and sympathy. Both may be had, even with the dead, by means of *reading*, and often more agreeably than with the living. The former is *increased* in proportion to the interest it inspires, and the attention given to it; and *diminished* by inattention, rude interruption, blunt contradiction, arrogant imperious dictation. Of the nature of *sympathy*, mention has been already made, No. 127: to its desire that of seeing theatrical representations, pantomime shews, and of contemplating expression of the passions, either by painting, statuary, or music, or by affecting tales either in prose or verse, must be ascribed. Pleasures of the comic kind are derived from a different source.

173. The

173. *Love of the marvellous or extraordinary.*—The mind is rendered sensible of its existence only by the vividness of its perceptions; hence it is scarcely conscious of it during sleep or a fainting fit. Now the relation, and much more the sight of any thing extraordinary or marvellous, in proportion as it is so, strongly attracts or absorbs our attention, excites the pleasing emotion of surprize, and consequently when unattended with any apprehension of personal injury or danger, becomes extremely agreeable.

Hence the sight, or even a detailed account of shipwrecks, hard fought battles, the relation of romantic adventures, even if improbable, seldom fail to gratify us, particularly in early youth, when their improbability is not fully discerned.

174. *Desire of ideal pleasures;* this is probably felt in a very superior degree by those that have the happy talent of gratifying their imagination, by assembling and connecting pleasing images and associations, in music, poetry, painting, statuary, or entertaining narratives or delineations of human life.

175. *Desire of knowledge, or curiosity.*—Though this desire is characteristic of the human species, yet it is very unequally distributed among the individuals that compose it; in some it scarcely exists, in others it amounts to a passion, whose unceasing gratification from the successive attainment of its numerous objects is attended with inexpressible pleasure.

176. *Desire*

176. *Desire of intellectual exercise*, that is study.—This desire is nearly allied to the last, and is often necessary to its attainment: it differs from it in this, that in the acquisition of knowledge, the mind is frequently passive, or at most, barely bestows attention; whereas in study, profound reflection, vigorous exertion, and extensive researches are indispensable. Yet they are all attended with supreme delight.

177. *Desire of amusement*.—In civilized societies we may distinguish three classes; one daily engaged in corporeal exertions; another in toilsome professional pursuits, and a third attached to no particular occupation or object of pursuit, and therefore idle. To the first mere *rest* affords much pleasure; yet even to them the amusements of dancing, singing and shews are far from indifferent, and in some countries are eagerly sought. To the second class, amusements, if not absolutely necessary, are at least highly agreeable. But to the third they are indispensably necessary to save them from the misery of *ennui*, that languor in which the soul seems oppressed by its own weight, and anxiously requires some new and powerful perceptions.

178. In mere amusements the mind is purely passive, though from long continued attention, fatigue is at last felt.

179. The more refined amusements are derived from chaste and polished theatrical representations, music and select entertaining

tertaining books. The less refined from shews, farces, &c. and the grossest and most vulgar, from games of hazard.

180. Some amusements participate of *studies*, as various games, particularly that of *chess*; solution of *enigmas*, &c. these are chiefly valuable for being easily procured.

181. *Desire of change*, or love of *novelty*. When the mind has bestowed sufficient consideration on any object for any considerable time, farther attention to it being superfluous, it naturally declines; to excite it some new object becomes necessary, as attention alone can save us from *ennui*. *Vilia sunt nobis quæcunque prioribus annis—Vidimus, & sordet quodcunque spectavimus olim*. No one is struck with the prospect of the rising sun, but we run to see an insignificant meteor.

182. *Desire of gain*.—This, when *rationally* pursued, leads to industry, that is, to employment of the means fitted to procure the necessaries and comforts of life, suitable to one's rank, to guard against future wants, and to permit occasional acts of benevolence; but when extravagantly pursued, it becomes what Shakespearé justly calls *staunchless avarice*, which aims at the accumulation of riches without a view to an appropriate end, other than that of mere accumulation; it sometimes (though rarely) becomes so outrageous a passion as to prevent expenditure even to procure the comforts of life, and may well be deemed a species of partial insanity.

183. *Emulation* denotes the animating desire of equalling others in the attainment of any praiseworthy object; hence

it



it may be defined the *desire of equality*. It is sometimes taken for the desire of *surpassing* others ; but I think improperly. Emulation is just, but the desire of *excelling* others is not always just, but frequently malevolent, and borders on the detestable sentiment of envy\*. I applaud Cæsar, who could bear no superior ; but detest Pompey, who could suffer no equal.

184. *Desire of distinction*.—This desire is manifestly selfish, as it urges to the endeavour of attracting the attention of others to one's self. It is honorable or vicious, ridiculous or indifferent, according to the means it employs to attain its object. When it excites to pursuits conducive to the happiness of the whole, or any large portion of the human species, it is laudable ; when on the contrary it aims at success by the commission of crimes that astonish mankind, such as that of Eratostrates, who set fire to the temple of Ephesus, it excites horror and detestation. But it is still more hateful when it aims at admiration, (a sentiment which men have hitherto been stupid enough to bestow on many monsters) by the oppression and conquest of unoffending nations. Nay I have seen some so silly as to feign drunkenness to attract attention by their extravagancies :—in such it is *truly contemptible*. To endeavour to attain distinction by superior skill or adroitness, in particular amusements or exercises, is perhaps mere mat-

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\* Yet I own that in Latin *Æmulatio* is capable of both senses. See the profound and accurate treatise of Mr. Hill on *Latin Synonimes*.

ter of *indifference*; the silly affectation of appearing happier than we really are, and valuing ourselves, and expecting distinction and superior attention from the possession of mere external advantages, or even from an *ostentatious display* of those that more truly belong to us as superior knowledge, splendid abilities, eminent talents, political address, &c. all these frivolities are denoted by the name of *vanity*, and are merely *ridiculous*.\*

185. *Desire of superiority in any pursuit*.—This is nearly allied to *emulation*; but as I already said, seems to differ from it; for the desire of equality is merely defensive of a natural right; whereas the desire of superiority to others is tinged with pride, and an usurpation of that distinction to which others have an equal claim: both are odious, when to attain their object, they endeavour to depreciate the *real* merit of others engaged in the same pursuits. I say *real*, because the detection of falsehood or error in religion, philosophy, politics, history, or even in taste, is in most cases either important, or advantageous to mankind.

186. *Ambition*, or the desire of obtaining political honours or power. The desire of receiving the former without deserving them by public services, betrays a ridiculous vanity; but the pursuit of that portion of legal power open to subjects, attended with the resolution of executing the duties it imposes,

\* See Smith's Theory of Moral Sentiments, p. 376.

imposes, is perfectly just and honorable. The ambition of conquest or of despotic power should meet with general abhorrence\*.

187. *Desire of esteem*.—Esteem denotes the value we set on any person, for the agreeable or useful qualities we deem him to possess; hence the desire of obtaining it stimulates us to the acquisition of those qualities, and the pursuit of the line of conduct that deserves it. When *rational* it is satisfied with the approbation of the true judges of merit; when *extravagant* it seeks universal applause, and often by means either undue or even base.

188. This desire, though natural to man, evidently exists in different individuals in different degrees, in some perhaps not at all; and these are invariably the worst characters.

189. *Courage* is the resolute animating desire of opposing or encountering danger, when such opposition is attended with any probability of success, or even without such probability, if opposition is commanded. But if success be utterly improbable, then opposition (not commanded) is unreasonable, and is called *rashness*. Fortitude denotes that strength of mind that enables us to support affliction with firmness, composure, decency and dignity. *Pusillanimity* denotes the want of it.

190. *Courage*

\* See some excellent remarks on this subject in 2d Edgeworth on Education, p. 76, in 8vo.

190. Courage derives its merit solely from the motives that influence its exertions; when these are just and proper it is highly commendable, but when unjust it excites a proportionate degree of indignation and contempt.

191. *Patriotism*, or the love of our country denotes the attachment we feel for the laws, customs and manners of the nation in which we were born and educated, or the tribe to which we belong, whose language we speak, of whose name and repute we participate, comprehending our families, friends and possessions, and all that is dear to us.

192. This attachment is manifested, when our country is invaded, or even menaced or insulted by a foreign foe; being then combined with desire of the esteem, praise, and applause of our countrymen, it stimulates to the contempt of danger and the most heroic exertions. *Vincit amor Patria laudumque immensa Cupido.* But as a sensible writer remarks, patriotism that injures any portion of mankind for the sake of a particular country is but a more extended selfishness, and highly criminal.

193. *Gratitude* is the desire of giving pleasure in return for that received or intended, and is manifested by due acknowledgments. Such return of kindness is by well disposed minds considered as a debt of the most sacred nature, and its neglect, and still more the failure of discharging it when possible, is deservedly condemned by the common voice of mankind.

mankind. But to requite it with injury is a crime of the deepest die, and so much more heinous, as the benefit conferred was more considerable and less to be expected.

*Painful.*

194. *Love of Revenge.* This consists in a deliberate, proud, persevering desire of the pleasure of inflicting pain on a hated object, in return for that received by some offence, and equal or superior to it. I say *proud*, because its gratification requires that the offender should know that the pain he suffers proceeds from the person offended, and marks his superiority.

195. This desire frequently rises to a tormenting passion, incapable of any alleviation but from the ardent hope of its final gratification. It exists chiefly among savages, and odious as it is, it is perhaps necessary to prevent them from injuring each other.

§ 3.

*Of Sentiments.*

196. *Sentiments* are impressions that arise in the mind, in consequence of the favourable or unfavourable opinion it entertains of its own merit or demerit, or of that of others.

197. They

197. They differ from *emotions*, as these arise from facts or events, and not from opinion. And from *desires*, as these excite to actions. Whereas *sentiments*, merely as such, may subsist without any tendency to action, though it must be allowed that desires frequently originate from them.

198. There is one sentiment however of a mixt nature, as comprizing both a desire and an emotion, namely, *hope*, which is compounded of *desire* and *expectation*; it is therefore susceptible of various degrees, according to the strength of the desire, and the apprehended probability of the object expected.

Sentiments favourable to ourselves or to others are *pleasing*; those that are unfavourable are *displeasing* or painful.

199. *Self estimation* is the just value which a man sets on his character, conduct and upright intentions. It is often, though improperly mistaken for pride.\* *Content* and *satisfaction* seem to me rather negations of desire than positive sentiments.

200. *Pride* consists in an overrated estimation of our own merit, power, rank, knowledge or other abilities beyond their real importance, or of the reputation we have gained, or the esteem in which our merit or abilities are held or (as we suppose) ought to be held by others.

201. *Presumption*

\* See some just and subtle remarks on this subject in 2 Edgworth on Education, p. 56, in 8vo.

201. *Presumption* is a sentiment grounded on an opinion that we possess a degree of merit, or abilities equal to an undertaking, to the due execution of which they are in reality inadequate. It is susceptible of various degrees, in proportion to this inadequacy.

202. *Self-sufficiency* denotes such confidence in the sufficiency of the knowledge or abilities we possess, as precludes any endeavour to encrease them, or even the suspicion that they are capable of any increase.

203. *Arrogance* is an undue claim of superiority over equals, or of equality with superiors.

204. *Haughtiness* denotes the expression of pride and unmerited contempt of others, either by words or demeanor.

205. *Contempt* is a sentiment flowing from the real or supposed worthlessness, meanness, absurdity, imbecility or folly of its object, or its degradation by crimes or actions of a shameful kind.

206. *Disdain*, when *just*, is a sentiment proudly repulsive of an act or conduct incompatible with self-estimation, and unworthy of one's character.

207. When *unjust* it consists in unmerited contempt of persons whom it insolently regards as inferior, and consequently unworthy of notice. It is generally found in *upstarts*, that is, persons suddenly raised to riches, power, or honours.

208. Its extreme degree is *scorn*.

209. *Derision* denotes the pleasure found in rendering, or finding another ridiculous, that is, an object of laughter.

210. All these sentiments, however displeasing, disgusting, or painful to the persons who are their objects, afford a malevolent pleasure to the person who feels them.

211. *Friendship* is a pleasing sentiment of affectionate attachment betwixt different individuals. It is not grounded on any instinct, but solely on the pleasing qualities of its object; similarity in such inclinations and pursuits as are not necessarily exclusive; participation of common dangers, and agreeable social intercourse.

212. It is strengthened by duration, and benefits mutually conferred. Hence it was much stronger in ancient times, when sufficient protection could not be obtained from the laws. It commonly exists betwixt persons of the same sex, but oftener betwixt men than betwixt women. With respect to persons of different sexes conjugally united, it is essential to their mutual happiness, and in proportion to the sensibility of either, the want of it is productive of misery. It may also exist betwixt persons of different sexes not conjugally united, if both are advanced in age, or at least if one far surpasses the other in that respect; but if both are young, it gradually, and perhaps imperceptibly, passes into *love*.

213. *Esteem*



213. *Esteem* denotes the value we set on persons possessed of superior intellectual abilities, and *their works*, or uncommonly attentive to the performance of moral duties. It is capable of many degrees.

214. *Regard* indicates the particular favourable attention of which we think another worthy. It is susceptible of many degrees.

215. *Respect* implies not only the regard, but also the deference, complaisance and some degree of preference and submission which we deem due to its object; and even to contemptible men when placed in respectable situations.

216. *Veneration* denotes profound respect, mixed with awe. It is bestowed on persons sunk in the vale of years, particularly if distinguished by meritorious services, wisdom or virtues. It may be repelled by criminal conduct through life, or even by a degree of levity unbecoming advanced age. Who could venerate *Frederick* the infamous, *Buffon* or *Voltaire*, had they even reached the age of Methusalem?

*Displeasing.*

217. *Humility* is well defined by Dr. Cogan, the sense of our own deficiency in intellectual or moral excellencies ; to which we may add, rank, fame and power, or the sense of our own deformity or despicable appearance. It differs much from *humiliation*, which consists in a painful depression of pride or self-estimation.

218. *Resignation* denotes humble submission to the endurance of pain, on the pleasing persuasion that such acquiescence is grateful to the Supreme Being. It is therefore a mixed sentiment of pain and pleasure, though the pain commonly preponderates.

219. *Patience* also denotes calm submission to the endurance of pain or affliction, but from a less elevated motive, namely, the persuasion of the inutility and aggravating tendency of vexation, or the necessity of its endurance to the production of some preponderating good.

*Painful.*

220. *Irrisomeness*, that peculiar uneasiness and weariness arising from protracted indefinite expectation, and more commonly from the want of pursuit or attention to any object.

ject. To shun it recourse is had to the most trifling, and often to criminal pursuits.

221. *Impatience* is the corroding reluctance of the mind to the delay of any expected pleasure, or the endurance of pain. It differs from vexation, by containing no mixture of anger, but it frequently passes into it.

222. *Discontent* denotes the uneasiness we feel on a view of the inadequacy of our circumstances to the gratification of our desires, whether just and reasonable, or wild and unreasonable; or from oppression whether real or fancied.

223. *Melancholy* is a permanent feeling of grief or sorrow arising from a persuasion that the loss or evil we deplore, is irretrievable, and such as renders all future happiness impossible. It is susceptible of various degrees as *dejection*, *apathy*, *terror* and *delirium*.

224. *Despair* is a sentiment arising from the supposed impossibility of the cessation of a present, or of preventing a future evil.

225. *Jealousy* is a sentiment arising from an apprehension of the success of a rival in any pursuit, whom we suppose less worthy of it than ourselves.

226. *Jealousy in Love* denotes the pain resulting from any favour conferred on another by the beloved object; it frequently arises to an outrageous passion mixed with resentment, indignation and rage.

227. *Envy*

227. *Envy* is a painful feeling of the superiority of another, either in talents, rank or condition, attended with the malignant endeavour to depreciate his merit, or deprive him of his envied advantages.

228. *Aversion* or *dislike* is opposite to *desire*. It implies pleasure at the absence, and pain, uneasiness or disgust at the *presence* of its object. It is capable of many degrees, and relates either to persons or to things; its highest degree is *horror*.

229. *Hatred* is opposite to love, and, as relative to persons, consists in aversion combined with a malignant pleasure at any evil that may befall the person hated, and a *wish* that it may happen. In this it differs from *malice*, which denotes a deliberate design of inflicting evil on its object, and if inveterate and implacable, is termed *rancour*.—Its degrees are detestation, abhorrence and execration.

230. But it also may have for its object certain vices, states or conditions; thus we may hate injustice, detest tyranny, abhor slavery, execrate cruelty, &c.

231. I shall now explain what I mean by *simple* and *complex* pleasures and pains. *Simple* pleasures are those that arise from a simple source, as those of parental love, and of filial love. *Complex* pleasures are those which arise from different sources, which harmonize and coincide with each other, and thus render the compound pleasure.

more

more intense. Thus the pleasure of gratifying the suggestions of pity is increased by coinciding with the dictates of the moral sense. The pleasure derived from the esteem of another, is heightened by the sentiment of esteem entertained for him that confers it, *Laudari a laudato maxima laus est.*

*Simple* pains are those of anger, sorrow, remorse, &c.

*Complex* pains are those that coincide with each other, and thus rendered more intense and pungent. Thus the emotion of *remorse* is imbittered by that of *grief*, as that of *Alexander* for the death of *Clitus*, so the sentiment of *envy* is aggravated by that of hatred for the object envied.

232. I here conclude the first branch of the present enquiry, having, if I mistake not, enumerated all the pleasurable and painful perceptions of which the human mind is capable, and assigned precise definitions of the terms by which they are denoted. For a more elaborate and detailed account of each, I must refer the reader to the elegant and luminous descriptions of Dr. Cogan.

CHAP.

## CHAP. V.

## § 1.

*Of the different States of Mankind.*

HAVING thus detailed and distinctly described the various pleasures and pains which mankind are capable of receiving, and their various degrees, it now remains to examine which of these opposite perceptions, the pleasing or the painful do at present, or have at any past period, as far as can be known, always predominated during the whole course of human existence.

On a question of so vast an extent, to venture on such a decision as the known data will permit, we must view the condition of our species in each of the four different states in which it anciently existed, or is at present found. These are, the *Patriarchal*, the *Barbarian*, the *Savage*, and the *Civilized*.

## § 2.

*Of the Condition of Mankind during the Patriarchal State.*

THE patriarchal state is that in which men lived under the government of a common parent ; that this was the state of mankind during the life of Adam their universal parent, appears by the testimony of Moses, the most ancient and respectable of all historians. His sons Cain and Abel lived with him, and were subject to him for many years. Cain, even after his banishment, we cannot suppose emancipated from the dominion of his father.

While Adam lived, that is, during 930 years, men must have been very numerous, and in great measure civilized ; for agriculture was practised, the metallurgic arts invented, the sciences cultivated, and cities built, the lives of men being then extended to an extraordinary length ; after the death of Adam the same authority subsisted for many ages in the common fathers of numerous families, nor do we read of any disorders until a few ages before the deluge. In the preceding period it is probable that the descendants of Seth, at least, enjoyed as much happiness as is now found in civilized states ; but as no memorials of the condition of man-

kind before the flood at present exist, it is impossible to estimate with any precision the proportion of pleasure and pain it then enjoyed.

After the flood, during the lives of Noah and of his three sons, the patriarchal government must have subsisted over their respective families until the dispersion, that is, during 537 years. Of the events that took place during that period, we are almost entirely ignorant; but it appears that great harmony prevailed among men, for with a few exceptions they were with some difficulty induced to separate from each other. Hence the golden age is said to have existed during that period.

After the dispersion, the *general* patriarchal government necessarily ceased, as different languages were spoken by each of the families descended from the same patriarch. Some remained in Chaldea, over whom Nimrod a distinguished huntsman soon obtained the sovereignty. Many of the arts and sciences before known, must have been preserved by them, since Nimrod was enabled to build Babylon and some other cities; others retained some imperfect knowledge of the most necessary arts; particularly those that settled in Assyria, Persia and Lower Asia. These in time became numerous; those of the same race collecting under a common chief formed tribes, whose members indefinitely increasing, formed new tribes, all speaking the same language,  
and



and denominated either from their primitive ancestor; or from their mode of living, their situation, or some other peculiarity. Different tribes coalescing either by conquest, or from various causes which need not be here examined, formed, in process of time, petty principalities, kingdoms or empires; I shall call them *barbarian* for reasons that will soon be seen. Of those that occupied Upper Asia, or settled in Europe, some were prevented by the sterility of the soil, or the difficulty of clearing it of immense forests, from cultivating the spots they occupied. Thus the knowledge of agriculture was gradually lost; but the various contrivances for subduing wild animals and catching fish being of constant and indispensable use were universally retained. Of these vagrant families, tribes and even principalities or kingdoms were formed after some ages.

A *partial* patriarchal government seems to have subsisted during several ages among the descendants of *Sem*; nay it exists at this day among the *Bedouin* Arabs, and other tribes of that singular people: as it was the primordial state of mankind, and as some accidents relative to it have been transmitted to us, which occurred in the most ancient times of which history gives us any account, I shall now examine 1<sup>o</sup> what degree of happiness or misery these events seem to indicate to have been the result of this ancient patriarchal

government; and 2dly, what the condition of the Arabs is who still maintain it.

§ 3.

*Of the condition of Mankind in the Patriarchal state after the dispersion.*

UNDER the ancient patriarchal government the mere corporeal pleasures seem to have been fully enjoyed. Abraham never wanted a comfortable habitation; he lived sometimes in the city of Arbea, Gen. xxiii. sometimes under tents, Gen. xii. xiii. he had flocks, herds and money in abundance, besides a number of servants and slaves. His nephew, Bathuel, appears to have been sufficiently opulent. So also were the sons and grandsons of Abraham; they were clad by the produce of their flocks, and subsisted partly by agriculture; partly on the cattle they pastured, and frequently on the wild animals they caught in the chase. Their lives were usually extended beyond 100 years, and temperance appears to have secured them uninterrupted health. What their amusements were is not recorded.

But

But these advantages were counterbalanced by many of their customs. Polygamy they practised without any scruple; and often concubinage, even by the persuasion of their wives. To have children was highly honorable, to have none rendered married women objects of contempt. This misfortune was in some measure remedied by supposititious children, the offspring of the handmaids of their wives, as these children were adopted by them, and deemed to be theirs. Women therefore always sensible to the point of honour, and subjugated by fashion, of their own accord offered concubines to their husbands. The indelicacy of these customs is apparent; matrimony became a brutal commerce, from which all refinement was banished. The jealousy and dissensions of the wives and concubines banished peace and comfort from the patriarchs habitation. The brothers sprung from different mothers, and their respective servants were constantly at variance with each other. In families thus circumstanced, it is plain that the pleasing emotions of joy and gladness were excited much more rarely than those of sadness, anger and vexation; instead of conjugal, filial and fraternal love—jealousy, envy, hatred and discord must have been the prevailing sentiments. Cruelty and oppression of the concubines and their children must have been often practised, of which we have an example in the treatment of Hagar and her

her son Ismael. Hence Jacob, the last of these ancient patriarchs, told Pharaoh that he had led an unhappy life.

Jacob and his family passed into Egypt, where they were soon after enslaved. The contemporary patriarchal families, descendants of *Sem*, (with the exception of those that passed into Arabia,) as those of Lot and Bathuel, were overwhelmed by the neighbouring barbarian states, and incorporated with them. The want of union was a radical defect in the patriarchal families.

A nominal or *mock patriarchal* government still exists in *China*, infinitely more imperfect than the ancient, and consequently productive of much more misery. The ancient patriarchs had no family to attend to but their own, to whose interests they could not be insensible, and to the management of whose concerns they were fully competent. But the pretended patriarch or emperor governs numerous and extensive provinces, containing some millions of families, of which he is the absolute despot, to whose welfare it is impossible his individual inspection should extend. Yet he is considered as the common father of his people, and exercises over them the same authority as the father of a family over his particular household, and is thus placed over all earthly controul. Conformably to this system, the governor of a province is considered as the father of that province, and the head of any office or department is supposed to preside over  
it

it with the same authority, interest and affection as the father of a family superintends and manages the concerns of private life.\*

It is much to be lamented (Mr. Barrow adds) that a system of government so plausible in theory, should be liable to so many abuses in practice, and that this fatherly care and affection in the governors, and filial duty and reverence in the governed, should with much more propriety be expressed by the terms of tyranny, oppression and injustice in the one, and by fear, deceit and disobedience in the other. The executive administration is so faulty, that the man in office generally has it in his power to govern the laws, which makes the measure of good or evil depend greatly on his moral character†. Nay property is more insecure here than elsewhere. The condition of women, who form one half of the human species, and that perhaps the best half, without whom the two extremes of human life, as a French writer well remarks, would be helpless, and the middle of it joyless, is as miserable in China as can be well imagined‡. Fathers sell their daughters for presents§. Polygamy is allowed by the laws. But it is only among the rich that plurality of wives can be found:

\* Barrow's Travels in China, p. 359, &c.

† Ibid. 380.

‡ Ibid. 140.

§ Ibid. 145.

found. Every great officer of state has his haram, consisting of 6, 8 or 10 women. Every merchant of Canton has his seraglio. But the poor find one wife fully sufficient for all their wants. Female infants are often exposed. Fathers have it in their power to sell their sons for slaves, and this power is not unfrequently put in force. Women must neither eat at table nor sit in the same room with their husbands. The male children at the age of nine or ten are entirely separated from their sisters. Thus the feelings of fraternal tenderness are nipped in the very bud of dawning sentiment\*. Among the poor women are employed in the most servile drudgery, even forced to plough, and are often yoked with an ass.

Hence it is remarked by a judicious anonymous critic, that it is not possible for a people deriving their subsistence from the cultivation of the soil, to be held together by means less favourable to human happiness; and that the Turks, whom we deem barbarians, in every particular which can be regarded as a mark or a result of civilization, are their superiors†. To which Mr. L'Evesque adds that the Chinese are perhaps the most vitious of all nations‡. It is therefore needless to be more particular. It is plain the wretched inhabitants

\* Barrow 142.

† Edinb. Review, No. 28, p. 413.

‡ Vol. 7. p. 176.

habitants of this celebrated empire are for the most part completely miserable.

§ 3. Of the Bedouins, or wandering Arabs.

*Of the condition of the Bedouins, or wandering Arabs.*

THE Arabs settled in cities have lost somewhat of their distinctive national manners; but the Bedouins, who live in tents and in separate tribes, still retain the customs and manners of their earliest ancestors—they are the genuine Arabs. The descendants of Jocktan, Esau, and Ismael formed different families under the guidance and direction of those to whom they owed their existence. As these families multiplied, the younger branches still retained some respect for the elder, which of all the progeny was deemed the nearest to the parent stem. And although the subdivisions became more and more numerous, they still regarded themselves as composing but one body. Such an assemblage of families all sprung from the same stock, formed what we call a *tribe*. Thus the representative of the eldest branch retained somewhat of the primary paternal authority over the tribe to

which he belonged\*. Each father of a family governs it with authority almost absolute.—These fathers are called *sheicks*. All sheicks who belong to the same tribe, acknowledge a common chief or grand *sheick*, whose authority is limited by custom†.

The dignity of grand sheick is hereditary in his family, but on his death the inferior sheicks chuse his successor out of his family, without any regard to primogeniture. The sheicks and their subjects are born to the life of shepherds and soldiers. As to corporeal pleasures, only the rich can be said to possess any. The poor live in a state of habitual wretchedness and famine. The food consumed by the greater part of them, does not exceed 6 ounces a day. Meat is reserved for the greatest festivals; a few wealthy sheicks alone can kill young camels. Hence they are plunderers of cultivated lands and robbers on the high roads‡. Polygamy, as far as 4 wives, is permitted by the Mahometan code. But the rich only can avail themselves of this permission; though some marry so many in order to profit by their labour§. But the disagreement of these women renders, as usual, domestic life intolerable.—Hence their husbands separate them under  
pretence.

\* 2 Niebur, 17. Dublin, edit.

† Volney's Travels in Syria, 242.

‡ Ibid. 18.

§ 2 Niebuhr. 213.



pretence of superintending their concerns in distant places\*.

They dwell under tents when they can afford to have any ; those who cannot, shelter themselves from the inclemency of the weather, either with a piece of cloth stretched upon poles, or by retiring to the cavities of rocks. The chief article of their furniture is a large straw mat, which serves equally for a seat, a table, and a bed†.

Listening to tales and songs forms their principal amusement ; but as they have no books, their stock is soon exhausted. To elude the *tedium vitæ*, they pass their time in smoking tobacco, or an intoxicating drug called *haschs*‡.

The Bedouins are the most irritable of all men, and their vindictive spirit leads to the most outrageous excesses. Not satisfied with blood of the offender they sacrifice that of all the males of his family§. As they have no courts of judicature to resort to, every family seeks to right itself ; it is true that if the contending parties belong to the same tribe, the Sheick and principal subjects join to reconcile them ; but if they belong to two powerful tribes, war is the consequence ;

M 2

hence

\* 1 Niebuhr, 211.

† Ibid. 209.

‡ 2 Niebuhr, 224, 225.

§ 2 Niebuhr, 198.

hence the greater tribes having ancient quarrels live in an habitual state of hostility.\*

Hence I think we may safely infer that the condition of this remnant of the ancient patriarchal state, is far removed from happiness, but on the contrary should rather be deemed miserable, though not in the same degree as the Chinese are.

§ 5.

*Of the condition of mankind in the Barbarian state.*

BY a *barbarian* state I understand that in which different families or tribes are united under a chief whose authority, though commonly despotic, is not derived from a common parental right of superintendance, but either on election or conquest, and includes some or other, or all the following defects or essential imperfections.

1°. That the rights of women are either injured or not sufficiently protected.

2<sup>do</sup>. That either the life, or the liberty, or the property of men is insecure.

3°. That

\* Ibid. 202. Volney, 245.

3<sup>o</sup> That laws exist or customs prevail, obviously incompatible with general happiness.

By the epithet *barbarian*, the Greeks originally distinguished only the Carians by reason of their vicious pronunciation of the Greek language. Afterwards they bestowed the same appellation on all who did not use the Greek language, and in process of time, on all who were not of Greek origin.\* In modern times it is given to all who do not profess the Christian religion, but principally to the African states bordering on the Mediterranean.

The two most ancient governments of this sort, of which we have any credible testimonies, are the Egyptian, and the Assyrian; they are said to have been nearly contemporary, but as the former was by far the most renowned for the wisdom of its institutions, and is even commonly supposed to have been civilized, I shall here shew that strictly speaking it rather merits the appellation of *barbarian*.

#### Of the Egyptian Government.

As to the physical wants of the Egyptians, it is certain they were in general amply supplied; agriculture flourished, pasturage

\* Strabo, p. 977.

pasturage was protected, and their habitations were comfortable.

Again, they had regular courts of justice, and distinct properties in land. The lives of men were well protected against each other, and several of their subordinate political institutions were admirable. It was to observe these that the ancient Sages of Greece travelled into Egypt.

But to counterbalance these advantages, the government was monarchical, and the monarch despotic, as appears in many instances. The father of Sesostris, it is said, caused all the male infants born the same day with his son to be brought to court. Cheops, another of their sovereigns, shut up all the temples, and forbid all to offer sacrifices, and yet the priests formed the most powerful class in Egypt. Nay, he compelled his subjects to build the principal Pyramid. His successor, Chephron was equally tyrannical, and oppressed his subjects by every possible means.\*

Again, the rights of women were essentially injured; they were often forcibly torn from their families, and if married, their husbands put to death, a fate which Abraham dreaded. Polygamy, without any limitation, was permitted.† Their wives were so strictly confined, that they were not permitted

\* Herodot. Lib. 2. Chap. 24 and 27.

† Diodor. Lib. 1. p. 91. folio Wessel. Edit.

mitted to wear shoes, and yet could not appear in public without them.

Though the lives of the subjects were well guarded against each other, yet they were not against superstition, for if any of them happened to kill a cat, or any other of their sacred animals, though inadvertently and by chance, he was irremissably put to death.\*

Men were prohibited from following any other profession but that of their fathers. Those who followed any mechanical trade or profession were held in contempt.†

Thieving was not only authorized by law, but even encouraged by rewards.‡

It is said, nevertheless, that the population of Egypt was very considerable, and thence it is inferred that the state of the inhabitants was happy. Yet I think this an insufficient proof of general happiness, for wherever food can easily be procured, the population will be considerable, though in many respects miserable. Goguet shews the population of Egypt was excessively exaggerated.∥

Several sciences, it is true, might, comparatively with other nations, be said to have flourished in Egypt, but they were

\* Diodor. Lib. 1. p. 94. † Herod. Lib. 2. cap. 167.

‡ Diodor. Lib. 1. p. 190. ∥ Vol. 2. p. 11.

were cultivated only by the sacerdotal order to which they were confined, and it does not appear that they were ever advanced beyond the rude state in which they existed before the dispersion, in the plains of Shinaar. The multitudes who flocked to Egypt were forced to unite into one social body sooner than the tribes that took another direction, from the necessity of jointly co-operating in draining the country. The various operations were conducted under the direction of the most knowing, who also attended to religious concerns.

Hence I think we may infer that the Egyptian government was at least *semi-barbarian*, and the condition of the inhabitants was, upon the whole, miserable; a certain proof of which is their easy conquest both by the Ethiopians, the Babylonians and the Persians; and the feeble efforts they made to free themselves from these foreigners.

*Of the Assyrian, Babylonian and Persian Empires.*

I mention these three empires collectively, as they seem to be barely three different successions of the same species of government and their institutions nearly the same; only a few particulars, however, have been transmitted to us by ancient historians.

In

In each, the government was monarchical, and the monarchy hereditary. They had written laws, and justice seems to have been duly administered. Acts of violence were severely punished.

The sciences were assiduously cultivated, particularly astronomy, by the Chaldeans and Babylonians, and the arts seem to have reached a high degree of perfection.

These are the most favourable sources of public happiness that occur in their histories.

But on the other hand their monarchs were despotic, and their despotism was often carried to the most extravagant excesses; one of them set up a golden statue, which he commanded all nations to adore under the severest penalty.\* Another enacted that no God should be prayed to for thirty days but himself.†

Yet, notwithstanding the plenitude of their power, they could not repeal their own decrees; probably to prevent remonstrances and petitions.

Polygamy was permitted. Concubinage to an unlimited extent universally practised, and the male sex essentially injured; thus the rights of both sexes were violated.‡

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Professions,

\* Daniel, chap. 3.

† Ibid. chap. 6.

‡ The first Darius had two wives.

Professions, at least among the Assyrians, were hereditary ; children were not permitted to quit their father's occupation and embrace another.\*

These governments must therefore be annexed to the *semi-barbarian* class ; but I think they approached nearer to the civilized state than the *Egyptian*, the evils of despotism being less felt in dominions of such great extent than within the narrow bounds of Egypt, nor were their subjects oppressed by that odious and stupid superstition under which Egypt was rendered wretched and contemptible.

#### *Of the Grecian Governments.*

Of these I shall mention only the two which are most celebrated and best known to us, the Lacedemonian and the Athenian.

#### *Of the Lacedemonian Government.*

The Spartan government (so called because residing in Sparta) has been amply described by many ancients, and praised infinitely beyond its merits by most writers both an-  
cien;

\* Diodor. Lib. 2. p. 142.



cient and modern, for reasons well set forth by Monsieur L'Evesque.\*

Its authority was distributed betwixt four different bodies. Two kings conjointly reigning, a senate, five Ephori (a sort of tribunes of the people) and the assembly of the people; but at last the whole power centered in the Ephori.

There were originally two factions in Sparta; after violent dissensions, one proved victorious, and engrossed the sovereignty; it consisted of 9 or 10,000 persons, to which the other, consisting of 30,000, was subjected. This class was called *free*, although in reality enslaved. The number of those that groaned under the yoke of the first or governing class was increased by the inhabitants of the city of *Helos*, who were reduced to the most abject servitude. Even those of the second class who were denominated not slaves, but *subjects*, might be put to death at the caprice of the Ephori, without examination of their guilt. The best lands were seized by the first class, and the poorest given to the second, and were scarcely sufficient for their support.

The Helotes were compelled to labour for both these classes; their masters were forbidden to grant them their liberty; nay, they received a certain number of lashes every year, with a view of keeping them in mind of their obedience; if any of them

\* Third Vol. of the Institute, p. 347.

was remarkable for his shape or beauty, he was put to death ; and farther, from time to time, the youth of Sparta were ordered to lie in ambush for them, and slaughter them at night, to prevent their growing too numerous.\*

Every year a feast was celebrated in honour of Diana. Then all the children of Sparta were whipped until the blood ran down the altars of the Goddess.

With regard to their domestic concerns, they were regulated by the severest restrictions ; no one had a right to adjust his mode of living by his own will ; a fat man was punished for being so.

Many other instances might be adduced in proof of the miserable condition even of the governing class, they are enumerated by Goguet and L'Evesque, but I think those I mentioned abundantly sufficient to prove that under the Spartan government, men were reduced to the most miserable condition the world ever beheld either before or since.

#### *Of the Athenian Government.*

The subjects of this state consisted of four distinct classes. 1<sup>o</sup> Free citizens.—2<sup>dly</sup> Sojourners.—3<sup>dly</sup> Free servants.—4<sup>thly</sup> Slaves. The first class consisted of about 30, or 36,000 ; the other classes of nearly 400,000, of which slaves formed by far the greater number.

The

\* 3 Goguet, 214, &c.

The legislative power was vested in the class of free citizens assembled, though no more than 6000 usually met, without any regard to property. Though this assembly could alone make or repeal any law, yet by the constitution this exorbitant power was in some measure restricted by a chosen senate, in whom a right of precognition was vested. The assembly had also the right of judging all causes on appeals to it, but after some time every power was absorbed by the general assembly of the citizens, ever giddy, capricious, factious, and frequently unjust.

This was accounted a *free* government, yet surely very improperly. No government can be accounted *free*, whose freedom is not sufficiently secured, which was far from being the case at Athens, where the most uncontrouled despotism was vested in a multitude, the majority of which was equally ignorant, capricious, insolent and improvident.

There were also many subordinate courts of justice, with various functions, particularly the Areopagus, whose decisions were generally equitable.

The physical wants of the inhabitants of Attica seem to have been sufficiently provided for. Commerce flourished, various arts and manufactures were practised, and a great degree of luxury prevailed. Consequently agriculture was successfully promoted, nor do they seem to have been deficient in commodious habitations.

Crimes

Crimes manifestly injurious to society, were rigorously punished.

The rights of women were tolerably well secured ; polygamy strictly forbidden ; any violence offered them was punishable by heavy fines. Wives brought scarce any fortune to their husbands, and if ill treated, might obtain a divorce. Adultery was severely punished.

These advantages however were fully counterbalanced by the tyranny of the governing democracy, and several outrageous and criminal practices either permitted or licensed by the laws. Opposite factions, headed by eloquent demagogues, kept the city in a constant ferment. Every restraint on the caprice of the multitude they gradually removed. They usurped the judicial power in the first instance, and many persons of the most signal virtue were unjustly condemned to death. All were liable to banishment without being accused of any crime by the decree of Ostracism. Nay those who chiefly suffered by it were those who being most eminent for reputation, riches, eloquence, or even virtuous and glorious actions, excited the envy of the people.

Inhabitants of foreign extraction, who formed a considerable portion of the population, were subjected to a distinct tribute, and incapable of any employment, and were not allowed to transact any business in their own name ; thus they existed in the state merely by connivance.

Slaves

Slaves, who together with free servants, formed the most numerous part of the inhabitants of Attica were wholly at the discretion of their masters, and might in most places be starved, beaten and tormented, without any appeal to superior power;—they were not permitted to plead for themselves, nor be witnesses in any case; yet it was customary to extort confessions from them by torture; they were stigmatized on the forehead with a red hot iron. However it is certain that for undeserved ill usage they had some redress, either by taking refuge in the temple of Theseus, or by a suit at law; but how miserable the condition of those, who from their distance from that temple, or otherwise, could do neither!

Farther, women were confined to their houses; were not permitted to appear at public entertainments. Concubinage was universally practised, and even unnatural crimes were not interdicted.

Thus we see that the condition of every class of the inhabitants of Attica, was upon the whole miserable; and that the Athenian commonwealth can at most be deemed only *semi-civilized*.

*Of the Roman Empire.*

THE authority of the Roman emperors being entirely despotic, the happiness of their subjects depended on the temper and disposition of the reigning monarch, and frequently on his superstition. Of the character of these emperors we have a more detailed account than of any of the ancient Asiatic monarchs: in perusing their history it will be found, that those periods during which the condition of their subjects approached nearest to happiness, were, in the space of 500 years, by far the shortest, scarcely exceeding 100 years, and succeeding each other at distant intervals; namely, during the reigns of Augustus, Titus, Nerva, Trajan, Adrian and the two Antonines.

However, for several years after the commencement of this empire, and even under the most cruel emperors, the greater number of those who either by birth or otherwise had obtained the privileges of Roman citizens, enjoyed the advantage of being governed by the Roman laws, the most equitable ever known; by which their lives, liberties and properties were secured against all but the supreme despot himself. Even the conquered provinces were more humanely treated than under the republican government.

Again,

Again, the Western provinces of the Empire, as Gaul, Spain, Britain, Pannonia, Illyricum, &c. were drawn from a state nearly savage, in which they were engaged in almost continual hostilities with each other, to a more peaceful and nearly a civilized state; taught various arts and a common language. Even the Eastern provinces were much happier than under their native tyrannic despots. And what chiefly contributed to the happiness of both the Eastern and Western provinces, the christian religion was announced to, and received by them; which amended their lives, humanized their manners, extended their views beyond the present life, and enabled them to bear its evils with patience and resignation.

These advantages were not however possessed without a considerable alloy of various evils; partly arising from the civil constitution of the government, and partly from the intolerant bigotry of the emperors, both Heathen and Christian, and partly from their imbecility. Evils which gradually increased and preponderated to such a degree, as finally to destroy the imperial government, and produce a mass of misery hitherto unparalleled. But to be more particular, these evils were derived, 1<sup>o</sup> from the invidious distinction that prevailed in the conquered provinces, betwixt the native freemen of these provinces, and those that possessed the rights of Roman citizens; much discontent was naturally engendered, as well as frequent irremediable distress and op-

pression of the former class, though by far the most numerous. This evil was co-extensive with the empire; however it lasted little more than 200 years, during which imperial cruelty was exercised only in the capital.

2dly, from the inhuman treatment of slaves, who though forming a numerous part of the population, were, until the reigns of Adrian and the Antonines, left wholly to the discretion of their masters, and could not claim the protection of the laws.

3dly, from the rapacity of the governors of the more distant provinces.

4thly, From the religious persecutions, whether of christians by the heathen emperors, or of different christian sects by each other, each claiming the exclusive possession of divine knowledge, and rejecting every other as impious. By this whole provinces were depopulated; the inhabitants flying for protection to the enemies of the empire.

5thly, From the civil wars of the various pretenders to the imperial dignity; for there being no settled rule of succession after the extinction of the Julian family, the different armies claimed the right of conferring the empire on their respective commanders; the outrages accompanying and succeeding these wars, may well be imagined.

6thly, From the sudden but wide-spreading incursions of the Northern barbarians who ravaged with impunity extensive



sive provinces, and massacred or made captives of the inhabitants.

7thly, From the imbecility of Honorius, who either put to death his ablest generals, or drove them into rebellion; and thus laid open the principal provinces of the empire to various barbarian nations, by whom they were successively ravaged, and finally subdued.

8thly, From the enormous weight of the taxes, which multiplied with the public distress. Severe inquisitions, which confiscated their goods and tortured their persons, compelled the subjects of Valentinian the 3d to fly to woods and mountains, and to prefer the more simple tyranny of the barbarians.

9thly, On the division and decline of the empire, the tributary harvests of Egypt and Africa were withdrawn. Italy was exhausted of inhabitants by war, famine and pestilence.

Hence Dr. Robertson remarks, that, "if a man were called to fix upon a period in the history of the world, during which the condition of the human race was most calamitous and afflicted, he would without hesitation name that which elapsed from the death of Theodosius an. 395, to the establishment of the Lombards in Italy, an. 571\*.

\* Life of Charles the 5th, vol. 1. p. 11.—there, and in Gibbon's history of the Decline of the Roman Empire, the proof of all the above particulars may be found.

*Of the Barbarian Governments in Europe.*

THE governments founded on the ruins of the Roman empire, namely, in Italy, Gaul, Spain and Britain, present many points of view favourable to the happiness of the inhabitants; of these I shall briefly point out the most conspicuous.

1st, Their firm attachment to a given family, to some member of which the executive and judicial, and in some degree also the legislative powers of the state were confided, and the regal dignity conferred: thus the confusion of elections, and the violent attempts of usurpers were prevented. This rule was never violated, except where the regal family, by reason of its imbecility, became incapable of exercising the regal functions, and not often even then.

2dly, That the regal power was constitutionally limited by general assemblies, at first of all the freemen and clergy of the state, and afterwards by those of the principal inhabitants and the bishops. Thus tyranny was checked, many wholesome laws enacted, perverse customs eradicated, and a due regard for learning was introduced among an illiterate people.

3dly, Principles

3dly, Principles of liberty were universally diffused, which were either extinguished or unknown during the existence of the Roman government, the courts of justice were so well modelled, that their decrees were commonly conformable to their laws and customs

4thly. The rights of women and the care of orphans were specially attended to.

5thly. Their veneration for the clergy was such, that amidst all their intestine wars after their conversion to Christianity, monasteries and ecclesiastical lands were generally respected. To this respect we owe the preservation of all the classics and other ancient writers that we now possess.

6thly. By the institution of chivalry in the 11<sup>th</sup>. century, a high sense of fidelity, honour and a spirit of gallantry were introduced, by which the rustic manners of the preceding ages were gradually refined and polished.

Favourable, however, as these circumstances were to human happiness, these governments contained numerous obstructions to its perfect attainment.

1st. A marked partiality was manifested for some centuries in favour of the Barbarian conquerors and their descendants, injurious and disgraceful to the ancient inhabitants and their posterity; most crimes were punished by pecuniary mulcts, but those inflicted on the latter were double those inflicted on the former.

2dly. The

2dly. The compensations for homicide, theft, robbery, &c. were easy to the rich, but grievous to the poor.

3dly. Slaves, who in every state formed the most numerous class, were left to the absolute dominion of their masters, who might punish them capitally, without the intervention of any judge.

4thly. Agriculture, commerce, trades and sciences were held in contempt, at least for many ages. No professions were honoured with the public esteem, but the military and the clerical.

5thly. Kings were permitted to divide and partition their dominions between their sons, who invariably after their father's decease made war on each other, and thus spread ruin and devastation throughout their territories.

6thly. The barons, among whom each kingdom was subsequently divided, claimed and exercised the right of committing hostilities on each other, and even on their common sovereign, at their own discretion, these hostilities were numerous and frequent, and consisting chiefly in mutual ravages, burning the houses of the unfortunate inhabitants, carrying off their cattle, and destroying the fruits of the earth, a general famine and its attendant miseries commonly ensued.

7thly. During many ages superstition also shed its baneful influence. Many were burned for the imaginary crime of witchcraft ;

witchcraft ; many for holding opinions deemed heretical. To exterminate these and Paganism, armies have been collected and whole provinces depopulated.

In a word, such was the situation of Europe from the fall of the Roman empire till about the opening of the eleventh century, that to use the words of a profound antiquarian, “ we shall probably not be able to discover a period of its “ history, in which there is to be found greater licence, less “ order, and consequently less happiness.”\* He adds, that we must not suppose, that these disorders ceased after this period, but they were gradually diminished after a lapse of some centuries.†

Stthly. To repress these disorders, and partly for ambitious purposes standing armies have for some centuries past been maintained by most European sovereigns. Through them their power at present knows no limits but those which decency and the spirit of the times prescribe. A victorious despot may set even these aside, and trample with impunity not only on the laws of his country, but on those of nature and nations.

*Of*

\* Ward's Enquiry into the foundation and history of the Laws of Nations in Europe. Vol. 1 p. 136.

† Ibid. p. 241.

*Of the Polish and Russian Governments.*

Neither Poland nor Russia were ever conquered by the Romans ; yet the Polish government was for some centuries the most imperfect in Europe, and the great mass of its inhabitants the most unhappy, from the turbulence and tyranny of the nobility, and the too limited prerogative of the nominal sovereign.

Citizens and tradesmen were held in contempt, and the peasants in slavery. The killing a peasant by a nobleman was atoned for by the payment of fifteen shillings.\*

The power of the *Russian* monarch is the most despotic in Christian Europe, and his territories the most extensive. The persons, goods and even lives of his subjects are wholly at his disposal. The nobility have no privilege, not even that of precedence, the peasants are in the same condition as those of Poland.† Punishments were shockingly inhuman untill moderated by a happy succession of female sovereigns. Russia enjoyed unparalleled glory and happiness under the reign of *Catherine the admirable*, the most accomplished sovereign

\* Totze, State of Europe, 270.

† Ibid. 353, 354, 2 Cox, 324.

sovereign the world was blessed with since the reign of Titus.\*

*Of the Gentoos or Hindou government.*

That portion of Asia improperly called the Indian peninsula contains many powerful kingdoms, and its ancient inhabitants *Gentoos* or *Hindous*. I shall mention only such laws, customs or usages as are common to all or most of them.

1st. The government is monarchical, and hereditary at least in the same family.

2dly. The inhabitants are divided into four distinct classes.

1<sup>o</sup> the *Bramins*, who form the learned and sacerdotal class.

2<sup>do</sup>. The *Cheteries*, who form the military and governing class.

3<sup>io</sup>. The *Bice* of which are the agriculturists and merchants.

And 4<sup>o</sup>. The *Sooder*, which consists of servants and labourers.

This distinction which is founded on their religion, is so rigorously observed that scarce any intercourse is permitted between them. Those of a superior class will not eat or drink with those of an inferior, nor suffer themselves to

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be

\* Yet the most falsely and basely calumniated. I would not disgrace her by the name of *the Great*—a title by which the most successful destroyers of human happiness have been hitherto distinguished,

be touched by them. A Bramin will not condescend to eat even with his sovereign. Women are not allowed to marry a man of an inferior class, nor men to marry women of a superior, under pain of death. Nay, if a man of an inferior class has had any illicit commerce with a lady of a superior, he not only is punished with death, but the nearest relations of the lady are allowed for three days to kill all such relatives of the criminal as they shall meet in the district where the fact was committed.\*

Polygamy is practised, but one wife is acknowledged as supreme ; if she be the wife of a Bramin she incurs disgrace if she does not consent to be burned in case she survives him.

Their political institutions must, as Mr. Pinkerton remarks, be originally bad, as the great mass of the people are oppressed by one or two privileged casts, whence, the disappointed natives were conquered by every invader,† and Dr. Buchanan, who long resided in India, tells us ‡ “ that no  
 “ useful science has been diffused by the Bramins among  
 “ their followers ; history they have totally abolished, mora-  
 “ lity they have depressed to the utmost ; even the laws at-  
 “ tributed to *Menu*, under the hands of the Bramins have  
 become

\* Dillon, 97. 6 Mod. Univ. History, 63 8vo.

† Pinkerton's Geography, Vol. 2. p. 248.

‡ 6 Asiatic Researches, 166.



“ become the most abominable and degrading system of  
 “ oppression ever invented by the craft of designing men.”  
 “ Passive millions drag a feeble existence under the iron  
 “ rod of a few crafty casts amidst a climate and a soil al-  
 “ most paradisiacal, and where it seemed impossible for  
 “ human malignity to have introduced general degradation  
 “ and distress.”\*

From the immense population of this country, many may still infer that its inhabitants enjoy no small share of happiness, yet in addition to what I have observed on this head, in treating of the Egyptian government, the vicinity of Vesuvius, notwithstanding its frequent eruptions is as populous as any other part of the Neapolitan kingdom.

### *Of the Mahometan Governments.*

These extend over a great part of the old world, and are every where so cruel, harsh and hostile to human happiness, that the epithet *Barbarian* has by all Christian nations been exclusively applied to them. I shall notice only two, the Turkish and the Persian as the Mogul and African governments differ from them only in a few particulars. That of Egypt is rather a cruel anarchy.

P 2

Of

\* Pinkerton's Geography, Vol. 2. p. 248.

*Of the Turkish Government.*

The sovereignty of the Turkish empire rests exclusively in the Ottoman family, but within that family the choice of the successor depends chiefly on the reigning Sultan, and frequently on the Janissaries, by whom the Sultan is often deposed and put to death. Hence he confines or massacres his brethren.

The power of the Sultan is in some respects despotic, and in others limited. It is limited, 1st. By the Rules of the Koran. 2ly. By the *Ulema*, or body of the lawyers or interpreters of the Mahometan law, at the head of whom is the *Mufti* the High Priest, without whose consent no political act can be undertaken ; but the *Mufti* is nominated, and may be deposed by the Sultan. 3dly. By the *great council*, consisting of the great military officers, and the heads of the *Ulema* ; no important act of government can be undertaken without a previous discussion in this assembly.\* In the regular administration however, the Sultan is possessed of the most arbitrary power over the lives of his subjects without process or formality. With regard to property

\* Eaton's Survey, Chap. 1. See also Porter's Observations on Turkey.

perty, he is the lawful heir of all his officers; and as to other subjects, he may first put them to death under various pretexts, and then seize their properties. Hence in Turkey neither life nor property are secure.

Polygamy, as far as 4 wives, is allowed, but the number of concubines is unlimited.

A cruel and oppressive distinction is established betwixt the Mahometan and Christian inhabitants; these, though said to form two-thirds of the whole number, yet through the excess of Mahometan bigotry and intolerance, they are reduced nearly to a state of slavery.

There are courts of justice indeed in Turkey, but justice is notoriously venal.

### *Of the Persian Government.*

This government is still more despotic than the Turkish: at least its despotism receives fewer obstructions, and scarcely maintains the appearance of justice.\* Its ancient regal families are extinct, and hence Persia is continually ravaged by contending claimants.

Polygamy obtains here as in Turkey.

Intolerance

\* 2 Decouverte's Russes, 272.

Intolerance is milder here than in Turkey, though it is in some respects greater. A Persian will not eat with a person of a different religion; nor drink out of the same cup with a Christian, a Jew, or even an Indian.\* Judges are still more corrupt here than in Turkey, for they take bribes from both the contending parties.†

Hence it is not in this country that we can seek for security either for life or property; consequently the government must be deemed *semi-barbarian*; though in politeness even to strangers, the Persians exceed every other Asiatic nation, but their politeness is interested.‡

Luxury of every kind is carried to a great excess, both in buildings, number of domestics, dress, and mode of living.§

### *Of the Condition of Mankind in the Savage State.*

By the *savage state* I understand that in which different families exist without any other connexion with each other, but a common language and habitation in the same territory; uncontrouled by any laws but those of nature, having no chief  
invested

\* Olivier Voyage en Egypte & en Perse, vol. 5. 253.

† Ibid. p. 256. & 258.

‡ 2 Decour. 276.

§ 5 Olivier, 258.

invested with coercive authority, except when engaged in hostilities, having no tribunals to decide their differences, implacable in their vengeance, treating their enemies with extreme cruelty; polygamists, yet without any restrictive matrimonial contracts, holding their females in a state of slavery, (though this abuse is not without some singular exceptions) possessing no arts but the rudest and grossest, having no property but in things absolutely necessary for their existence.

These are the distinctive characters of the savage state; most savages it is true live either by fishing or hunting, or both; but no lawful mode of life affords a sufficient reason for denominating any portion of mankind *savage*; for even civilized tribes might subsist in that manner.

The savage state seems to have existed in the remotest ages; it appears to have originated principally from the ancient mode of punishing criminals. Notwithstanding the Noachic institution that homicide should be punished with death, criminals frequently escaped that punishment by flight, as was the custom in Greece.\* Involuntary homicide was always so punished,† and consequently crimes of inferior magnitude; hence Euripides says,

Quam

\* Diodor. Lib. 4: cap. 5.

† 2: Goguet. 73.

Quam bene parentum provida ætas statuerat  
 Ut cogeretur de via decedere  
 Hominumque visu, cæde patrata, nocens ;  
 Fugaque lueret triste. non letho, Scelus.

GROTIUS:

Many instances of this custom occur in Homer.

During the interval of 531 years betwixt the deluge and the dispersion, and many subsequent ages, various criminals followed by their families must have been from time to time driven to countries far distant from the parent state. There, ignorant of all arts, destitute of tools, and furnished only with bows and arrows and fishing tackling, they fell into that miserable unconnected lawless state which we call *savage*. In a course of ages their original language was corrupted or lost. Different nations or tribes arose from a succession of such outlaws from different countries, or perhaps from the same.

This I believe to have been the cause generally productive of this mode of life ; but it probably often originated also from various accidents, as shipwrecks on desert countries, expulsion by a conquering nation, &c.

That savage nations or tribes existed in the most ancient ages, we have many authentic testimonies. Pomponius Mela, treating of the nations in the interior of Africa, says,\*  
*Sequantur vagi pecora.—Quanquam in familias passim & sine lege dispersi, nihil in commune consultant.* And Sallust, De Bello

\* Lib. 1. cap. 8.

Bello Jugurthino,\* says, *Africam, initio habuere Getuli & Libyes, Asperi incultique—hi neque moribus, neque lege aut imperio cujusquam regebantur; vagi, palantes, quas nox coegerat sedes habebant.*—Nay, the ancient inhabitants of Italy, Salust tells us were savages,† for he calls them, *Genus hominum agreste, sine legibus, sine imperio liberum atque solutum.*

Such savages exist even at this day in Asia, America, Africa and Europe. The principal circumstances that regard the most remarkable of these I shall briefly mention, and shew, that though most, if not all of these are, through God's benignant providence, content and satisfied with their desolate state, yet that it cannot be denominated *happy*, much less the *happiest*, is an undertaking that might well be thought superfluous, if not ridiculous, if the contrary had not been maintained by the most powerful and imposing orator that perhaps ever existed.‡ His paradox I shall, in the sequel minutely consider.

Before I proceed further I feel it necessary to remove a mistake that has generally prevailed, in considering the condition of savages; it consists in confounding content with happiness; and as many savage tribes are content with their situation, it is inferred that they are happy. In what that

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happiness

\* Cap. 18.

† De Bello Catalin. Cap. 6.

‡ Jean Jacques Rousseau, in his treatise, Sur l'origine de l'inégalité parmi les hommes.

happiness consists which may be enjoyed in the present life, I have already shewn. Content does not imply so much; it requires not the excess of pleasing perceptions over the displeasing, but merely the absence of intense pain, whether corporeal or mental, and consequently of the fruitless desire of change to a more comfortable state. Desire includes some knowledge of the object desired, but the savage knows no other comforts but those he enjoys, and if by any chance he discovers them, he finds himself incapable of receiving them,\* he is satisfied with mere existence and possessing the means of maintaining it, however disgusting and nauseous they may be. Of pleasurable perceptions he is acquainted with none but the grossest.

The content of many in the lowest classes of civilized society stands on a much better footing. Their food may be simple but not nauseous, and it may be secured without any dangerous or even painful exertions; their habitations are sufficient to guard them from the inclemency of the seasons, and free from the offensive smells that are found in the dens or caverns of savages; their clothing coarse and homely, but not frowzy nor verminous as that of savages always is. To most mental pleasures they have free access, and if they are wise, their desires extend no farther than their power of lawful gratifications.†

*Of*

\* See the proof of this No. 15.

† See this subject well handled in Gilpin's Dialogues.



*Of the Asiatic Savages.*

Of these the fullest account is given by Mr. L'Evesque in the 6th vol. of his History of Russia. He collected it in Petersburg and Moscow from the journals of various travellers and navigators. These savage tribes are very numerous, but I shall confine myself to a description of only six of them, as these will afford a sufficient idea of savage life. These are, 1st. The inhabitants of the *Alouetian* islands, seated on the north eastern extremity of Asia and neighbouring on America. 2dly. The *Kampschatdales*, nearly at the N. E. extremity of the continent of Asia. 3dly. The *Koriacks*. 4thly. the *Tchoutkchi*. 5thly. The *Samoieds*. 6thly. the *Toungousi*.

*The Alouetians.*

The Alouetians have *no government of any kind*, yet each community elects some chief, invested with no other authority but that of deciding any dispute they may have with each other. They generally chuse the man that has the largest family, and is most successful in hunting or fishing;

when at war he is their leader, and his authority is then more absolute.

Their *food* is generally fish, frequently half putrified and cast on shore, and the flesh of foxes and birds of prey, which they devour raw. Though at their festivals they boil it, and serve it up as a dainty. They eat also some wild roots and sea weed.

Their *cloathing* the skins of sea calves, of foxes and of birds.

Their *habitation* a ditch 9 feet deep, 18 in breadth, and from 30 to 300 in length; the sides supported by posts, and covered by a frame, on which earth and grass are laid, with apertures to serve for doors, with a ladder fixed to each, and others to admit air and light, and some to let out smoke when they happen to have fires, which they seldom have, for even without any, the heat is insupportable, and the smell from putrifying fish horrible. From 50 to 500 persons inhabit the same ditch. Each habitation has a separate property annexed to it on the opposite shore. All the fish and shells found on it, and maritime plants, exclusively belong to the owner of the habitation.

Their marriages (if they can be called so) last only during pleasure, no previous consent of parents, no contracts, nor portion, nor festivity are required, and polygamy constantly practised.

practised. They frequently exchange their wives with each other.

Their *disposition* is brutal; they endeavour to surprize their enemies, and if they succeed, they exterminate them. Parents pay no attention to their adult children, who quit them when they chose.

They occupy the lowest place in the scale of savage life.

### *The Kamptschatdales.*

While at peace they are *perfectly independent*, and have chiefs whom they obey when at war, and whom, if victorious, they continue to respect.

Their *food*, the flesh of bears or other quadrupeds, or fish smoaked and dried; the heads of fish half putrified and reduced to a pap is their greatest delicacy. They never wash the vessels in which they prepare or eat their food.

Their *cloathing*, the skins of Rhen-deer, which they purchase from the Koriacks, or even of sea calves or birds.

Their *habitations*, separate ditches four feet deep, whose dimensions are proportioned to the number of persons in each family. In the midst of which four posts are fixed at the distance of about seven feet from each other. These are traversed by joices to which others are fastened, which reach  
to

to the ground, and the whole covered with moss and clay mixed together. In this covering two apertures are left, one to serve as a common door, a chimney and a window, and another to serve as a door for the women. To each door a sort of ladder is annexed; that belonging to the common door being placed close to the fire, when there is any, becomes so hot as to be scarce tolerable, to say nothing of the cloud of smoke through which one must ascend or descend. Their summer habitations are built on the surface of the earth, and somewhat less inconvenient. Each community claims a property in the banks of the river opposite to their habitation.

*Women* are here highly respected, even after they become wives. Hence polygamy, though permitted, is rarely practised. Their courtships and marriages are accompanied with some festivities and ridiculous ceremonies. Divorces are common. Children are never checked or reprimanded.

Their *disposition* is cruel; they endeavour to surprise their enemies; the most valiant of their prisoners they put to death with the most exquisite torments. Others they reduce to slavery.

*The Koriacks.*

Of these, some tribes have fixed habitations, others rove through extensive deserts. None have any chiefs; homicide is punished, and with great cruelty by the relations of the deceased.

The wandering tribes lead a pastoral life, and support themselves by the products of their herds of Rhen-deer; the sedentary are hunters, and live on the products of the chase.

Their *cloathing* is the same as that of the Kampschatdales.

The *habitations* of the sedentary, resemble also that of the Kampschatdales. Those of the wandering tribes are formed of posts fixed in the earth and covered with the skins of Rhen-deer, with an opening at top to let out smoke and let in light.

The *wives* of the pastors are reduced to the most abject servitude; they are polygamists, and as they divide their herds, they oblige one of their wives to superintend each one division. They may even kill them with impunity. The sedentary are less jealous, and even offer their wives and daughters to strangers.

Yet these pastors think themselves the *happiest* of men, and that strangers come among them only to eat of the  
flesh

flesh of their Rhen-deer. They are of a choleric, cruel and vindictive temper, and make war on their neighbours, though unprovoked by any injury received from them. Those that possess the most numerous herds are most respected.

*Of the Tchouktchi.*

These are both pastors and hunters, and at times fishers. They have no chiefs; their *habitations* are similar to those of the Kamptschatdales, but more extensive. They also construct others loftier, as the Kamptschatdales, and sometimes they lodge in the caverns of rocks.

They *cloath* themselves as the former.

Their food is fish or flesh, but through avarice they eat only such tame Rhen-deer as die a natural death. They sometimes intoxicate themselves by an infusion of a root called *Moukamore*.

They are hospitable to an excess, for they offer their *wives* to strangers.

Their ferocity exceeds that of the Koriacks, they are constantly at war with their neighbours, whose Rhen-deer they carry off.

*Of*

*Of the Samoiedes.*

They inhabit the borders of the frozen ocean from the Mezen in Europe, to the Lena in Asia. They have no chiefs or government of any kind. They abhor homicide, and commit no crimes.

Their *food* consists of the animals whom they hunt, and eat raw, and sometimes a dead whale: some have herds of Rhen-deer. They procure intoxication of late by smoaking tobacco, and sometimes by whiskey they procure from the Russians.

Their *raiment*—the skins of Rhen-deer or foxes.

Their *habitation*—huts half sunk in the ground, over which some posts are placed covered with the skins of Rhen-deer, with an aperture to admit light and let out the smoak. Their summer habitation is laid on the surface of the earth, and similarly constructed.

Their *females* are treated with the most unaccountable cruelty and contempt. They are considered as polluted, and are not suffered to approach the fire, which is regarded as sacred. They are not allowed in travelling to tread in the track of their tyrants, nor even of his Rhen-deer; any thing they touch must be purified; yet they are bought by their husbands, who even affect to be jealous of them: and what

is equally extraordinary, they are often mothers at the age of 12 or 13, and feel no pain in parturition.

In other respects their disposition is mild, nay timid; the least noise frightens them. Miserable as their condition is, they prefer it to all the conveniencies of civilized life, which some of them saw at Moscow. They viewed them without curiosity, and with a stupid indifference; they regretted their deserts, and hastened to return to them.

### *The Toungousi.*

The Toungousi inhabit much milder climates than the savages above mentioned; when at war they elect chiefs to command them; they respect the descendants of their ancient chiefs, from among whom they elect their commanders, unless they find some one else of distinguished merit. They delight to wander from place to place, and *subsist* in winter by hunting, and in summer by fishing, and some by pasturage. These last have often 1000 Rhen-deer, and the more Southern possess horses, sheep, goats and camels.

Their *cloaths* and *habitations* are much the same as those already mentioned; but they are strangers to intoxication. They never eat their meat raw, but rather boil or roast it.

*Polygamy*



*Polygamy* is allowed; some have five wives, but most only one, whom they quit when they please. Their marriages are attended with no ceremonies, but however with some festivities. They purchase their wives from their fathers, and never ill treat them, even when guilty of *adultery*. Seduction is grievously punished.

Their *disposition* is vindictive, but they are sensible to the point of honour; if grievously offended they challenge the offender to single combat. Assassination they scorn. Their duels are accompanied with some ceremonies as formerly in Europe. Lighter injuries they terminate by reference to arbitrators—generally their chiefs.

They seem to form the link that unites the savage with the barbarian state.

All savages are distinguishable by a total inattention to cleanliness.

### *Of the American Savages.*

The peculiarities of the different tribes of American savages have not been described with that minuteness and precision with which Mr. *L'Evesque* has delineated those of the Asiatic savages. The missionary, *La Fitau*, who lived several

ral years among those on the borders of Canada, has indeed given an account of their various customs and manners, in two quarto volumes, but intermixed with dissertations so foreign to the subject he undertook to treat of, as to render his work a chaos, from which scarce any precise notion can be extracted. Dr. *Robertson*, in his history of America, abounds indeed in just philosophic reflections on savage life; but they are rather the results of various observations, than specific accounts of any particular tribes; which he thought would lead to details of tiresome extent. Moreover, he constantly confounds the savage and barbarian states: however, it is him I am in general obliged to follow. Some important particulars I have also extracted from Hearne's Journey to the Northern Ocean.

The American savage tribes are divided into small *independent* communities, scattered over regions of vast extent, and in a state of constant hostility and rivalry. The forest or hunting grounds are deemed the *property* of the tribe, from which it has a title to exclude every rival nation. When they go to war, or to hunt, the leader of the most approved courage and skill takes the lead; but during seasons of tranquillity and inaction, all pre-eminence ceases.—*Roberts*. 90, 93. *Volney's View*, 397. Such he tells us was the form of political order established among the greater part of the American nations, Eastward of the Mississippi, from the mouth of the  
the

the St. Laurence, lat. 50° to the confines of Florida, lat. 30° but he does not mention that singular *Guinocracy*, or female government, that, according to La Fitau, 463, existed amongst the *Iroquois* and the *Hurons*, among whom the men are only the deputies of the women. I suppose he did not credit it: yet as to the *Hurons*, it is confirmed by *Masson Morvilliers*. Encyclopedie selon l'ordre des Matieres. HURONS. Yet they inhabit a country as cold as *Canada*.

If violence is committed, the community does not interfere; it belongs to the family injured, or of whom any member was slain, to avenge the wrong, or accept reparation, 2 Roberts. 95.

But, south of latitude 30. the power of those vested with authority, gradually increases. In Florida the authority of the *Sachems* or chiefs was not only permanent but hereditary. Among the *Natchez* some families were reputed noble, and enjoyed hereditary dignity; the body of the people was considered as vile, and formed for subjection. The will of the great chief is considered as law; the lives of his subjects are absolutely at his disposal. 2 Roberts. 97, 98, &c.

The North Americans above lat. 60° *subsist* chiefly by hunting or fishing. In more temperate latitudes, in addition to these they practise some species of cultivation, 2 Robertson, 83. In the warm climates of South America, the roots which the earth produces spontaneously, fruits, berries and seeds

seeds, together with lizards and other reptiles supply them with food during some part of the year. At other times they subsist by fishing, 2 Robertson, 79. The North Americans frequently eat their meat and fish raw. Hearne, 315. 316. and the most disgusting vermin, 325.

Their *habitations* are miserable huts intended merely for shelter, without any view to convenience; the doors so low that it is necessary to creep on the hands and feet in order to enter them, with one large hole in the middle to let out the smoke. Yet some are so large as to contain 80 or 100 persons, occupied by different families, which dwell together without any screen or partition. In the hot climates they form sheds of the branches and leaves of trees, and in the rainy season retire to covers formed by the hand of nature, or hollowed out by their own industry. 2 Roberts. 126, 127.

Their *dress*, the skins of animals in the colder climates, Hearne, 324, in the warmer none at all; but they bedaub themselves with various ointments to save themselves from the bites of insects. 2 Roberts. 124.

In the warmer climates *polygamy* is practised, but in the colder, where food is difficultly procured, they content themselves with one wife, and the union is easily dissolved. The condition of women is so grievous, and their depression so complete, that servitude is a name too mild to describe their wretched state. 2 Roberts. 73, 74. Hearne, 89, 90, 310,

Yet

Yet Hearne tells us, in the coldest climates men have often from 4 to 6 wives, 88, &c. but a general state of promiscuous intercourse betwixt the sexes was never known. 2 Roberts. 72.

The *disposition* of the Americans is of the worst kind, of a ferocious and brutal nature, (Volney's View, 397.) in general morose, cautious, and unacquainted even with the name of gratitude. The southern Indians carry their vengeance to the greatest excess. Hearne, 307. 2 Roberts. 104. Women entreat their husbands and fathers going to war, to bring them a slave, that they may have the pleasure of killing it. Hearne, 266. The northern Indians are much milder, for let their affronts or losses be ever so great, they never will seek any other revenge but that of wrestling. Murder, so common among the southern Indians, is scarce heard of among them. Yet they pay so little regard to private property as to take every advantage of bodily strength, to rob their neighbours not only of their goods, but of their wives. Hearne, 106, 108. Parents never chastise or even chide their children, who act as if totally independent, and treat their parents with harshness and insolence. 2 Roberts. 77. Nay, even beat their mothers. Volney, 463. The Asiatic savages, on the contrary, behave to their parents in the most affectionate manner. 6 L'Evesque, 326. These wretches, nevertheless, consider themselves as the standard of excellence

lence, and are satisfied with their condition, valuing themselves on their absolute and lawless independence. 2 Roberts. 166. An independence, however totally imaginary, for they are engaged in almost perpetual hostilities with each other. 2 Robert. 133 ; and if taken prisoners are burned alive. But of this more in the sequel.

§ 3.

*Of the African Savages.*

They are found only in the southern extremity of Africa betwixt lat. 28. and 32. a space originally possessed by various tribes of Hottentots, but of which a great part is at present held by Dutch colonists, by whom many Hottentot tribes are enslaved. Only a few are as yet free, who are called Gonquois Hottentots. 2 Vaillant. 10. 182. and 186. Beyond them are the Cafres, whom I call Barbarians, as they acknowledge the superiority of chiefs, as do indeed all other African tribes, 1 Vaill. 234. What Kolbé relates of their courts of justice is a mere fable. 2 Vaill. 43.

Among the Hottentots all are equally free and independent 2 Vaill. 41. 1 Sparm. 216. 218. Yet it seems each horde has  
a sort

a sort of chief whom Sparman calls a *Patriarch*, 2 Sparm. 3. and 1. Vaill. 260. His authority is therefore rather parental than coercive.

They subsist partly by *pasturage*, and partly by *hunting*; those called *Boschiesmen*, often on roots, wild berries and plants, which they eat raw, and are frequently so famished as to be wasted nearly to a shadow. 1 Sparm. 214.

Their *dress* consists of an ointment of fat mixed with soot, with which they besmear themselves, which is never wiped off, and a belt or girdle, from which two pieces of dried skin hang, one before and another behind, which serves to defend them against flies, and also to cool them when in motion, by constant flapping. 1 Barrow, 153. 1 Sparm. 194.

They dwell in villages called *Kraals*; their houses nearly such as those of the American Savages. See 1 Sparm, 184, 207, 213.

*Polygamy* is permitted, but scarce ever practised. 1 Sparm. 381. 2 Vaill. 43.

As to their *Disposition*, it is acknowledged they are a mild, quiet and timid people, 2 Vaill. 85. harmless, honest and faithful, kind and affectionate to each other. 1 Barrow, 151. not given to violence or revenge, 2 Sparm. 217. However, it is said that they have a horrid custom of burying alive children at the breast, when their mother is interred, 1

Sparm. 384. However, he says this never happens but when their nearest relatives, who are their natural guardians, are dead. No one else will take the trouble of rearing them.

## § 4.

*Of European Savages.*

I know of none that come at present under this denomination but the Laplanders, and perhaps some Samoieds in Permia. Though they pay tribute to the Russians and Swedes, they are in other respects independent, and have no interior government.

Of the Laplanders, some have fixed habitations, and these subsist by hunting in winter and by fishing in summer. Others lead a wandering life among extensive mountains, and possess numerous herds of Rhen-deer, whose milk and flesh supply them with food. 6 L'Evesque, 443.

Their *dress* consists of a jacket, tight pantaloons, and a surtout, all formed of the skins of Rhen-deer. Of late they use also woollen, which they procure from the Swedes and Russians and coarse linen, which they wear in summer.

Their



Their *habitation* in winter is in a ditch sunk 6 or 8 feet, and covered with moss, reeds and skins of Rhen-deer. Regnier's Account of Lapland. In summer they lodge in huts formed of posts fixed in the earth, and covered with moss and skins, and so low that one cannot stand upright in them. Both have a hole at the top to give a passage to smoke. 6 L'Evesque, 450.

They purchase their *wives* from their fathers, and enter into strict matrimonial contracts, it does not appear that they are polygamists. They have a contempt for women, and think them polluted, and therefore do not permit them to dress their victuals. 6 L'Evesque, 447.

Their *disposition* mild, peaceable, gay and courteous, even to strangers, 6 L'Evesque, 441. Mem. Stock. 1734. 222.

They are much attached to their own independent wandering mode of life, and think themselves the happiest of men. 6 L'Evesque 437. 39. Mem. Stock. 47. Yet of those that border on Norway, many pass into it to enjoy somewhat more of the comforts of life. It is not wonderful that they should prefer even the most indigent independence to the tyrannic disposition of the neighbouring governments.

It is said that the Laplanders originally inhabited a less inhospitable climate, but were driven northward by the Fins and Russians. Mem. Stock. 1734. p. 216.

From this survey of the principal circumstances of savage life, under every climate of the habitable globe, I apprehend it is sufficiently apparent, that it is far indeed from being productive even of that approximation to happiness which mankind is capable of attaining. To such mental pleasures as are referable to *intellect*, *memory* or *imagination*, savages have no pretence. And as those sources of pleasure are unproductive of pain, here is one great deficit in the scale of happiness without any counterpoise of pain. With respect to the pleasures and pains resulting from *affectibility* they feel no pleasing *emotions* but the *expectation* of meeting their prey, and *joy* on obtaining it; but daily experience *veaxation* from the miseries they endure, and *rage* and *indignation* at supposed affronts from their brethren. As to *desires*, they are insensible to any but such as are purely instinctive, Most of them court *distinction*, either by their riches, when they possess any, or skill in hunting, or valour in war; but as it is impossible that all should obtain distinction, each village is filled with distrust, jealousy and secret ambushes.\* They are universally devoid of gratitude; their chief amusement is dancing, accompanied with drums and singing. But the passion whose gratification yields them the highest pleasure is that of revenge; on exposing their enemies to the most excruciating

\* Volney, 397 and 427. To these odious passions the Hottentots and Laplanders are strangers.

ing tortures, they feel a cool and premeditated delight, and it must be owned, that from the same stern, obdurate and inflexible frame of mind, they bear the torments inflicted on them by their enemies with a ferocious, insulting firmness and patience, which some call *fortitude*. With the pleasures of *sympathy* they are totally unacquainted, and the pains of others, not even their enemies, are to them mere matter of sport.

Their females (with only two extraordinary exceptions) they treat not only with inhumanity, but with the most insulting contempt.

The gratification even of their *corporeal* wants can scarcely be called pleasurable or comfortable, at least it is so in the least possible degree. Their food is commonly of the most disgusting kind; and any pleasure it can afford is frequently counterbalanced by the severe abstinence of many days. Their sense of smelling, if not entirely blunted, is assailed by the most fætid odours. Their cloathing harsh and verminiferous. Their habitations, at least in the colder regions, are dens of misery. Cleanliness they systematically avoid.

How then is it possible that any should doubt, as some have, whether with regard to external circumstances, happiness and misery is equally diffused through all states of human life? “ In civilized countries, where regular policies have secured  
“ the necessaries of life, ambition, avarice, and luxury, find  
“ the

“ the mind at leisure for their reception, and soon engage it  
 “ in new pursuits that are carried on by incessant labour, and,  
 “ whether vain or successful, produce anxiety and contention.  
 “ Among savage nations imaginary wants find indeed no  
 “ place; but their strength is exhausted by unnecessary toils,  
 “ and their passions agitated, not by contests about superi-  
 “ ority, affluence or precedence; but by perpetual care for the  
 “ present day, and by fear of perishing for want of food.\*”

But these sceptics have not considered that the miseries of the savage state are the *inevitable* consequences of that situation, whereas those of civilized life, as we shall presently see, arise not from that state, but from *voluntary* indulgence to overgrown passions; to say nothing of the numerous countervailing pleasures that occur in this state.

In speculating on the origin of mankind, Diodorus, lib. 1: cap. 3. p. 10. informs us, that some philosophers supposed that our species originally existed in a state still more desolate and miserable than any savages now existing, or of whom we have any account; without language, and consequently without any social intercourse; subsisting, like other animals, on roots and fruits; quenching their thirst at the next stream or fountain; but that at length, through fear of wild beasts, they associated with each other, and formed a language, or rather

\* Johnson's Life of Drake, 1 Fugitive Pieces, p. 211.

rather different languages. Of this imaginary state, Lucretius, lib. v. 923. gives an enchanting description ; and indeed it is admirably suited to the wild delirious excursions of poetic fancy ; but that the belief of its existence and superior happiness should seriously be obtruded on the common sense of mankind towards the middle of the 18th century, would surely not be credited, had not its existence been confidently supported with astonishing eloquence and subtlety by the famous *Jean Jacques Rousseau*, in a prize discourse on the origin of the inequality among men, offered to a French provincial academy. His discourse did not indeed obtain the prize, yet it made so deep an impression on the minds of many, that *Mr. De la Harpe* affirms it mainly contributed to excite that frenzy which a few years afterwards desolated France.\* And this seems also to have been the opinion of *Mr. Volney* ; for he thinks that if *Rousseau* had written in favour of civilization, “ he would have prevented, “ or counterbalanced the false and extravagant bias, the “ sad consequences of which have been exhibited to us “ within these few years.†”

As in this discourse Rousseau affirms not only that mankind originally and during many ages existed in this lowest imaginable state of savage life ; but also that while in that state they have since been in a civilized state, it naturally falls

\* Cours de Liter. vol. 16. p. 337.

† Volney's View of America, p. 440. English Edition.

falls within the limits of this essay, to shew 1<sup>o</sup> that the existence of that state he so loudly vaunts, is perfectly imaginary and groundless. 2<sup>dly</sup>, that even if it had existed, it would be infinitely more destructive of happiness than a civilized state can, in any possible case, be supposed to be.

And 1<sup>o</sup>, that men originally existed in a savage state, is directly contrary to the express testimonies of Moses and Sanchoniatho, both the most ancient, and the former the most credible ancient historian now existing. Both agree that all men sprung from a single pair, had a language, formed families, and lived in a social state from their very origin.

To this testimony our orator allows, that religion obliges us to assent, but insists that it does not forbid us to form conjectures grounded on the nature of man, and of the beings that surround us, if God had not intervened. This guarded concession he evidently makes to avoid prosecution, for he presently after throws off the mask, supposes his discourse addressed in Athens to Plato and Xenocrates, and roundly asserts, "that his account of the original state of man is not taken from histories composed by men, who are lyars, but from nature, which never lies."

I shall now briefly state the paradoxes which he imagines to have read in the book of nature, and in brief remarks on each, shew he has falsely interpreted it.

He

He begins by asserting, that man considered abstractedly from all his social, and as he thinks, adventitious acquirements, possessed the following eminent advantages.

1st, That men were less subject to various distempers, than they now are in the civilized state.

This is not agreeable to truth. The savages of modern times who subsist as the ancient savages must have done, by fishing or hunting, and are furnished with many more advantages than Rousseau's fictitious savages could have been, (who must have originally at least, been destitute of fishing tackling and bows and arrows, and who could not find fruits throughout the year, nor possessed any tool for digging up roots, nor even distinguish such as are nourishing, which are not every where to be found,) are notwithstanding extremely subject to consumptions, pleuritic, asthmatic and paralytic disorders, as Dr. Robertson remarks\*, who adds, that in the savage state hardships and fatigue violently assault the constitution; and that in polished society intemperance undermines it: that the influence of the former is most extensive, and that whereas the pernicious consequences of luxury reach only to a few members in any community, the distresses of savage life are felt by all. He tells us, that as far as he can judge, the general period of human life is shorter among savages than in well regulated and industrious societies. To

VOL. XI.

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the

\* 2 Roberts, America, p. 61.

the above disorders Volney adds intermitting fevers and pleurisies; from rheumatisms he thinks they would suffer more did they not practise fumigations by means of red hot pebbles\*.

In the 2d place our orator roundly asserts, that his primæval savages were stronger than men now are in the social state, who are he says enervated by leading a tender and effeminate life.

But assuredly it cannot be said that the savages of our times lead a tender and effeminate life; yet Dr. Robertson collects from a number of Spanish writers that the savages of South America were much more feeble than Europeans†. Volney extends the same remark to those of North America‡; and L'Evesque, treating of the Asiatic savages says, “that it is a mistake to think them stronger than other men§.

3dly, Our orator tells us, that his primeval savages had no habitation, and required none, not even cloaths. For that in the warm climates they did not want them, and in the colder they soon appropriated to themselves the skins of the wild beasts that they killed.—

This however is clearly contradicted by facts. All savages, whether of ancient or modern times, had and have some habitation either in caverns, or huts constructed of trees¶: or  
in

\* Volney, 416.

† 2 Roberts. 44.

‡ Volney, 417.

§ Vol. 7. p. 299.

¶ 2 Roberts. 126.



in ditches covered with hurdles\*. And in warm climates most of them cover themselves, at least as much as modesty requires, with leaves or barks of trees or otherwise; and in the colder they cloath themselves with the skins of wild beasts.—But how could Rousseau's savages either kill or flay any beasts, having no instrument of any sort?

4thly, He pretends the primeval savages were destitute of language: he even shews the difficulty or rather the impossibility of the artificial formation of any; and so far I perfectly agree with him; but absolutely deny that men ever existed that had not some language.

5thly, He supposes his primeval savages never to meet each other, or at least only once or twice—a strange paradox! were there no families, no brothers or sisters?

6thly, He thinks it impossible to imagine why one man should want another, any more than a monkey or a wolfe require another of their species; and even if he did, what motive could induce the other to assist him, or if there were any, how they could agree as to the conditions.—This scarcely requires an answer; and if it did, he himself furnishes one, as we shall presently see. That monkies however assist each other on various occasions many travellers assure us†; and wolves are well known to hunt in droves.

T 2

7thly, Yet

\* 6 L'Evesque, 34. 2 La Fitau, 16.

† Bingley's Animal Biography, p. 76.

7thly, Yet he owns that man is naturally benevolent. Here there is a motive to assist his fellow man; but to what purpose if his fellow savages never required his assistance, had no language, and scarce ever met?

8thly, He affirms that men are depraved by society, which necessitates them to hate each other; that individual interest always opposes that of the social body.

But that men should become depraved by combining to assist each other is affirmed without any proof. The seller and the buyer may perhaps have opposite interests with respect to the object on sale, but assuredly they do not hate each other as our orator pretends, but on the contrary, for their mutual interests, wish the prosperity of each other. The English merchants made large remittances to the Portuguese after the earthquake of 1755, which destroyed Lisbon. The body of society is composed of individuals; its interest is therefore the true interest of each.

Yet he objects 9thly, that there is no lawful gain, but may be exceeded by the unlawful.—

This assertion, taken universally as it is laid down, is evidently false; for on the contrary, unlawful gain, if universally practiced, would soon cease, for even a robber would be robbed in his turn. The lawful is secure, the unlawful precarious.

10th, He

10th, He quotes Maupertuis' calculation, that the evils of social life are far superior to its enjoyments. This I shall examine in the sequel.

11th, He insists that there is no proportion, betwixt the labours men have undertaken, and the happiness of the human species, such as the invention of arts, the acquisition of sciences, levelling of mountains, bursting rocks, rendering rivers navigable, draining morasses, raising enormous buildings, forming lakes, constructing ships, &c.

To this assertion, which is glaringly absurd and entirely gratuitous, I nevertheless answer that the inhabitants of the countries wherein those labours were undertaken (if we except the pyramids of Egypt, the intent of which is not well known) gained advantages fully adequate to their labours. Egypt, for instance, from being a morass, became the most fertile country in the world. So China, Italy, Germany, France, England, &c. Who can deny that the manufactures of leather, woollen, linen, pottery, metallurgy, &c. are useful to the majority of the human species: those who exercise those arts are always fully compensated for their trouble.

12th, The savage when he has dined, is, as our orator supposes, in friendship with his fellows; if any dispute arises, it is terminated by a few blows.

This

This however is far from being true; for a vindictive character is the distinctive feature of almost all savages. Moreover, two savage girls who could speak no language, and circumstanced as Rousseau's primeval savages, were taken in a wood near *Chalons Sur Marne*, A. D. 1731, met, disputed with each other the possession of a chaplet, when one of them killed the other by a violent blow on the head, as the survivor related when taught to speak\*.

13th, He also pretends that men and women met each other only by chance, and soon separated.—That love was confined to mere animal instinct, and that his savage though destitute of language and of any fixed habitation, and perhaps not knowing individually any other of his species, not even his own children, was yet fully capable of satisfying his real wants.

This supposition is unsupported by any proof, and is inconsistent with the real nature of man and the continuance of his species. It is well known that even in savage life the preservation of children requires the joint assistance of both parents or their relatives.

14th, He affirms that a savage at liberty never desires to terminate his existence, as many do in civilized life. Here, to his fictitious savages he substitutes modern savages, who possess many more advantages than his primeval savages,  
and

\* An account of the savage boy found in the woods near *Ancyron*, p. 7. & 8.

and therefore should be more desirous of prolonging it. Yet these when they grow old, desire an end to be put to their existence.\* The slightest affliction is sufficient to induce the Kamptschatdales to destroy themselves.† When a savage loses a limb either in war or by disease, he is undone; for how can a cripple resist an enemy, or fish, or hunt, or procure any kind of subsistence, with which no one will supply him? for among them no one has, or can have, any store in resource; every one is reduced to his own casual and variable acquisitions‡. In civilized life scarcely one in a million puts an end to his existence.

15th. Our author confidently asserts, that savages in no part of the world can be persuaded to embrace a civilized life.

Here again he substitutes modern savages to his imaginary primeval, yet he must allow, even granting his own hypothesis, that his primeval savages have adopted a civilized life, since civilized societies actually exist, and by far the greater part of mankind are in a social state. It is however true that adult savages cannot be persuaded to adopt the manners of, and remain among a civilized people; but one of them explained to Mr. Volney why he wished to return to his own tribe. He alleged his ignorance of the language and his inability

\* Volney, 414, and 422.

† L'Evesque, 71.

‡ Volney, 422.

ability to exercise the trades and occupations of a civilized people, adding that he would incur the contempt and indignation of his relatives, and of all those with whom he was connected and acquainted; Volney, 423. But a whole tribe of savages would certainly abandon that state, if they found lands cleared of woods on which they could settle, and a possibility of procuring provisions. This is what in fact happened to some savage tribes on the banks of the Mississippi, who in summer cultivate fields of Indian corn, and in winter follow the chase, and may be said to retain nothing of the savage but the name.\* The Caffres, a Hottentot tribe practise agriculture.† The different tribes of wandering Arabs, as often as they find a possibility of procuring provisions in any district, take up their residence in it, and adopt insensibly a settled state, and the arts of cultivation; so true it is that the settled and cultivated state is that to which mankind is naturally inclined.‡

16th. Our orator quotes an instance from the 5th vol. of Prevost's history of voyages, of a young Hottentot, carefully educated by the governor of the Cape of Good Hope, and taught several languages, who on his return from a visit to his parents restored his European cloaths, and fled with all speed

\* Page's Voyages, p. 22. Dub. Edit.

† Thunberg's Voyages. Dodsley's Ann. Regist. for 1793, p. 287.

‡ Volney's Travels in Syria, p. 236, 237. Dublin Edit.

speed to the Hottentot tribe to which he belonged, and never returned to the Cape.

But besides that Kolbe, the author from whom, I think, this tale is taken, is entitled to little or no credit, 1 Sparm. 77. 2 Barrow, 15. 2 Vaillant, 43, 72. Our enthusiastic author forgets to tell us, that the Hottentots who live with the Dutch are in reality enslaved; which accounts for the precipitate flight of this youth (if true) and his preferring to live with his own family and regain his liberty. 1 Sparm. 218.

17th. Lastly, our orator alledges that many abandon civilized life and embrace that of savages.

To which I answer, that this, if it were generally true, would not support his hypothesis; for it is not the destitute state of his primeval savages, but that of modern savages, (who possess many advantages to which his fictitious savages, as he himself supposes, must have been strangers,) that any person had ever embraced, now Mr. Volney informs us, that on diligent inquiry in several parts of America, the unanimous result was, that the adoption of savage life among the American descendants of English or Germans, scarcely happens but to youths under the age of 18, who have been carried off prisoners, which because of the excessive liberty it allows children, is much more pleasing to them than the confinement of schools, and the punishments inflicted on them for their idleness. That as to adults taken and adopted by the

savages, scarcely any can accustom himself to their way of life. Those that voluntarily join the savages are Canadians, generally men of bad character, libertines, idle, of passionate tempers or little understanding. The influence they acquire among the savages flatters their vanity, while the licentious life they lead with the squaws indulges the prevailing passion of their headstrong youth; but when they grow old they scarcely ever fail to return to their country, regretting their rambles when too late\*.

Having thus evinced the folly or falsehood of all the arguments of our orator in support of the existence and superior happiness of his imaginary savages, I shall take no notice of what he advances in the second part of his discourse to account for the origin of property, it being foreign to the object I now treat of.

\* Volney's View, 418, 419.



## CHAP. VI.

*Of the Condition of Mankind under the Barbarian Governments  
in America.*

IN treating of the Asiatic and European barbarian governments I omitted those of America, as that part of the globe was chiefly inhabited by savages. Before, however, I enter on the investigation of happiness in more civilized life, it will be necessary to consider in what degree it existed in the few tribes that coalesced into social communities in America.

*Of the Government of the Natches and of Bagota.*

Doctor Robertson informs us from numerous Spanish authorities,\* that among the *Natches*, a nation on the borders of the Mississippi, not only an hereditary nobility was established, but the most unlimited despotism in the person of a single chief. The body of the people was considered as vile and formed for subjection to the will of the chief. All sub-

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mitted

† 2 Roberts. 98.

mitted with implicit obedience ; the lives of his subjects were so absolutely at his disposal, that if any had offended him, he came with profound humility, and offered him his head. Nor did the dominion of the chief cease with his life, for his favourite wives and principal officers were sacrificed at his tomb, with many domestics of inferior rank, that he might be attended in the next world by those that served him in this.

Nothing surely but the most infatuated superstition could render such a government tolerable. And accordingly we are told that the chief was reputed a being of a superior nature.

In Bagota, now a province of New Grenada, there was settled a nation more considerable in number, and more improved in the various arts of life than any people in America, except the Mexicans and the Peruvians. The idea of property was introduced among them and secured by laws handed down by tradition. They subsisted by agriculture ; they lived in large towns, and were decently cloathed ; their houses might be termed commodious, when compared with those of the people around them. Courts of justice were established, which took cognizance of different crimes ; a distinction of ranks was known. Yet their chief or monarch reigned with absolute authority, and so venerated by his subjects that none presumed to look him directly in the face.

2 Roberts.

2 Roberts. 99. 103. The power of this monarch was, probably, though not limited, yet restrained by the prevailing manners, as that of the Danish king is at present. It is not said that they were acquainted with letters, nor how their women were treated, nor what religion they professed. However, they professed some, and their veneration for their chief was founded upon it. A great degree of happiness they probably possessed, and their state may be deemed civilized.

*Of the Chilese Government.*

The Chilese are divided into numerous tribes ; each hamlet or village has chiefs, who in several points are subject to the supreme chief of the tribe. The succession of these chiefs is established by hereditary right ; but their authority is very limited, that is, merely directive and not coercive. They subsist chiefly by agriculture, raising different esculent plants or roots, pulse of various kinds and potatoes ; rabbits, and a species of camel. The right of private property is fully established and hereditary. They have no written laws, but merely ancient usages.

They manufacture cloaths of the wool of the camel.

They

They live in houses formed of brick, or of wood plastered with clay.

They are unacquainted with letters; Yet they have attained a wonderful knowledge of astronomy.

There are other circumstances that strongly counteract these advantages. *Polygamy* is allowed and practised by all who can afford it, and women are condemned to servile labour. Children are never corrected, their insolence is even encouraged. Husbands and fathers are not subject to any punishment for killing their wives or children. Crimes deemed worthy of death are treachery, voluntary homicide, adultery, robbery and witchcraft. Witches are first tortured by fire, and then stabbed with daggers. Justice is administered in an irregular and tumultuous manner, without any preliminary formalities. Public justice is either ill administered, or entirely abandoned to the caprice of individuals: in such a state the abode of happiness can be merely casual. This account is extracted from the 2d volume of the history of Chili, written by Don Jean Ignatius Molina, a native of that country, and published in 1787.

Of

*Of the Mexican Government.*

In the Mexican empire the sovereignty was originally vested in monarchs elected from the members of a particular family, whose authority was at first limited, but under the reign of the last emperor became despotic. 3 Roberts. 133.

His subjects consisted of various classes of nobility, whose titles and possessions were hereditary ; but the great body of the people were in a very humiliating state. Even those considered as freemen were treated by their haughty lords as beings of an inferior nature ; and domestics might be killed by their masters with impunity.

The right of private property was established in its full extent ; hence agriculture and various arts had made some progress.

There were also courts of justice whose decisions were usually equitable. But they had no written laws, nor appear to be acquainted with letters.

Their habitations were mean stragling huts, formed of earth and stones. In the city of Mexico and some others they were equally mean, but more orderly.

Their disposition was in the highest degree ferocious. They were incessantly engaged in hostilities, and were chiefly in-  
tent

tent on making prisoners, all of whom they put to death and devoured. On the death of any distinguished person a certain number of his attendants were chosen to accompany him to the other world, put to death and buried in the same tomb.

The victims of superstition who seem not to have been foreigners, but native Mexicans, and probably of the lowest class, were still more numerous. For according to the most accurate account, they amounted to 2500 annually. Robertson, 315.

This empire must then be deemed *semi-barbarian*.

#### *Of the Peruvian Government.*

This government was perfectly theocratic. Mango Capac and his wife pretended they were children of the sun. He was their first *Inca* or sovereign, and none but his descendants could aspire to the sovereignty. His authority was considered as that of the divinity, and therefore implicitly obeyed. 3 Roberts. 164, &c.

Among the Peruvians a great inequality of ranks prevailed, and the great body of the inhabitants were held in a state of servitude.

The

The state of property was no less singular than that of religion. All the lands capable of cultivation were divided into three shares; one consecrated to the Sun and destined for the support of religion. The second belonged to the Inca for the support of government. The third, and largest share, was reserved for the maintenance of the people among whom it was parcelled out. No person however had an exclusive property in the portion allotted to him—he possessed it only for a year, when a new division was made, in proportion to the rank, number, and exigencies of each family. All those lands were cultivated by the joint industry of the community. Hence their agriculture was extensive, and conducted with more skill than in any part of America.

Their *houses* were built of stone, brick or wood, as convenience required, and sufficiently commodious, though without any windows. In all arts they made a greater progress than the Mexicans.

All crimes were punished capitally, being looked upon as insults to the deity.

Yet their *disposition* was mild and gentle even to prisoners of war, whom they never put to death, but incorporated with themselves.

The horrid custom that prevailed among the most savage tribes subsisted among them. On the death of their Incas or other eminent persons, a considerable number of their attend-

ants were put to death, that they might be properly attended in the other world. On the death of Huana Capac 1000 persons were doomed to accompany him to his tomb. Thus, upon the whole, this government must be deemed only *semi-civilized*.

The foregoing account is extracted from S Robertson.

*Of some anomalous States.*

Among these I denote that of the ancient Germans; that of the Otaheitans, and that of the inhabitants of the Pelew Islands; in which a mixture of savage, barbarian, and civilized manners and modes of living were observed.

*Of the ancient Germans.*

Of the German tribes many were governed by kings, but most had chiefs or leaders chosen for their valour. The authority even of their kings was limited, except among the *Suiones*. They had, for the most part, a class of nobility, out of which their kings were chosen. (I say for the most part,  
for



for I think the *Franks* had none.) In fact there were three classes; that of the nobility, that of freemen, and that of slaves. Of matters of small importance their chiefs decided; but the more weighty were referred to a council, formed of the whole tribe. By these councils state criminals were tried.

They *subsisted* chiefly by hunting or rapine; and though they disdained agriculture, yet they divided their lands every year, and raised some corn. Some subsisted on wild berries, and venison and curds. Most had beer, and some wine.

Their *habitations* were formed of rude materials, without any cement; always filthy, as their beasts dwelled among them. Some lodged in caverns or ditches covered with dung.

Their *cloathing*, a cloak or jerkin formed of the skins of wild beasts.

They were not strangers to *property*, for their children inherited.

For *women* they had the highest respect; they supposed them to possess a sanctity and prudence more than human; hence they were frequently consulted. Polygamy scarce ever existed, and adultery was rarely known; and when known severely punished. *Villeda* was honoured as a goddess. *Aurinia* and many more were merely venerated.

Their principal amusement was gaming, and this they pursued to such excess as to stake even their own personal liberty, and steadily maintained their engagements. To gratitude they were absolute strangers, but their hospitality was boundless and indiscriminate.

Injuries were avenged by the injured family, but even homicide might be compensated by a certain number of sheep or cattle.

See Tacitus de Moribus Germanorum, and 1 Gibbon, 345.

### *Of the Otaheitans.*

*Otaheite* being situated in a delightful and healthy climate, its inhabitants enjoy more happiness than any people hitherto mentioned except the *Peruvians*. Their happiness however is wholly of the sensual kind, and debased by various criminal practices, partly of the savage and partly of the barbarian kind.

They consist of three classes of men, the nobility or chiefs, freemen and common people or servants, who are held in the lowest and most degrading servitude, but the principal authority resides in a king stiled *Eree di hoi*.

Their

Their *food*, pork, poultry, bread fruit, bananas, yams, fish, apples, dog's flesh. However, it is only the chiefs who have flesh daily served to them,

Their *dress* is not only decent but graceful; it is formed of cloth made of the macerated fibres of the inner bark of a tree, spread out and beaten together.

Their habitations are commodious and thatched with the leaves of the plantain tree.

*Women* (I suppose those of the second or third class) were educated without any sense of modesty, and treated with the most marked contempt. Men might have as many wives as they could maintain, and divorce them at pleasure, nay, destroy their children. They were not suffered to eat with their husbands, and were excluded from a share of the best sorts of food. The unmarried were frequently led to prostitution by their fathers and brothers. There even existed a confraternity of nobles who kept concubines in common, and purposely destroyed their children.

Their disposition was mild and gentle towards each other, but when engaged in hostilities they treated their prisoners with the most inhuman cruelty. Hence they can scarcely be accounted even *semi-civilized*.

This account is taken from 2 Cook's Voy. 155, &c. and 1 Hawks. Collection, 148. 154. 290. 313. 314.

Of

*Of the condition of Mankind in the civilized State.*

The civilized state is that in which different families are associated for the protection of their natural rights, namely, life, liberty, property, and safety, together with such advantages, as may be gained by the united power of the society.

It originated on the cessation of the general patriarchal government, when the different families of mankind were no longer subject to a common parent. But the first attempt to obtain this protection was grossly defective. The whole power of the association was confided to a single person, probably from the constantly recurring necessity of defence against foreign foes, or from the lust of conquest. The will of the prince gradually became the governing principle by which the public force was in every instance directed, and the rule by which his subjects were obliged to regulate their actions, or in other words, the law. Subjects were indeed often protected against external hostile aggressions, but in no case were their natural rights sufficiently secured against the despot himself; hence I termed these governments *barbarian*. In process of time, however, several of these received gradual

dual improvements, and in proportion to these, merit the title of *civilized*.

Hence the *natural* or original state of mankind was that of filial subjection to a common parent; this was succeeded by the barbarian, which in many instances was refined into the civilized. That which Hobbes and many other philosophers and jurists call the *state of nature*, is nothing more than that of men abstractedly considered, and never had a real existence.

The mere possession of property is not a characteristic of civilization, nor was property originally a creature of law or society, for it was for the secure possession of property previously acquired, that different families originally associated, except perhaps some wandering tribes, who distributed among themselves by lot or otherwise, the lands of a territory in which they newly settled. In such cases, landed property and the course of its subsequent acquisition, transmission or disposition may justly be called the creature of law. This is so true, that even savages claimed and enjoyed a property not only in common, but individually, in the portion of land necessary for their subsistence, as I have already shewn.

The degrees of civilization are various, according to the variable extent and degree of protection and security afforded to

to the natural rights of men, and the number and importance of the advantages procured for them by the power of the society.

With regard to *extent*, the lowest degree of civilization is that in which protection is unequally distributed. Hence those nations in which the rights of women and children, or of any particular class or sect of the society are injured, or not sufficiently protected, even supposing those of the higher classes to be respected, must be accounted only semi-civilized.

Again, as to the degree of civilization, that state must be deemed most perfectly civilized, in which the natural rights of the inhabitants are most perfectly secured, from the encroachments of the sovereign himself, the injustice or illegal aggressions of individuals, and the hostilities of foreign foes, in which every other advantage contributing to the general comfort and ease of the inhabitants obtains.

The degree of civilization which the greater part of Europe has already attained, is chiefly to be attributed to the benign influence of christianity. The advantages derived from it are well enumerated by the Rev. Mr. Ryan, in a learned work, entitled, an *History of the Effects of Religion on Mankind*.\*

To

\* And Montesquieu, Spirit of Laws, B. 24. C. 3.

Much however is due to chivalry ; and philosophy may justly claim a share.

To chivalry European society is indebted for polished manners, a high sense of honour, fidelity to sovereigns, and respect for the female sex. To philosophy we owe the cessation of trials by ordeal, and of the judicial (I wish I could also say extra-judicial) trials by battle ; the discredit of witchcraft or magic, an imaginary crime for which many thousands have been condemned to death ; and the general prevalence of religious toleration.

It must be confessed, however, that most European countries are, as yet, but imperfectly civilized ; in most of them an absolute unlimited authority is at present, and has been for some ages, vested in a single person whose power is supported by a numerous disciplined army ; hence it is frequently abused, and those rights for the preservation of which men originally associated, are frequently grossly violated, by arbitrary imprisonments, heavy, unequal and unnecessary impositions, severe restraints on the communication of knowledge, and in many by punishment, even unto death, of those who adopt speculative religious opinions different from those authorised by the state. Those guilty of this atrocity cannot surely reproach the Mexicans with their execrable human sacrifices.

Thus far I have been obliged to enlarge on the nature of civilization, as it has not hitherto been sufficiently defined; but shall at present confine myself to the examination of the degree of happiness enjoyed, or that may be enjoyed, under that government which appears to me to approach most to perfect civilization, namely, that under which we have the good fortune to live\*.

The essential rights of men being sufficiently secured to them, or at least presumed to be so, by the united powers of the society at large (an advantage which cannot be obtained by the solitary efforts of disunited individuals;) they have the leisure and opportunity of pursuing that course of life proportioned to their abilities, which seems to them most productive of pleasure, and least exposed to pain.

The inhabitants of all countries may be ranged under four general divisions or classes; namely, the *opulent*, the *rich*, the *poor* and the *indigent*.

The *opulent* are those who in addition to the necessaries and comforts of life, possess also its luxuries, superfluities and pageantry.

The

\* I do not deny that a great degree of happiness prevailed among the middling classes of society in many parts of the continent, until about 70 years ago, when Frederic the 2<sup>d</sup> introduced the system of *misery*—the *conscription*, into Europe, which has since been adopted by other sovereigns. The happiness enjoyed by a very numerous part of the French people before the year 1789, is attested by *Marmontel* in his *Memoirs*.



The *rich* I call those who, without manual labour, possess the necessaries, comforts and decencies suited to their rank in society, without any refined luxuries or ostentatious superfluities.

The *poor* are those who by manual labour acquire the necessaries, and many at least of its comforts for themselves and their families, but not its luxuries.

The *indigent* are those who cannot even by *manual* labour (of which they are often incapable) gain the necessaries of life\*.

The *necessaries of life* are wholesome *food*, an habitation so contrived as to secure the inhabitant against the inclemency of the seasons, *fire* and sufficient *cloathing*, *dry materials to rest on*, and the *means* of procuring those necessaries†.

I call *comfort* whatever frees us from uneasiness, and contributes to our conveniencies or pleasures.

By *luxuries* I understand, 1st, objects which are chiefly valued as ornamental, costly or fashionable.

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2dly, Various

\* Doctor Adam Smith has much enlarged the notion of necessaries; for he comprehends under that name, not only those things that nature, but those which the established rules of decency have rendered necessary to the lowest ranks of the people, as linen shirts, and shoes for men, though not for women. *Smith on the Wealth of Nations*, vol. 3. p. 332; all besides he calls luxuries. However, as Julius Cæsar and the richest Romans could do without linen shirts, as well as many modern tribes, I cannot consent to call ~~them~~ *necessaries*, but rather *comforts*.

† This necessary distinction was first made by Mr. Colquhoun.

2dly, Various delicacies and refinements, so contrived as to flatter the senses, particularly those of taste and smell.

Indulgence to the desire of possessing such objects and delicacies is called *luxury*\*.

Betwixt these principal classes (of each of which, except the last, there are various degrees) there exist various intermediate *conditions*, participating of those classes betwixt which they lie, as the *industrious* and the *professional*, which lie betwixt the poor and the rich; and the *official*, which, according to the nature of the office, lies either betwixt the poor and the rich, or betwixt the rich and the opulent.

It may, I think, be laid down as evident maxims, 1<sup>o</sup>, that the principal source of pleasure to mankind consists in the prudent gratification of innocent and attainable *desires*; the pleasing emotions arising therefrom, and just and benevolent sentiments, together with the intervenient tranquil *hope* of such gratification. And 2<sup>do</sup>, that *complex* pleasures are by far the most durable and valuable.

As the gratification of our desires relates to a future period, prudence requires that we should examine first the probability of our attaining that period: as it were idle to aim at a gratification obtainable only at a period to which it is improbable we should arrive; or to undervalue any advantage obtainable

\* From *λυω*, *solvo*, as it was supposed to relax and unnerve the mind.

obtainable at a period which it is highly probable we should attain.

2dly, The probability or practicability of our obtaining at that period the advantage sought for. 3dly, That we should calculate and compare the pains, labour, time and expense necessary for its attainment, with the real value of that advantage.

I scarce need add, that the probability of a future *danger* or other *evil* should be examined in the same manner, and its magnitude compared with the pains, labour and expence necessary to avoid and escape from it.

The probability of the event first mentioned has been calculated by several. I shall only quote a few cases from *De Parcieux*, premising that I consider  $\frac{9}{10}$ , or even  $\frac{8}{10}$  as high probabilities. By his table it appears that of 806 healthy persons of the age of 21 years, 798 arrive at the age of 22, that is 99 out of 100, or 990 out of 1000, which is a high probability.

So of 1000 at the age of 21, 900 will arrive at the age of 31, or 900 out of 1000, or 90 out of 100, which is also a high probability.

So of 1000 of the age of 21, 815 will attain the age of 40 years, or little more than 81 out of 100, or about  $\frac{8}{10}$ , and the probability that a healthy man of 40 will attain the age of 50 is  $\frac{884}{1000}$ .

The

The other probabilities should also be examined, but cannot be so accurately estimated or calculated.

*Prudence* then, which is nothing more than practical wisdom, is the surest guide to happiness; by it we guard against future wants, ensure future advantages, avoid future dangers, and decline from whatever may probably be destructive of the former, or productive of the latter. It requires that in all cases of delicacy or moment, the safer alternative should be chosen, though the least probable, in preference to the most probable, if the failure of this would be attended with any important danger or loss.\* So also, if the success of the least probable would be attended with advantages of greater importance than the danger or loss arising from the failure of the most probable alternative.†

It also demands a cautious and discreet selection of the means, order, time and circumstances best suited to the attainment of the desired end.

*Imprudence* consists in acting with *precipitation, inattention, to probabilities, presumption, rashness, indiscretion, want of caution, neglect* of that estimation and comparison above recommended, *inconstancy* and *levity*, altering from inadequate causes, resolutions already formed, &c.

I now

\* On this principle the practice of insurance is founded.

† This was the practice of Suwarrow, and other great generals.

I now proceed to examine whether, and in what degree happiness may be expected in the different classes above mentioned.

The general desire of the *opulent* is the acquisition of *power*; that of the *rich* is to obtain *opulence*; that of the *poor* is to acquire *riches*; and that of the *indigent* is to attain *relief*.

But *sensual pleasure* is the principal pursuit of the generality of each class while young.

There is also a fifth description of men, namely, the *philosophic* or *literary*; too few, perhaps, to form a class, whose principal pleasure is mental exercise, and the attainment of knowledge. Such persons are chiefly found among professional men, and some among the rich, or at least, of those who have obtained a competency.

The general desire of youth is directed to the gratification of mere animal propensities, sexual intercourse, the luxuries of the table, violent exercise, and a round of amusements.

When a young man arrives at the age of 21, being then at his own disposal, he finds the company and conversation of persons of superior age irksome, his want of experience unfits him for entering into it, and the silence he is obliged to observe disgusts him. Hence he carefully avoids it, and seeks the society of those of nearly his own age, whose inclinations are congenial with his own. By their excitements and  
examples

examples he is encouraged to vicious pursuits ; the first precept of *prudence* is therefore to avoid such company.

The pursuit of illicit connexions with the opposite sex leads to the commission of various crimes, the basest deceit, seduction of the innocent, the affectation of love, where the most cruel injury is premeditatedly intended ; its gratification transient, frequently followed by disgust, and constantly with the misery of the deluded object, and the affliction of the families nearly connected and allied with it ; infallibly followed by shame and remorse, often by a serious loss of property, through the legal infliction of damages, and invariably by the contempt and abhorrence of all considerate men. Promiscuous gratification, on the other hand, generally entails or generates the most loathsome diseases.

Other evils resulting from the thoughtless indulgence of youthful desires are derived from improvident marriages, involving the parties and their growing families in distresses and embarrassments for which nothing can compensate.

Immoderate indulgence of the pleasures of the table is generally attended with expences ruinous to fortune ; its transient gratifications gradually impair the constitution, and lay the foundation of various painful distempers, which far surpass both in duration and intensity, the pleasures that occasioned them. This observation is applicable with equal certainty to the pleasure of intoxication, which moreover  
frequently

frequently leads to the commission of the most shameful follies, and even of atrocious crimes.

Thus we see how miserably these are deceived whose idea of happiness centers in compliance with those desires. *Exercise* is necessary to health at all ages, but its violent exertions are attended by dangers often fatal to human life.

*Amusements* pursued with moderation are necessary relaxations from the more serious and interesting occupations; but when considered and sought as the sole business of life, they occasion an irreparable neglect of its more important concerns, and some of them, particularly gaming, with absolute ruin, both of property and repute.

*Power* is agreeable to all men, as far as it relates to dominion over their own actions; in this sense it coincides with the love of liberty and independence; but power over others is most commonly the peculiar aim only of the opulent class of society; its acquisition is considered by them as the source of the greatest happiness. It flatters their pride, fosters the high estimation they entertain of their own talents and dignity, and obliges or induces others to concur in the gratification of their wishes.

Its *pursuit* is however attended with circumstances much more productive of pain than of pleasure; under despotic monarchies it is generally attainable only by mean intrigue, degrading servility, perfidious hypocrisy, profound dissimu-

lation and gross flattery of those who secretly are held in the utmost contempt. Under limited monarchies, the first step to its attainment, is a seat in the legislative assembly, which indeed to the opulent is seldom a matter of much difficulty, and the second is connexion with a party, and adoption of all its measures whether right or wrong; this principle is now generally received; but when acted upon, must, to a virtuous mind, be frequently productive of the most painful feelings; obstinate resistance from the opposite party must be experienced; the contest frequently lasts many years, embittered with unceasing vexation, and during its continuance, counterbalanced by no pleasure, but fallacious hopes constantly disappointed.

But secondly, supposing the efforts of a party finally crowned, with success, and its leader invested with the plenitude of ministerial power, still its duration is precarious, attended with anxiety, misrepresentation of its views, calumny and abuse, often unmerited, forced compliances with the desires of the sovereign, often unreasonable, and even with his favourites, if he has any, and a heavy responsibility for failures of success of measures however wisely planned.

The only compensation of all these evils is the intoxicating pride of superiority, and that of rewarding with places, pensions and honours its most active supporters, together



ther with the malignant satisfaction of displacing its opponents.

Yet precarious and sickly as is the enjoyment of power, its turbulent solicitude is esteemed by most of those who possessed it, a lesser evil than the gloomy vacuity, and insipid tranquillity of still life which succeeds to its loss; and it were well if that were all, for it is not unfrequently followed by ignominy and contempt, or even legal prosecution. What then can be the happiness of a state, whose precarious possession is less pleasurable than either its acquisition or loss are painful?

Yet so deeply rooted is the desire of most men to attain power, that the Grand Council of Venice, though consisting of upwards of 400 members, patiently endured for three centuries, and indeed to the final dissolution of the republic, the annual despotism of the state inquisitors, though they had every year the power of subverting it, rather than forego the hope of succeeding to it, though only for one year.\*

The general and principal desire of the *rich*, when arrived at the middle period of life, though placed in the happiest circumstances of ample competence and tranquillity, is to attain a state of *opulence* which from its exterior pomp, splendor and parade, they fondly prefigure to themselves as a state  
of

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See Moore's *Italy*, vol. 1. p. 173.

of sublimer happiness than that which they enjoy. This desire originates in unbounded *vanity*, as that of power does from the arrôgance of *pride*. Nor is the pursuit of the former attended with incidents much less painful than those that occur in the pursuit of the latter. The more substantial pleasures of life, nay, even the more refined gratifications of sense are necessarily sacrificed to its attainment; a system of austere frugality, not to say avarice, must rigidly be adhered to; the proper education of children neglected, the demands of friendship, of benevolence, generosity and charity rejected. Visionary schemes are often adopted, ending in disappointment and loss. Unremitting vigilance and anxiety to prevent the frauds of inferior agents, oppression of tenants by the extortion of extravagant rents, purchases of bad titles, tedious and expensive litigations, are a few of the numerous vexations that attend the pursuit of opulence; a pursuit which knows no precise limit; and though its object should to a certain degree be attained, yet it seldom can be enjoyed, by reason of the different habits necessary for its acquisition, and for its enjoyment. If it succeeds in attracting respect from the vulgar, this pleasure must be blunted, if not annihilated by the grating reflection that even this futile regard is not grounded on personal or even ancestral merit, but solely on adventitious external advantages, that dazzle the vulgar only. Hence it is evident, that the  
pains

pains attending this pursuit, and even its final success, far exceed both in number, duration and intensity any pleasures it can afford.

To sum up all, I shall conclude with the sage advice of Doctor Johnson : “ When, therefore, the desire of wealth is  
 “ taking hold of the heart, let us look round and see how it  
 “ operates on those whose industry or fortune has obtained  
 “ it. When we find them oppressed with their own abundance, luxurious without pleasure, idle without ease, impatient and querulous in themselves, and despised or hated  
 “ by the rest of mankind, we shall soon be convinced, that  
 “ if the real wants of our condition are satisfied, there remains little to be sought with solicitude, or desired with  
 “ eagerness.”

The predominant desire of the *poor* is to obtain riches ; a desire which under the guidance of prudence is perfectly rational, since *money* is the representative of most of the necessaries, and of many of the comforts that contribute to render existence a blessing ; without some share of it, poverty may, by many casualties sink into *indigence* ; its possession renders them independent, and rescues them from that contumely, neglect and insult to which they are otherwise exposed.

But to obtain even a moderate pittance of money, what struggles are not the poor obliged to maintain ! what hardships

ships to endure ! the inclemency of the seasons while toiling abroad, or irksome confinement, while labouring within doors, scanty enjoyment of food, or firing, cloathing insufficient for their wants, either by day or at night, miserable, sordid smoky inconvenient huts, or humiliating servitude. Such is the lot of the poor in most countries.

Neither are they exempt from the *moral* pains of the rich, with this difference, that the rich may avoid them if they please ; but the poor are much more exposed to them, and in a manner compelled to endure them. Unceasing solicitude and anxiety, corroding envy, mortified pride, discontent, distressing disappointments, and numerous temptations to fraud, theft, robbery, and perjury.

Even their *pleasures* are of a baser alloy ; delicacy and refinement are always banished from them ; that of intoxication, pernicious as it is, is indeed common to both rich and poor ; but that of the rich is produced by delicious draughts, that of the poor by impure, muddy, and often nauseous liquors. From mental pleasures, the acquisition of science, refined taste and rational conversation, they are, with a few exceptions, totally excluded. Their usual amusements are of the grossest and most despicable kind—attention to wild extravagant fictions ; uncouth lamentable ditties ; indecent buffoonery ; scurrilous farces ; ridiculous pantomimes, and other inhuman sports.

Yet

Yet a late very ingenious and original writer on the principles of moral science tells us, “ that an European merchant who “ lives in a palace surrounded by luxuries, but whose wants “ have increased with his riches (that is, who still continues “ his traffic) has little reason to boast of superior happiness “ to what the Hottentot enjoys in his hut, in the midst of his “ cows and his swine\*.” As well may he tell us that a savage feeding on a half putrified whale, is as happy as an Alderman feeding on turtle. It is certain that extreme hunger renders the coarsest food highly agreeable ; but it is by affording *relief from pain*, rather than by conferring positive pleasure. Dr. Paley thinks, that “ the luxurious receive no greater pleasure “ from their dainties, than the peasant does from his bread “ and cheese†.”—This is evidently confounding the pleasures of taste. If so, the peasant would never require meat or any thing else. Hence it appears very evident, that in whatever aspect we view the condition of the poor, its pains will be found far to exceed its pleasures ; both in number, duration and poignancy ; and consequently far inferior to the share of happiness which the rich have, at least the power of enjoying, but the poor have not, supposing both equally governed by the rules of prudence. The slightest infraction of these rules may prove fatal to the poor, but is easily remedied or repaired by the rich. The poor may lie in jail during life for a debt  
of

\* p. 12.

† Principles of Moral and Political Philosophy, p. 24.

of ten or twenty pounds; the rich, even if distressed, easily find bail, or soon discharge a similar or much larger debt. To obtain justice for rights withheld, or wrongs suffered, is often attended with considerable expense, both of time and money, and constant vigilance and attention. To the rich these requisites are possible, to the poor impossible.

Thus we find that the assertions of many celebrated writers are grounded on very superficial observations, rather than on a close and accurate inspection of the real state of these different classes of civilized society. Dr. Paley affirms, "that happiness is pretty equally distributed among the different orders of civil society, a maxim which (he says) is laid down in most books of morality\*; but which he thinks has been seldom supported by any solid reasons." Let us then consider those by which he supports it.

1<sup>o</sup>, with regard to the *pleasure of superiority*, he tells us, "that if a farmer can shew better cattle than any other farmer in the *hundred*; or if a lord have a larger estate than any other nobleman in the county; if a king possess more extensive territories than any prince in Europe; in all these cases, the parties feel an equal satisfaction in their superiority."

But surely if the farmer could shew better cattle than any other farmer in the kingdom; or the lord a greater estate than

\* Paley, b. I. chap. 6.

than any other nobleman in the kingdom ; or if the king were master of all Europe, would they not respectively feel much higher satisfaction in their superiority ?—Hence the pleasure arising from the gratification of the desire of superiority, increases with the number of equals over whom it is attained, and consequently is not equal in the cases above mentioned.

He also thinks, “ that the pleasures of ambition, which  
 “ are supposed to be peculiar to high stations, are in reality  
 “ common to all conditions.”—(So they are, but not in the same degree.) “ The farrier who shoes a horse better, and  
 “ is in greater request for skill than any man within 10 miles  
 “ of him, possesses, for all that I can see, the delight of *dis-*  
 “ *tinction* as truly and substantially as the statesman, the  
 “ soldier and the scholar, who have filled all Europe with  
 “ the reputation of their wisdom, their valour, or their  
 “ knowledge.”

Here the doctor confounds the pleasure of *ambition*, which consists in the desire of power, with that of *distinction*, which denotes the desire of attracting attention ; and to this latter his examples apply. What he means by *substantially*, as distinct from *truly*, I do not understand ; but is it possible that he should confound the *simple* pleasure of the farrier, arising from the trifling regard of his few neighbours, with the *complex* multifarious pleasure of the statesman, who has promoted the prosperity of his country, of the soldier who has valiantly defended it, or of the philosopher, who is honoured and res-

pected by all Europe for his scientific discoveries and improvements. Can he compare the glory of *Newton*, of *Lavoisier*, of *Franklin*, of *Adam Smith*, with the puny satisfaction of an obscure farrier?

Even Mr. Hume was of opinion, that all pleasures of the same species were equal; for he says, that all that are happy are equally happy; and by happiness he certainly understood pleasure. He pretends that “a little miss with a new gown  
“ at a dancing school ball, receives as great enjoyment as a  
“ general at the head of a victorious army, or the greatest  
“ orator who triumphs in the splendor of his eloquence,  
“ while he governs the passions and resolutions of a nume-  
“ rous assembly.\*”—This Doctor Johnson denied, adding, that “a peasant and a philosopher may be equally *satisfied*,  
“ but not equally happy. Happiness consists in the multi-  
“ plicity of agreeable consciousness. A peasant has not the  
“ capacity of having equal happiness with a philosopher.” And Boswell adds, “I remember this question very happily  
“ illustrated by Mr. Robert Brown at Utrecht;—a small  
“ drinking glass, said he, may be equally full, but a large  
“ one holds more than the small.”†

The equality of pleasures is also deemed certain by the ingenious author of principles of moral philosophy; “There is,”  
(says

\* *Essays*, 4to, p. 102.

† *Life of Johnson*, vol. 1. p. 428.



“ says he) “ little doubt, that a profligate, possessed of health  
 “ and thoughtless vivacity, is as happy a Being as a Newton,  
 “ embracing the universe in his sublime conceptions.—It is  
 “ no good answer to this, that the happiness of the latter is of a  
 “ higher kind than that of the former ;—we cannot be more  
 “ than fully blest.—A happy child does not enjoy less plea-  
 “ sure than a happy man ; and a happy fool is as blessed as a  
 “ happy philosopher\*.” Who does not see that all these pa-  
 radoxes are founded on mistaking *pleasure* for *happiness*, and  
 confounding *complex* with *simple* pleasures ?

Even the general position on which most moralists agree, namely, that the universal aim of mankind is to attain happiness, seems to me unfounded. Few men lay down any such plan. To receive pleasure and avoid pain, as either occurs, is the constant aim of mankind. Happiness is an abstract notion, involving a comprehension of present and future, which seldom presents itself to the imagination of any one but in a vague manner. The present alone engrosses general attention ; even professions are commonly chosen to obtain support, without any explicit view to happiness in any sense of the word.

The condition of the *indigent* is more degrading, but abstracting from the bodily pains or disorders under which they

2 A 2

labour,

\* Forsyth, p. 13.

labour, is in other respects scarcely inferior to that of the poor. From the number of hospitals, poor houses, and other charitable institutions in all parts of Europe; and the liberality of the convents in those of the Latin communion; and the general commiseration of the rich in all Christian and even Mahometan countries, the indigent are seldom in want of food, habitation or raiment: In so much, that many of them prefer the state of mendicity to that of the labouring poor.

It now remains to consider the condition of another description of men to be found in most civilized countries, though too few perhaps in any, to form one of the great subdivisions of the social body: It consists of persons possessed of competent fortunes\*, and of others attached to learned professions, enjoying sufficient leisure and property; whose principal occupation is the exercise of their understanding in philosophical pursuits. The pleasures attending this exercise are so *intense*, as to engross the whole attention; so numerous, as to admit no limit; and as durable as the health of those engaged in it. They are perfectly innocent, and generally useful; they neither exact the multiplied labours of the *legal* profession; nor are they attended with the disgusts and

\* By a *competent* fortune I understand that which is sufficient for procuring, not only the necessaries and comforts, but also the decencies suited to one's situation and rank in society.

and frequent disappointments of the *medical*; nor with the dangers, perplexities, or solicitude of the *military*. They require little external assistance—a few books, instruments to work with, and materials to work upon—the modern library of a lawyer is much more expensive. Great were the discoveries of the immortal Scheele, with the help of very few instruments. Some departments of science require none at all. They provoke neither envy nor contention, or at least very seldom. How great must have been the pleasure of a Napier, a Briggs, a Newton and a Bernouilli, while intent on the most laborious calculations? or of a Boyle, a Black, a Priestly, and a Lavoisier, discovering and scrutinizing the invisible agents of nature, as Newton did the connecting principle of the stupendous masses that surround us. Or of a Locke and a Berkeley in their profound researches? Moreover, these studies cannot fail to impress the firmest conviction, of the power, wisdom and goodness of the Creator of the universe; and inspire corresponding sentiments of piety, obedience and resignation to his will: and thus extend happiness beyond the limits of our present existence.

Pursuits of this nature seem to me to be best calculated to produce happiness, affording the purest pleasures, and being least exposed to adventitious pains.

A life devoted to acts of benevolence and piety, as that of Mr. Howard and the late Lady Arabella Denny, affords the sublimest

sublimest present pleasures and the least envied, together with the most encouraging hopes of future happiness.

Next to the pleasures resulting from the exercise of the *understanding*, and those of the *moral sense*, we may rank those of the *imagination*, in the composition of poetry, painting and music. These, however, being derived from innate powers, of which nature is very sparing, can fall to the lot of very few. *Quos Jupiter æquus amavit.*

Of the pleasures of serious studies of any sort, Dr. Young gives an eloquent description in a letter to the author of Sir Charles Grandison, of which the following is an extract\* :

“ Composition, to men of letters and leisure, is not only a  
 “ noble amusement, but a sweet refuge ; it improves their  
 “ parts and promotes their peace ; it opens a back door out  
 “ of the bustle of this busy and idle world, into a garden of  
 “ moral and intellectual fruits, the key of which is denied to  
 “ the rest of mankind ; when stung with idle anxieties, or  
 “ teized with fruitless impertinence, or yawning over insipid  
 “ diversions, then we see the blessings of a lettered recess ;  
 “ then we retire to our disinterested and immortal friends in  
 “ our closet, and find our minds, when applied to some fa-  
 “ vourite theme, as naturally and as easily quieted and re-  
 “ freshed as a peevish child when laid to the breast. Our  
 “ happiness

\* British Plutarch, vol. 2. p. 222. Irish edition.

“ happiness no longer lives on charity, nor bids fair for a  
 “ fall, by leaning on that most precarious and thorny pillow  
 “ another’s pleasure, for our repose. How independent  
 “ of the world is he, who can daily find new acquaintance,  
 “ that at once entertain and improve him. These advan-  
 “ tages composition affords, whether we write ourselves, or in  
 “ more humble amusement, peruse the works of others.  
 “ Moreover, if we consider life’s endless evils, what can be  
 “ more prudent than to provide for consolation under them ?  
 “ A consolation under them, the wisest men have found in  
 “ the pleasures of the pen. Witness among many more,  
 “ Thucydides, Xenophon, Tully, Pliny the younger, who  
 “ says, *in uxoris infirmitate et amicorum periculo aut morte*  
 “ *turbatus, ad studia, unicum doloris Levamentum confugio.*”

At an advanced period of life at least, the study of the  
 scriptures and of the doctrines of Christianity, is by far the  
 most satisfactory and consolatory.

I do not deny that some share of happiness may be obtain-  
 ed by some individuals engaged in the busy, active, and in-  
 dustrious occupations of society, that is, upon the whole, the  
 sum of their pleasures may be found to exceed that of their  
 pains and labours ; but the number of persons so fortunate  
 I believe to be very small, and much indebted to chance ;  
 their pleasures are not so *pure*, for they frequently originate  
 from

from the misfortunes of others ; nor so *intense* or *durable* ; and consequently their happiness is much inferior to that of persons engaged in speculative pursuits.

To ensure the continuance of the pleasures resulting from the exercise of the intellectual or other mental faculties, the concurrence of certain circumstances are necessary, or contribute much. 1st. *Health*, which indeed is the subtraction of any sort of happiness, and consequently moderate *exercise*, as without it health cannot be long maintained. 2dly, *Patience*, and a placid temper, which is absolutely requisite in philosophic pursuits. 3dly, *Society* of persons engaged in the same pursuits, and a correspondence with the most eminent in our own or in foreign countries. 4thly, *Relaxation* from continued attention, either by pleasing conversation on other subjects or by theatrical amusements, or by entertaining *books*, during the perusal of which the mind is almost wholly passive, as accounts of voyages, travels, select novels, &c. Lastly, a prudent stated attention to the sources of competence.

A mind thus incessantly occupied bids fair for the enjoyment of as much happiness as can be found in the present state of our existence.

I should here conclude, did I not think it necessary to obviate some objections to different parts of the above essay.

First, it has been said, that the closest attention to a pleasure of our own choosing, is not a proof of the intensity of  
of

of that pleasure, for that gamesters pay the strictest attention to games in which they are deeply interested, and yet certainly feel no intense pleasure. This instance, however, does not meet my statement; for gaming, when not a relaxation, is not a pleasure, but a refuge from *ennui*, and the attention it exacts when success or loss is of great importance, is of the most perturbed and anxious kind, ever fluctuating betwixt hope and despair.

Secondly, that in general men love pleasure more than they fear pain, has been indirectly opposed by Barbeyrac,\* but the truth of this assertion is evident from daily observation. Drunkards, epicures, and libertines pursue their practices though certain of inevitable pain. Barbeyrac, indeed, says no more than that men hate pain as much as they love pleasure, but properly speaking we do not *hate* pains we do not feel, we only *fear* them when we expose ourselves to them, and this fear is generally overcome by the love of pleasure.

Thirdly, according to Dr. Ferguson, the pleasure of a miser in hoarding money may be not only more entire than that of the prodigal in spending it, but as great as that of the virtuoso, the scholar, or the man of taste.† This

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sentiment

\* Notes on Puffendorf, Lib. 1. c. 6. sect. 14.

† Essay on the History of Civil Society, part 1. sect. 8. p. 72, 73, Dublin Edit.

sentiment in so considerate a man as Dr. Ferguson, I own surprizes me, even though he supposes the miser free from the passions of jealousy and envy. Could he suppose the pleasure of an Elwes, devoured by anxiety, and who deprived himself of the common gratifications of sense, as well as of all intellectual pleasures, and covered by the contempt of all who knew him, equal with the pleasures of a Newton, a Grotius, a Sydney, or an Addison? The pleasures of a miser are only those of a crazed imagination, as those of a Bedlamite who imagines himself an emperor.

Fourthly, according to the sagacious author of the light of nature,\* “ all pleasures depend on our constitution and disposition. To instance only the acquisition of knowledge, which is commonly held sweet to the mind, by the very frame of her constitution. But if it were so, every accession of knowledge would engage every body alike, whereas in fact we find the contrary. What would the mathematician give to know the newest fashions as they start into vogue? or what cares the beau for discoveries in astronomy, or explanations of attraction or repulsion, and other secrets of nature?” Be it so; the question examined in this essay is, what pursuits are most productive of happiness, and surely he will not say that the pursuits of  
a beau

\* Vol. 2. part 2. chap. 22. p. 97.



a beau are as productive of happiness in the sense I take that word, as those of a mathematician blessed with a competent fortune. His original assertion may well be doubted, for when knowledge is fashionable, thousands will endeavour to attain it; the metaphysical lectures of *Abelard* allured 3000 young men into the deserts of Champagne, from Paris, Flanders, England and Germany; the mathematician D'Alembert, though possessed of a very moderate income, refused a much greater offered him by the empress of Russia, if he would attend her court. How many mathematicians and men excelling in every branch of science has France produced since science has been there honoured and encouraged? Numbers would equally be excited in other countries to the attainment of science, in circumstances equally favourable; consequently, fondness for science does not entirely depend on a particular frame of mind, though it must be owned that some minds are more eagerly prompted to its pursuit than others.

Lastly, it has been said by *Maupertuis* and others, that the *evils* of every condition far surpass its pleasures; in proof of which they say that few would consent to renew precisely the same course of life through which they had already passed. Yet I believe that *many* in the situations above mentioned, as most productive of happiness, and *many* in the middle classes of society would, with the ex-

ception of some immoralities, of which reason and religion forbid the repetition, gladly once more renew the same course of life. At least Virgil was of that opinion, for mentioning those whose sufferings induced them to terminate their lives, he says :

—— quam vellent æthere in alto  
Nunc et pauperiem pati durosque labore

FINIS.

ANTIQUITIES.

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## ERRATA.

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THE author requests the indulgence of the reader for this table of errata, which, undoubtedly, would not have swelled so considerably, had not his unavoidable absence in the country, during the impression of the work, materially interfered with the correction of the proofs, and necessitated him to confide the revision of the latter part to some resident friends, who had other difficulties besides those of an almost illegible hand and total ignorance of the subject, to struggle with in their exertions. The alterations, however, do not materially affect the sense, except in a very few instances, and the reader will, while he marks *those* in the margin, before he commences the perusal, kindly excuse the little inaccuracies of orthography or punctuation which may have been casually overlooked.

### Page

- 18 line 5 from top, read "40" for 4
- 27 last line, for "which misled them" read "by which they were misled"
- 34 line 6 from bottom, put the sentence from "Apud" to "temple" in line 3 from bottom, both inclusive, in a parenthesis, or note
- 40 line 3 from bottom, dele "and"
- 57 line 8, for "rulers" read "ruler"
- 74 note, for "<sup>ν</sup>εστῆν" read "ἔτη"
- \*82 line 3, remove first bracket of parenthesis to next line after "priest"
- 86 line 6 from bottom, for "with" read "in powerful" &c.
- 86 line 3 from bottom, for "to" read "from the feelings" &c.
- \*93 line 8 from bottom, dele semicolon after "Heaven"
- 98 line 11, for "by read "in"
- 112 line 5, dele semicolon after "principii" put comma
- 119 line 2, dele "into"
- \*126 line 9, for "423 years" read "523"
- \*127 line 3, after "683 years" add 7 months
- \*127 line 14 read for 453 y. 7 months, 463. put comma between "633" and 7 months
- \*129 line 4 from bottom, for 638" read "683"
- 129 line 11, for "263" read "363"
- \*130 line 8 from top, for "Josephus" read "Joshua"
- \*136 for "458" read "478"
- 138 put comma between 567 and 7 months, similarly in next line, 566, 7
- 138 last line but one of note, "Apion" for "Aponi"
- 138 last line, read "uncompromising"
- 156 line 3, for "Gibbi" read Giblii"
- 162 line 5 from bottom, read "editor" for "editors"
- 164 line 9, for "that" read "this"

- \*168 line 2, dele " not"
- \*169 line 5, for " 200" read " 800"
- \* line 8, read " 807" for " 907"
- \* note, " accurately" instead of " inaccurately" and " consistent" instead of " inconsistent"
- 171 line 5, dele semicolon after " millenary" put a comma
- 173 line 11, for "was" read " were"
- 173 line 5 from bottom, put a comma after " as"
- \*175 line 9, after " 350" read years
- \* after " any" read " one"
- 176 line 2, put a comma after " single" and after " event" a comma
- \*177 line 3, before " from" read " the interval" for " to" read " until"
- \*178 line 13, for " ascribed" read " stated"

☞ Thus marked \* are the more important, and should be corrected previous'y to perusal

OF THE ORIGIN OF  
POLYTHEISM, IDOLATRY, AND GRECIAN MYTHOLOGY.

BY RICHARD KIRWAN, ESQ. L. L. D. P. R. I. A. F. R. S. &c.

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READ DECEMBER 7th, 1808.

**CURIOSITY** is one of the characteristic properties of man ; no other animal feels its impulse any farther than respects the discovery of the objects of its physical wants. Man alone possesses it universally, unless confounded by the multiplicity of its objects, or deterred by despair of its gratification. But of all the objects that can attract human attention, that of facts is the most easily comprehended ; and these are so much the more interesting, as they partake more of the marvellous, or more nearly relate to us. In an account of the formation of the universe, the origin of our species, and of our primeval ancestors, both these qualities are combined. Nothing can be imagined more sublime, more marvellous, or that more nearly concerns us. Hence, in all ancient civilized nations, some relation of these stupendous objects, in a word, some system of cosmogony, has existed ; this, adorned with all the graces of poetry, and the charms of music, together with many adventitious embellishments, formed the principal entertainment of the ancients. Thus Virgil in his sixth eclogue represents Silenus transporting nymphs and shepherds

herds into extasy, by his account of the origin of all things, v. 31, *namque canebat, uti, &c.* and the grand entertainment given by the Tyrian Queen to Æneas and her court, concluded, the poet tells us, with the song of Jopas, accompanied on his lyre, on the origin of men and animals, Æneid I. 740: the Persians also sung their Theogonies.\*

Whether the first and most ancient inhabitants of our globe ascribed its origin and superintendance to one or more beings, has lately been questioned. Mr. Hume, in an elaborate essay on the natural history of religion, labours to prove, “ that polytheism or idolatry necessarily must have been the “ first and most ancient religion of mankind. It is (he says) “ a matter of fact incontestable, that about 1700 years ago; “ all mankind were idolaters. The doubtful and sceptical “ principles of a few philosophers, and the theism, and that “ too not entirely pure, of one or two nations, form no “ objection worth regarding.” The almost univereal spread of idolatry about 1800 years ago is incontestable; but this date is later by four or 5000 years than that of the primeval inhabitants of our globe, whose religion is the sole object of the present question. He adds, “ the certainty of this fact “ rests on two grounds, first, on the clear testimony of history; “ for that the most ancient records of the human race present “ us with polytheism, as the popular and established system. “ What can be opposed to so full an evidence?” Certainly nothing, if it were true that such evidence exists; but it so happens

\* Herod. Lib. I. § 132.



happens that the very reverse is the truth. The most ancient record of the human race, and by far the most credible, are the writings of Moses, being written upwards of 1500 years before our æra, and consequently 3300 years ago; and these unequivocally attest the unity of the Supreme Being to have been originally known to the whole human race. Mr. Hume, assuredly, has not acted fairly in neglecting this testimony, without assigning any reason for rejecting it. Sir William Jones, in his 6th discourse addressed to the Asiatic Society, asserts that, if we may rely on the authorities adduced by Mohsani Fani, the primitive religion of Iran was that which Newton calls the *oldest of all religions*, a firm belief that one Supreme God made the world by his power, and governs it by his providence. Under the name of Iran, he comprehends Chaldea, Assyria, and the greater part of Lesser Asia, and adds that it cannot be doubted that the corruption of this purest and oldest religion was the system of Indian theology, invented by the Bramins.

Mr. Hume assumes as his second ground, the apparent impossibility that mankind, in their original state, “while as yet  
 “rude and barbarous,” should attain a truth so sublime as that of the divine unity; for that, “according to the natural  
 “progress of human thought, the ignorant multitude must  
 “first entertain some grovelling and familiar notion of human  
 “powers, before they stretch their conception on that  
 “perfect Being, who bestowed order on the whole frame of  
 “nature;

“ nature ; we may as well imagine that men inhabited palaces  
 “ before huts and cottages,” &c.

This reasoning would be perfectly just, if men had sprung up from the earth like mushrooms, as Atheists suppose ; but since such origination is evidently impossible, reason as well as history compels us to believe that the human race owes its existence to the will of the Supreme Being, and that the first created pair received various instructions from the Author of their existence, else they must have soon perished, not being able, from want of experience, to discover even their proper food. Among these instructions, the duties of gratitude, veneration, and worship, must have been impressed on their minds, and consequently a sufficient knowledge of the Being to whom these sentiments were due. It cannot surely be doubted that they communicated this knowledge to their descendants, and consequently Monotheism must have been the primeval religion of mankind.

This being the case, it must surely be a curious and interesting subject of inquiry, to discover through what causes the knowledge of this important truth was lost. What could induce men almost universally to embrace, first the errors of polytheism, then idolatry, and finally to give credit to fables so glaringly absurd, that nothing but the most indubitable testimony of all histories, both sacred and profane, and the unshaken attachment afforded to many of them even at this day in the East Indies, could oblige us to believe that the human mind once was, and still is capable of prostituting its  
 assent

assent to such wild and monstrous deviations from reason and common sense ?

By an attentive consideration, I think I have discovered a circumstance long attendant on Adam's family, but whose final cessation chiefly contributed to the introduction of polytheism.

The circumstance I allude to is that supernatural appearance by which the presence of God was rendered sensible to Adam immediately after his creation. It is supposed to have been an extraordinary splendor or bright cloud called the *face of God*, Exod. xxxiii. 14, and by the Jews *Schechinah*, with which the Divinity, or rather his representative, was shrouded. From this, God frequently spoke to Adam and his family, Gen. ii. iii. and iv. It probably reposed permanently near the habitation of Adam, as we find, that Cain, when condemned to banishment from that habitation, complained that he should also be banished from that symbol of the divine presence, Gen. iv. 14. and in effect he was banished from it, v. 16.

Again, 120 years before the universal deluge, God acquainted Noah with his resolution to exterminate all mankind, with the exception of him, his wife, three of his sons, and their wives, Gen. vi. I say three of his sons, for it is not reasonable to think that he had none, before he had attained the age of 500 years : afterwards he had those three who survived the flood, Japhet, Sem, and Cham : his former sons, being probably guilty of those excesses which entailed  
the

the destruction of the old world, perished in the deluge. After the flood had ceased, he again communicated his will to Noah and his family ; but thence forward we read of no other divine appearance until the days of Abraham, who was born 1072 years after the flood.\*

Noah survived the flood 350 years. During his life it is not probable that his descendants embraced any worship but that which he himself professed, namely, that of one eternal and omnipotent Being, nor that any other prevailed for 181 years after his death, that is, before the dispersion of his posterity over different countries, occasioned by the confusion of languages, which happened 531 years after the flood ; for the sons of Noah, at least Sem, were living during the greater part of that period ; and they having been witnesses of the flood, and acquainted with the causes of it, having heard the voice of God, and received his commands immediately after it, cannot be supposed guilty of adopting polytheism. It was not then until after the dispersion, during the interval that preceded the vocation of Abraham, that polytheism made its first appearance. Now the vocation of Abraham took place 1147 years after the flood, and 616 after the dispersion ; or, computing to the Christian æra,† the dispersion took place 2638 years B. C. and the vocation of Abraham 2022 years, which presents us with the same interval. We cannot, however, suppose the ancient religion to

\* According to the Septuagint corrected by Jackson.

† For the grounds of this calculation, see 1 Jackson's Chronology, 126, 127.

to have been perverted, in the early part of this interval ; for many of those who had seen and had been instructed by the sons of Noah, must have been then alive ; and therefore what happened to the Israelites after their introduction into the land of Canaan, must have happened in this case also, namely, that as long as those who had survived Joshua, and known the works that God had done for Israel, lived, the Israelitish nation continued faithful ; but after that generation became extinct, the next forsook the religion of their fathers, and worshipped *Baalim*, Judges ii. 10. So here, when the generation which had conversed with the sons of Noah had passed away, the succeeding generation bethought themselves of new objects of worship, at least in Mesopotamia, for we find polytheism to have prevailed in it long before Abraham was ordered to leave it ; since we read, Joshua xxiv. that *Thare*, the father of *Abraham*, and *Nachor* his grandfather, had worshipped other Gods. *Shem* witnessed the flood, but died twenty-eight years before the dispersion ; his son *Arphaxad* was born two years after the flood, and outlived the dispersion many years. *Peleg*, one of his descendants, was born in the year in which the dispersion happened, and lived with his ancestor *Arphaxad*, thirty-six years ; from him he must have learned all the antediluvian transactions, and the strict unity of the Supreme Being. It is not therefore probable, that during his life, that is, about 330 years after the dispersion, the primitive religion suffered any alteration. Accordingly it is to his grandson *Serug*, that the

guilt of this alteration, by the introduction of polytheism, is commonly ascribed; sixty years after the death of Peleg, 399 after the dispersion, 930 after the flood, 141 before the birth of Abraham, 217 before his vocation, and 2239 before the Christian æra. At least it is certain, that *Nachor*, the son of *Serug*, and *Thare*, the son of *Nachor*, were Polytheists, as already seen.

But we must not imagine that polytheism universally obtained at so early a period; for *Abraham*, who, to avoid the Polytheists, was ordered to quit *Mesopotamia*, did not meet this superstition, either in *Canaan* or in *Egypt*. On the contrary, *Melchisedeck*, king of *Jerusalem*, is expressly called a priest of the *most high God, who created the heavens and the earth*, Gen. xiv. 18, 19. and Gen. xx. We see the true God was known to *Abimelech*, king of another part of *Canaan*, and also to *Pharao*, king of *Egypt*, Gen. xiii. Other nations also probably retained a due notion of the divine unity for many ages; for we read in *Herodotus*, Lib. 1. § 171, that the *Carians* had an ancient temple dedicated to *Jupiter*, into which they admitted none but the *Lydians* and *Mysians*. No other object of their worship is mentioned; by *Jupiter* or *Zeus* in the most ancient times, certainly *Jehovah* was meant. With respect to the *Lydians*, this is confirmed by *Porphyry*, quoted by *Eusebius*, Præpar. Evang. Lib. ix. Cap. 3. § 10, p. 412, who, instructed, as he says, by the dictates of an ancient oracle, admitted that the true worship of God was known to the *Assyrians*, *Lydians*, and *Hebrews*; and by their joining the two former with the latter, he shews they must have been Monotheists.

Thus

Thus we see how grossly Mr. Hume abuses the credit, which on other subjects he deservedly obtains from the generality of his readers, when he so confidently affirms, that polytheism was the original religion of mankind.

That the cessation of the before mentioned extraordinary luminous symbol, in which the Divine Presence was manifested, towards which prayers were addressed and sacrifices were offered, was the first source of the corruption of the patriarchal religion, can scarce be doubted; when we consider that the natural luminaries, and particularly the sun, were the first objects that attracted the veneration of all the polytheistic nations, as they imagined them to be the natural symbols, and the habitations of the Divinity; a supposition which soon degenerated into a belief that these luminaries were inhabited by distinct intelligences, and, as such, received divine worship.

Thus Diodorus relates that the Egyptians at first adored the sun, which they called *Osiris*, and the moon, whom they called *Isis*.<sup>\*</sup> According to Plato,<sup>†</sup> the first inhabitants of Greece worshipped no other Gods but the sun, moon, and stars, to which they afterwards (long after) added the earth, as the parent of men and animals. The sun and moon alone were worshipped by the ancient Arabians:‡ Job mentions this worship, chap. xxxi. 26 and 27, and calls it an high impiety, v. 28. The Phenicians, in the same manner,  
c. 2. . . . . chose,

<sup>\*</sup> Lib. 1. § 11. Euseb. Præp. p. 27. † In Cratylo. ‡ Herob. Lib. 3, § 11.

chose, for the objects of their adoration, the sun, moon, and planets, to which their philosophers thought proper to add the elements,\* for reasons that will presently be seen. The Persians also, at first, confined their religious worship to the sun and moon, to which they afterwards added fire, earth, water, and the winds, but they erected no temples to them, nor raised altars, nor represented them by statues. Neither at first did any of the Polytheists, as Eusebius assures us; † that they imagined the planets actuated by distinct intelligences, appears by Diodorus. ‡ The Cananeans certainly, even so late as the days of Moses, had no temples, else he would have commanded them to be destroyed, as he did their altars, groves, and high places, Exod. xxxiv. 13, and their images, Deuter. vii. 5.

Fanciful and absurd as were these and other polytheistic notions, it is possible that they were led to receive them, by a misconception of some parts of the true antediluvian tradition: for instance, by that in which it is related, Gen. i. 18, that the *sun was to preside over the day, and the moon over the night*; or as the Hebrew has it, to have *dominion* over the day and the night: hence they might infer that dominion implied intelligence. It is also said, Psalm xix. 5, that God placed his tabernacle in the sun (so the Septuagint translate it, and the Vulgate in the supplement to the 18th psalm): and elsewhere it is said, that God dwells in light inaccessible; now such light is that of the sun. Their belief, also,

\* Euseb. p. 29. 30. † P. 29. 30. ‡ Lib. 2. § 30.



also, that God was male and female, might have arisen from the tradition, Gen. i. 27, that *God created man in his own image; in the image of God created he him; male and female created he them*: from whence they inferred, that since they were created to the image of God, and were both male and female, that reciprocally the Divinity resembled them, and consequently was both male and female. Thus Apuleius *de Mundo*, p. 753, quotes, from one of the orphic hymns, Ζεὺς ἀρσενὴ γενετὸς, Ζεὺς ἀμβροτὸς ἐπέλετο Νυμφῆν. And Valerius Soranus, an ancient latin poet, has the following Lines.

Jupiter omnipotens, Regum, rerumque Deumque  
Progenitor, Genetrixque Deum.\*

But most speculatists thought it more reasonable to distinguish the male from the female divinities: thus the Phenicians, when Polytheists, called the sun *Baal*, and the moon *Astarte*, and the Chaldeans *Belthis*,† the Egyptians *Isis* and *Osiris*. as already said.

*Light* then, and the luminaries that afforded it, were at first considered as emblems of the Divinity, for the reasons above mentioned; and afterwards as the habitations of Divinities; not from any puerile admiration of their splendor, as Eusebius,‡ Diodorus,|| and others supposed; for these objects, being familiar to them from their infancy, could no more excite their attention, than the powers of gravity or magnetism do that

\* See Moreri's Dictionary, *Valerius Soranus*.

† Hesychius in Voce *Belthis*.

‡ P. 18.    || Lib. 1. § 11.

that of the bulk of mankind at this day: whereas, from the cause above assigned, the origin of planet worship, in which form polytheism at first appeared, is clearly deducible, they having been supposed to be natural *Schechinahs*.

In process of time, *Light* ceased to be considered as the sole characteristic of Divinity, and the reason why it was at first supposed to be so, was forgotten. *Power* was then thought to be a sufficient indication of a Divinity in the Beings that possessed it in a superior degree, especially, if beneficially exerted. Hence the Phenicians and Persians, as above observed, worshipped the elements and winds; for the derivation of all power from one invisible Being seemed to them too difficult to comprehend; they, therefore, supposed the various operations of nature were executed or conducted by inferior agents, derived from one supreme Being: these agents they called Gods. This supreme Being, if we may believe Plutarch, the Egyptians acknowledged and called *Cneph*.\*

Of all the nations of antiquity, the Egyptians abused most the persuasion that power was an indication of the residence of a Divinity, in the objects that possessed it; a notion which, being pursued in all its consequences, led them at last into the most absurd excesses. At first, indeed, it seemed to them deserving of veneration, only in proportion as it was beneficially exerted. Hence the *moon*, and not the *sun*, was their principal Divinity, Herod. Lib.

2, §

\* De Iside & Osiri.

2, § 49, because its light is milder; whereas that of the sun is in Egypt so intense as to be offensive. Hence, also, their respect for cows, *ibid.* § 41, having been chiefly nourished by their milk in the early ages, before Egypt, which was originally a morass, was sufficiently drained for the cultivation of grain, and after it was so improved, for their usefulness in agriculture; for in Egypt they were employed in ploughing;\* probably, also, in memory of their utility in affording nourishment to mankind, when shut up in the ark. Hence the bull *Apis* was worshipped, as the representative of the vaccine species;† and, also, the *Nile*, as the dispenser of fertility to Egypt. Afterwards they venerated power, even when destructively employed, and then crocodiles and wolves were worshipped;‡ I say, afterwards, because at first crocodiles were hunted.|| These senseless superstitions can be accounted for on no other principle but that here stated.

It appears that polytheism was introduced into Egypt long after its introduction into Chaldea, for in Chaldea it commenced 2239 years before Christ; whereas in Egypt it commenced only after Abraham's return from it, that is, after the year 2021 B. C.; consequently the Chaldean apostacy preceded the Egyptian 218 years at least: I say *at least*, for it is uncertain how soon after Abraham's departure it commenced. It is certain it did not prevail there when Abraham arrived, for he and his flocks were kindly received:  
but

\* Diodor. p. 97. † *Ibid.* 25, 93. ‡ *Ibid.* 91, 93. || *Ibid.* 41.

but when Jacob entered Egypt, that is, 213 years after Abraham's return, many superstitious notions prevailed in it, originating most probably from their peculiar polytheistic system, for they then held shepherds in abomination, Gen. xvi. 34, because shepherds were accustomed to sacrifice animals, which the Egyptians venerated, and on this account they would not eat with the Hebrews, as they held them polluted, and scarcely permitted any strangers to enter their country before the reign of Psammiticus.\*

In the days of Moses, who was born 1672 years B. C. there is no doubt but idolatry was fully established in Egypt; for the bull *Apis* was worshipped, magical arts were cultivated, Exod. vii. viii. xxxii. and various idols adored, Deuter. xxix. 16, 17. Hence the Israelites, after their departure from Egypt, were forbidden to worship the sun, moon, stars, or the likeness of any thing on earth, or on the water, Deuter. iv. 16, 19. In the interval then betwixt the return of Abraham and the birth of Moses, consisting of 349 years, not only idolatry was established, but many extravagant fables were invented: for instance, they pretended that the Egyptians were the most ancient people upon earth; † that Isis and Osiris were sister and brother, and jointly governed Egypt, and were afterwards deified; ‡ that Egypt was governed by Gods and Semi-Gods many thousand years. || Nay in the succeeding ages they boasted that the  
Egyptians

\* Diodor. 78, 80. † Diodor. p. 13. ‡ Ibid. 17, 24.  
|| Ibid. 30, and Herod. Lib. 2, § 43.

Egyptians sent colonies into other countries; that the Athenians were a colony sent from Sais in Egypt; that Belus led a colony into Babylonia, and Danaus another into Greece. These extravagant fictions,\* so contrary even to the tenor of their own institutions, and to every other history, both Diodorus and Herodotus were weak enough to receive, and particularly the latter, for which he was severely censured by Strabo, Lib. 11, p. 507, and even by Diodorus. However, I must allow the Egyptians the merit of having never admitted hero worship:† this I am inclined to believe, though contradicted by Diodorus, p. 17. Schuckford supposes idolatry to have been introduced into Egypt by Suphis, one, as is said, of their kings, who, he thinks, began his reign about eighty years after the entry of Abraham into Egypt; but the existence of this prince rests only on the authority of Manetho, a writer whom, for reasons I cannot here detail, I think unworthy of credit.

Polytheism was in most countries soon followed by idolatry. This also seems to have originated in Chaldea, or Mesopotamia, so early as the year 1860‡ B. C. for we read, Gen. xxxi. 19, 30, that at that time, *Laban*, the grandnephew of *Abraham*, who lived in Mesopotamia, had household Gods or Images, which his daughter *Rachel* stole from him. They must have been very small, since they were concealed in a camel's saddle; these, it is said, had

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planetary

\* Diodor. 33, 32, 92.

† Herod. Lib. 2, § 50.

‡ See this well proved, 1 Jacks. 127.

planetary figures engraved upon them : Jacob buried them under an oak near Sichem. These *Michaelis*, on the testimony of *Pausanias*, Lib. 6. cap. 24, informs us, were afterwards found, and resembled the statues of *Silenus*.\* They certainly are the most ancient idols of which we have any account; but we do not find that any were set up in Chaldea as objects of public worship, until several ages after, when temples were erected to the Gods represented by idols, see Dan. iii. and xiv. and Diodor. 122, 123.

Idols were frequently so constructed, as to represent the Divine attributes. Thus, the *Divine Wisdom* was represented, by affixing to a human body a number of heads. *Omnipotence* by a number of hands, and *Omniscience* by a double face, one before and another behind. These statues were supposed to receive a divine influence, by the ceremony of consecration, from the Gods they represented. Hence, the Romans invoked the Gods of besieged towns, to quit their statues; that is, to withdraw from them their supernatural influence. According to Pausan: in Achaicis, p. 28, the Greeks addressed their prayers to brute stones, before they admitted statues; see also Pitiscus in voce *Simulachrum*. This seems to me to be the origin of the veneration in which the Mahometans hold their *Caaba*. Thus, also, some savage tribes, in the interior of Africa, venerate their *Fetiches*, which are any objects they chose, a block of wood, or even a mountain.

According

\* Comment. Societ. Gotting. ad An. 1758, 1762.

According to the author of the *Wisdom of Solomon*, xiii. 2, idolatry began by the worship of the sun, moon, stars, and fire. Afterwards, a father, grieving for the untimely death of his son, made an image of him, honoured him as a God, and delivered to his subjects ceremonies and sacrifices, *Wisdom*, xiv. 15.

In the nations most anciently civilized, as the East Indies, Persia, Chaldea, Egypt, and Phenicia, some system of cosmogony and theogony formed the basis on which their religious worship, and its distinct objects were founded. Most of these systems I shall, however, at present, overlook, and confine myself to that of the Phenicians alone, they being the only people with whom, in the earliest times, the Greeks, the origin of whose mythology I now mean to investigate, had any connexion.

But before I proceed, I must remark, that I consider the Phenicians and Canaanites as one and the same people, both as to descent, language, and worship : the inhabitants of the interior country of Palestine being called Canaanites, of whom there were several tribes ; and those of the sea coast being called Phenicians. Their identity has been abundantly proved, first by *Bochart*, and lately by *Abbé Mignot*, in the 34th volume of the *Academy of Inscriptions*, p. 193, and is now, I believe, generally admitted : what is said of the worship of the one, is therefore applicable to that of the other.

The most ancient account of the Phenician or Canaanitish worship, can be learned only from the books of the old Testament, and a fragment of *Sanchoniatho*, a very early Phenician writer; for he is supposed to have been contemporary with *Gideon*, one of the judges of Israel, who flourished 1313 years B C. In the former we find frequent mention of the Canaanitish idols, to whose worship the Israelites were strongly addicted; but of their cosmogony or theogony no mention is made: in the latter both are detailed. Unfortunately, the original work of *Sanchoniatho* does not now exist; it was translated from the Phenician into Greek by *Philo Byblius*; but this translation also has long since disappeared. Nothing more than a fragment of it, but a pretty long one, now remains. It is found in the first book of *Eusebius's* *Evang. Prepar.* of which I have taken the following extract.

“ In the beginning of all things, there existed a dark air,  
 “ replete with spirit, and a confused chaos covered over  
 “ with darkness; both were infinite, and had subsisted many  
 “ ages: but when the spirit, struck with love, for its own  
 “ principles had united to them, this union was called  
 “ *Cupid*, or *Desire*, and was the origin of the production of  
 “ all things; but the spirit itself was unproduced, and  
 “ acknowledged no beginning. From this conjunction arose  
 “ *Mot*, or an earthy slime or mud, impregnated with the  
 “ seeds of all things; from it the sun, moon, and stars burst  
 “ forth, and shone. There were also some animals, but  
 “ they



“ they were devoid of sense, though they afterwards generated animals endowed therewith.

“ 2dly. When the air had emitted a fiery *light*; then from the heat and inflammation of the sea and earth, clouds, storms, thunder and lightning were produced, the noise of which roused the living animals from their stupefaction. These were the first who consecrated the fruits of the earth, and deeming them to be Gods, worshipped them as being those from whom, not only they themselves, but their ancestors owed the continuance of their lives.”

In this paragraph, it is plain, there must have been some mistake, either in the original, or in the translation; for, how could the first animals have had ancestors; or could it be meant that animals worshipped the fruits of the earth, or any Gods whatsoever? I have omitted some parts of this text as being utterly unintelligible.

“ 3dly. From the wind *Colpia*, and his wife *Baau*, were produced *Aiona* and *Protogonus*, both mortal. *Aiona* first taught men to seek their food from trees.

“ 4thly. These had issue, *Genus* and *Genea*, who dwelt in Phenicia, and worshipped the sun, whom the Phenicians call *Beelsamen*, the Lord of heaven, and the Greeks *Zeus*. These had issue, which were also mortal, and were named *light*, *fire*, and *flame*. These discovered the art of producing fire by the friction of wood.”

Such is the account Sanchoniatho gives of the formation of the world, and the origin of mankind; and this, he says, he

he extracted from the books of *Thaut*. Absurd as it is upon the whole, we may yet discover in it evident, though disfigured traces of the true account transmitted to us by Moses, some scraps of which were long preserved in all nations ; but the Phenician account, in particular, seems to have been purposely distorted and perverted, for the following reasons.

In the 6th chapter of Genesis, we read that the sons of God, that is, the descendants of *Seth*, took to them wives from the children of men, that is, from among the descendants of *Cain*. Hence it is not unlikely that Noah himself, or his sons, or at least his son *Cham*, had wives of that race. These women corrupted their husbands before the flood, for it is to such intermarriages that the general corruption of mankind before that catastrophe, is attributed. Now the descendants of *Cain* could not fail misrepresenting, disguising, and mutilating the tradition transmitted to Noah, as being unfavourable to *Cain*, the author of their race. *Cham*, who possibly had married one of Cain's descendants, treated his father with gross disrespect. To punish him, his father foretold him the misfortunes that awaited the posterity of his son, *Canaan*. This prediction, which had the appearance of a curse of course,\* irritated the whole family of *Cham*. Now from *Cham* the Phenicians or Canaanites descended ; these, therefore, embraced the accounts current among *Cain's*  
 descendants,

\* So it is commonly understood, but the original implies no more than a prophecy.

descendants, relative to the antediluvian transactions, preferably to the traditions transmitted by the descendants of *Seth*, and handed down to Noah. On this hypothesis, the errors and absurdities of the Phenician theology are clearly accounted for; hence neither paradise nor the fall of man are mentioned in it, nor are *Abel* or *Seth*, nor consequently the banishment of *Cain*; nor the flood, of which the wickedness of his descendants was the principal cause. The suppression of this grand event forms a strong presumption of the truth of the motives I have stated, which induced the Phenicians to pass it over in silence, as did the Egyptians, who also descended from *Cham*, though the Chaldeans, Persians, and Greeks expressly mention it, as may be seen in the extracts of Berosus and Abydenus, preserved by Eusebius, and in the first book of Ovid's *Metamorphosis*; but the Phenicians did not fail to remark that *Cain* worshipped the sun, which, indeed, is not improbable, to justify the worship they themselves addressed to it.

It is evident, however, that by *the spirit which acknowledged no beginning*, and "from whose love, or rather benevolence to the chaotic mass, all things originated," the Supreme Being must be understood. The Phenicians would not call him *Jehovah*, as he was known under that name to the Israelites, whom they and the Canaanites hated.

Again, by *mot* or mud, they certainly meant the earth, before the waters were separated from it, impregnated, they supposed, with the seeds of all things. Of the separation  
of

of the waters they make no mention, and thus mutilated the Mosaic tradition. The first effect, therefore, of the divine benevolence, according to them, was the impregnation of the chaotic mass with the seeds of the heavenly bodies, and of all animals and vegetables; for after this impregnation, the sun, moon, and stars sprung forth in their luminous state. Before this impregnation, the whole was immersed in profound darkness, as Moses also relates. These luminaries, therefore, though the objects of their adoration, they must have considered as subordinate to the Supreme Being, to whose benevolence they owed their existence; and to justify their worship, they probably, at first, supposed them to be habitations of the Supreme Being, and afterwards to be inhabited by separate intelligences.

In this *mot*, Sanchoniatho says, there were animals endued with no sensibility, but which (afterwards) generated animals endued therewith. However absurd this part of the Phenician tradition may be, I suspect it to be a false extension of the Mosaic, in which it is said, Genes. i. 24, *Let the earth produce living creatures*: these the Phenicians called *beholders of the heavens*, as inanimate beings are incapable of beholding them; but they feigned that for some time these remained in a lethargic state, and were roused from it by the roaring of thunder and storms. The probable foundation of this fiction was what Moses mentions, Genes. ii. 7, that God first formed Adam in an inanimate state, and then *breathed into his nostrils the breath of life, and man became a living soul.*

This

This mode of animation the Phenicians supposed to have been that by which all other animals obtained life. The breath or *voice of God* is frequently compared to thunder by the Oriental writers, particularly when reaching to distant or numerous objects. The corrupt state of the remainder of this paragraph renders it so obscure as to be scarcely intelligible; but we may easily see that an apology for the worship of the earth, and for the Egyptian Zoolâtry is intended. Thus, also, we see how the Phenicians justified their worship of the heavenly bodies, and particularly of the *sun*; of the air, as the ancient residence of the Eternal Spirit, before the existence of the sun; of *water* and *earth*, as integrant parts of the chaotic mass, to which all animals owe the prolongation of their existence. At first it is probable they barely venerated them; but the experience of all ages shews how easily, among an ignorant people, subordinate worship slides into the suprême; at last sacrifices were offered to them.

The wind *Côlpia*, mentioned in the third paragraph, denotes, according to *Bochart* and *Grotius*, the voice of the mouth of God.\* His wife, *Bâau*, the learned Abbé Mignot interprets, matter in its confused state, namely, that of slime.† *Protogonus* and *Aiona* evidently denote *Adam* and *Eve*, as do their issue *Genus* and *Genea*, *Cain* and his sister. *Abel* is not mentioned for the reason above given. *Aiona* is said to have

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taught

\* De Verit. Rel. Christ.

† Vol. 34 de L'Academie des Inscript. p. 369.

taught men how to seek fruit from trees, plainly alluding to her eating the forbidden fruit, which is certainly the only fruit she and Adam are mentioned to have eaten. She is said to have taught men to eat fruit, because she eat it before Adam had eaten of it; and this is said with a view of excusing her, for it is added that both were mortal, which, having no connexion with any thing preceding, was evidently intended to prevent the belief that mortality was occasioned by a breach of the Divine command; in eating the forbidden fruit.

The fourth paragraph was intended to convey a justification of the worship of the sun, or *Beelsamen*; the subsequent words, whom the Greeks called *Zeus*, were probably interpolated by the translator. Many such interpolations occur in the remainder of this fragment.

Whether Sanchoniatho's works can be considered of such high antiquity as has been attributed to them by Philo, Porphyry and Eusebius, is much controverted; their antiquity and authenticity are contended for by *Bochart*, *Vossius*, *Huet*, *Cumberland*, *Warburton*, *Goguet*, *Jackson* and *Mignot*, and admitted by *Grotius*; but denied by *P. Simon*, *Dodwell*, *Vandale*, *Calmet*, *Dupin*, and *La Barre*.

I shall not, at present, meddle with this question, but simply notice that the cosmogony and anthropogony of Sanchoniatho bear the strongest marks of high antiquity; but the remainder of the fragment seems to consist not of traditions, but of additions made by Phenician priests, of whose

whose corrupt practices the translator complains.\* Nay Sanchoniatho himself, Philo adds, rejected many of their fables, as well as the allegorical explanation given of them; but after his time, the priests again related the same fables, and extracted from them a mystic sense, which the Greeks never before thought of; but he says that both the Egyptians and Phenicians were accustomed to reckon among the greatest Gods, such men as contributed most to the happiness of human life, by important inventions or other signal benefits. This I believe to be true, with respect to the antediluvian discoverers or improvers of various arts, and is attested by Sanchoniatho: but no such apotheosis took place after the flood, either in Egypt or in Phenicia; for Herodotus expressly denies that hero worship was practised by the Egyptians,† nor was it by the Phenicians in the most ancient times; otherwise the Israelites, ever prone to the Canaanitish worship, would have adopted it, or, at least, rendered it, to their own patriarchs, Abraham, Isaac, Jacob, Noah, &c. Yet we do not find that they were ever guilty of such impiety: the prophets never reproached them with it, but always with the worship of *Baal*, the sun or Lord, or *Baalim*, the Lord's, that is, the planets, or the host of heaven, or *Ashtaroth*, the moon, or *Moloch*, who appears to be the same as *Baal*, considered as an avenger; for we read in Jeremiah, xxxii. 35, *they have erected high places to Baal, to cause their sons and daughters to pass through (the fire) to Moloch,*

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\* Euseb. p. 32.

† Lib. 2. § 50.

*Moloch*, to the planet Saturn, which is not unlikely ; or *Dagon*, who is represented by Sanchoniatho as a deified man, and the improver of agriculture.

However, the remainder of the fragment presents such a tissue of absurdities, that the son of *Thabian*, the most ancient of the Phenician Hierophants, considered them as allegorical representations of the operations of nature. Euseb. 39.\*

I now proceed to state the origin of the Greek mythology. Under the appellation of Greeks, I principally understand the Hellenistic race, and only incidentally, the Pelasgi, who possessed the Grecian territory long before the arrival of the Hellenes, by whom many of them were expelled ; but many, also, retained the possession of the Peloponesus, and finally were incorporated with the Hellenes, whose language they also adopted.

The Hellenes for several centuries resided in Lesser Asia, as I have shewn in a late paper read in this Academy, vol. x. p. 149 and 152: they preserved not only the primitive language, but also the primitive religion of mankind ; and this last subsisted also among the Carians and Lydians, the purity of whose worship has been proved, p. 6. Eusebius, Lib. i. p. 413, expressly says that the Greeks originally held the true worship of God, but afterwards depraved it. Hence, when Plato† says that the first inhabitants of Greece believed the

\* A very ingenious and learned account of these fables is given by Jackson, in the third vol. of Chronological Antiquities.

† In Cratylus.



the sun, moon, stars, earth and heaven, to be the only Gods, must be understood of the Pelasgi ; or if supposed to mean the Hellenes also, this assertion must be modified, as it is by Aristotle, who confines this opinion to the most ancient sages, adding that the rest of the Greek theology consisted of fables to amuse and please the vulgar, support the laws, and for public utility.\* However, these fables were invented, or adopted, only after a long course of ages.

The Hellenes for a long time had neither temples nor altars. *Cecrops*, who reigned in Attica about the year 1550 B. C. is said to have been the first who raised an altar to God, whom he called *Zen*, that is, the *giver of life*. This was certainly the true God, for at that time this name was not associated with, or polluted by the extravagant tales of a subsequent period ; but it does not appear that he set up any statue of him, Euseb. Lib. x. p. 486. Eusebius indeed adds that *Cecrops* erected a statue of *Athene*, whom the Latins long after called *Minerva* ; but this statue was set up to honour her not as a goddess, but as the inventress or improver of several useful arts, as that of spinning and weaving. Ovid Fasti, Lib. 3. v. 817, &c. She probably substituted the wheel for the distaff, and also invented the shuttle. She also cultivated olives more skilfully than was before practised. Diodorus, Lib. v. p. 389 ; but neither her statue, nor any other statue, were at that time, nor for many ages after,

objects

\* Metaphy. Lib. xiv. Chap. 8, ad finem.

objects of adoration ; for we do not find any traces of idolatry properly so called, that is, the worship of images, even so late as the Trojan war. No mention is made of them either in the *Iliad* or in the *Odyssey*. That the Greeks were at that time Polytheists, is certain, but not idolaters until long after the age of *Cecrops* ; for Herodotus assures us, *Lib. 2, § 53*, that for a long time they were ignorant of the origin, form, or nature of their Gods, and whether eternal or not ; consequently they could form no images of them. The statue of *Minerva* was therefore not that of a goddess, but of a woman highly reputed by the Athenians. Thus the practice of erecting images or statues of those who rendered signal services to mankind began. They were at first respected, then venerated, and finally adored as Gods.\* Hence we may conclude, that from the reign of *Ogyges* to that of *Cecrops*, that is for 232 years, namely, from 1789 to 1557 B. C. the religion of the *Hellenes* was pure and uncontaminated. The first temple dedicated to *Zen* was built by *Deucalion*, Pausanias p. 43, probably in the year 1528, the year succeeding that of the flood, called after his name, to thank *Zen* for his deliverance. *Deucalion*, indeed, never reigned in Athens ; but he must have possessed authority, for his son *Amphyction* was married to the daughter of *Cranæus*, the successor of *Cecrops*, and afterwards became king of Attica : that *Deucalion* was a native Athenian I have shown in my last paper.

Thus

\* Euseb. p. 70. 73.

Thus we see that the Hellenic Greeks were the last of all civilized nations that embraced either polytheism or idolatry. How they were seduced into polytheism I shall now explain:

That the Hellenes were led into polytheism by their intercourse with foreigners is generally admitted; and that the Egyptians and Phenicians were those who principally contributed to the alteration of the primitive Hellenic religion, is also commonly supposed: but notwithstanding the assertion of Herodotus, I think it impossible to attribute this perversion to the Egyptians; and to shew how little Herodotus is to be credited in this instance, the passages of his history which relate to it must be stated. Lib. 2, § 4, he says, the Egyptians invented the names of the twelve Gods, and that from them the Greeks borrowed them; and § 50 he tells us, "Egypt has certainly communicated to Greece the names of almost all the Gods; that they were of barbarian origin, I am convinced by my different researches." His own researches then have taught him nothing more, than that these names were not of Greek origin, but did not prove they were derived from Egypt. He adds "the names of *Neptune* and the *Dioscuri*, I mentioned before (§ 43) with those, if we except *Juno*, *Vesta*, *Themis*, the *Graces*, and the *Nereids*; the names of all other deities have always been known to the Egyptians. In this instance I only repeat what the Egyptians themselves say." It is then on the assertion of the Egyptian priests, and not on his own researches, that his certainty rested. "Those names, of which they

“ they disclaim any knowledge, are all, except Neptune, of  
 “ Pelasgian derivation; and they were informed of his name  
 “ by the Africans.” Yet it is evident, the names of the  
 principal Grecian deities have not the least resemblance  
 to Egyptian names, nor the Egyptian names of the divinities  
 they principally adored, to the names of those the Greeks  
 adored. What resemblance has *Thot* to *Hermes*, or *Osiris*  
 and *Isis* to *Zeus* and *Herc*, or *Neith* to *Athene*? What  
 Herodotus therefore must have meant, is that the Greeks  
 found in Egypt Gods whose principal functions were the  
 same as those of the deities they themselves adored;  
 and as he knew that these deities were not in the most  
 ancient times known in Greece, for instance, in the time  
 of *Cecrops*, he supposed the knowledge of them must have  
 been imported from Egypt; but it is certain they were not,  
 for the histories of the Grecian divinities are totally diffe-  
 rent from those of the Egyptian, whereas they must resem-  
 ble those of the Phœnician, as will presently be seen.  
 The Egyptian priests, it is true, among other extravagant  
 tales, told the historian Diodorus, that the Athenians were  
 a colony from *Sais* in Egypt, than which nothing can be more  
 distant from the truth; both the language and the customs  
 and manners of Egypt and Athens were totally different: as  
 to their language the difference is enormous, and so by every  
 account was that of their customs and manners. The  
 Egyptians were circumcised; the Greeks held that practice  
 in contempt and derision. The Egyptians indulged them-  
 selves

selves in a plurality of wives: the Greeks were not permitted to have more than one, Diodorus, Lib. 1. § 80. p. 91; and of this law, *Cecrops*, the pretended Egyptian, was the author.\* Nay, the Egyptians had an utter aversion to the Greek usages, Herod. Lib. 2. § 91; and even for those of all other nations, *ibid.* which is a sufficient proof that they sent out no colonies, for these at least would have retained the customs of the parent state. The Greeks descended from *Iavan*, the son of *Japhet*, the Egyptians from *Misraim*, the son of *Cham*. The only historian that ascribed to the Athenians an Egyptian origin, is *Theopompus*, who lived in the time of *Philip* of Macedon, whom *Josephus*, in his first book against Appion, cap. 24, stigmatizes as unworthy of credit, as he wrote with an express view of humbling the Athenians. *Cornelius Nepos*, also, † and *Dionysius of Halicarnassus* treat him as a calumniator. Moreover, he has been contradicted, as to what regards the Athenians, as *Wesseling* observes in his note on this passage of *Diodorus*. The only reasons assigned by the Egyptian priests as the ground of their assertion are, first, that the Athenians alone called their city *Astu*, as did also the Egyptians, which is false, as *Wesseling* shews; and if true, were a feeble reason indeed; secondly, that the Athenian citizens were divided into three classes, as

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were

\* See *Potter's Antiquities*, vol. 1. p. 8, and vol. 270, *L'Archer's Herodot.* vol. 2. p. 367: these and many other customs, entirely opposite to each other, are stated by the learned Doctor *Musgrave*, in his *Treatise on the Greek Mythology*, p. 5, 6, and 7.

† In *Alcibiade*.

were the Egyptians; which regulation, indeed, Cecrops might have imported from Egypt, as it is not denied that he visited Egypt; but it affords no proof that he led a colony of Egyptians into Attica.

Lastly, the Egyptians in the most ancient times held the sea in abomination,\* therefore they sent out no colonies by sea; they looked upon it as the emblem of Typhon, the enemy of Osiris. It was a maxim among them never to sail from their country.† Nay, until the reign of Psammiticus they excluded all strangers from their harbours, Diodor. Lib. 1, 78, except the Phenicians, with whom, as being of their kindred, they traded in the most ancient times, for at least 1745 years B. C. *Io*, the daughter of *Jasus*,‡ was carried into Egypt by the Phenicians, as Herodotus relates, Lib. 1, § 1, who, he says, exported the commodities of Egypt into different countries. Hence we see the impossibility of deriving any part of the Greek religion from Egypt, either immediately, as Herodotus has asserted, or even through the medium of the Phenicians, as the Egyptian cosmogony was atheistical, and their theology totally different. I know but one fable which the Greeks seem to have borrowed from the Egyptians, it is that of the Nine Muses; for the Egyptians, in their fabulous history of Osiris, related that  
in

\* Plutarch, de Iside & Osiride. † Porphyry, de Abstinencia, Lib. 4, 8.

‡ Pausanias, 145. Herodotus says she was the daughter of Inachus, but Wesseling proved the name *Inachus* to have been an interpolation. See L'Archei's Note.

in his travels he was accompanied by musicians, among whom were nine virgins.\* This fable was rather an embellishment, than a part of the Greek religion; they were invoked by poets, but never adored; they seem also to have converted some parts of the Egyptian history, doubtless, communicated to them by the Phenicians, into fictions. Thus, it being mentioned in the Egyptian history, that the Nile, having burst its mounds, had overflowed that part of Egypt, of which Prometheus was governor, and that these mounds were repaired by Hercules, who thus freed Prometheus from the pain, grief and anxiety which that accident had caused him;† the Greeks converted the whole into a fiction, and reported that an eagle preyed on Prometheus's liver; the river being called an eagle, from the sudden violence of its irruption, and that it was killed by Hercules. They laid the scene on Mount Caucasus, as it was much frequented by eagles; but the fable of Charon, which is commonly thought to have been grounded on a fact mentioned by Diodorus, namely, that the Egyptians transported the bodies of their dead beyond the Lake Mœris, and that Charon was the ferry-man, I believe to be an original Greek fable, and that no such practice ever existed in Egypt, otherwise Herodotus would have mentioned it; it was too important not to have been noticed by him. Diodorus, who visited Egypt 400 years after Herodotus, must have heard it from the Egyptian priests, who, during the reign of the

\* Diodor. Lib. 1. p. 22. † Ibid.

Ptolemies probably adopted many of the Greek fables and superstitions.

As *Herodotus*, Lib. 2, § 53, ascribes the earliest Greek theogony to Homer and Hesiod, many have thought that they were the fabricators of it. Certainly the expression of Herodotus is ambiguous, as the term ποιῶν signifies either to *fabricate*, or to *compose in verse*; it is in this last sense I think Herodotus should be understood, for, as Mr. Beloc justly remarks, “it were as unreasonable to imagine that Homer was the first author of their mythology, as it would be to think Homer first taught them to read and write.” Nay, Herodotus himself frequently acknowledges that the Gods of Greece were of foreign origin, Lib. 2, § 43, 50, 52.

The introduction of Polytheism into Greece must then be attributed solely to the Phenicians, who not only visited it as traders, but settled a colony there in a very early age. Pride would not suffer the Greek historians to own that they were indebted for any part of their institutions to a people so inconsiderable as the Phenicians were long thought to be, in every other respect than as skilful merchants and navigators. On the other hand it was rather creditable to the Greeks to have received their religious knowledge from the Egyptians, who, in the remotest age, as that of Cecrops and Moses, and long after, were esteemed the wisest, most civilized, and powerful people then known; and hence,  
according



according to Diodorus,\* Orpheus, Homer, Pythagoras and Solon, went to Egypt for their instruction, as did many more, if the Egyptian priests are to be credited.† Cecrops himself, though a native Athenian, seems to have been educated in Egypt.

A Phenician colony settled in Greece so early as the year 1494 B. C. that is, about fifty-six years after the accession of Cecrops to the kingdom of Attica, and ten years after the Deucalion deluge.

Cadmus, who led this colony, was the son of Agenor, king of Phenicia. The cause of his expatriation seems to have been the progress which the Israelites were daily making in the conquest of Canaan ; for he arrived in Greece thirty-three years after the death of Joshua. The Canaanites were struck with fear, and flocked to the sea coast, which after some years could no longer maintain them. Cadmus, unwilling to expose the true reason of his emigration, pretended his father had sent him to seek his sister Europa, and forbid him to return until he had found her.‡ Part of these Phenicians were soon after expelled from their new settlement by the Beotians, and retired to Athens, where they were adopted on certain conditions as free citizens ; to them Herodotus owns the Greeks were indebted for many improvements.|| Undoubtedly the Phenicians were much more advanced in civilization than the Greeks were at that time ;

\* Lib. 1. p. 80.

†Ibid. p. 107.

‡ Herod. Lib. 4. § 174, and Diodor. Lib. 4. § 2, p. 247.

||Lib. 5. § 57, 58.

time ; but, with real improvement, they at the same time communicated to them their own corrupt religious opinions. From them they learned the worship of the sun, moon, and planets, and of the elements, and to limit the number of the principal or greater Gods to twelve, which the Phenicians themselves learned from the Chaldeans ;\* the only difference being that the Chaldeans confined them to the twelve signs of the Zodiac, whereas the Phenicians comprehended the elements among them, as did also the Greeks. The Phenician *Baal*, or Lord, or Supreme God, the Athenians already acknowledged *Zen* to be ;† and therefore did not learn this from the Phenicians, but from them they learned that he inhabited the superior part of the air, as did *Here* or *Juno* the inferior. *Here* denotes lady or mistress ;‡ and as the state of the lower air is inconstant, and frequently turbulent, this laid the foundation of many fables in subsequent ages. The earth they stiled *Hestia* or *Vesta*, from its stability : the God of fire, the Phenician *Chrysor*, they called *Ephestion*, from its power of softening metals : the God of water, or the watery element, they called *Possideon*, *Neptune*, though they afterwards considered him peculiarly as the God of the sea, that being the largest collection of waters : the moon, the *Ashteroth* or *Astarte* of the Phenicians, the Greeks adopted under the name of *Artemis* ; and as her temple was always situated in a wood,||  
the

\* Diodor. Lib. 2. p. 144. † Pausan. 600.  
‡ 1 Lenep. 292. || 38 Mem. Inscrip. 393.

the Greeks considered her as the Goddess of hunting, and an huntress. With *Mercury* also they were made acquainted by the Phenicians; the planet so called they adored, and called *Hermes* or the *Interpreter*, for the Chaldeans called all the planets interpreters, 1 Diodor. 143; but this name was specially given to Mercury, as that planet performs its revolution in the shortest time.

Though *Athene* or Minerva is mentioned by Sanchoniatho; yet, the passage in which she is mentioned, Euseb. 38, has to me the air of an interpolation, and the Athenians had a statue of her long before the arrival of the Phenicians, though they did not worship it until some ages after, when they fell into idolatry.

*Ares* or *Mars* was the name of a planet so called by the Chaldeans; the Being that governed it was esteemed a God, and, for some astrological reasons, was by the Greeks thought to be the God of war; he was worshipped as such by the Assyrians.\*

The Phenician *Baal*, or the sun, the Greeks called *Apollo*, either from the perpetual emission of his rays, as *Plato* thought, or from its being single and not many, as *Chrysippus* supposed;† and hence, perhaps, the Latins called him or it *Sol*, quasi *Solus*.

As to the planet *Saturn*, whom the Greeks called *Kronos*, the Chaldeans and Phenicians supposed it governed by a  
malevolent

\* Sextus Empyricus adversus Mathem. Chron. Alexandr. quoted by Stanley, 787.

† See Macrob. Lib. 1. Saturnal. chap. 17, p. 236.

malevolent intelligence, and hence endeavoured to render him propitious by human sacrifices. But the Greeks, who had some true traditions of their own concerning the person so called, entertained a very different opinion of him, which they nevertheless disfigured by a mixture of Phenician fables, as will be shewn in the sequel. As for the *Dioscuri*, their worship was certainly derived from the Phenicians, for they are mentioned by Sanchoniatho as the sons of Sydoc, Euseb. 36. Herodotus owns the Egyptians knew nothing of them.

The worship of Pluto was also introduced into Greece by the Phenicians, who called him *Muth* or *Death*; and is said by Sanchoniatho to be the son of *Saturn*, Euseb. 38.

Thus we see that the Hellenes received the knowledge of those Gods whom they principally adored from the Phenicians.

In the opinion of many, both of the ancients and moderns, the Pelasgian part of Greece, namely, the Peloponnesus, received its religious rites and worship from Egypt, as Danaus, it is said, led a colony from Egypt, and settled in Argos; but this surely must be a mistake, for we do not find that the Argives ever professed any other religion than that of the Hellenes, and must therefore have derived it from the same source; and that no Egyptian colony ever settled in Argos I shall now prove.

Long before the reign of Cecrops, namely, in the year 1829 B. C. 147 before the birth of Moses, and 269 after the birth

birth of Abraham, *Inachus* founded the kingdom of Argos : of him we know nothing more than that he was a Pelasgian, consequently not an Egyptian ; that he came to Greece by sea, and thence was called a son of Neptune. He is said to have reigned sixty years ; his descendants succeeded him in the kingdom of Argos for many generations : of these the most noted was *Danaus*, whose genealogy indeed is variously related. But the most probable account seems to me to be that given by *Pausanias* Lib. 2, cap. 16 and 19 : he tells us that *Triopas*, the sixth in descent from *Inachus*, had two sons, *Iasus* and *Agenor* ; that *Iasus* had a daughter called *Io*, who was carried into Egypt, and had a son called *Danaus*, and that she being absent in Egypt, *Crotopus*, the son of *Agenor*, took advantage of her absence, and succeeded his father in the kingdom of Argos, and was himself succeeded by his son *Stheneleus*. The reigns of these two princes lasted but thirty-two years.\* In the mean time *Danaus*, being then old enough to assert his right to his grandfather's kingdom, as heir to *Iasus*, came to Argos and laid his claim before the people, who preferred it to that of *Gelanor*, the son of *Stheneleus*, and thus he obtained the throne of Argos. He neither led a colony there, as the Egyptians gave out, nor fled from Egypt, as others pretended ; but obtained his kingdom by the free voice of the people. His arrival in Argos dates from the year 1586† B. C. and consequently preceded

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\* 3 Jackson, 313.

† 3 Jackson, 113, according to the Parian marbles corrected.

preceded that of Cadmus ninety-one years, and the reign of Cecrops twenty-nine years ; but was posterior to the birth of *Moses* by sixty-six years. He certainly came from Egypt, most probably, in a Phenician vessel ; but we have no reason to think he was educated in the Egyptian religion, but, on the contrary, his mother being a Pelasgian, and he himself expecting the throne of Argos, the religion of Argos, that is, the Pelasgian, must have been that in which he was educated and professed. Had he embraced the Egyptian superstition, he could not even eat with those he expected to govern. Accordingly, Herodotus does not ascribe the Grecian polytheism, or names of the Gods, to *Danaus*, but to the oracle of Dodona, Lib. 2, § 52. They adopted the Phenician Deities probably at the same time that they did the Hellenic language.\*

Of the Greek cosmogony, on which a great part of their mythology was founded, there appears to have been two sources, one Phenician, of which we have already given an extract, p. 14. (this was followed by Hesiod in his theogony,) and another much more conformable to the Mosaic account, and adopted by Ovid,† but of which only a very few traces can be found in any Greek writer that has

\* Diodorus it is true relates that *Danaus* erected a temple to *Minerva* at Rhodes, Lib. 5. p. 377 ; but this was probably the Phenician *Minerva* mentioned by Sanchoniatho, and not the Egyptian, who had a temple at Sais ; for, according to Apollodorus, *Danaus* and *Cadmus* were related.

† Ovid, Lib. 1. *Metamorph.*

has reached our times ; and yet he must have found it in some Greek writer ; I had almost said the Septuagint. The *Hellenes*, and even the Pelasgians, had a traditionary cosmogony transmitted to them from the son of *Noah*, from whom they both descended, namely, *Japhet*, the Hellenes through his son *Javan*, and the *Pelasgi* through *Magog* ; but this tradition was corrupted more or less by its mixture with the Phenician, which introduced polytheism.

Hesiod, v. 105, tells us the Gods had *evermore* existed ; yet in the next following line he tells us they were produced by the earth and the starry heaven. It is impossible he should thus contradict himself, as he evidently would if he meant the same Gods ; he must then have meant that Gods of subsequent origin had been generated by the heaven and the earth. He admits that chaos, or an universal confusion, preceded all things ; but how it was disembroiled and its heterogeneous ingredients were separated from each other, he does not expressly mention. This defect Ovid *in some measure* supplies, for he tells us the chaos was disembroiled by a God, and the principle of *attraction*, *hanc Deus et melior. litem natura diremit*.\* This *melior natura* does not mean a nature better than God ; but better than that which they had in their disunited chaotic state. What this new nature or rather principle was, Ovid does not mention ; but Hesiod does, v. 120, and calls it *Eros, Cupid*, the connecting principle ;

G 2

or.

\* So the best editions have it, and not *aut melior natura*.

or in modern language, the principle of attraction, though he does not assign to it the regular arrangement of the substances contained in the chaotic mass, as Ovid does, who must have considered it as a principle impressed on the chaotic ingredients by a *Deity*. Hesiod ascribes this arrangement to no Deity, which shews he adopted the Phenician tradition, for neither does *Sanchioniatho* but very obscurely.

Hence we see how much mistaken Herodotus was when he tells us that the Greeks for a long time prayed to Gods, of whose names, duration, nature, and functions they were perfectly ignorant; that is to say, of whom they knew nothing, and of whom they could consequently form no notion or idea, Lib. 2. § 52 and 53. This is too absurd to be credited, for how could they pray to they knew not what? \* Accordingly he rests this on the authority of two old women, the priestesses of the oracle of Dodona, who at the same time informed him that this oracle was established by the order of a black pigeon that flew to Dodona, from Thebes in Egypt, § 55. Tales of this sort have discredited Herodotus to such a degree, that *Strabo*, Lib. 11. p. 774, declared, he was as undeserving of credit as *Hesiod* or *Homer* in

\* It is true St. Paul, Acts xvii. 23, reproaches the Athenians for worshipping an *unknown God*; but the Athenians were ignorant only of the functions of that God, but not of his nature, for they supposed their Gods to have a form and nature similar to the human. Herod. Lib. 1. § 131.



in their accounts of their heroes. Diodorus, Lib. 1. p. 80, agrees with him, as does Josephus against Appion, p. 874; besides, it is a contradiction to what he himself relates, namely, that they were called Gods, from maintaining the *order* of the universe. This then was their function; moreover, Cecrops had long before dedicated an altar to *Zen*, and to *Zen* only, the original name of the true God.

Hesiod personified, and even deified, the circumstances that accompanied the chaotic mass, v. 117; he says that after chaos, the *earth*, *Tartarus* or *Erebus*, and *Cupid* existed, and *Night*. Now *Gaia*, the earth, is in the sequel reputed a goddess.

*Erebus* denotes the deepest part of the abyss, as *Servius* notes.\* This then signifies that the chaos was originally surrounded with darkness, agreeably to what Moses relates; and v. 124, Hesiod says that from *Erebus* and *Night*, day and æther originated; that is, from the abyss and darkness, *light* and the *firmament* were produced. This being exactly the same order in which Moses states their creation, it is a sufficient proof that the Greeks were once possessed of the true primitive tradition: this they did not borrow from the Phenicians, for Sanchoniatho did not state it. A God indeed is not mentioned, because Hesiod was a Polytheist, and did not know to what God creation should be ascribed.

Again,

\* Virgil, Georg. iv. 471.

Again, v. 126, Hesiod tells us the *earth* at first produced of itself the starry heaven, mountains, and the barren sea; and afterwards, with the concurrence of heaven, the *ocean*, *Japetus*, *Hyperion*, *Phæbe*, &c. Here it is remarkable that he states the existence of light to have preceded that of luminaries, as Moses has also. *Hyperion* was the sun,\* though he is also represented as the father of the sun, and *Phæbe* the moon.

*Ovid* states the order in which the principal natural objects were brought into existence much more accurately; for, after giving a florid description of the ancient primitive chaos, to which neither the sun or moon afforded any light, nor was any in the air, v. 6 and 13, he says, v. 17, that God put an end to that strife, and separated the water from the earth, and heaven from the grosser air; the fiery force of the weightless heaven shone forth. The order of the succeeding events agrees perfectly with the Mosaic account: the stars and planets next appeared, then fish were created, birds, and land animals; and, last of all, *man*, v. 78.

Though *Ovid* attributes, v. 32, the regular arrangement of the component parts of the chaotic mass to God; yet as he acknowledged many Gods, he did not know to which of them he should attribute it. He could not ascribe it to Jupiter, as he believed him to have been preceded by Saturn,  
nor

\* So *Ovid* in his *Fasti*:

Placat equo Perses radiis Hyperiona cinctum,  
 Ne detur celeri victima tarda Deo.

nor to Saturn, as it was commonly believed that he was dethroned by his son Jupiter; though probably the tradition, from whence he drew his account, ascribed the creation to the command of *Zeus* the true God, *Jussit et ambitæ circumdare littora terræ*, v. 37. Yet in Ovid's time, the name *Zeus* was given to Jupiter; however, he ascribes it to a God: he was also at a loss to account for the origin of the human race, whether to attribute it to the Creator of the world, or to the earth, still impregnated with celestial particles, and formed into the shape of a man by the son of *Japetus*. This last notion was more generally received by the Greeks, as they looked on *Japet* or *Japhet* as the author of their race, as he in truth was, though in a less absurd manner.

Thus far we are enabled to trace the Greek cosmogony, as stated by their most ancient writers; and absurd as it evidently appears, particularly that stated by Hesiod, and imperfect as is that given by Ovid, yet it is sufficiently plain that both, and particularly that of the latter, sprung from the true Mosaic tradition, mutilated, distorted, and disfigured.

The subsequent part of the Greek mythology, comprehending their theogony and theurgy, as stated by Hesiod, seems a confused medley of Phenician rhapsodies, related by Sanchoniatho, and alluding to feigned antediluvian transactions, and some other events which seem postdiluvian: the former transactions are rendered still more absurd by the  
poet,

poet, misled, perhaps, by the ambiguity of the Phenician names when translated into Greek. Thus there being a Phenician tradition, that *Uranus*, one of their kings, had married his sister *Gea*, and had several sons, one of whom was named *Kronos*, Hesiod (or rather his predecessors) understanding these names in the sense they present in the Greek language, and at the same time retaining the Phenician sense, who considered them as *persons*, says, v. 133, that the heaven and the earth begot ten sons and daughters, the youngest of whom was *Kronos*, whom the Latins call *Saturn*; and as this word by a slight variation of the pronunciation might be called *χρονος*, which signifies *time*; hence the poets called him *Time*, or the God of *Time*. So *Orpheus* in his 12th hymn addresses him as the God who brings forth and gives increase to all things. So *Sophocles* in his *Electra* calls *Time* (*χρονος*) a most gentle God. That Hesiod understood the heaven and the earth in the gross sense appears, by v. 133, and 159, and indeed by all that precedes and follows.

There were other antediluvian transactions, which *Hesiod* mentions in his poem *De Operibus et Diebus*, which are not mentioned by *Sanchoniatho*; but seem derived from the old Hellenic tradition, followed as we have seen by *Ovid*, in which the original state of man in paradise seems alluded to, and his degeneracy in the succeeding ages, which occasioned the universal deluge. This tradition was much amplified and embellished both by *Hesiod* and *Ovid*; hence originated the division of the space of time that intervened betwixt

betwixt the commencement of the world and the flood, namely, 2256 years into four ages, the Golden, the Silver, the Brazen, and the Iron.

The *golden* age was probably that which Adam passed in paradise, for we are not informed by Moses how long he continued in it; and also during the years that elapsed before the murder of Abel by Cain. During that period, it is said, there was no strife or contention, but the earth yielded its fruits with little labour: that there was some labour is evident, since Cain is said to be an agriculturist, Gen. iv. 2. The curse inflicted on the earth after the fall, related only to that on which paradise stood, which seems to have been destroyed by a volcano, and now forms the desert of Chamo. As Seth was born when Adam was 230 years old,\* which must have been soon after the death of Abel, this age may be deemed to have lasted 229 years.

The *silver* age we may suppose to have existed from the death of Abel to that of Adam, that is, nearly 700 years. In this age the poets tell us men did not scruple to injure each other, and ceased to honour the Deity: the seasons also underwent an alteration unfavourable to mankind.†

The *brazen* age began soon after the death of Adam, that is, in the year of the world 930. Hesiod expressly mentions that this age commenced after the former generation had

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passed

\* According to the Septuagint.

† Hesiod, De Operibus, v. 126, Ovid, 1 Metamorph. v. 113 and 139.

passed away. In this age war commenced, and brazen arms were used: it probably lasted until about the middle of the period that elapsed betwixt the death of Adam and the death of Enos, the grandson of Adam, that is, 205 years;\* for in the lifetime of Enos a distinction was made betwixt the children of God and the children of men. *Adam* was called the son of God, and so were his descendants by *Seth*; but the descendants of *Cain*, who probably abandoned the worship of God, or joined with it the worship of creatures, were by way of distinction called the children of men. This interpretation of the 26th verse of Genes. iv. was first given by Le Clerc, and is now generally received.†

The *iron* age, beginning, as I suppose, at the middle of the period that elapsed betwixt the death of *Adam* and the death of *Enos*, and being terminated only by the flood, must have lasted 1121 years; for the space of time that intervened betwixt the death of Adam and the death of *Enos*, was 410 years, the half of which is 205; *Enos* died in the year of the world 1340, which subtracted from the year of the world 2256, the year in which the deluge happened, leave a remainder of 916 years, to which adding 205 years that preceded the death of *Enos*, we have the duration of the iron age 1121 years.

During this period Moses relates, Genes. vi. the children  
of

\* Capel, *Chronologia Sacra*, p. 1.

† The Septuagint and Vulgate translations are rejected by Rosenmuller and Dathius; our English translation is taken from the Vulgate.

of God intermarrying with the daughters of men, all mankind became corrupt; there existed a race of ambitious and powerful men, robbers, whom the Septuagint and Vulgate call giants,\* heroes celebrated in ancient times, but odious to God, who determined to exterminate them.

Upon this foundation the Greeks, and particularly Hesiod, and the Cyclic poets, grounded their wild fictions of wars, which the giants and Titans made on the Gods, Hesiod, Theog. v. 630, 664, with which Philo Byblius, though himself an Heathen, justly reproaches them, Euseb. 39: hence also their various tales of Gods falling in-love with women.

According to Moses, the children of God became enamoured of the daughters of men, because they were handsome; but why should they be handsomer than the daughters of Seth? The truth seems to be that they were more seductive and artful. Sanchoniatho relates that the daughters of these giants were extremely libertine.

Sanchoniatho mentions these giants, and says they were men of a wonderful size, but bestows no censure on their conduct, and makes no mention of the flood by which they were destroyed; hence it is highly probable that Cham's wife, from whom the Phenicians descended, was herself a descendant of Cain, and concealed every circumstance that tended to their disgrace. Neither does Hesiod, who bor-

H 2 rowed

\* Rosenmuller insists that there is no necessity for regarding them as men of a size superior to the common, and so Dathius.

rowed many of the Phenician traditions, make any mention of the flood ; yet the Greeks, as I already noticed, must have had another tradition much less corrupt ; for Ovid, *Metamorph. Lib. I. v. 144*, &c. mentions the extreme wickedness of mankind before the flood, and particularly the impiety of the giants, who even made war on the Gods, which drew upon them the vengeance of Heaven ; almost the whole race being exterminated by an universal deluge.

The description of the deluge given by Ovid is certainly very remarkable, and evidently a fragment of a tradition of the highest antiquity ; but that given by Lucian is more particular, and agrees almost perfectly with the Mosaic account. Ovid tells us that *Deucalion* and his wife *Pyrrha* alone survived it, by taking refuge on the summit of Mount Parnassus ; but *Lucian* states that Deucalion, a man of eminent virtue and piety, and his wife and children were saved in an ark, into which they introduced pairs of various animals ;\* but both erred most grossly, in confounding the flood, which deluged Thessaly, with the universal deluge, that covered the whole earth. *Ovid* seems to have purposely mutilated the ancient tradition, in order to introduce his favourite object, the metamorphoses of stones into men and women, grounded probably on the affinity betwixt *Λαας*, a stone, and *Λαοι*, people.

The Greek poets were equally mistaken and inconsistent with

\* De dea Syria, p. 660.



with themselves, in stating the first golden age, at least, to have taken place in the reign of *Saturn*. How they were led into this inconsistency and anachronism, I shall now shew.

There were two traditions current amongst the Greeks concerning *Saturn*, and though contradictory to each other, yet *Hesiod* followed both. The first is stated by *Diodorus*, p. 383, to have been the only one received and credited by the *Cretans*, who themselves were Greeks. According to this tradition *Saturn* was a wise and just prince, under whom his subjects were perfectly happy, and his reign was called the *golden age*. This tradition *Hesiod* follows in his poem *De Operibus et Diebus*.

According to the second tradition, which was more generally received in Greece, *Saturn* was a monster of impiety and avarice, *Diodor.* Lib. 3. p. 229, 30. This was evidently derived from the Phenicians, for *Sanchoniatho* accuses him of various crimes, warring, dethroning and emasculating his father, and destroying his own children, *Euseb.* 36, 37, 38. This tradition *Hesiod* follows in his *Theogony*, v. 461, &c. and adds, that he was dethroned by his son *Jupiter*, and confined. Succeeding poets feigned that *Jupiter* treated him as he treated his father.\* The Latin poets say, that he escaped into Italy, where he lay concealed from his son, and hence Italy was called *Latium*, *Ovid*, Lib. 1. *Fasti*. *Virgil*, *Æneid*.  
Lib.

\* *Statius*, *Theb.* Lib. 8. *Claud. de Raptu Proserpinæ*, Lib. 1. ; and among the Greeks the ancient historian *Timæus*.

Lib. 8. v. 320, and there founded the golden age. The Greeks extended it more universally; but not knowing precisely when it took place, they supposed it must have been in the earliest or primitive times; and I make no doubt but it existed at two different periods, as will presently be seen; the first before the flood, as Ovid mentions, and the second after it.

The very learned *Bochart* has endeavoured to reconcile both traditions in his *Phaleg*, a work which I could not procure, but am obliged to recur to extracts from it in *Tooke's Pantheon*, translated from the French of *Pomey*.

But before I state the opinion of *Bochart*, I must remark, that both the Phenicians and the Greeks believed most of the antediluvians to be Gods, and particularly such of them as owed their birth to *Uranus* and *Gea*. Thus *Hesiod*, in his treatise *De Operibus et Diebus*, says, that the first race of men, after their death, became Gods or Semi-Gods, v. 120, &c. and in his *Theogony*, calls the *Titans*, and all the children of *Saturn* and *Rhea*, Gods, v. 631, though banished to the extremities of the earth, the habitation of eternal darkness; and so does *Homer* in his Hymn to *Apollo*. So, according to *Sanchoniatho*, *Chryssor*, the Vulcan of the Greeks, *Eliun*, and many others, were deified after their death, *Euseb.* 35, 36, &c.

According to *Bochart*, *Noah* was the *Saturn* of the Greeks, though they misrepresented many of the circumstances that relate to him. Of the truth of this opinion he gives the following proofs:

1st.

1st. That as Noah was the last of the antediluvian patriarchs, so *Hesiod*, v. 137, states *Saturn* to have been the last of the Gods produced by heaven and earth. So *Diodorus* also, Lib. 1. p. 32.

2dly. In the time of *Noah* there was but one language upon earth, *Genes.* xi. So *Plato* in *Polit.* says, that in *Saturn's* time all men spoke the same language.

3dly. As only three of the sons of *Noah*, *Japhet*, *Sem* and *Cham*, with their wives, were saved from the flood, though it cannot be supposed that he had not many more, he being then six hundred years old: so *Hesiod*, v. 459, says that *Saturn* swallowed all his children except three, *Zen*, *Possideon*, and *Aides*, that is, *Jupiter*, *Neptune*, and *Pluto*, and their wives, *Here*, *Demetra*, and *Vesta*, v. 453, that is, *Juno*, *Ceres*, and *Vesta*.

4thly. As *Noah* foretold the flood,\* so also did *Saturn*, as *Abydenus* in his *Assyrian History* attests;† and ordered an ark to be constructed, in which birds and land animals were preserved.

5thly. As *Noah* was the first planter of vineyards, (at least after the flood,) so *Saturn* is said to have been the first planter of vines.‡

6thly. *Saturn* is said to have enacted, that whoever saw the

\* *Hebr.* xi. 7, 1 *Peter* iii. 20, 2 *Peter* ii. 5.

† *Euseb.* Lib. 9. p. 414, *Alexander Polyhistor*, apud *Cyrill.* Lib. 1. *Contra Julianum*.

‡ *Aurel. Victor de Origine Roman.*

the Gods naked should be punished;\* an evident allusion to the disrespectful conduct of *Ham*, Gen. ix. 25.

7thly. During Saturn's reign the *golden age* is said to have subsisted, and surely we may well presume that after the flood, during Noah's life, and he lived 350 years after it, mankind enjoyed peace and tranquillity; and after his death, which happened 181 years before the dispersion, we may suppose the *silver age* existed. Some bickerings, perhaps, there were, but no wars; for wars would have forced them to separate, which they seem to have been very loath to do.

These proofs appear to me, as they did to *Sir William Jones*, to render the identity of *Saturn* and *Noah* highly probable.† To these proofs I shall add one more.

8thly. As the Mosaic tradition takes no farther notice of *Noah*, after his marked disapprobation of the conduct of his son *Ham*, and probably in his old age he left the government of his descendants to his eldest son *Japhet*, Homer and Hesiod feigned that his eldest son *Zen*, as the Greeks, or *Jupiter*, as the Latins call *Japhet*, dethroned him, and bound him in chains. But this silly opinion was not universally received, even among the Greeks; for Diodor. Lib. 5. p. 386, relates, that there were two traditions concerning Jupiter, or *Zen*; one, that he violently ejected his father, and another, that he peaceably succeeded him after his death. Nay, there seems to have been a third, which approached much nearer to

\* Callim. in hymnis.

† 1 Asiatic Researches, 229.

to the truth, according to which his father peaceably resigned to him the government, Diodor. 230. This tradition is followed by Lucian,\* for he tells us that *Saturn*, of his own accord, resigned the government to his son *Jupiter*, being by age and infirmities incapacitated to undergo its management, and his chains were nothing more than the gout. From the silence of *Moses* concerning him, during the last 350 years of his life, the fabulists feigned he lay hid in Italy, where they said he made many improvements in agriculture; hence they called him *Saturnus* a *Satu*.

The account given us by *Moses* of the sons of *Noah*, seems to have influenced the Greek tradition concerning the sons of *Saturn*. In Genesis the sons of *Noah* are recorded to have been *Sem*, *Ham* or *Cham*, and *Japhet*, names as usual curtailed from the Greek; *Sem* from *σεμνος*, venerable, as from him the Jews, the peculiar people of God, originated; *Ham* from *αμαρα*, canals, in which water is collected,† as it was in Egypt, which was a swamp or morass when allotted to *Ham*; *Japhet* from *α*, *Spiro*, quasi *ιασπαστηρ*, *Spirandi Pater*, the father of all that respire,‡ that is, the Father of Life.§ It is somewhat remarkable, that as *Japhet* is named last, when *Noah's* sons are enumerated, so the Greeks name *Zen* (*Jupiter*) last when the sons of *Saturn* and *Rhea* are enumerated, Hesiod, v. 456.

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*Japhet,*

\* Saturnalia, p. 610.

† Lennep. 124.

‡ Lennep. 181.

§ The Jod is prefixed, as it is in the wind called Japyx.

*Japhet*, whom the Greeks called *Japetos*, they knew to be the author of their race, through his son *Javan*, or *Ion*. But as *Moses* says nothing more of him, than that the dominion of his posterity should be the most extensive of those possessed by his sons, they lost all memory of subsequent transactions; or at least if they had any memoirs of them, they were lost in the Ogygian inundation, as I have elsewhere said. Hence they fell into the grievous mistake of supposing *Deucalion* and *Eolus* to be the grandsons of *Japhet*, though numerous generations must have passed between them. However, they did not proceed to the deification of *Japetos* until they became acquainted with the Phœnician superstition; then they bestowed upon him the august appellation of *Zen*, and confounded him with the Supreme Being, which they anciently adored. But by an inconceivable inconsistency, though they allowed him to be the son of *Saturn*, and a poor weak infant, difficultly saved from destruction by the craft of his mother, yet they asserted that he was to become the father of Gods and men, *Hesiod*, v. 457, 468. *Callimachus* justly derides the story that he and his brothers drew lots for the share of dominion each was to have over the universe, and says, that *Zen* obtained the supreme rule by force. *Te divûm regem non sors, sed dextra fecit*: this was the tradition generally received. They seem to have glanced at the true tradition, that the sons of *Noah* (*Saturn*)  
divided

\* Hymn to Jupiter, v. 76.

divided the world between them, though they disfigured it; for to *Jupiter* they assigned the dominion of heaven and earth, to *Neptune* that of the sea and to *Pluto*, the subterraneous regions.

*Cicero* \* remarks, that there were three persons called *Jupiter*; one, whose name was *Æther*, another, whose father was *Cælum*, and a third, whose father was *Saturn*. Now this last being the most celebrated of the three, the most noted actions of the other two, however disgraceful, were by the poets attributed to him. Hence arose the various tales of his scandalous intrigues. Moreover, *Philo Byblius* relates, that the Phenicians were wont to bestow the names of their kings on the elements, even on such of them as were already supposed to be Gods; † consequently on *Jupiter* and *Juno*, the divinities of the air, on *Neptune*, the God of the sea, on *Vulcan*, the God of fire, and *Vesta*, the Goddess of the earth. Thus the good and evil actions of those kings were, in process of time, attributed to those divinities. This afforded to the Greeks, who borrowed their religion from the Phenicians, a sufficient excuse for ascribing many ridiculous, nay, even wicked actions, to those divinities. Thus a copious source of fables was opened to them.

Besides the multiplicity of *Jupiters*, *Cicero* also reckons four *Apollos*, two *Dianas*, four that bore the name of *Venus*, five *Minervas*, three of the name of *Hercules*. ‡ All these,

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\* *De Natura Deorum*, Lib. 3. cap. 21.

† *Euseb.* 33.

‡ *De Natura Deorum*, Lib. 3. cap. 22. 23. See also *Musgrave*, p. 95.

he says, he collected from ancient Greek traditions. Now, when the actions of each of these are attributed to one, the most celebrated of those that bore the same name, we may easily imagine what an ample field for various, and even inconsistent tales, was opened to the Grecian poets.

The personification of moral qualities gave occasion to the invention of numerous fables: thus Hesiod says, v. 223, that *Night* begot *Nemesis*, the Goddess of revenge and envy, and also fraud and contention; and, v. 886, that the first wife of Jupiter was *Metis*, prudence; and, v. 901, that his second wife was *Themis*, justice.

But perhaps the most fruitful source of all was the innate love of fables with which the Greeks were possessed. Hesiod himself owns, v. 27, that false tales, no less than true, may be inspired by the muses—for the entertainment of the happy, and the consolation of the unfortunate.

The immoral tendency and gross indecency of many of these tales was noticed and censured in the earliest times, by those that received the less exceptionable parts of the Greek theology. *Dionysius of Halicarnassus*\* relates, that *Romulus*, who lived about seven hundred years B. C. and two hundred after *Homer* and *Hesiod*, adopted the principal part of the Greek theology, but rejected their immoral and indecent fables; a conduct which the historian himself highly approves. It scarce need be mentioned, that *Aristotle*,  
*Plato*,

\*Lib. 2. cap. 7. (or 18 of the Oxford Edition.)



*Plato*, and other Greek philosophers, treated these fables with the utmost contempt, as did *Cicero* among the Romans, in his books *De Natura Deorum*. Nay, the Phenician priests were at last convinced of the absurdity of their fables when taken in the literal sense, and to excuse them, they pretended they were mere allegorical representations of the operations of nature, for which they were severely censured by *Sanchoniatho* :\* and *Eusebius* asserts, that they were still in his time believed in the literal sense in the towns and villages of Phenicia. *Plutarch*, *Porphry*, and the later Platonics, alarmed at the progress of Christianity, whose teachers successfully exposed the absurdity and turpitude of these fables, endeavoured also to convert them into allegories, but in vain. Most of these allegories were as absurd as the fables themselves; see *Eusebius*, p. 100 and 108. Lord Bacon explains some of them so happily, that he thought they must have been invented by philosophers: but except that of Pandora and a few others, it is plain they had no reference to morals; but his ingenuity might extract *quidlibet ex quolibet*. It should be remembered that Parnel proved the Rape of the Lock to be a treasonable libel.

\* *Euseb.* 39.

The first of these is the fact that the  
 human mind is not a tabula rasa, but  
 is filled with ideas and impressions  
 from birth. This is the doctrine of  
 innate ideas, which has been  
 maintained by philosophers from  
 Plato to Descartes. It is the  
 doctrine that certain ideas are  
 implanted in the mind by God  
 or nature, and are not derived  
 from experience. This doctrine  
 has been attacked by Locke and  
 others, who maintain that the  
 mind is a blank slate at birth,  
 and that all ideas are derived  
 from experience. The doctrine  
 of innate ideas is still maintained  
 by some philosophers, but it  
 is generally regarded as a  
 relic of a bygone age.

— The end —

A  
DISSERTATION  
UPON THE  
CHRONOLOGY  
OF THE  
JUDGES OF ISRAEL.

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BY  
HUGH. B. AUCHINLECK, SCHOL. T. C. D.

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*Read, April 10, 1809.*

**T**HE question I have undertaken to examine is of considerable importance in the results which it indicates, and the consequences to which it leads us; both, as affording new and authentic testimony, to the truth, and accuracy, of the Jewish records; and as obviating one great ground of sceptical objection, and remark, on the alledged inconsistencies, and uncertainty, attending the history, or chronology, of the sacred writings. Nor is it devoid of a certain degree of interest, and attraction, even to those, who, in a religious or historical point of view, may undervalue the relative importance of the controversy. Perhaps, from the innumerable pages of

discussion, and enquiry, with which ingenuity, erudition, or paradox, may have elucidated or obscured the annals of mankind, no single subject can be selected, that unites in so striking an assemblage all the various qualifications which criticism could desiderate, zeal supply, ingenuity present, or literature unfold, upon the decision of a speculative point. The zeal of the polemic, the copiousness of the commentator, the erudition of the scholar, the harsh recrimination of theological bitterness, and the happy temerity of critical correction, have been alternately exercised and exhausted. The passions of the human heart have been lamentably united with, and embittered, the prejudices of the religious education.\* The pretensions of an infallible church will not admit many, to recognize even the possibility of error; while the assumptions of a rational dissent which the professors of reformed belief consistently claim, are carried by others, to lengths the most unwarrantable and dangerous. The theory of evidence, has been perverted to support the purposes of system, and the principles of legitimate

\* Thus Genebrard, a Catholic writer, condemns the critical correction or rational doubts of Funccius, a Protestant, on a passage in the text, in terms the most severe and unqualified:—" Ut os impudentissimum Funccii evomuit," says he, while the great Scaliger defends his faith and possibly his practice also, by retorting on Genebrard the expressions, (which in this instance at least he seems to have deserved,) " Pecus maledicentissimum Genebrardus." But although I may mention this one instance to justify the censure I have bestowed on the conduct and severity of some of the authors I have been obliged to consult; I shall not again offend the taste or the feelings of the reader, by recurring to this disgusting picture of uncharitable recrimination and illiberal animosity.

mate discussion have been arbitrarily rejected, and reclaimed, to suit the views of hypothesis, or elude the authority of argument. To the philosopher, it may not be without a portion of instruction, and utility, to perceive the disputes on a chronologic character assume all the violence and severity of a religious controversy. And while *he* may smile in derision, or sigh in regret, over the weakness of the human intellect, as displayed in the solemn trifling, the solicitous anxiety, or the embittered vehemence, of the combatants; the *christian*, too, may derive advantage from the instructive lesson; and reflect with purer, and more unmixed pleasure, that infidelity has no cause to triumph, in the eventual decision of the question; or the friends of religious truth to fear, that its interests, or its accuracy, must be compromised in the discussion of its evidence. In renewing an enquiry, which for so many ages, has divided the opinions of the learned, little it should seem could be hoped from industry, and little expected from talent; but the arrow of Paris has *sometimes* succeeded, where the spear of Hector had been launched in vain. And the vanity of adding another name, to the hosts, who have tried their strength at the Ulysses' bow of chronologists, may perhaps, be pardoned, or overlooked, when the value of the stake or the importance of the interests involved, is considered. The comparative antiquity of the globe, as far as it concerns mankind, is affected in the enquiry; and the only means we possess, of synchronizing or correcting the histories of nations, is surrendered, to uncertainty and caprice, while this question

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remains

remains undecided. These observations the author would rely upon as an apology for his attempt; and he will venture to hope, that *they* will plead with the candid and the impartial in favour of any effort, however humble, to investigate the causes of this singular difference of opinion, on a question of such acknowledged importance; and to give a solution of its subject, consistent with the legitimate rules for interpreting scripture, and reconciling the difficulties of history.

The great ground of controversy and discussion is the authority of the celebrated passage in the 1st Book of Kings; which affords the chronologic characters of the æra of the foundation of the temple; and the consistency and agreement of the interval therein delivered with the several periods deducible from the history of the Judges, and the various fortunes of the Jewish nation, from the exod to the commencement of the regal state.

The passage itself in question is thus rendered conformably to the Vulgate in our translation :

1 Kings, vi. 1.—And it came to pass, in the four hundred and eightieth year, after the children of Israel were come out of the land of Egypt, in the fourth year of Solomon's reign over Israel, in the month of Zif, which is the second month, that he began to build the house of the Lord."

Before I proceed to develop the peculiar views of my own system and hypothesis, it may be useful to deliver a rapid and concise analysis of the different theories, which have been already submitted on the subject of this enquiry; and to  
examine

examine into the authority and evidence of the grounds on which they have been supported. This, perhaps, will have the further advantage, of impressing more deeply on the mind of the reader, the vast importance which has been, in all ages of the church, attached by the learned, to the solution of the question; and, at least a view of the objections under which these hypotheses severally labour, will prepare the mind for the reception, of a theory simplified from their obscurities, and freed from their errors, and objections. In this indeed I have only the drudgery of transcription to deprecate, or the difficulty of analysis and selection to surmount. Each seems more anxious, as well as more successful, in his attempts to destroy, than to rebuild; to overthrow, than to restore; and the arena seems sufficiently open to renewed competition, as far as the mutual hostility of the combatants could have cleared it for their successors. In effect, the arguments which have induced me to reject the systems already proposed, will be stated *generally* in the words of the adversaries who have noticed them; each exposing the errors he has discovered in the hypothesis he attacks; to be himself successively reprehended for a neglect of the same reasoning, or a commission of the same faults, he had originally reproved in others. Thus, it is, that even the most obscure, or trivial subject of enquiry, may be made useful in the cultivation of mind, and thus, in the language applied to much more interesting and important discussions, *multi pertransibunt, augebitur scientia*.

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The sentiments of the different authors, who have distinguished themselves in this celebrated controversy, may be conveniently ranged in three general classes:—

1. Those, who led by their several hypotheses to lengthen the interval considerably, have endeavoured to give a new and forced *interpretation to the passage*, conformably to their own views of the subject, while they acknowledge its authenticity. 2. Those, who contend that the numbers, assigned in the text, have been falsified by the copyists, and, as they at present stand, are totally irreconcilable to the chronology of the sacred history from the exod. And 3. Those, who support the fidelity of the interval according to the text, and allow absolutely, but four hundred and eighty years, from the exod to the foundation of the temple. It is for the last class, I declare myself, but, upon what different grounds will be seen in the sequel.

1st. The learned Pere Petau, better known by his scholastic appellation of Petavius, whose various works and more particularly his "*Uranologia*," and his "*Doctrina Temporum*," bear equal testimony to his judgment, his erudition, and his sagacity,\* having made every retrenchment which his system and his calculus, would safely permit, found notwithstanding, that the interval between the exod and the foundation of the temple, still remained 520 years or forty years of excess,  
above

\* If, indeed, our applause should not be qualified by a reprehension of the uncandid severity, with which he magnifies the inaccuracies, or misconceptions, of his predecessor, the great Scaliger.



above the numbers in the Book of Kings. In this dilemma, unwilling, totally to neglect the authority of the text, he endeavours to reconcile it, with the period he would assign, by alledging, that the 480 years should be computed from the entrance of the Israelites into the land of Canaan, "which," says he, "finished in *effect* their peregrinations after the exod:." And in support of this new interpretation, he alledges (Deut. 4-45) where the expressions "After they came forth out of Egypt," (which are the same as those in 1 Kings, 6-1), are used with considerable latitude, as including the whole period of their sojourn in the desert; and the passage in the Psalms, (Ps. 114-1-3) stating, that "When Israel went out of Egypt, Jordan was driven back," which, however did not happen until the fortieth year after the exod. And on these grounds he justifies the interpretation of the passage, as referring to the entrance into Canaan, and not including the 40 years passed in the desert. Ravius and Codoman have followed, or anticipated him in his ingenious method of eluding the authority of the sacred text, with this difference, that, the calculus which they would follow enlarges the interval considerably. Codoman determines it precisely to 598 years, "because," says he, "the peregrinations of Israel, did not finish until 118 years after the exod, when the tribe of Dan acquired possession of its allotted inheritance." *Tunc finem habuit exitus vel iter filiorum Israel ex Egypto.* To justify his enlarged interpretation of the expression, "*exitus*," or, "coming forth of the  
the

the children of Israel," (1 Kings, 6-1), he produces the same texts as Petau, (Deut. 4-4-5, Ps. 114-1-3), and to authorize his actual epoch for the commencement of the 480 years, he subducts them, from 598, and thence deduces 118 years after the real exod, for the final settlement in the land.

To say nothing of the propriety with which he first assumes an arbitrary interval, (598 years) and then strains the meaning of unambiguous expressions, to impress the sacred text into the service of his theory, I would ask, what are we to think, in general, of an hypothesis which affords such a facility to system, and such an inlet to conjecture, unsupported, and contradictory; which, in a word, will afford to Petau a latitude of 40 years as the meaning of the term Exodus, and on the same grounds, extend the same interpretation to 118, in favour of Codoman? The force of this objection was so evident and irresistible, that many authors, though adopting the sentiment, refused to support it by so loose an interpretation of the sacred text, and invented other grounds to justify their computation, which would assign a more enlarged interval between the exod, and the building of the temple, alledging, that the author of the Book of Kings has expressly neglected the periods of servitude, and anarchy, which afflicted, and oppressed, the Jewish nation, and has not included them in his calculus; "*Quia tristia & inauspicata, mortua & infausta sunt,*" as Isaac Vossius expresses it; and he produces some degree of evidence that this was the custom of other nations, and of the Asiatics  
in

in particular. Livy, (4-20) remarks, “*Quidam annales velut funesti nihil præter nomina Consulum Suggestunt;*” and Job “wishes the day of his birth may not be counted in the months.” Several, and in particular Pezron, (the great antagonist of Marsham, in every question of chronologic discussion to which that great man has lent the sanction of his authority,) have adopted this solution, and have founded upon it a system sufficiently daring and unauthorized; the latter enlarging the interval between the exod and the foundation of the temple to no less than 873 years, the excess of which above the number assigned in the Book of Kings (viz. 393 years) he fills up with servitudes, and anarchies, in the manner most agreeable to his hypothesis, and his fancy. The idea seems ingenious, except when pushed to the monstrous lengths of Pezron and his followers; but it is no more: it will not stand the touch-stone of judicious criticism, and if it was not sufficiently refuted in itself, from the very fact, (as we shall see in the sequel) of the years of the servitudes being distinctly enumerated and marked in the Book of Judges, we might ask, in the words of Strauchius, “*Quare igitur diluvii, mentionem fecit Moyses, quod universo mundo, incomparabilem attulit tristitiam; & quid fiet de excidii tum Israelitici, tum Judaici historia? Certe si in sacris libris non tantum anarchiæ, sed etiam servitutis, tempora tanquam tristia & inauspicata non memorantur, nec tristissima hæc memorari debuissent.* (*Strauchius Brev. 422.*)

In a word, does a simple date comprehend an history of misfortunes and anarchies, that the sacred historian should fear to announce any thing unfavourable to his nation in marking an epoch or an interval? Surely, this conjecture affords no solution to the alledged difficulty, or no argument for introducing an arbitrary calculus. The authorities of Vossius himself bear out the conclusion against his principle; for the name of a Consul alone affords the requisite series of chronology. But, what shall we alledge against the temerity of an author, who forgets that he is commenting on the history of truth—that this history “was written for our instruction,” and that, containing the dreadful denunciations of the vengeance of the Almighty, it should also contain a record of those punishments, which are at once the completion, and the sanction, of his commination and his law. Surely, he should have remembered, that the great and singular characteristic of the scriptural history—that, which distinguishes it, and distinguishes it to its honour, from the history of every other people, is the inflexible impartiality, both in respect to person and to circumstance, that marks its narration. In the very Book of Kings, to the author of which he ascribes this disingenuous suppression, he will find every instance of infliction, and calamity, referred to the national disobedience and guilt. Vide 2 Kings, 17-7, & seq.

The second class, or those who contend for an alteration of the text, or an error of the copyists, is more formidable, and their

their arguments possess infinitely more of consistency and strength. I shall proceed to give a summary of their reasoning and hypothesis :

The great argument common both to this class and the preceding, is the disparity between the interval in the Books of Kings and that reported in the Acts, xiii. 20. where St. Paul says, "After the conquest of Canaan, God gave them Judges for 450 years, until Samuel the Prophet." And Louis Cappellus declares expressly, "Necesse est alterutrum horum numerorum (Scil in lib. Regum & Acts) esse falsum non possunt enim simul consistere." Vossius, the elder, agrees with him, adding, according to his own supputation, "Ant centum annis justum numerum auxit Lucas sive Paulus vel Regum lib. 1. sive III. (scil. counting the 1 of Samuel the first) centum anni desunt." Perizonius forcibly contends for the error of the copyists, and concludes, "Mihi, modestius longe & reverentius videtur, mutare istic unam numeri notam, quam hic, complura exturbare penitus vocabula." Sulpicius Severus also says, "Non dubito Librariorum, potius negligentia veritatem fuisse corruptam, quam ut propheta, erraverit." (Hist. Eccles. 1-40.) Serrarius likewise coincides with Vossius and Perizonius, only, that where *they* would hold an error of an hundred years, in 1 Kings, 6-1. reading 580, he would wish to read 680, "& pro," says he, "quadringentissimo, legere sexcentissimo, quam cum tricis innumeris, anxie, ne dicam misere conflictari, ac dum unius loci emendationem metuo, sexcentis me difficultatum laqueis involvere."

The opinions, too, of almost all the Greek chronologists, who universally appear to neglect the authority of the Book of Kings, and reckon considerably more than it admits, seem also to afford a strong ground of evidence that the passage is corrupted, and that they read a different interval in the copies of their own times; for even Eusebius himself, who in his Chronicle, quotes, and follows the supputation of the 1 Kings, 6-1, yet, in many other places, and particularly in the preface to his Ecclesiastical History, admits a different calculus, and enlarges the controverted interval agreeably to the other chronologists: besides, the Greek copies of the Septuagint read 440, (except one exemplar mentioned by Usher); and the venerable Bede acknowledges, that in some MSS. of his time, he had found six hundred instead of four, or according to Hardouin, five hundred instead of four. His words seem to imply he had found 680: “Et ne quis dicat falsam nos sequi regulam, 480 annorum, quasi 680, sint potius juxta quaedam exemplaria computandi,” &c. Omnes apud Vignoles, vol. 1. 185, &c. & auctores cò citatos videsis.

And Josephus, also, although he uniformly reckons the years of the Judges, (except in the instances of Tholah and Abdon, which appear to be faults of the copyist, and are in themselves trifling,) conformably to the Hebrew, yet evidently makes no account of the supputation, 1 Kings, 6-1; for he says, Antiq. 8-2. “Solomon began to build the temple 3102 years after the creation, 1440 after the deluge, 1020 after

after the vocation of Abraham, and 592 after the departure from Egypt.”—Edit. Gen. 1609.

Euty chius also, the learned patriarch of Alexandria, with whom we have become acquainted through the labours of the illustrious orientalist Pococke, adds his name and authority to the hosts already mentioned, reckoning from the exod, to the reign of David 606 years, adding then, the 40 years of David, and four first of Solomon, agreeably to 1 Kings, 6-1, we have 650 years from the exod to the foundation of the temple.

In fine, to avoid accumulating evidence and materials unnecessarily, we shall conclude with Clemens Alexandrinus, whose works, in arranging the series of events in ancient history; in synchronizing the times of sacred and profane chronology; and in preserving valuable notices from the writings of several authors, who have not themselves come down to us, will ever be highly estimated by the learned. “From the beginning of the Judges,” says he, “until the end of the government of Samuel, there are 463 years and 7 months, (and he counts Joshua the first judge,) after that,” he adds, “Saul reigned 20 years alone, then David 40; so that, according to our chronology, which is most exact, if to the 523 and 7 months to the death of David, you add the 120 years of Moses and the 40 of Solomon, there are from the birth of Moses to the death of Solomon, 683 years and 7 months.” We see then, that Clemens, who appears to have considered  
this

this subject very attentively, (giving us, as we have noticed, minute chronologic characters omitted by less accurate historians,) reckons from the exod, in eightieth year of Moses, to the foundation of the temple, in the fourth year of Solomon, 567 years and 7 months :

<i>Years.</i>	<i>Months.</i>	
463	7	from Joshua to Samuel,
20		Saul,
40		David,
4		Solomon,
40		in the wilderness.
<hr/>		
567	7	
<hr/>		

Thus I have, I trust, impartially stated the evidence and authorities against the opinion I have thought proper to adopt; and doubtless it will appear forcible and almost decisive: yet many and great names may be adduced in support of the controverted passage, (1 Kings, 6-1,) whose theories I must shortly recapitulate, and animadvert upon, before I produce my own system, which although agreeing with them, in supporting the authenticity of the text, yet, as will appear, differs most materially in the grounds on which it rests, and in the answers which it opposes to the adherents of the contrary opinion.

3d. The first name, in point of antiquity, who upheld the authenticity of the contested text, was Eusebius, bishop of  
Cæsaréa



Cæsaréa, whose authority, in questions of history and chronology, is deservedly respectable. The translation of his Chronicon by Hieronymus or Jerome, which is to us the original, (as the Greek Eusebius of Scaliger is rather a monument of the genius and industry of the editor than an original work;) made his opinion familiar to the Latin Church, which universally adopting the Vulgate translation from the Hebrew, was induced, from a respect to its authority, to receive the computation of Eusebius in this point, while it differed from him in almost every other. The great Scaliger supported it with all the earnestness and zeal of an editor, and an host of learned names bowed to his chronological supremacy; until in the seventeenth century, the Vossii, the Capelli, Louis, and James; and in general the French critics and chronologists, began to sound the trumpet of sedition, or enquiry, against the authority of Scaliger, and the authenticity or interpretation of the text; fortifying their doubts and hesitation by the arguments already recited, and more particularly by the evidence of the Greek Fathers. Yet the antient faith of chronology did not want its advocates, in this hour of historic heresy and dissent: and Usher and Marsham stepped forward, with no mean apparatus of solution and reasoning, in its defence.

The grand principle on which *they* proceed, is to include the terms of servitude and oppression in the years of repose, or in the several periods assigned to the government of the Judges; and by this expedient, they endeavour to adhere to  
the

the 480 years mentioned in the text. This, Usher supports on the ground, that Hebrew numbers should be read as if they were ordinal and not cardinal, as the grammarians express it; that is, when the historian relates, the land had rest 40 years, it means, that it commenced to be in repose in the fortieth year after the conclusion of the preceding repose.

On this principle, he thus constructs his table:—

A.M.

3263 Joshua, 6 years of government.

3269 First repose, land divided.

Government of the Ancients.

3301 First oppression of Chusan Rishathaim, 8 years.

3309 Othniel, in the fortieth year after the first repose.

3371 Second oppression, or servitude under Eglon, 18 years.

3389 Ehud after Othniel, in the eightieth year.

3409 Third oppression under Jabin, 20 years.

3429 Deborah, third Judge in the fortieth after Ehud.

3462 Fourth oppression, Midianites, 7 years.

3469 Gideon, fourth avenger, in the fortieth after Deborah.

Add 9 intervening years.

3478 Abimelech, 3 years.

3481 Tholah, 23 Do.

3504 Jair, 22 Do. fifth oppression, Ammonites, 18 years  
inclusive.

3526 Eighth Judge, Jephthah, 6 years.

3532 Ninth, Ibsan, - - 7 Do.

3539

- 3539 Tenth, Elon, 10 years.  
 3549 Eleventh, Abdon, 8 Do.  
 3557 Thirteenth, Eli, 40 Do. including sixth oppression.  
 3558 ——— of Philistians, 40 years, and thirteenth Judge.  
 3577 ——— Samson, - 20 Do.  
 3597 Capture of the ark, and beginning of the government  
 of Samuel, for 22 years.  
 3619 Saul, first King, 40 Do.  
 3659 David; - - - 40 Do.  
 3699 Solomon.  
 3703 Fourth year of Solomon, and foundation of the temple.  
 Add to these the 40 years of Moses in the desert, and the  
 sum is exactly four hundred and eighty years.

3263 beginning of Joshua.

Subduct 40 for the æra of the exod.

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3223

Add 1 Kings, 6-1, 480

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Sum, 3703 foundation of the temple, as above.

Marsham has nearly agreed, at least in principle, with Usher, but differs in the arrangement of the periods, and the arguments by which he supports them. It will not be unnecessary or useless, to subjoin a view of his system and reasoning. It is as follows.

NOTE.—*My edition is that of Leipzig, 1683, in quarto—the English editions are commonly in folio.*

## A.M.

- 3267 Joshua, 25 years.  
 3273 ——— Division of the land.  
 3292 Commencement of idolatry, which continued 34 years.  
 3326 First servitude under Chusan Rishathain, 8 years.  
 3334 Othniel, first Judge, 40 years.  
 3374 Second servitude, under Eglon, 18 years.  
 3392 Ehud, second Judge, 80 years, including the servitude.  
 3412 Under Jabin, King of Canaan, 20 years, and  
 3432 The government of Deborah and Barak, 40 years, in  
       the North, of Israel.  
 3472 Fourth servitude, under the Midianites, 7 years.  
 3479 Gideon, fourth Judge, 40 years.  
 3519 Abimelech, fifth Judge, 3 years.  
 3522 Tholah, sixth ——— 23 ———  
 3545 Jair, - seventh ——— 22 ———  
 3567 Fifth servitude, under the Ammonites, 18 years, in the  
       Western side; and the Philistines, on the East, who  
       ruled 40 years, until Samuel.  
 3585 Jephthah, eighth Judge, 6 years.  
 3587 Twelfth Judge, Samson, for 20 years, in the Eastern  
       tribes with Eli, thirteenth Judge, during the Philistine  
       oppression.  
 3591 Ibsan, ninth Judge, in the West, after Jephthah, 7 years.  
 3598 Elon, tenth Judge, in the West, 10 years.  
 3607 Samuel, fourteenth Judge, after Samson, for 16 years.  
 3608 Abdon, eleventh Judge, in the West, 8 years.

7 years

7 years deficient, in the account of the Eastern Judges.  
3623 Saul, first King over all the tribes, after Samuel's government of 16 years.

Thus it appears, he calculates the interval between Joshua and the beginning of Saul, 356 years, to which if we add the 40 years of Moses' government in the desert, the 80 years of Saul and David, and the four first years of Solomon, agreeable the passage, 1 Kings, 6-1. we shall have precisely 480 years, as in the disputed text.

From 3623 beginning of Saul,  
Subduct 3267 ————— Joshua.

Remains, 356 Interval between them.

Add, 40 of Moses in the desert.

— 80 of David and Saul, 40 years each.

— 4 of Solomon.

Sum, 480 years from the exod to the foundation of the temple.

It is evident, then, that the principle both of Usher and of Marsham, which originally was invented or introduced by Eusebius, in his *Chronicle secundum Judæorum traditiones*,\* as he says, appears satisfactorily to solve the difficulty, at least so far as to agree with the sacred historian, in  
M 2
reckoning

\* The *Chronicon Paschale* also, in the case of Othniel, to whom it attributes 32 years, remarks, "that the 8 years of the preceding oppression are to be included, *κατα τα Ιουδαϊα παραδοσιας*."—p. 78. Edit. Du Cange

reckoning only 480 years, and that, of course, we may indifferently adopt either, according as we approve of their system and reasoning. It is necessary, then, to state the arguments that have induced me to reject the hypotheses of both, and to propose another, that should appear more completely to fulfil the conditions of the problem, as the analysts speak.

With regard to the system of Usher, I may remark, first, that he has departed from his original principle, in allotting nine additional or intercalary years between the government of Gideon and Abimelech, for which he gives no reason, except we receive as one, his simple assertion, that he acted on better grounds than other chronologists, (*meliore ratione*, &c.) who, from a similar motive, (*viz.* that of completing the sum of 480 years required by the text,) have granted to Joshua 16 or 17 years, and this when the sacred text (Judges 8-20.) says expressly, “The country was in *quietness* 40 years, *in the days of Gideon.*” If he had been consistent with himself, Abimelech should have succeeded in the same year that the 40 years of repose after Deborah concluded; or, if he had been consistent with Scripture, he should have allotted 40 years to Gideon, instead of nine.

2d. Again, in allotting to Joshua only 6 years, he is certainly at variance with the whole stream of antiquity, as the fathers unanimously allow him 27 or 30 years at the least, (*vide* Vossius Capellus, Scaliger, and the authorities they cite, to which add the Alex. Chronicle, which allows him  
27 years.

27 years. I quote the copy, in the Louvain edition of the Fathers, in Marsh's library), and evidently contrary to the authority of Scripture, (Joshua, 23-1.) where Joshua is said "to have waxed old and stricken in years," *after the conquest* and the division of the land, and (c. 24. v. 29.) he died aged 110 years. Now, we learn, (Joshua, c. 14-7.) that Caleb was 40 years old when he was sent to view the land with Joshua, and as *he* (Caleb) was 85 years of age at the division of the land, (Joshua, 14-10.) it will follow, that, supposing Joshua nearly of the age of Caleb, (which certainly has some verisimilitude, as he would be taken in the flower of his youth for an office of such responsibility and exertion as that of a spy), that he survived the division of the land, at least 15 years. On what principle, then, does Usher abridge his government to six?

3dly. The sense of the sacred historian, (Judges, c. 3-4-11.) appears evidently to allot but 40 years repose after (or, as Usher will have it, *to*) the period of Othniel's victory; yet his calculus would give us 62 years, viz. from A. Jul. Per. 3309, to the oppression of Eglon, 3371.

Similarly, he allows but 20 years to Ehud, in place of 80, (Judges 3. 30.); to the third repose, instead of 40 years, he allots but 33; to the fourth, only 9, as we have seen in the first objection.

4th. His supputation will not agree with the message of Jephthah to the king of the Ammonites, (Judges, c. 11. v. 26.) in which he computed 300 years from the conquest of the

Amorites

Amorites until his time: for the beginning of Joshua is placed in 3263, and that of Jephtha, 3526, affording an interval of 263 years, nearly 40 less than the period assigned.

5th. He does not adhere to his own proper principle of estimating the cardinal numbers, as if they were ordinal, but arbitrarily rejects and resumes it, as it suits his convenience, or his theory. *Cumque numerorum in temporum notatione ea sit ratio ut interdum quando, res aliquis contigerit indicat, interdum quam diu duraverit; in annis oppressorum posteriorem explicationem in annis quietis terræ, priorem hic accipiendam censemus.*

The objections to the system of Marsham are, in part, the same as those I have urged against that of the learned Usher; yet Marsham has avoided some of his errors, as we may observe in the period he assigns to Joshua, Gideon, and in some other points. But, as he found that this would materially interfere with his calculus, and his object, which was to compute according to the text 1 Kings, 6-1. he was compelled to invent a new expedient to abridge the remaining years of the Judges, in order to include only the precise interval of 480 years. He admits, with the sacred historian, that after Ehud had slain Eglon, king of Moab, the land had rest 80 years, and so avoids the error, or at least inconsistency, of Usher. But he contends, that it was only in the Eastern tribes; for that, in the 20th year of that repose, Jabin, king of Canaan, who reigned at Hazor, near (or in) the tribe of Asher,



Asher, (or, according to Cellarius and Reland, Naphthalim), invaded the Western tribes, and subjugated them for twenty years: but Barak, of the tribe of Naphthalim, having defeated Sisera, the *whole* country enjoyed peace 40 years, which concluded with the 80, which the Eastern tribes enjoyed.

2d. He preserves this distinction of the tribes, in the sequel, as appears from the table. After the death of Jair, the seventh Judge, the Israelites were attacked in concert by the Ammonites on the East, and by the Philistines on the West, (1 Judges, c. 10. v. 7. 8. 9.) On the Eastern side, after the oppression of the Ammonites, for 18 years, Jephthah, Ibsan, Eglon, and Abdon, were Judges, for 31 years; during which the Eastern tribes were at peace. On the West, the Philistines ruled 40 years until Samuel, who governed 16 years before the choice of Saul to be king. This makes 56 years, so that Samuel began to judge the Western tribes in the last year of Elon, and was co-temporary with Abdon in the East. As for Samson, we read, "he judged the people, 20 years in the days of the Philistines," (Judges, c. 15. & 20.) or during the period of the 40 years their domination lasted; but he did not deliver them, neither did Eli accomplish their deliverance. He died in the twentieth year of the servitude under the Philistines, after the captivity of ark, and his judicature, whenever it commenced, was only a civil jurisdiction. ("Illius judicatura, quandocunq; cæperit, non alia fuerit, quam litium pro Pontificali auctoritate, disceptatio.

tatio jurisquedictio.”)\* This account of Marsham’s system, which it was necessary to premise, in order to make the table which I have given above from him, perfectly intelligible and clear, is extracted literally from his great work, (my edition is in quarto, p. 307, &c.) and from it, it is evident, that he includes an interval of 169 years within 49.

Jud. c. 10. 8. . . . .	18 years under the Ammonites.
Judg. 12. v. 7. and sequel,	31 years, four Judges, Jephthah, Ibsan, Elon, and Abdon.
J. C. 13. v. 1. and sequel,	40 years under Philistines.
C. 15. v. 20. ————,	20 ———— Samson.
1 Samuel, 4. v. 18. ————,	40 ———— Eli.
	20 after the return of the ark.

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“ Hujus Synchronismi ratione evanescent difficultates,” says he, “ & exundantes numeri intra ripam colliguntur.”

1st. Little will be necessary to refute this system in some of its leading principles, for Scripture does not acknowledge this distinction of two contemporary Judges. (Judg. 10. 7. 8. 9.) The Israelites were attacked, both by the Ammonites and Philistines, to the East, as he alledges; but it adds, (v. 9.) “ They passed the Jordan immediately, and attacked the other tribes,” who, according to him, were at peace.

2nd. Three Judges, whom he places over the East, after Jephthah, were really from the West: Ibsan, of Bethlehem,  
(whether

\* Marsham Sæculum. XI. p. 308.

whether of Judah or Zebulun, both to the West, (Jud. 12. v. 10.) Elon, of Zebulun, (v. 11.) Abdon, of Pirathon, “*in the land of*” Ephraim, (v. 13. 15.)

3d. If the Western tribes were oppressed by the Philistines in the time of these Judges, how can he add, “The country enjoyed peace during their government?”

4th. If, in the time of Jephthah, Ephraim was in subjection to the Philistines, how could he, in the civil war, destroy 42,000 of them, without the Philistines interfering in defence of their subjects and tributaries.

5th. In fine, he makes four Judges contemporary, as we have seen, without any scriptural authority, which we can by no means admit, as the whole tenor of the scripture, (except perhaps, in one instance,) marks the Judges as successive. (Vide Judges passim.)

It could not be supposed that so many errors and unsupported assumptions, in the hypotheses of these great men, would not have been perceived and pointed out by those who followed and examined them. In effect, what has been attributed, with justice, to Locke, in metaphysics, may be applied to Usher and his illustrious co-adjutor, in chronology. They have themselves thrown so brilliant a light on the subjects of their science and pursuit, that the subsidiary rays collected and concentrated by their genius, have enabled us to point out the path from which they deviated, and to detect the errors which misled them. These objections which I have

urged against their hypotheses, have been partly brought forward by several able advocates of the contrary system, and more particularly by the accurate and copious Vignoles, and appeared so forcible and convincing, that despairing after the failure of such minds as Usher, Marsham, and Scaliger, to support satisfactorily the authority of the Hebrew text, they began to found themselves on the reading of some Greek copies, and the general opinion of the Grecian Fathers, supported by the passage of the Acts mentioned above; and proposed to alter the contested passage, 1 Kings, 6-1. by reading 580 or 680; or by interpreting it in a different manner, and supposing it omitted the years of the servitudes and anarchies. Capellus and Vossius support the new reading of 580 years, which they alledge will completely solve every difficulty, and take in the whole period.

I have already submitted a view of their arguments, and after I have presented the hypothesis which I have adopted, I shall, in the remarks upon the objections that may be alledged against it, urge other reasons in refutation of their system, and, I trust, demonstrate that my own is more consistent, satisfactory, and conformable.

But, before I proceed to deliver the peculiar views of the theory I propose, I must premise some general observations, tending to elucidate the system and method on which I have proceeded.

Ist.

1st. The duration of the government of the four first Judges or avengers is not expressed in the sacred historian; or it is very differently expressed from that of their successors.

2dly. That the terms of the Vulgate, "quievit terra," or of our translation, "that the land had rest," signify a peace, or cessation from all hostility during the expressed period; which peace or rest is concluded, only, by having again recourse to arms, without being interrupted by any servitude intervening, unless when the people rose to avenge themselves on their oppressors, so that every such expression, "quievit terra," or "the land had rest," is to be understood as declaring, that such a period intervened without hostilities interrupting it; and when the words "a præliis," or, as our translator has it, "from war," (Jos. 14-15.) are not expressed in the Book of Judges, they are to be understood.

3dly. That we have no authority from Scripture for understanding the words, "the land had rest," as synonymous to the terms, "the Judge presided," as most authors have done, since it will not be clear, if we do *thus* understand them, why the sacred historian should not have been consistent in his expression, as the Judges, after the four first, are distinctly mentioned to have "judged Israel," for the assigned periods.

To prove the first, it will not be necessary to look farther than the sacred history itself, (Judges, chap. 3. & 4. passim.)

and to consider properly the force and evidence of my third observation.

On the second, I would remark, that according to the acknowledged principle, "that an author is his own best commentator," and the admitted conformity of style in the earlier historic records of the Jewish nation, I have produced a passage from another book (Joshua, 14. 15.) of similar style and period, which absolutely expresses the words I would have understood in all passages of the same tendency and import; so that unless we understand the expressions in the manner I have proposed, we convict the author of the Book of Judges of a manifest inconsistency in his narration, unknown to the books of the Old Testament, and contradictory to the uniform simplicity of the Eastern genius, which delights to narrate the same fact in a similar style of language, and cast of thought; and finally, that it was so understood by the ancient interpreters, as many of the earlier Vulgates add "a præliis," as in Jos. Vide Simon sur le vieux Test.

The third observation, I trust, is already fully elucidated in the preceding remarks, and is, in itself, sufficiently clear. But we want not their authority to support or to confirm our supposition, since we can refer to another passage, so completely in point, that it is surprising how it could have been overlooked in the decision of this question. In the 2 Book of Chron. 17 chap. 1 verse, we are informed—Asa succeeded his father Abijah, and "in his days the land was quiet ten years."

years." Here sovereignty is distinctly separated from repose, and it is sufficiently remarkable that the same terms are used in the Book of Judges, 8-28, in relating the repose immediately succeeding the conquest of Midian.

There are, indeed, but two modes by which a rational or judicious critic can attempt to reconcile or to correct an author on whom he comments. He must either adhere to the strictness of the letter, and invent a method of accounting for apparent inconsistencies and contradictions, amending with judgment and altering with cautious and deliberate investigation. Or, conceiving the true spirit and meaning of the author, the system he pursues, and the method he develops, to be inconsistent with the strict expression of the letter, he must reject its authority, where it fetters and constrains him, refer its errors to the mistakes of a copyist, and endeavour by a bold, and hardy, or a subtle, delicate, and discriminating criticism, to derive from the author himself, or from sources collateral and extrinsic, evidence and grounds to correct and to alter his original; to justify his doubts of the authenticity of a passage, or to afford him lights whereby to restore and to amend it. Usher and Marsham are willing to enrol themselves among the first class, whenever it is possible, and the former explicitly declares, speaking of an error in the copyists, "*Quidvis potius dicendum fuerat quam ad hoc desperatum remedium recurrendum.*" (Chron. p. 87-6.) While the numerous hosts who combat their authority and interpretation,

interpretation, find no difficulty in ranging themselves with the latter class, and aspire rather to the praise of ingenuity in the critic, than that of zeal or fidelity in the commentator. It is surprising, that Usher and Marsham, who display an anxiety so laudable to uphold the authenticity of the text, in a single point, should have overlooked or neglected to observe its incomparable accuracy in many others, should have agreed to convict the historian of an inconsistency of expression unknown to the sacred writings, and without reason or authority presume, that repose, and jurisdiction, are synonymous, and this, when every passage in which the term "repose," occurs is directly contradictory to their sentiment, and at variance with their hypothesis. It may seem, that the system of Usher is not immediately subjected to the severity of this censure, since, on grounds nearly similar to my own, he holds the terms to bear a different construction. Yet a consideration of the objections I have (after his adversaries) urged against his theory, will clearly demonstrate, that he is obnoxious to this censure in substance and spirit, if not in letter and expression, because he arbitrarily rejects the authority of the text, and substitutes intervals and periods unknown and unrecognized. He attempts to define, where the sacred historian affords him no data even to describe; he assigns periods without evidence, and limits epochs on assumptions, perfectly gratuitous, (vide objection 3. above); and all this on the principle of adhering to the *literal* fidelity of  
of



of the text, 1 Kings, 6-1. If the accurate archbishop, or the learned Marsham, had examined the text with unprejudiced judgment; if they had followed, step by step, the detail of the narrative, and had collected and applied the various minute circumstances of elucidation and commentary which may be gleaned from the perusal, they would not have been compelled to adopt, or invent, systems so unsupported and so unauthorized, to defend a single text by the disregard or neglect of several equally authentic and express. And perhaps, also, had their adversaries and opponents, who have been more willing to point out and to reprobate the errors of these great men, than to imitate the example they have afforded of a laudable anxiety for the interests of truth, and for the authenticity of Scripture, been less desirous of acquiring the praise of ingenuity and originality, than of establishing their titles to the more solid applause of accuracy and candour; *they*, also, would have perceived, that, the text, within itself, affords materials to justify and to reconcile its apparent inconsistencies; and that, new light, authority, and evidence, in favour of the truth and testimony of the whole, may be struck out from the collision and analysis of the parts; that the few rules and observations we have laid down are to be found in Scripture, as they are in reason; and that, from a simple adherence to the principles they indicate and propose, every difficulty will be simplified, corrected, or removed. It must be evident, that the sacred historian,

torian, agreeably to the uniform tenor and spirit of the biblical records, intends to present us with a chronological order and series in his narration. The author of the Book of Kings undoubtedly, in marking the interval that had elapsed between the exod and the foundation of the temple, had a view to prevent any difficulty or hesitation that might arise from the dubious calculus pursued in the history of the Judges; and the precautionary wisdom and foresight which directed him, is clearly manifested in the event. It is, indeed, almost impossible to derive any unobjectionable and consistent system from the numbers nakedly assigned in the narrative, unassisted by the grand epoch afforded by the text, (1 Kings, 6-1.) and the various circumstances casually disclosed in the history, which tend to elucidate and confirm it. The numberless variety of opinions which have been delivered upon this subject, and which all pretend to stand on the same ground of adherence to the assigned periods of jurisdiction and servitude, are abundant proofs of this. Among the ancient chronologists, the periods and intervals oscillated between the 480 or 600 of Eusebius, and the 757 of Nicephorus; Apud Vignoles, but Nicephorus ad calcem Syncelli in Goar's edition, Paris, 1652, reckons from exod to David 630, which would give only 674 to the foundation of the temple; while, among the Christian writers, the younger Vossius and Pezron, as we have seen, have discovered authority and evidence to enlarge it beyond even the

the extreme of Nicephorus, above an hundred years. Convinced that the design of the sacred historian is, to afford us the exact interval, which elapsed between the foundation of the temple and the exod; and equally convinced, from the failure of so many, that any attempt to derive a consistent period from the Book of Judges, without having recourse to the passage in which the epoch is assigned, would be fruitless and unsuccessful, I can devise but two methods of proceeding: first, either to defend the fidelity of the passage absolutely, as we find it in the Vulgate and the Hebrew; or else, to adopt some correction that will not completely deviate from the original, and read 580 with the elder Vossius, or 680 with Serrarius, and some others. I have determined in favour of the former, on grounds which I shall proceed to develope, and which I hold to be equally clear and irrefragable. Indeed, the principles of interpretation I have premised, would, of themselves, lead me to this determination, since the correction of Vossius is only adopted in order to include the periods of repose and servitude consecutively, considering repose and jurisdiction as synonymous—a position which I have endeavoured to prove is equally unsupported by Scripture; and, as I shall now proceed to demonstrate, is disavowed by the rules of sound criticism and legitimate interpretation. The grand difficulty under which those labour, who would support the contrary hypothesis, “that the years of repose are to be supposed synonymous with the jurisdiction of the Judges,” is,

that they extend the period of life beyond the limits allotted to humanity. Pezron and Vossius appear to make little account of this objection, but even Marsham himself, who observed so many errors and inconsistencies in the scheme of Usher, (which calculated the reposes in retrospect, rather than in progression,) that he imagined the only means of avoiding them was to account the reposes consecutively, has afforded an eminent and striking instance of this oversight, which is alone sufficient to overthrow the authority of his system. He places the term of the judicature of Othniel A. J. P. 3374, 101 years, according to his own calculation, after the division of the land.\* Does he forget, that Othniel must have been alive, and even come to man's estate, at that period, since Caleb soon after gave him his daughter in marriage, on his conquest of Kirjath Sepher? (Jos. 15-16. compared with Jud. 1. 13.) and we know that the period of marriage was later then than in after ages.† It follows, Othniel must have

\* It is remarkable, however, he does not attribute the whole repose of 80 years to the government of Ehud. He, indeed, allots him but twenty years, "*Supponimus Jabinem mortuo Ehudo in Israelitas impetum fecisse circa annum ab expulsis Moabitis vicesimum.*" —(Sæc. xi. p. 306. quarto.) And if he does not expressly attribute the 40 years of the first repose to the judicature of Othniel, he does not, as in the case of Ehud, give us any reason to suppose he rejects the supposition, and, at least, he is partially subjected to our censure, since he commences his jurisdiction 65 years after the passage of the Jordan, when he must have been nearly, or perhaps above, an hundred years of age.

† Isaac and Esau married, when arrived at the age of 40. Pere Pezron has no objection to suppose Othniel lived 180 years, or even more.

have been near 140 years of age at his death. We are told, on demand, the Holy Scripture, which records Joshua to have been very "old and stricken in years," when he could not have yet reached a century; which mentions Gideon dying "*in good old age*," but much younger than Joshua; which relates the great age of Eli, so that he had even lost his sight at ninety years; which speaks of Jesse, the father of David, (1 Saml. 17-12.) as considered and respected in Israel as an aged man; which records, in like manner, the diminution of human life, in the days of Moses, even to seventy years; and which had taught the Israelites to look upon length of years as a peculiar mark of the favour of Heaven, (Deut. 11. v. 21.) (1 Saml. 2-32.); have dwelt on, or, at least, commemorated this prolonged existence? In vain will my adversaries array against me the authority of the text; it is evident, their mistake originates in their failing to distinguish two things, which are, however, clearly discriminated in the sacred historian, viz. the death of Othniel, and the period during which the land had rest from war. (Jud. 8. v. 11.) The Vulgate unites the latter part of the alledged verse with the beginning of the following, in this manner: "And Othniel, son of Kenaz, died, and the children of Israel did evil again in the sight of the Lord;" thus evidently distinguishing the period of repose, mentioned in the former verse, from the duration of his life, after his victory, which could not have

been long, on account of his great age when he obtained it. The 80 years attributed to Ehud are liable to the same objections, on grounds as irrefragable and evident, but more particularly on the hypothesis of Marsham and his followers, which admits, as we have seen, that *during* this *supposed* jurisdiction, the servitude under Jabin and the government of Barak took place, contrary to the express words of Scripture, that (Judg. 2. 17-18.) “the Lord delivered them from their enemies *all the days* of the Judge,” whom he had raised to defend them. Happily for the authority of the system I have adopted, the spirit and expression of Scripture itself, unite in this last instance, to confirm and establish it. The text (Judg. 3. 30) informs us, that after the death of Eglon, “the land had rest 80 years;” and afterwards, in the first verse of the ensuing chapter, proceeds to relate, “and the children of Israel again did evil in the sight of the Lord, when Ehud was dead.” This should seem to be after the expiration of the 80 years mentioned before, as many have understood it, and accordingly have attributed that whole period to the jurisdiction of Ehud; but the last verse (v. 31.) of the preceding chapter expressly overthrows this supposition: it informs us, “*And after him, (Ehud) was Shamgar, the son of Anath, which slew of the Philistines six hundred men with an ox-goad, and he also delivered Israel.*” Here are all the requisite and usual descriptive terms, which are applied to the earlier Judges;  
succession

succession after Ehud; opposition to the enemies of his country; and deliverance of his people—nothing can be more precise, consistent, and appropriate. His titles are so far recognized, that Josephus (Ant. 5-5.) assigns him one year of jurisdiction, while the Chronicon Paschale, and the Chronicon Latinobarbarum, published by Scaliger, extend his period to 24 or 25 years, which they retrench from the 80 usually attributed to Ehud, and grant to the latter but the remainder. But the Scripture is *silent* as to his government, rather I should say, *speaking* as to the truth and justice of our system.

1. Because, unquestionably, the period of one of the four first Judges or Deliverers is not mentioned in *any* manner, however equivocal or ambiguous.

2. Since his judicature intervenes between the conquest of Moab and the subjugation of Israel, (c. 4. v. 2.) to the king of Canaan, which the text assures us took place “*in consequence of the idolatry, (or rather vices,) of the people, after the death of Ehud*” we find, in this, as in the former instance of Othniel, that there is an express distinction drawn between repose and jurisdiction; the death of Ehud and the repose of 80 years being clearly contradistinguished. If not, how could the people require a new deliverer, during the life of their former chief? contrary to the text produced above. (Judges, 2-18.) Or, shall we be compelled to adopt the method of eluding the authority and expression of the historian,

torian, invented by Marsham and recognized by the marginal notes on the text, and suppose cotemporary Judges? The text itself, as we shall see in the sequel, would condemn us.

But another remark occurs here, still more decisive on this subject. It is that the supporters of the system, "that the repose means the jurisdiction of the deliverer," are reduced to this alternative, that they are compelled to make the years of the succeeding servitude commence immediately after the death of each Judge, or to suppose an anarchy always succeeds it.' The first is altogether indefensible, because the text, in every instance, expressly assures us, that it was the idolatry of the people that provoked the wrath of Heaven, and subjugated them to their enemies. But this relapse always requires time to be consummated, for, "the Almighty is slow to anger, and of great patience and long suffering;" or else, we are to suppose their idolatry uniformly commenced during the last years of the Judge who had saved them, on their former repentance, and who now tolerates their disobedience—a supposition contradicted as it is, in express terms by the text, (Jud. 2. 19.) that, I trust, will not be lightly hazarded. The second alternative only remains, that an anarchy always succeeded the term of each jurisdiction during which the people had time to relapse into idolatry—a position totally unsupported by Scripture or reason, and which at once abandons the series of sacred chronology to uncertainty, system, and caprice; and which, independent  
of



of the gratuitous assumption of its principle, we shall find, in the sequel, positively contradicted by facts. I trust it is now clear, that the jurisdiction of the Judge is not always to be understood as synonymous with the term of the repose. If it is, why does the sacred historian deviate from the consistency of his expression, and inform us that the land had rest forty years, "*in the days of Gideon?*" (Jud. 8. 28.) If the forty years repose was synonymous with the term of jurisdiction in every case, surely the additional sentence was inapplicable and redundant; evidently, at least, calculated to inspire hesitation and distrust, whether it ought to be understood in the former instances or not, which is quite inconsistent with the usual precision, clearness, and accuracy of the Jewish writings. But upon the hypothesis we adopt, which does not, until the time of Gideon, assign the periods of the Judges' authority, all this obscurity, misapprehension, and mistake is cleared away, every period becomes definite, harmonious and consistent, and the sense and expression of the sacred historian, is adhered to with scrupulous attention and fidelity; we discover a clear reason for his apparent deviation from usual terms; the precision of the text receives new demonstration and evidence; and the term "repose" acquires its natural and obvious meaning, as an interval between the epochs of warfare and hostility. And it is peculiarly observable, that, upon our system, we assign a period succeeding every deliverance, equivalent to the length of a generation,

before

before Israel again provokes the wrath of Heaven, by relapsing into idolatry and disobedience; agreeably to the text, "And Israel served the Lord, all the days of Joshua, and all the days of the elders that over-lived Joshua, and which had known all the works of the Lord that he had done for Israel," which, it is natural to suppose, equally influenced them in all future time.

It is now of importance to investigate the epoch and term of the 40 years repose, which the sacred text mentions to have succeeded the victory of Othniel, (Jud. 3-11.) This, agreeably to our first observation, must have had for its commencement a war that preceded it, viz. the conquest of Cushan, and for its term another war that followed, viz. that against the King of Moab, in which his authority was shaken off by the Israelites under the conduct of Ehud, the period of his oppression is evidently included in it, since it does not appear that this domination was resisted, until the final contest which took place after he was slain by Ehud. In effect, the text itself expressly assures us, that the king of Moab only possessed himself of the city of palm-trees, (Jud. 3-13-14.) and in the next verse, proceeds to relate that "the children of Israel sent a present," which in the eastern style is tribute,"\* "to Eglon, and Ehud having slain him, summoned

\* If authority is wanting for this, it is supplied by 11 Kings, 17-3. where "presents" in the text, are translated more agreeably to the Hebrew idiom, "tribute," in the margin, and many other places in the sacred writ, 1 Chron. 18-2. 11 Saml. 8-2.

summoned the men of Ephraim, and defeated the Moabites, which victory determined the first repose, and commences the second of 80 years. Usher, as we have seen, concludes the first repose with the victory of Othniel, computing it from the conquest of the land, which is at complete variance, both with his own proper principles and the authority of the sacred text; for it is plain from Scripture, (Judges, 1st passim.) that the wars of Caleb and the elders, which succeeded the death of Joshua, took place during these forty years, on his own hypothesis, and consequently the land had *not* rest, during that period, which objection I hold to be decisive against the reception of his theory.

The second repose, which commenced with the victory over the Moabites, concludes with the next warfare in which the Israelites were engaged, viz. that against Jabin, king of Hazor, who, having oppressed Israel 20 years, his domination began in the sixtieth year of this repose, for he also appears to have subjected the tribes, without any intervening hostility, that might have interrupted the repose; and his authority, like Eglon's, was only tribute and service, which does not determine the period of eighty years, agreeably to our second principle of interpretation.

But I must arrest myself to reply to an objection, that will be forwardly urged against this system. Is servitude, I am asked, synonymous with repose? Could the land enjoy rest, when it was enslaved? I answer yes; it enjoyed rest from

the evils of hostility and war, which is all my principles would go to establish. Will it not be granted to me, that the kingdoms of Judah and Israel, when they agreed to purchase off the vengeance of their Assyrian oppressors by tribute, were at peace? Under the Tirshatha or Assyrian satrap, that is, under subjection, was not the land at rest? When Zedekiah paid tribute to Nebuchadnezzar, for some years, the land enjoyed repose; when he refused it, and the country was exposed to the invasions of the enemy, the repose was terminated. Under the Persian monarchs also, when Israel prayed in the temple for the safety of their sovereigns, under the Seleucidæ, and under the Roman republic, was "the sceptre yet departed from Judah?" In fine, for it is needless to accumulate examples, when the church suffered the severity of persecution and proscription, it was analogous to the Jewish state, during the period of unsuccessful hostility; when it was legally established under Constantine, it enjoyed rest, although suffering under the common calamities of the empire, and that every intermission of active persecution was at least a comparative repose, is a mode of speech very familiar to the ecclesiastical writers. We have produced positive evidence that the first servitude was only tribute and service; we have another sufficiently strong in the history of Samson, where we find (Jud. 15-10.) the men of Judah remonstrating with the Philistines, "Why are ye come up against us." Urging, as it were, that they had performed all the  
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the conditions of servitude imposed upon them; and the Philistines, in their reply, acknowledge the force of the appeal, "We are come up," say they, "against Samson, to do unto him as he hath done unto us:" as if they said, "we wish to punish those only who deny our authority, or resist our dominion." In a word, when the children of Israel permitted the people of the land to remain as their tributaries, "and they dwelt among them to this day," says the text, (Jud. 1-15. & aliter passim) will it be denied, that those, although in subjection, enjoyed peace. The case will be perfectly analogous, if we should suppose those tributaries had their native Judges and sovereigns during the period of their subjection, and the annals of the nation might, like those of Israel, record their subjection to a foreign dominion at the same time that they should notice the circumstances of internal œconomy, and the hereditary, or elective, succession of their chiefs, and if we have no grounds from the silence of sacred history, to quote the instance as perfectly analogous, yet we have other accounts that amply supply the requisite examples. Moab and Edom were conquered by David, and remained tributary to his successors for a considerable period, during which we meet with the names of some of their sovereigns attending the kings of Israel and transmitting them tribute, (v. 11. Kings iii. pass.) should we not then suppose, that Israel, when subjected to their enemies, likewise possessed an internal jurisdiction and sovereignty, si-

milar to those of the other nations of the East, even if Scripture had not expressly, as we shall see in the sequel, assured us of the fact. It is therefore neither inconsistent nor false, to suppose the jurisdiction of the Judge, as in some instances, contemporaneous with the dominion of a foreign enemy. In a word, the genius of Asiatic conquest, more particularly in the earlier ages, never went to destroy or to alter the form of government, in the subjugated state:\* it was limited to the imposition of tribute, and personal service, in the nature of a feudal fee, of which singular, or, perhaps, in an uncultivated age, natural policy, it would not be difficult to assign the probable causes, or to accumulate examples. The sacred volume affords us, many, and the instance of Deborah, which we are proceeding to examine, though sufficiently clear, is not the most express. It is a distinction which deserves to be remarked, between the character of a monarchical and that of any other form of government, when both are abandoned to their natural bias, uninfluenced by the casual effects of political and religious prejudices; and it will not, perhaps, be found an unfavourable feature in the moral aspect of the former. Thucydides, and the Greek historians in general, sealed as their narrations are with the stamp of truth and verisimilitude, from the events of a later day, will supply the

\* The inquisitive reader may consult, on this interesting subject, Ferishta, as translated by Dow, Xenophon, *Cyr.* and *Anab.* particularly the former, and above all, the judicious and learned Pref. of Richardson to his *P.* and *A.* Lexicon.

the broad lines of policy and practice which are requisite to fill up the contrast. It is now, I trust, sufficiently clear, that the period of the jurisdiction of the three first Judges is not assigned in scripture; that the term "*repose*," is not synonymous with "*jurisdiction*;" and that the second repose of 80 years concludes with the war against Jabin, king of Hazor, in which Israel shook off his dominion. The history of this servitude, and of the subsequent revolt, as it is related to us, affords a very striking confirmation of the observations we have just submitted, and of the system we adopt. The text, (Judg. 4. 4. 5. &c.) having recorded the oppression of Jabin, for 20 years, (v. 3.) proceeds to relate, "And Deborah, a prophetess, the wife of Lapidoth, she judged Israel at that time," viz. during the dominion of Sisera and his sovereign, as (if there could be any doubt,) is plain from the following verses, (5. 6.) in which the children of Israel are represented as "coming up to her for judgment," when she selected Barak, the son of Abinoam, to be *their deliverer*. Summoning the tribes of Napthali and Zebulun, he completely defeated Sisera, (v. 15.) and pursued the course of his success until the sovereign and the kingdom of Hazor were "completely destroyed," (v. 24.); and, in fact, from this period, the Canaanites appear to have made no further opposition to the dominion or prosperity of Israel. It was in commemoration of this signal success, that Deborah composed the hymn of praise, in which she relates, in the most sublime and

and elevated language, the triumphs of her country and her religion, and which is also valuable as affording a just idea of the state of the federal republic of Israel, and a picture of the earlier manners of the neighbouring nations. But we are at present only interested in it, in an historical point of view, and as affording what I conceive to be forcible evidence in support of our theory. Contrasting the flourishing state of her country, after the victory of Barak, with the effects of a foreign domination, she says, (chap. 5. v. 6. 7. 8.) “ In the days of Shamgar, son of Anath, in the days of Jael, the high-ways were unoccupied; the travellers walked through by-ways; the inhabitants of the villages ceased; they chose new gods. Was there a shield or spear seen among forty thousand in Israel?” We behold here, Deborah explicitly acknowledging Shamgar as a Judge, or deliverer, of the people; she recognizes his succession to Ehud, and thereby establishes the observations which I have made before on the subject of his jurisdiction. Bishop Patrick, in his commentary on this passage, would read, “ *From* the days of Shamgar, &c.” which undoubtedly appears to be the just construction, since the text itself, (c. 3. 31.) informs us, “ and he also delivered Israel,” which is not very compatible with the description of the state of the country, during his jurisdiction, afforded in the hymn of Deborah. Adopting, then, the correction of the learned bishop, we find that the country was disarmed (v. 8.) by the policy of the oppressors, (of which policy we may remark other examples, (1 Sam. 13. v. 19. 20. 21.)

after



after the period of Shamgar's jurisdiction; that there was no resistance opposed to the invaders, and that the Israelites, to conciliate their enemies, had adopted the idolatry and worship they professed; that therefore the servitude under Jabin is to be included in the repose of 80 years after the conquest of Moab; and that the duties of the avenging deliverer are often distinct and separate from those of the legal magistracy, or authorized Judges of the state, as we shall afterwards explain more particularly, under the article of Samson. Deborah expressly mentions those "that sit in judgment," as distinct and separate from the conquering chieftain, who had led the tribes to victory, (v. 10.) In effect, the first Judges, as they are denominated, appear to be rather leaders to deliver Israel from her oppressors, than legislators to expound the law, or to dispense judgment among the people. We have seen a woman exercising this office, and Israel bowing to her jurisdiction. The text informs us she was a Prophetess, which perhaps explains the nature of her authority and influence. She was resorted to from her supposed knowledge of the law of Moses, derived from the nature and superiority of the qualifications with which she was endowed. It was the legitimate empire of science and reason she possessed; and the spontaneous submission of her countrymen is the most honourable testimony to the value of these acquisitions; in like manner, we find Huldah, the Prophetess, appealed to, even under the established government  
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of the sovereign, her opinion respected and her authority allowed. The Arabic records furnish us also, with a parallel and analogous instance: the wife of "the Prophet," we are informed, for many years acted as supreme arbitrator and Judge of the national disputes, on account of her supposed knowledge of the law, and meaning of her husband. In fact, in our commentary and interpretation of scripture, the analogy of eastern manners, and the subsidiary rays deducible from Asiatic history, should never be out of sight: it affords us a clue to many points irreconcilable to merely European ideas; and the success of a work conducted on this principle, in happily elucidating many important circumstances in the sacred writings, is the best criterion of its advantages. It will be easily seen I allude to "Burder's Oriental Customs."

Perhaps we may attribute much of the obscurity and disagreement, which has arisen on the state of this period of the Hebrew records, to a misconception of a passage in which the term "Judges," and "deliverers," is used as synonymous. It is not to be denied, that the chieftain, who had avenged his country on their enemies, might, in many circumstances, have also executed the duties of civil jurisdiction; and, undoubtedly, if he had been one of the authorized Judges, who appear, from the hymn of Deborah, to have been continued in the state, perhaps from the original election of Moses, (Ex. 19. v. 20. 21.) he would have, after his victory, persevered in the discharge of his  
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function. Perhaps most of the avengers may have been of the class of the civil Judges, and that, as is usual in many cases, the term being generalized, outran the idea, and was applied to them all indiscriminately. The verse (Jud. 2. 16.) which I have alluded to, is as follows; "Nevertheless, the Lord raised up Judges, which delivered [*margin*, "saved,"] them out of the hand of those that spoiled them." It is evident, from the sequel of the history, that many of the Judges did *not* deliver Israel, for their countrymen were not oppressed during their administration, as Tola, Abimelech, Ibzan, Elon, and Abdon. It is evident, also, that the term "Judges," applied to the deliverer, or the description "judged Israel," does not occur, except in one instance, until after the time of Tola. Ehud is not mentioned to have judged Israel; Deborah judged Israel, as we have seen, *during the third servitude*; and Barak is not recorded to have judged Israel, or rather, he is expressly distinguished from the Judges, (Jud. 5. 10.); Gideon, the fifth avenger, after his conquest of the Midianites, and his refusal of the sovereignty, (Jud. 8. 23.) "went and dwelt in his own house," (v. 29.); but he seems to have possessed a local jurisdiction in his own tribe. They were all deliverers, and, as such, enjoyed influence and authority, but not exclusive jurisdiction. The exception is that of Othniel: "the spirit of the Lord came upon him, and *he judged Israel*, and went out to war." (Jud. 3. 10.) It should seem from this, that the proper term,

VOL. XI. Q "Judge,"

“Judge,” in so much as it was synonymous with “deliverer,” merely referred to his military jurisdiction and decision, as leader of the host; and that it was not till after the time of Tola, it assumed a more appropriate, definite, and precise signification, as the dispenser of civil justice among the people. Thus, we find, that among the Carthaginians, whose suffetes are evidently similar to, and perhaps derived from the Hebrew sopherim, or Judges, Hannibal, grandson of the first Hamilcar, possessed the office of suffete, when he went on the Sicilian expedition; and the great Hannibal, when he was setting out on the Spanish war, was created one of the same magistrates. (Vide Rollin, vol. 1. 254. 312. and auctores eo citatos, Ed. Dundee, 1800.) Perhaps, the civil powers of the Judge were conferred on the leader of the host, when he had not before possessed them, to consolidate his authority and influence among the troops; at least, it appears clearly, there is no ground from the text to understand the terms, “Judge,” and “deliverer,” as *completely* synonymous, and thence to deduce the inference, that the period of repose and jurisdiction is the same—a supposition founded on a further misapprehension of the text, (Jud. 2. 18.) in which it is said, “And when the Lord had raised them up Judges, then the Lord was with the Judge, and delivered them out of the hand of their enemies all the days of the Judge,” which is by no means inconsistent with the principles of our theory, for we have shewn, that, in the case of Othniel, Ehud, Shamgar, and  
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and Gideon, the life of the Judge is clearly distinguished from the period of the repose, and concluded before it. (Vide supra and Judg. c. 3. v. 11. 30. 31. c. 8. 28. 33.) It is not useless to have entered so much at large into this subject, since it is to a misconception of the principles it unfolds, that the variety of opinion, the obscurity, and the uncertainty attending the history of the earlier ages of the Jewish republic, should undoubtedly be referred. Indeed, a consideration of the very next verse to that quoted above, would demonstrate the error of those who have so misunderstood the former, (v. 19.) “ And it came to pass, when the Judge was dead, that they returned and corrupted themselves more than their fathers, in following other gods, they ceased not from their own doings, or from their stubborn ways.” Must not this relapse, this idolatry, this provocation to the vengeance of Heaven, require time, perseverance, habitude? “ Nemo repente turpissimus.” Yet those who adopt the contrary hypothesis, commence their idolatry and their servitude in the very year of the death of their last deliverer—a position, on the extravagance of which I have already remarked. What? is it to be supposed that the people of Israel wait with deference and respect for the death of Othniel, at 150 years; or of Ehud, at, perhaps, 130, to commence the open practice of idolatry? or, that the nations who surround them, uniformly put off the day of vengeance and punishment, during the life of an exhausted old man, and immediately commence

hostilities, on his dissolution? Such are the conclusions to which the suppositions of our adversaries, contradicted as they are by the spirit and tenor of the text, would unavoidably conduct us. But the conclusion is their own; it is no more the conclusion of Scripture than it is the conclusion of reason; and it must afford the most unqualified satisfaction to the liberal and candid mind, to discover, that under the most accurate and discriminating analysis, the most trivial expression, the most isolated allusion, appears to have its due measure of design, intention, and importance; nothing is redundant or strained; nothing, when duly weighed, inconsistent or contradictory; the light, the harmony, and the union of the parts, is equally reciprocal and beautiful; nothing can be unnecessary when its value, if not intrinsic, is re-active; if not *sui generis*, it is relative; is effectual to prove, if not to guide; to direct, if not to inform.

The hymn of Deborah, also, affords us decisive arguments against the reception of the system, which would adhere to the interval assigned in the Book of Kings, by supposing some of the first Judges to be contemporary. We have seen the Prophetess acknowledge the election and authority of Shamgar, who was, according to Marsham's system, Judge in the West, on the side of the Philistines, whom he repulsed and "delivered Israel;" while the judicature of Deborah and Barak is confined to the most Northerly parts of Israel, divided, by almost the whole latitude of the country, from the  
territory

territory of the Philistines. Now the punishment of Israel, in the servitude under Sisera, was in consequence of their apostacy and disobedience “ *after the death of Ehud,*” (Jud. 3. 1.) who had conquered the Moabites on the most Easterly frontier, so that Deborah, in the North, recognized Shamgar in the West, as a legitimate Judge, and the text expressly relates that the defection meriting the punishment of Israel from the Northern independent states, took place after the death of the Judge, who had conquered in the East; which seems clearly to indicate, that the Judges were successive, and their services universally acknowledged and generally effectual. And the complaint against the several tribes who refused to assist in the war against Hazor evidently supposes that, as the oppression was common to *them* all, the danger should have been equally so, (v. 17.) “ Gilead abode beyond Jordan, Dan remained in ships, Asher continued on the sea-shore and abode in his breaches,” while “ Zebulun and Napthali jeoparded their lives,” (v. 18.) “ Reuben dwelt among the sheep-folds,” (v. 15. 16.) but Issachar joined Barak, (v. 15.) and Ephraim and Benjamin were also his auxiliaries, (v. 14.) So that almost all the tribes of Israel are mentioned as useful auxiliaries, or as faithless neutrals in this war. It is to be observed also, that Reuben, whose dissensions and infidelity to the common cause is lamented with so much force and pathos, is upon the borders of Moab, and, of course, would be subjected to

to the jurisdiction of Ehud, who had delivered Israel from the dominion of Eglon, and to whom Marsham allots the Eastern tribes. Gilead is also to the East; while Dan is directly on the Philistine frontier, and should consequently have been under the authority of Shamgar, to whom the Western tribes are supposed to have been obedient; yet those are the tribes who refused assistance to their oppressed countrymen. Is it to be supposed, this could have happened under the authority, or during the lives of the chiefs who had been raised by the signal providence of God, to deliver and to defend them? Or, is it not rather a full, forcible, and decisive argument in favour of the principles of interpretation we have adopted. The servitudes were undoubtedly partial, as the apostasy of the tribes must have been: the Moabites, for example, oppressed, as we have proved, only the Eastern tribes; the Philistines, usually, only the Western; and the king of Hazor's dominion more particularly affected the Northern states. But the *avengers* were successive, and the fruits of their success was beneficial to the whole confederacy, in preserving their liberty and prosperity, and in manifesting the more particular protection of Heaven, in the triumphs of their leaders. It is also clear, that the power of the first Judges was merely personal, although their illustrious exploits afforded an epoch for the national annals to synchronize or refer to, as we find the act of Jael, in killing Sisera, celebrated in the hymn of Deborah, with the triumph or the jurisdiction of Shamgar.

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In a word, I trust the positions, and rules of interpretation, which I have premised, are, at least in the case of the five first Judges, so clearly proved, that we may, without difficulty, assume them in our future observations. I shall only add one elucidation farther, on this subject: if the periods of repose are synonymous with those of jurisdiction, to what epoch are those ages when "there was no king [more properly 'rulers,'] in Israel, and every man did as was right in his own eyes," to be assigned? The sacred text is careful to record that, at the commencement of Micha's idolatry, and the defection of the tribe of Dan, there was no established or legitimate government, as some apology or extenuation for those acts. It is hence evident, that they cannot be ascribed to the government of the elders, because "all the days of Joshua, and all the days of the elders that over-lived Joshua, Israel served the Lord." (Jos. 24. 31. Jud. 2. 7.) Nor can they be attributed to the period of the servitudes, because some of those events suppose not only internal peace, as the journey of Levite; but external success, as the final settlement of Dan, which, more particularly as the unassisted act of a single tribe, could not have taken place during the \*jurisdiction of Joshua or Caleb; and the mention of it in the Book of Joshua (19. 47.) is evidently posterior to the division of

\* This will be easily conceded, when we recollect that Joshua refused to permit Caleb, to conquer his inheritance alone, but joined him with the force of all the tribes, in his attempt.

of the land, as the first verse of the chapter in which it is related, clearly proves, (Jud. 18. 1.) "until that day, their inheritance had not fallen to them among the tribes of Israel." and "that day," we find from the sequel, was contemporary with the idolatry of Micha. The internal jurisdiction manifested by the assembling of the tribes at Mizpeh, is also destructive of the supposition, that it was during a period of servitude. Where, then, can they be placed, except in the interval of repose after the death of the first avengers, and the commencement of the subsequent captivity, as after the conquest of Chusan, which Othniel could not long survive, or of Eglon, which, perhaps, Ehud survived fifteen or twenty years, and thus leave the remainder of the 80 years repose for the captivity of Jabin, and for the period "in which there was no king or ruler in Israel." On the point also, that the periods of servitude may be included in those of repose, agreeably to our second principle of interpretation, I would remark that the accuracy, the precision, and the fidelity, with which, in the whole course of the Jewish records the numerical items both of the armies assembled; and more particularly of their own loss, in the chance of defeat, and of the enemies, in case of victory; the notice taken of the different geographical points in which the hostile, or the national forces, were collected, or opposed; the allusions, or more enlarged detail of the choice of leaders, and of the dubious circumstances of the war; the recapitulation of the several chieftains, who, in  
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the different periods of their history, had either led the hosts to triumph, or incurred, by their obstinacy and disobedience, the penalties of defeat; the facts which seem to indicate, that the earlier servitudes were merely local, partial, and confined, while the dissensions of the remaining tribes, or their negligence of the common cause, or the more remote pressure of the danger, prevented them from assisting their countrymen, and thereby endangering their own unattempted prosperity and peace; and, above all, the evident design of the sacred historian, "to write all things for our ensample," and, of course, to dwell more particularly on the dreadful punishments of rebellion and idolatry, whenever they should occur, and thereby to offer a perpetual commentary on the denunciations, as well the promises of God, (Deut. 28 passim. part. v. 25.); all these considerations are to me decisive evidence, that if any hostilities had occurred, before the periods of the several servitudes we have been examining, they would have been distinctly related, and individually detailed; but the very circumstance of disarming the land; and the imposition of tribute; the apparent hopelessness of relief; the consequent indifference and despair, so often manifested to the public welfare, are incontrovertible arguments against it. But, in effect, if the arguments I have submitted, to prove that "repose," and "jurisdiction," are not synonymous, are allowed to have any weight, the very text and authority which is usually urged for the contrary hypothesis, may be produced

as a forcible argument, that the first servitudes are to be included in the periods of repose, (Jud. 2. 18. 19.) For, we are assured, “the Lord delivered them from the hands of their enemies,” only “*all the days* of the Judge;” but, after the death of the Judge, they were delivered into the power of the surrounding nations, without, as we have seen, resistance or hostility intervening, *or* before the repose concludes. The terms, also, generally used, “the Lord delivered Israel into the hands,” &c. &c. “the Lord sold the children of Israel,” &c. and the dreadful denunciations against disobedience, (Deut. 28. 25. &c.) seem to infer, that the punishment was equally prompt and inevitable, and that even the glory, equivocal as it might be of resistance, was not permitted to give relief or elevation to their misfortunes.

We shall now proceed to the next period, according to the text. After the death of the last avenger, and the usual forgetfulness of the mercy and the providence of God, which generally took place in the course of a generation, “the Lord (Jud. 6. 1.) delivered Israel into the hands of Midian, seven years, and the circumstances of the oppression are distinctly marked; the severity of it also, forms a new feature in the history. It does not seem to have been the servitude of tribute, for “because of the Midianites, the children of Israel made them the dens which are in the mountains, and caves, and strong holds; and so it was, when Israel had sown, that the Midianites came up, and the Amalekites, and the children

children of the East, and destroyed the increase of the earth, until they came to Gaza, and left no sustenance for Israel, neither sheep, nor ox, nor ass."\* (6. 3. 4.) This severe and unprecedented oppression, continued during seven years, until Israel, in its distress, "cried unto the Lord," (v. 7.); and he raised up Gideon, to be their deliverer. The circumstances of the war are narrated with minuteness and precision, and the consequence of this great deliverance, "That Midian could lift up their heads no more," is amply verified in the sequel of the history, in which we find no further mention of hostilities between Israel and Midian, "And the country was in quietness *forty years, in the days of Gideon.*" (c. 8. v. 2.) This is a period so unambiguous and defined, that I cannot conceive on what principle the learned Usher allots him but nine years.

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\* This was a most remarkable consummation of the prophetic denunciations, declaring the penalties of disobedience. Deut. 23. 31. 33. 38. 39. 40.

" 31. Thine ox shall be slain before thine eyes, and thou shalt not eat thereof: thine ass shall be violently taken away from before thy face, and shall not be restored to thee: thy sheep shall be given unto thine enemies, and thou shalt have none to rescue them.

" 33. The fruit of thy land, and all thy labours, shall a nation, which thou knowest not, eat up; and thou shalt be only oppressed, and crushed away.

" 40. Thou shalt have olive trees throughout all thy coasts, but thou shalt not anoint thyself with the oil: for thine olive shall cast his fruit.

" 42. All thy trees, and the fruit of thy land, shall the locust consume."

And it is a further confirmation of the observations we have presented above, for here certainly is no hint of opposition or resistance, although this oppression was so unusually severe; and surely, as the circumstances of punishment and oppression are narrated with such exactitude and minuteness in this case, they would not have been neglected in the preceding, if any had occurred similar or analogous.

The history of Gideon, however, affords another evidence in favour of our hypothesis, concerning the three first periods and the first avengers of Israel. We find, first, that Midian made war against the children of Israel and subjugated part of the tribes, (for the expression (c. 6. v. 2.) “ the caves which are in the mountains,” seems to mean “ now visible there,” and, of course, that it was those tribes who inhabited the vicinity of the mountainous parts that were principally subjugated,\*) which is not related of the former servitudes; therefore, *they* must have been distinct, viz. only of tribute and service. And, secondly, (c. 8. 22.) the people, grateful for the ability and valour which had saved them, call on their avenger to rule over them,† and to transmit the power to his descendants, which certainly implies, that in the case of the preceding Judges, no such power was possessed or exercised, in consequence of their deliverance, or that, in other words, *they* only enjoyed the reputation and honour due to their exploits, without exercising the duties of judicature and authority, and consequently, that the duration of the three first  
reposes

\* It should seem, also, those caves were, perhaps, the same that, during the reign of Saul, afforded an asylum to the Israelites, in his first war against the Philistines. (Saml. 13. 6.)

† The excessive and unusual severity of this oppression was, probably, a primary cause of the singular gratitude of the people. Besides, the providence of Heaven had been *more remarkably* displayed in their late *miraculous* deliverance; and perhaps, too, the experience of the evils of civil dissention and anarchy, which had been so strongly exemplified in the course of the war, contributed not a little to their consent and proposal.

reposes cannot properly be referred to the continuance of their power.

After the death of Gideon, Abimelech, his son, succeeded to his authority, for three years, upon the slaughter of his 70 brethren, (another argument for allotting to Gideon 40 years.) Could Usher suppose, that he who was a young man "in his father's house," when he was called to redeem Israel, would have 70 children, and some of them of man's estate, in nine years, more especially, as the text itself informs us, (8. 32.) "he died in good old age?"

"After him, (c. 10. 1.) there arose to defend Israel, Tola, son of Puah, son of Dodo, during 23 years."

Here commences a distinct manner of expression, which is afterwards properly adhered to. Every future ruler *judged* Israel, and his period of authority is marked. It is not difficult to assign the cause of this. Israel had now been accustomed to a partially acknowledged authority, for 43 years, during the lives of Gideon, and his son, who is implied to have been elected by his countrymen, out of respect to the memory and deliverance of his father; and the people had experienced the advantages of this alteration so far, that in future, they adhered to it.

Jair succeeded Tola for 22 years, including in it the 18 years oppression of the Amorites; for we read (c. 10. v. 8.) and "that year they oppressed Israel 18 years," viz. those, says the text, which were "beyond Jordan, in the land of the Amorites, which is in Gilead."

This.

This appears to me evidently to mean, that in the last year of Jair, they had already oppressed Gilead 18 years, and the text proceeds to relate, "that Ammon passed over Jordan to fight against Judah, Benjamin, and Ephraim, so that Israel was sore distressed," which I thus interpret, that *after* having oppressed Gilead 18 years, to the last year of Jair, they *then* joined and passed the Jordan, to subjugate the other adjacent tribes. This will explain to us (v. 10. 18.) the account of the "*princes and people of Gilead*" assembling to select a chief and leader, viz. in the room of Jair, who was a Gileadite; for if the 18 years of servitude followed his death, how could the people be *that year* united in opposition to their enemies, and assembled for the purposes of legislation? But by the other hypothesis which I adopt, it is sufficiently clear, that the Ammonites, invading the trides on the other side of the Jordan, the year of Jair's death, those tribes rose to repel the invaders, and Gilead revolted upon the prospect of assistance from their brethren; for the text continues the narration, "Israel encamped at Mizpeh against the Ammonites in Gilgal." Jephthah, their countryman, was the choice of the princes, and elected their chief; he delivered them from their enemies, and "judged Israel six years." (Jud. 16. 7.) Two arguments are almost decisive for this interpretation of the text: first, the continuance of the Israelites in the belief and worship of the true God, will be, on the contrary system, very contradictory to the invariable tenor of their former habits



habits and conduct; fifty-five years, during the jurisdiction of Tolah and Jair, and some few at least after the death of the latter, of fidelity and virtue, before their total apostacy, together with the period of Abimelech, and the long continued peace and tranquillity, during the life of Gideon; this would be, indeed, an example of perseverance in fidelity, obedience, and virtue, almost irreconcilable to the character, and perhaps to the circumstances of this extraordinary and infatuated people. It would almost certainly expose the hypothesis which would support such an unprecedented course of religious and practical perseverance, to just hesitation and mistrust, from the whole analogy of history and Scripture, if we had been even left to analogy alone, to guide or to govern us; but happily, in this, as in many other instances, the sense and expression of Scripture is equally clear and decisive, in favour of our hypothesis. We are informed, (Jud. 8. 27.) that all Israel were perverted to idolatry, by the ephod “ which Gideon had made and placed in Ophrah, his own city;” and more particularly in the sequel, (v. 33.) “ And it came to pass, *as soon as Gideon was dead*, that the children of Israel turned *again*, and made Baal-berith their God.” The next chapter appears to confine *this* latter defection to the worship of Baal to the city of Shechem, and relates the severe punishment which God inflicted on them by the hand of Abimelech, whom they had aided in his usurpation. But the idolatry of the ephod in Ophrah, and the worship of  
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of Baalim, with which they were so often reproached, and which also, they adopted after the death of Gideon, (v. 33.) remained yet unpunished. And as the principles I adopt always admit the interval of a generation, to consummate the apostacy of Israel, and merit the vengeance of the Almighty, this period is properly supplied by the 30 years that intervene, between the death of Gideon and the fourth year of Jair, in which I hold the eighteen years of the oppression of the Ammonites to have commenced; and it is further observable, that the contemporaries of the conquest of Midian must have generally disappeared, as this generation may have been their grandsons, agreeably to the course and observation of Scripture. (Jud. 2. 10. Exod. 1. 1.)

Secondly. We must otherwise admit an anarchy after the death of Jair; to allow time for the general apostacy of Israel, related in the text, (chap. x. 6.);—a supposition which we have already, in general, rejected, and which the sequel will prove *demonstratively* false, if the very fact of the assembling of the people, to elect a chief in his room, did not sufficiently expose its absurdity. It is true, the death of Jair is mentioned before the particulars of the apostacy of Israel are recorded; but we have seen already, that the death of the chief is a very distinct thing from the commencement or the duration of a servitude; and it is observable, that it is not mentioned “*after* the death of Jair,” the people relapsed, as is said in so many other instances, but only “*again,*” which

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is by no means synonymous. It may refer to the usual introduction and prelude to the history of any oppression or servitude, which it naturally precedes, as cause precedes effect; or it may be used as a term to signify that *this* succeeded the defection last recorded; or it may be still more probably only a more enlarged statement of the defection related to have taken place after the death of Gideon—an apostacy which the justice and the denunciation of Heaven were equally concerned to punish and to avenge, but on which there is no mention of any chastisement being inflicted, till the oppression we are examining took place. The rebellion being after the death of Gideon, was during the judicature of Tolah, and the measure of iniquity being completed, and the long-suffering mercy of Heaven finally exhausted, the oppression took place under the government of Jair. It is the genius and the character of the Eastern writers, (and perhaps, generally of antiquity,) to anticipate, to unite, and to coalesce all the circumstances and events relating to a single individual, or a single occurrence in their narration. The sacred historian has been just recording the family, the influence, the possessions, and the government of Jair; the length of his jurisdiction, and the circumstances of his death naturally unite with these, and they are as naturally conjoined in his family panegyric and memoir. He is proceeding on a separate field, and he will not break or interrupt the course of his future narration, to record what seems to him to have been more

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more properly anticipated before. But again, Gilead and the country beyond Jordan, is clearly expressed to have been subjugated eighteen years before the invasion of the trans-fluviatic tribes. (c. 10. v. 8. 9.) To what are we to attribute this cautious reserve, this restrained hostility for so long a period? On the hypothesis of my adversaries, I know not; but, on my own, it seems consistent and analogous, that the death of Jair, and the consequent jealousy, dissention, and anarchy, usual before the election of a successor; and the want of unanimity and conduct, natural to such a period, should have inspired the enemy with hopes of an easy and bloodless conquest.

Jephthah reckons from the conquest of the Amorites to his time, three hundred years, (11. 26.) The Amorites were conquered in the fortieth year of the exod, and this gives us an irresistible argument in favour of our system. In fact, no other hypothesis satisfies the supputation equally well, as will be visible from my table, in the sequel. Usher allows 263 years, by the help of abridging Joshua to 6 years, and Gidcon to nine, both of which, as we have seen, are contradictory to the spirit and expression of the sacred historian, and therefore cannot be admitted. Marsham has accomplished 278 by similar conjecture and supposition equally arbitrary and unsupported. It will be seen, that we have approached on just and defensible grounds to the calculus; which fully establishes the arguments we have already urged for the three first reposes, and for including the 18 years of the

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the Amorites' oppression in the jurisdiction of Jair. If we were to reckon regularly the reposes and servitudes in exclusive succession,\* rather than in inclusive, we should find a number much exceeding that of Jephthah, and which of course he would have used as making more in favour of his argument, drawn from a long possession of the country, and concluding from *that* an indefeasible right to it. But it is singularly remarkable, that if we subduct the periods of servitude and oppression, by including them, as I have done, in the duration of the preceding reposes, or in the government of the Judges, (as in the case of Jair,) the calculus completely answers; the system, therefore, must be founded in fact. But we may also remark, that the princes of Gilead, when assembled to elect a chief to lead them against the Ammonites, can only promise "he shall be head over all the inhabitants of Gilead," (10. v. 18.); which is a strong confirmation of the opinion we have delivered on the nature and confined limits of the jurisdiction of the Judges. The civil war against Ephraim (c. xii.) proves, that in the first instance, at least, his authority was disputed.

After Jephthah, Ibsan, Elon, and Abdon, judged Israel respectively, 7, 10, and 8 years which afford no difficulty,

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\* The calculus would amount to above three hundred years, from the commencement of Othniel, without including the jurisdiction of Joshua and the elders, the length of the generation succeeding the conquerors of the land, or the servitude of Cushau. Vignoles is compelled to reckon 363 years.

but supply an answer which we have already stated, against the system of Marsham.

The remaining numbers of the calculus present some nice questions which we shall endeavour to elucidate. "The Lord," says the text, "delivered Israel into the hands of the Philistines 40 years," and it proceeds to mention the circumstances of the birth of Samson, of whom it was foretold by an angel, "he should *begin* to deliver Israel," and (c. 15. 50.) "he judged Israel in the *days of the Philistines*, (c. 17. 31.) twenty years. His birth, then, was foretold in the beginning of the servitude, and he was, perhaps, about 16 or 18 years of age when the spirit of the Lord began to move him, (14. 25.) in the camp of Dan, which shews, that there was opposition to the Philistine oppression, at least from his own tribe.\*

It does not appear that he led any army against the enemy. His exertions were personal, and his country, during all his life, oppressed, (c. 14. v. 4.) even so far that the tribe of Judah endeavoured to deliver him to their enemies; so that he is rather, like Shamgar, to be looked upon in the light of an avenger than a Judge, or interpreter of the law. The high priest, Eli, appears to have discharged the legislative functions

\* Bishop Patrick, (in loco,) and some other interpreters, I know, understand the "camp of Dan," mentioned in the text, as the name of a place called Mahaneh Dan, the same that occurs in another passage in this book (18. 12.); and the circumstances of its situation appear to warrant their opinion. But the other translation is more generally received, and whichever is adopted will be of little consequence to the chronology of the period.

functions of the Judge, and the forty years which are attributed to him, (1. Saml. 4. 18.) are parallel and contemporaneous to the twenty of Samson, which I thus prove:

Samson, at his death, had destroyed the whole assembly of the Philistine lords. This was the beginning of redeeming Israel from their enemies, which had been foretold of him. We next hear, (in Samuel, c. 4. v. 1.) that the children of Israel went out against the Philistines; which I should interpret to mean, that after the signal destruction of *their* leaders by Samson, Israel revolted. Since it is quite inconsistent and anomalous to suppose such an event, in their favour, would be overlooked; this war concluded in the taking of the ark, and the death of Eli; which, of course, happened in the same, or the year following the death of Samson. The contrary opinion would be subject to inextricable difficulties: it would suppose, that Israel had not taken advantage of the destruction atchieved in their favour by Samson; or it would suppose, that Samson, by that act, had accomplished their deliverance,\* contrary to the declaration

\* Syncellus and the Chronicon Paschale seem to adopt this latter alternative, in granting 40 years of profound peace and interregnum between the death of Samson, and the commencement of Eli. The Chronicon Orientale, published by Abraham Ecchellensis, grants to this imaginary interval of repose, only 8 years, both equally unsupported by Scripture or by reason; but such are the gratuitous and arbitrary suppositions to which those are obliged to recur, who would reject the authority of the text, or lengthen the interval from the exod. (vide Syncellus, Chron. Pas. ut supra et Chron. Orientale cura Ecchellensis, Paris 1685.)

tion of the Angel, that he should only “*begin* to deliver Israel out of the hands of the Philistines;” or, it would suppose, thirdly, an hiatus in the sacred history, which we can by no means admit. But there is also another argument, which may be adduced, destructive of any contrary system. The sacred history expressly assigns to the dominion of the Philistines forty years—of these, Samson judged Israel 20 years; he could not have commenced his functions of an avenger, or Judge, until he had attained the age of 16 or 18 years;\* so that this death falls in with the thirty-eighth or thirty-ninth year of the Philistine oppression, his birth being after its commencement. It follows, therefore, that it was about the period of Samson’s death and great revenge on the Philistines, that Israel endeavoured to shake off the dominion  
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\* However, it would perhaps enable us to avoid many perplexing and dubious questions, which might arise on this period of the Sacred History, if we should adopt the ingenious supposition of Whiston, and understand the term, “the days of the Philistines,” with some latitude, as including the whole period from their former invasion, in conjunction with the Ammonites, to the final emancipation of Israel by Samuel; which would permit us to place the birth of Samson under the jurisdiction of one of the Judges succeeding Jephthah, perhaps in that of Abdon, the latter years of whom were probably disturbed by their incursions, previous to their general invasion and oppression, in the year of his death. The idea of Whiston certainly receives something of verisimilitude, and support, when we recollect, that there is no mention of any other servitude, or oppression, except that of the Philistines, from the jurisdiction of Jephthah until the invasion of Nahash, in the first year of Saul, and, of course, the fears of the Israelites, as well as their hopes of deliverance, would be necessarily directed to, and exhausted on the oppression of this formidable enemy. (Vide, Dissertation on the Chronology of Josephus, prefixed by Whiston to his translation of the Jewish historian.



of their enemies and united against them, (Saml. c. 4. v. 1.) If it was not, what becomes of the intervening period?—of the express words of Scripture, that the Philistines only oppressed Israel 40 years, and that Samson only *began* their deliverance? We have already accounted for 36 or 38 years of their domination: Did, then, the 40 years conclude without any providential interference or heaven-inspired deliverance? Or, are we to suppose the chain and series of Scripture chronology mutilated and broken? Or, are we not rather to adopt the natural, obvious, and unobjectionable interpretation of the sacred text, and determine the forty years of the Philistine oppression by the victory of Samuel, at Mizpeh? The death of Eli coincides with the thirty-eighth or thirty-ninth year, the same, or that immediately succeeding, the death of Samson. The ark abode seven months in the country of the enemy, which brings us to the thirty-ninth or fortieth year; and Israel recovered under the conduct of Samuel, in the fortieth year. Thus the *ecclesiastical* jurisdiction of Eli commenced two or three years before the oppression of the Philistines, and includes the years of Samson, which was by no means unusual or unprecedented, as we have already seen that Samson was more properly an avenger than a Judge. As Deborah and Barak appear to have exercised authority together; as, the sons of Eli and Samuel are constituted assistant or auxiliary Judges, during *their* immediate jurisdiction; as, Eli, himself seems, in his remonstrance with his sons,

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to separate the offices of Judge and leader, which latter probably they possessed from the period of their original appointment, as well as at their death, (Saml. 2. 25.); and as, in fine, we observe the duties of the leader of the army and those of the judges clearly defined and distinguished, not only in the example of Moses, constituting Joshua leader of the host, and retaining to himself the legislative jurisdiction, but also afterwards, when Moses was dead, we find Joshua represented surrounded by his "Judges and officers," and the "*Judges standing at the side of the ark*," (Jos. c. 8. v. 33. and c. 24. v. 1.) as religious functionaries or interpreters of the law.

But this means of interpretation affords us another advantage, not to be overlooked—it explains the reason of a difference in the reading of the text, observed by many chronologists and commentators. Several of the ancient MS. and versions particularly the Sixtine edition of the Septuagint, grant only 20 years to Eli; and Eusebius\* and Procopius concur

\* Eusebius, it must be admitted, in another Work, grants Eli the forty years assigned in Scripture, and Procopius acknowledges the Hebrew allotted him forty years. Syncellus, p. 175. (Edit. Goar. Par. 1652.) accuses Eusebius of inconsistency, in granting 40 years to Eli, "contrarium pollicitus," &c. says he, in the language of his translator. He himself, although enlarging the interval between the exod and foundation of the temple, adheres to the Septuagint, and accounts only 20 years to Eli. Nicephorus (ad calcem Syncelli,) likewise grants him but 20 years, and diminishes the oppression of the Philistines also to the same term, εἴτην, κ." The very learned Petavius, (vide Pet. Doc. temponum vol. 2. p. 60, in Bibliotheca Fag. Collegii Dub.) also admits, that to reconcile the

concur in the amendment. This is evidently subducting the 20 years of Samson, which I restore by supposing them, as the text necessitates, contemporary and parallel—the one exercising jurisdiction in Shiloh, in the tribe of Judah, the other avenging Israel in the camp of Dan, as we have shewn that Dan resisted the invaders. But there is an objection usually urged against this hypothesis, that must not be forgotten or unanswered. It is, that many suppose an interregnum after the taking of the ark, which they assign according to their different principles—Josephus, 20 years, some more, or less; whereas, my system obliges me to place the jurisdiction of Samuel as immediately succeeding that of Eli. The answer is obvious, and I hope will be satisfactory.

1st. Josephus is obliged to conclude this, from a supposition originally false—that Samuel was but 12 years of age at

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the 20 years, which Eusebius declares the Greek versions of his time allot to the jurisdiction of Eli, (and with which the Sixtine edition of the Septuagint agrees) to the forty of the Hebrew copies, it is necessary to suppose, that the years of Samson, are included in the latter; but it is particularly worthy of remark, that the copies of the Septuagint, to the time of Nicephorus, appear generally to have retained the reading noticed by Eusebius, which we now find only in the Sixtine edition, and in the Polyglott of London. To what are we to attribute the modern variation? The discussion of this might lead to some interesting results. The passage in the Sixtine edition is express, and the error, if any, could not have arisen from the casual mistake of a transcriber copying one character for another resembling it, as the years are written at length. 1 Saml. 4. 8. “ἔκρινε τον Ισραηλ ἑικοσιν ἔτη.” The note of Nobilius is important, “Ita vetusti codices; & sic Eusebius in Chronicis affirmat scripsisse 70 & ita Lucifer Sed in *Impressis Græcis* τεσσαρακοντα quadraginta quemadmodum etiam in Vulgata.” (Vide edition of Paris, 1628, with Vulgate Translation item Romæ Zanetti, 1587, only Greek.)

the death of Eli and when he began to prophesy, which age is doubtless too young to commence the civil jurisdiction of a people, but it is false; for Scripture (Saml. c. 3. v. 15.) informs us "he opened the doors of the house of the Lord," which was not an office for that age, as the law of Moses commanded the Levites to officiate at the age of 30, (the Septuagint says 25, which agrees better with another text, Numb. 8. 24. c. 4. v. 3.) David also numbered the Levites from the age of 30, (Chron. c. 26. v. 35.) and afterwards, as the Levites were no more to carry the tabernacle, he numbered them from 20 years, (v. 20.) so that Samuel was at least 20 or 25, when he first began to open the doors of the temple. But the text afterwards relates, (v. 19. and sequel), "that Samuel grew, and the Lord was with him, and let none of his words fall to the ground," and "all Israel from Dan to Beersheba, knew that Samuel was established to be a Prophet of the Lord," and (c. 4. v. 1.) "the word of Samuel came unto all Israel," (c. 7. v. 15.) "Samuel judged Israel all the days of his life," which texts prove not only that he was of an age to undertake the government of the people, but that, even during the life of Eli, his prophetic character and acquirements were universally acknowledged. Who, then so authorized to succeed him? But the very authority of Josephus is destructive of the principles on which he proceeds. He assigns to the jurisdiction of Samuel alone, before the election or association of Saul in the government, twelve years,

years, (Ant. 6. sub. fin.) this period, with the twenty years of the interregnum, and the twelve years of his age, at its commencement, amount to forty-four years, an age evidently too young to answer the expressions and narration of the text, (Saml. 8. v. 1.) which describes Samuel, in his old age, constituting his sons Judges over Israel, and the elders (v. 5.) address him: "Behold thou art old, and thy sons walk not in thy ways." (Vide also 1 Saml. xii. 2.) This obvious objection overthrows the authority of Josephus, in the age which he assigns to Samuel, and in this he is without scruple rejected by his usual followers, while they tenaciously adhere to his principle of an interregnum, during twenty years, which, it must be admitted, is not very consistent or defensible. It is true that Samuel is called "a child,"\* (Saml. 3. v. 1.); but this was before the spirit of prophecy was granted to him, before "all Israel knew that Samuel was established to be a Prophet of the Lord," (Saml. 3. 20.); and besides, it is usual and familiar in Scripture, to apply that term to persons who are otherwise rather advanced in years. Thus, Solomon is called a child, when king of Israel, (1 Kings, 3. v. 7.) and

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Abijah

\* The expression may, in this view of it, be synonymous with that of Jonah, "120,000 who know not their right hand from their left," which is generally understood and interpreted, (although it is certainly subject to considerable difficulty) as denoting a spiritual, rather than a physical ignorance, as Samuel's might naturally be in "the days when the word of the Lord was precious;" "for there was no open vision," (1 Saml. 3. v. 1.) but after his vision, "Samuel grew and the Lord was with him," he is no longer classed among the young.

Abijah attributes the conduct of Rehoboam, in rejecting the complaints of the ten tribes, to his youth, (11 Chron. xiii. 7.); yet he was then above forty years of age, (11 Chron. xii. 13.)

2d. If this opinion is not received, it will be evident, that the duration of the Philistine oppression continued longer than the period assigned to it in the text; for, as we have already accounted for 36 or 38 years of it, if there succeeded an anarchy of 20 years after the death of Eli, it must follow, that these also are to be allotted to the dominion of the Philistines, as, according to the opinion of many of those who uphold this interregnum, it was a necessary consequence of the victory of the Philistines; and it is perfectly absurd to suppose that they did not take advantage of their victory and of the anarchy ensuing, to establish and consolidate their power. Therefore, this supposition extends the period of servitude beyond the limits in the text, and, of course, cannot be admitted.

3d. Scripture affords no authority for the supposition, and the text, (v. 7. 2.) which has been produced as sanctioning it, only states, that "the ark remained in Kirjathjearim 20 years," and it certainly required the microscopic discrimination of Josephus and his followers, to find, in that text, an authority for so long an anarchy, "non nobis licet esse tam disertis."

After perusing the remarks we have offered on the last period, the learned reader may well enquire, on what grounds Marsham has assigned the twentieth year of the Philistine oppression

oppression as the period of the death of Samson and the taking of the ark, when Scripture, in terms almost express, informs us (Jud. c. 13.) that he was prophesied of and born *after* the commencement of the Philistine oppression; and reason will not permit us to suppose him to begin his mission until his sixteenth or eighteenth year, so that, as he judged Israel 20 years, his death coincides with the thirty-sixth or thirty-eighth year of the tyranny of the Philistines. Could Marsham have supposed that the 20 years of his authority commenced with his birth? But also, the arguments urged by Manoah's wife in favour of her opinion, that the Angel could not mean to destroy them, seem directly to declare, that he was born under the Philistine oppression: "If the Angel intended to destroy us, he would not, *as at this time* have told us such things as these," (chap. xiii. v. 23.) He would not, in the hour of our distress and misfortune, have promised us a deliverer, as I would paraphrase it.

However, as this period of the history of the Judges is, perhaps, the most perplexed, uncertain, and obscure, and as the generality of the ancient chronologists have concurred in placing an interregnum between the jurisdictions of Eli and Samson, and also between those of Eli and Samuel, it is of importance to examine the authorities and arguments by which their opinions have been supported and upheld. I shall principally consider those of Vignoles, the most able and enlightened of them all, who, after Josephus, his usual guide,  
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has determined that an anarchy of 20 years intervened between the death of Eli and the commencement of the jurisdiction of Samuel at Mizpeh, (Saml. 7. v. 6.) "The Book of Judges makes no mention of Eli, and that of Samuel is equally silent as to the jurisdiction of Samson; it should appear, therefore, that there was some deficiency or interregnum in the chronology and history of this period." (Vignoles, p. 72. Ed. Berlin, 1738.) As Severus Sulpicius, had long since observed, "*Sed mihi annorum ordinem & seriem temporum persequenti parum continuatæ videntur historiæ—sed quam quot anni inter Heli & Samson minime Scriptura prodiderit video medii quiddam fuisse temporis quod laboret ambiguo.*"—(Hist. Eccl. Lib. 1. cap. 29.) Yet it is a remarkable and singular inconsistency, that Vignoles, after these observations, rejects their authority and makes Eli succeed Samson immediately, in the very year of his death. However, as he will not admit the years of Samson and Eli to be contemporaneous, he presents the following as his opinion and his argument in favour of his hypothesis: The slaughter of the Philistines by Samson, at his death, (Jud. 17. 30.) obliged the oppressors to resign their usurped dominion, and leave the country in repose; perhaps, the Israelites, profiting by the disorder incident to this signal destruction, took up arms, and emancipated themselves, and probably subjected their enemies, under the conduct of Eli, who was then 58 years of age, but after his dominion of forty years, the Philistines  
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took advantage of his infirmities, and again had recourse to hostilities, either to subjugate the Israelites, or to shake off the yoke of their dominion. (Soit pour Sècouër le joug des Israelites ou pour les subjuguier de nouveau.) The event of this war was the taking of the ark, the death of Eli, and the commencement of the twenty years of interregnum and subjection, which was concluded by the government of Samuel. (Vignoles. 79.) It would appear on the first inspection, that this statement perfectly answers and explains all the various conditions of legitimate interpretation: but, compared with the strict letter of authority, examined with the light of Scripture, its defects will be quickly exposed and made evident.

1st. It is, indeed, undeniable, that the Book of Judges makes no mention of Eli, and that the Book of Samuel is equally silent on the character, exploits, or jurisdiction of Samson. But this will give us no argument or authority for supposing an interregnum between them, any more than the silence of either of the last Books of Kings or Chronicles with regard to names or events recorded in the preceding, should afford us grounds to suppose, that there was an hiatus in the history. The Book of Judges does not speak of Eli, because his *separate* jurisdiction did not commence until after the death of Samson, because a new and unprecedented authority was now established, viz. that of the priesthood; and because the Book of Judges was principally intended as a record of the chiefs who had avenged Israel of their enemies,  
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and had led the people out to war. During the continuance of the first reposes, and *after* the death of the Judges who had delivered Israel, (it is natural to suppose, that the high priest, as we have demonstrated that "*repose*," and "*jurisdiction*," are by no means commutative or co-extensive,) was the usual and last resort in cases of civil jurisdiction, as the oracle of the law. We may therefore imagine, that as during the successive jurisdictions after the time of Jephthah, Israel was gradually falling off from the worship of the true God, the Philistines invaded them, to punish this defection and apostacy, and subjected them to tribute, in the year of Abdon's death; the high priest, upon this as usual, assumed the jurisdiction and held it till his death, and the commencement of his administration is, of course, not mentioned any more than in the occurrence of similar and preceding instances. But others supposing that, after Samson commenced his mission, the power more properly belonged to the leader of the armies, allow Eli but twenty years, viz. those preceding the commencement of Samson, and so his death, and that of Eli, were nearly cotemporary. The Book of Samuel reciprocally makes no mention of Samson, because, in its commencement, it is merely a family memoir. It opens with the jurisdiction of Eli, it affords merely a detail of occurrences in Shiloh, where the ark and the civil magistracy were seated—and the notice of the pilgrimage to Shiloh surely was by no means connected with the mention of the exploits or the

the judicature of Samson. Samuel, when giving a catalogue of the chosen deliverers of Israel, (Saml. xii. v. 11.) does not, even when his subject would seem to lead him to it, mention Samson, his achievements or his jurisdiction. Are we to conclude from this, that he was not acquainted with his existence? Yet the argument would be as just as that produced by Vignoles for supposing an interregnum. However, as Vignoles has given up the point in *this* case, and as we shall see in the sequel, that it is as clearly contradicted in this period of Scripture, as in any other where anarchies have been arbitrarily inserted, we shall proceed to consider his remaining arguments for making Eli and Samson *exclusively* successive.

1st. If the slaughter of the Philistine lords had emancipated Israel, according to his first supposition, then Samson *finally* delivered Israel, instead of commencing their deliverance, contrary to the express language of Scripture.

2dly. If the Israelites, under the conduct of Eli, took advantage of the death of the Philistine lords, and emancipated themselves, on what principle will he account for the silence of Scripture, that there is no allusion however slight, no mention however casual, of an event so flattering to the national pride, so unlooked for by its vanity? depressed and humiliated as both must have been by the consciousness of a subjugation of almost half a century, the longest and most severe they ever had experienced. May we not here retort

the arguments of Vignoles from the silence of history, against himself? Why is not the usual language and expression, the "land had rest forty years," employed on this occasion? Or if, as he supposes, the Israelites probably subjected the Philistines, (*les assujettir a leur tour,*) as is most natural and consistent, on the hypothesis that their victory was so complete as to insure a peace of forty years, still more I would reiterate the question, Why is there no allusion to it in the Books of Judges or of Samuel, no facts recorded that would, at least, *insinuate* their triumph, and the subjection of their bitterest enemies? Why, on the contrary, do the Philistines, hearing that the ark of the covenant was come into the camp of Israel, (Saml. 4. 7. 8. 9.) encourage one another, "Be strong, oh ye Philistines, quit yourselves like men, that ye be not *slaves to the Hebrews*, as they have *been to you*." This at least it will be admitted, would not be very natural language to use, after a subjugation of forty years to those very despised Hebrews, whose oppression they are represented as attempting to shake off. Men are generally most affected with the later and more immediate crises of their fortune, are disposed to remember late experience, rather than ancient tradition, to consider the *last forty years* of slavery, rather than the *preceding* of dominion; and historians are at least as willing to record the flourishing periods of their country's prosperity and triumph, as the disastrous interval of its subjugation and decline. To what principle in the human mind, then,

then, shall we refer the conduct of the Philistines, who seem spontaneously to forget and overlook their late and lengthened subjection, while they remember, without effort, their former and remote triumph? And, on what principle equally irreconcilable and anomalous, have the historians of Israel so carefully recorded the oppressive domination of the Philistines during forty years, (Jud. 1. 3. 1.) and so completely forgotten *their* subsequent subjugation, and the triumph of their countrymen during a period equally long? Surely, they were bound to record the mercies, equally as the punishments of heaven, when writing the history of the particular providence of God. But we see, on the one hand, the Philistines expressly assert their dominion over Israel, and implicitly at least, deny their own subjection; and we see on the other, the sacred historians acknowledge the explicit justice of *their* statement, admit the subjection of their countrymen, and set up no claim to any subsequent authority over their oppressors. Are we then to admit into the history of truth, facts, statements, and periods, unauthorized, nay, contradicted by Scripture, in order to serve the purposes of system—surely not.

But we may also remark, as an observable singularity, that Samuel, when recounting to the people, the mercies and the punishments of God, notices three particular oppressions:—that of Jabin, of the Philistines, and of the king of Moab. But he records four deliverers, and among them Jephthah and himself. The oppression of the Ammonites, from which

Jephthah emancipated them, is not mentioned, yet the avenger is panegyricized! The text, recording the oppression of Ammon, informs us, they were assisted by the Philistines, (Jud. 10. v. 7.) who were doubtless their most powerful auxiliaries, and who, at least at the time Samuel was addressing the elders of Israel, were the people most formidable and dangerous to his countrymen, and consequently he would principally dwell on a deliverance from them as from the more pressing and immediate objects of their fears. If, therefore, there had been any other deliverance achieved by either Eli or Samson, surely he would have recorded it, when he has celebrated the defeat of *this* people, when acting as only auxiliaries, as if they had been principals in the war.\* But, again I would demand, when the Prophet, (c. 2. 27.) was denouncing the approaching judgments of Heaven on Eli and his house, would he not have recalled the great instance of the divine favour, which had selected him as the deliverer of his people and have contrasted with powerful and pathetic eloquence, his present guilty weakness with his former fidelity and virtue? Would he not have appealed to the strongest emotions of the human heart against the vice most abhorrent to the feelings of human nature—ingratitude. Would he not, like Nathan, have addressed his judgment through his passions? called upon him  
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\* We may remark here also, how inconsistent this is with Marsham's principles, which determine, that the Ammonites *only*, were defeated by Jephthah, and that the Philistines continued their dominion in the West for 40 years, until the time of Samuel.

to deliver the sentence of eloquent self-accusation, on the dramatic picture of his represented criminality, and finally ratified the condemnation, by the simple and sublime verdict, "thou art the man."

3dly. But even the expressions of Scripture contradict the conclusion of this system. Instead of supposing that the Philistines rose in the last year of Eli, to emancipate themselves, or to subjugate the Israelites to their dominion again, as Vignoles alledges, it, on the contrary, represents Israel as revolting, or assembling against the Philistines. (Saml. 4. v. 1.) "Now, Israel went out against the Philistines to battle, and pitched beside Ebenezer, and the Philistines pitched in Aphek." In the whole series of the history of the Judges, Israel assembles its armies only to repel invasion, or to shake off the yoke of oppression. In the first case, there would have been *preceding* mention of the conduct of Israel, which had provoked the wrath of Heaven, and also of the *enemy* who was appointed the instrument of vengeance. The denunciations in the last chapters, delivered by a Prophet to Eli, (c. 2. 27.) and by a vision to Samuel, (c. 3. 11. and seq.) were personal to Eli and his house, but the punishment was awfully national. We must suppose, then, as the national vices are not mentioned as the *immediate* cause of the severe vengeance of Heaven, that *they* were previously subjected to punishment, or that Israel was at that very period under oppression, which must be the same as that, from which Samson had *begun* to deliver.

deliver them; and that the great defeat of their armies which took place in the last year of Eli, and occasioned the loss of the ark, was the *consummation* of their punishment for presuming to attempt to shake off the Philistine oppression, without previous repentance and contrition.\* We shall, from this view of the question, derive the reason of the singularity both in the *statement* of this revolt, and the *application* of it to the house of Eli. The first is without any previous account of transgression or of repentance, and the second is an instance of divine justice at once uncompromised and unimpeachable; since the punishment of national guilt happily assimilates and coincides with the ends of divine wisdom, in the manifestation of its *more particular* providence: and it naturally happens, both that Israel should attempt to take advantage of the achievements of Samson, esteeming, in the views of human policy, the opportunity favourable to effect their deliverance, and that their attempt should be punished by defeat, since it was undertaken without *previously* conciliating the favour of Heaven, by an earnest repentance, and by an humble acknowledgment

\* We may here take notice of a strong argument for this interpretation, which has been hitherto completely overlooked, that when the historian records that Eli had associated his sons in the government, they are represented as remaining with him in Shiloh, (1 Saml. 2. 12. 17. 22.) and *there* exercising many acts of oppression and tyranny over the people, it is not mentioned as in the case of Samuel and his sons, that they divided the cares of government, and each attended to a particular district, (1 Saml. 8. 2.); which certainly infers that their jurisdiction was confined to the tribe of Judah, and agrees only with the time of Samson, when there was a peace between the Philistines and *that* tribe (Jud. xv. 10.) while they oppressed all the other tribes in their vicinity,



ledgment of the justice, which had hitherto pursued their criminality, and under which they were now experiencing all the awful punishments incident to unrepented guilt.

4th. The arguments produced against the contemporaneous years of Samson and the Philistines by Vignoles, and which seem to have been the great cause of his making the administration of Samson and Eli *exclusively* successive, have not greater force, and therefore, the conclusion founded upon them must be given up. "Is it to be supposed, is it credible, that a young man of eighteen or twenty years of age, undistinguished and unknown (*d'ailleurs un simple particulier*), should be *chosen* Judge of the nation against a foreign domination consolidated now for twenty years, and this when the Israelites were only numbered from that age?" (Ex. 30. 14.) Here the whole argument consists in the ambiguous and equivocal signification of the word "*chosen*," (*choisi*), and I would answer it by saying, that Scripture, in no one place informs us, alludes to, or even can be brought to signify, that Samson was "chosen Judge of Israel." He was *designed* for it by Heaven, he was prophesied by an Angel; he was deserving of it by his exploits, but we cannot say he was chosen to it by his countrymen. In effect, none of the Judges, except Jephthah, seem *properly* to have been *chosen* by the election of the tribes, and *his* authority appears to have been sufficiently limited, (*vide supra*). He was only acknowledged "head over the inhabitants of Gilead," and the very fact of the tribe of Judah  
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assembling to seize and to deliver up their avenger, in the case of Samson, proves the extreme distinction between the designation of Heaven and the choice of men. The text expressly assures us, "the Philistines had dominion at that time over Israel," and *that* time was the commencement of his ministry. (Jud. 14. 4.) (xv. 9. 10.) The Philistines came up against him, and his countrymen address him, "Knowest thou not, that the Philistines are rulers over us," (v. 11.) and, (v. 20.) "He judged Israel in the days of the Philistines, twenty years." Can any thing be more express, definite, or precise? And, on what principle can Vignoles state, "the period of his jurisdiction was neither absolute servitude, as during the forty years preceding, nor absolute liberty, as under the other Judges." (p.67.) I can see nothing in the narrative of Scripture, that bears even the marks of relative freedom, much less of the civil or internal jurisdiction of independence. He is, indeed, a great avenger of Israel, but there is not a single passage that can lead us to suppose he ever led the thousands of Israel against their enemies. Vignoles remarks, as a great singularity in his history, that the period of his jurisdiction is recorded twice in Scripture, (Jud. 15. 20. 16.31.) I would remark another, that a greater space is granted to the account of his exploits, than to those of any other of the Judges. Surely, therefore, if any other distinguishing achievement or memorable action had occurred, if he had led the armies of his country against the enemy with triumph and  
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success, it would not have been omitted. Indeed, we are told, he slew more at his death than during his life, (16. 30.) and the numerical accuracy of Scripture is so great, that it affords us *data* almost precise, to judge the terms of the proportion; and it will be evident to every one considering *both*, that all his exertions were personal, and his success individual and exclusive. It is, indeed, true, as Vignoles has remarked, that Samson has obtained a privilege not accorded to any other of the Judges of Israel, that of being specially prophesied by Jacob, while declaring the future fortunes of his race, (Gen. c.41. 16.) “Dan shall judge his people as one of the tribes of Israel,” which the ancient Jews, St. Jerome, and most of the moderns agree, is *uniquely* applicable to Samson, who was of that tribe, (Jud. xiii. 2.); but I cannot see what his argument will gain by this, for placing him (contrary to the express and reiterated declaration of Scripture,) *after* the conclusion of the Philistine oppression, at the *commencement* of which, it should seem, he was born. He most assuredly did judge or avenge Israel, and he commenced their deliverance. He was as singularly distinguished by the peculiar election, and designation, of Heaven, from his birth, as by the earlier prophecy of Jacob, but he might as well commence the office of an avenger of his country at 18 or 20 years, when his exertions were to be merely personal, as at a more advanced age. David was chosen by the Almighty about the same age, and had, like Samson, received evidence of the protection of Heaven, by his destroying a lion

at an earlier period. When he is first recommended to Saul, he is described as a "valiant man and prudent," when he could scarcely have been more than sixteen years old. (Saml. 16. 18.)

5th. The gloss and paraphrase which Vignoles attempts to give the expressions of Scripture, that Samson "should begin to deliver Israel;" and the idea he has introduced, "that the sacred historian, from the commencement of Samson, supposes a new state which does not conclude till the reign of David," are not authorized by Scripture, "Samson is to begin to deliver Israel from the hands of the Philistines, and the deliverance is to be consummated by David, the new state is the alternation of hostility and peace between the two people, the Philistines and the house of Israel." (p. 68.) I can in no place discover any indication of the sacred historian, introducing us to this new state, or supposing it himself. It is plain indeed, that the Philistines appear *now* upon the scene as principals, when they had *before* invaded Israel only as predatory or auxiliary hosts, in the time of Shamgar and of Jair. All the other surrounding nations, had been, at different times *since*, extirpated or subdued; while the increasing commerce of Phœnicia, and the peculiar advantages of situation they enjoyed, had contributed to strengthen and to consolidate their power, and their resistance was consequently more obstinate, as their resources became continually more efficient, productive, and inexhaustible. Hence, the duration of the hostilities between the two states, before  
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the final contest; but this is merely a continuance of the ancient state of the Jewish republic, and not by any means an introduction of a new one. The same mean of interpretation might be extended to David's conquest of Moab and Edom, and we might, on this principle, state, that Ehud only *commenced* the deliverance of Israel, which was *finally* consummated by David. The text, indeed, (2 Saml. v. 8.) which Vignoles produces, does state, that David was designed to be the deliverer of Israel from the Philistines, but we are to recollect, this is spoken by Abner, during the division of the kingdom between Ishbosheth and David, and *after* the great defeat in Gilboa, in which Saul was slain. We are to suppose this defeat was productive of signal consequences, and that the kingdom of Israel must have suffered in loss of territory or in subjection to tribute. This is the oppression from which Abner expects and predicts David will emancipate them. The reunion of the kingdom under one head; an accomplished warrior, and the chosen anointed of Heaven; appears to be the best means of securing this desirable object; and the crafty politician, meditating treachery against his sovereign, urges such arguments as will be most likely to influence the pride, the patriotism, or the religious feelings of his countrymen. (2 Saml. 3. 18.) Agreeably to this, we find that Samuel, in his last solemn address to the people assembled to renew the kingdom, on the defeat of the Ammonites, (S. xii.) after recounting the several instances of rebellion and idolatry of which they

had been guilty, and the dreadful punishments and oppressions they had justly incurred, proceeds to commemorate the deliverers whom God had raised up on their repentance, and mentions himself as one, "who delivered them out of the hand of their enemies, on every side, and ye dwelled safe." If we look back to the history of the jurisdiction of Samuel, we shall find a full and decisive paraphrase on this modest and equitable panegyric, (7. 13.) "So the Philistines were subdued, and they came no more into the coast of Israel, and the hand of the Lord was against the Philistines, *all the days of Samuel*. And the cities which the Philistines had taken from Israel were restored to Israel from Ekron even unto Gath; and the coasts thereof, did Israel deliver out of the hands of the Philistines. And there was peace between Israel and the Amorites," In this, we have every possible character of a deliverer and a Judge, distinctly enumerated, and we must equally acknowledge the title of Samuel to that honourable distinction, with that of David; for the deliverance atchieved by David is circumstantially detailed almost in the identical terms here used. (2S. 8. 1. Chron. 18. 1.) I trust the arguments Vignoles has urged for placing the jurisdiction of Samson after the domination of the Philistines, will not now be insisted on. Besides, the very same course of argument would prove, that Saul was to *consummate* the deliverance of Israel, *commenced* by Samson, for (Saml. 9. 16.) the Lord addresses Samuel, "I will send thee a man out of the land of Benjamin,  
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and thou, shalt anoint him, to be captain over my people, Israel, that he may save my people, out of *the hand of the Philistines*, for I have looked upon my people, because their cry is come up to me." This, evidently alludes to the subsequent deliverance of that part of the tribes which were still subjected to them, and whom Samuel had not been permitted to deliver from their perseverance in idolatry and guilt. (chap. 10. 5. c. 13. 3. 14. 1.)

6th. But the reasoning of chronologists, in favour of the interregnum of twenty years between the death of Eli, and the commencement of the jurisdiction of Samuel, will be found equally inconclusive, and unsupported by the authority of Scripture. There is, indeed, a single text to which we have before alluded, that speaks of the ark of the covenant after its return, remaining "for 20 years in Kirjathjearim," (chap. 7. 2.); and this is the *single* ground of argument for the insertion of this anarchy or interregnum: because, say its advocates, it is placed "historically *before* the jurisdiction of Samuel." (Vignoles, 82.) And the historical precedence attributed to the supposed interregnum is merely because that it *literally* antecedes, since the commencement of the administration of Samuel is related only in the next verse. Such are the arguments arising from a spirit of system! I have had occasion before to remark on the evidence and force of these verbal, grammatical, and positional reasonings, derived from the particular place or situation of a verse, including an epoch or an interval, and I shall now produce a very remarkable instance.

instance of the anticipating spirit of the sacred historians, or of that adherence to the unity of narration, that induced them sometimes to postpone the mention of an event prior in point of period to the one they are relating, when the introduction of it would interrupt the course, or affect the completeness, of the narration. In the eighth chapter of Samuel, the elders of Israel are represented as demanding a king from Samuel, and complaining of the government of his sons—"Behold, now thou art old, and thy sons walk not in thy ways, now make us a king to *judge* us like all the nations." (v. 5. & seq.) The two next chapters are taken up with the proceeding upon their request, and the consequent election of a sovereign. It appears, however, that, as is usual in elections, many of the people were dissatisfied, and asked, in captious disquietude, "How shall this man save us." (10. 27.) From what evil? we might reasonably demand: for, until this, there is no mention of danger or oppression, nor is it alluded to in the request of the elders. In the next chapter, the historian fully informs us, both of the danger and of its cause. It was the threatened invasion of Nahash, king of Ammon, that induced the people to desire a king to judge and to lead them; and Samuel himself, fully demonstrates this, in his last address, to which I have formerly referred: (chap. 12. 12.) "And when ye saw that Nahash, the king of the children of Ammon, came against you, (or "was coming,") ye said unto me, Nay: but a king shall reign over us; when the Lord your God was your king." From this it will, I trust, be evident  
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and acknowledged that *positional* precedence does not *always* infer historic or chronological priority, and consequently cannot be alledged, without subsidial and extraneous argument, for the insertion of this interregnum. If we examine the current of sacred history, as we have done in the case of this supposed interregnum, we shall find it is by no means acknowledged or insinuated. In effect, there is but *one* oppression of the Philistines recorded, until the period under review, viz. that from which Samson “began to deliver Israel.” (Jud. xiii. and sequel.) If the jurisdiction of Eli and the taking of the ark, commenced *another*, it is a remarkable deviation from the usual style and expression of the sacred history, that its duration or commencement are not any where recorded, and that the sojourn of the ark should be understood as synonymous with the continuance of the oppression. It would be remarkable that the wonderful and providential return of the ark should produce no adequate effect upon the religious feelings of the Israelites, that for twenty years after this miraculous intervention in their favour, they should have persevered in idolatry and disobedience, and afterwards assemble, “lament after the Lord,” (v. 2. sub. finem,) repent, on the preaching of Samuel, and “put away Baalim and Astaroth, and serve the Lord only;” when twenty years had elapsed; when the memory of the Philistine misfortunes, in consequence of the capture of the ark, misfortunes explicitly ascribed, by *the enemy* themselves, to the power and influence of

of the God of Israel, (Saml. v. *passim*, part. c. 11. 12. chap. 6. v. 5. 6.) must have almost died away; when the signal defeat of their armies, 'defeat, which *usually* brought them to a sense of duty and an acknowledgement of guilt, was but partially remembered or completely forgotten; when servitude was lightened by habit, and external dominion assimilated by time to legitimate authority; when the example, the precepts, and the personal influence of Samuel, unquestionably would have been sedulously exerted to recal them to piety and virtue; an influence, doubtless powerfully assisted at this juncture by the renewed manifestation of the particular providence of God, evinced in the miraculous return of the ark; in the punishment of the Philistines and the men of Bethshemesh, and more particularly by the experience of his singularly prophetic gifts; so awfully proclaimed even in the late destruction of their hosts; in the death of their leaders, the sons of Eli; and in the loss of the peculiar religious symbol of their nation; according to his prediction. What! are we to suppose, that his authority, and his preaching, acquired new influence on the minds of his countrymen, in proportion as the evidence for the divinity of his mission, for the religious importance, the heavenly selection of his character, became remote, indistinct, or traditional? The effect of "line upon line, and precept upon precept," recommended by inspiration, is doubtless great and operative; but precept, practice, the language of prophecy, or the recommendations of virtue, are more powerfully

fully decisive, more authoritatively impressive, influential, and commanding, upon the human heart, when it is humiliated by misfortune; affected by an awful sense of divine displeasure; elevated by the conviction of the revealed majesty of a present God; and the acknowledged sanctity of its ritual and belief, upheld by the testimony, equally unbought and unimpeachable, forced *even* from their enemies; pressed by a sense of the immediate miracle; and, at length satisfied of the selection and the inspiration of its leader. To them, prophecy had become reality, misfortune its consummation, and miracles its test. This accumulated and more immediate pressure of every motive to piety and practice, which could influence the mind, surely, would not be neglected, or overlooked, for twenty years; when zeal might become languid, and inducements indecisive. And it must have been the influence of these obvious considerations, which obliged Josephus to suppose, that, “during the twenty years the ark remained at Kirjathjearim, the Israelites lived *very religiously*, and offered, with the greatest fervour, sacrifices and vows to the Lord, so that the prophet Samuel believed the time was at length arrived, in which he might with propriety stimulate and exhort them to the recovery of their liberties.” (Ant. lib. 6. p. 171.) Determined to derive, an anarchy, and oppression, of twenty years, he was only consistent with analogy and reason, in supposing, that after all the various encouragements to fidelity and obedience they had received, the period was passed in the manner he describes; the language of Scripture, however,

which does not desire to support a system, but, to record a fact, is very different: (Saml. 7. 3.) “ And Samuel spake unto all the house of Israel, saying, ‘ if ye do return unto the Lord with all your hearts, *then* put away the strange Gods and Ashtaroth from among you, and prepare your hearts unto the Lord, and serve him only, and he will deliver you out of the hands of the Philistines. Then the children of Israel did put away Baalim and Ashtaroth, and served the Lord only.” Was it necessary, after twenty years of virtue to speak thus? Or, are we to suppose, that after so many late and awful evidences of the sin of disobedience, and of the presence and providence of the Deity; from experienced misfortune from consummated prophecy; from previous denunciation; and from miraculous interference; so long a period would have been passed in the practices of vice, in a perseverance *in idolatry* and in the commission of those sins which had subjected them to the wrath and visitation of Heaven? Surely, we must suppose, that, the growth of those evils, and the practice of those idolatries, is to be referred to the period of the jurisdiction of Eli, corresponding, and contemporaneous to, the oppression of the Philistines; (Jud. xiii. 1.) an age and period sufficiently determined to have been fruitful in iniquity; to have been so far disobedient and rebellious, as to be abandoned by the long suffering justice of Heaven to its own evils; (Saml. iii. 1.) for we read, “ the word of the Lord was precious in those days; there was no open vision.” And it was  
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was not until after the choice of Samuel as a prophet, that (Saml. iii. 21.) "the Lord appeared again in Shiloh." The Scriptures expressly declare, that "Samuel judged Israel all the days of his life;" (Saml. 7. 15.) and, that "all Israel, from Dan even to Beersheba, knew Samuel was established to be a prophet to the Lord," even before the death of Eli. (Saml. 4. 20.) This is repeated again, in terms yet more precise, "And the word of Samuel came to all Israel," before the destruction of the host and the loss of the ark. (Saml. 4. 1.); unless we chuse to adopt the marginal reading, "came to pass," to all Israel, and then it will refer to the consummation of his prophecy against the house of Eli, which the historian is proceeding to relate. And Samuel himself, in his address to the people, at the renewal of the kingdom, in which he resigns all authority to Saul, declares to them, "I have walked before you from *my childhood, even to this day,*" (xii. 2.); which evidently refers to the continuance of his power from a very early age, or from the death of Eli; as he had said before, "behold the king *walketh before you,*" (xii. 2.) is your chief, leader, and ruler, as I have been. How can these texts, so express, unequivocal, and determinate, become compatible or consistent with an anarchy, or interregnum of twenty years? They confer and receive reciprocal illustration and evidence: and, if Vignoles remarks, as singular authority for his reasoning in the case of Samson, "that his jurisdiction is twice mentioned in Scripture," I may, in this,

borrow and retort his argument, and defence, against the principle, I combat—*fas est et ab hoste doceri*.

7th. But I may be asked, what then shall we understand by the contested verse, (Saml. 7. 2.) to which Codoman has so long since, (above 220 years), directed the attention of chronologists. “ *Hic lectorem obiter abhortor ut diligenter consideret cur mansionis 20 annorum arca Dei in Kirjathjearim mentio fiat.* (Cod. Chron.) I have already given my reasons why it does not appear to me to be made synonymous with the Philistine oppression, or Israel’s idolatry; and having determined that, it bears little on my subject, or supputation, to enquire, or to speculate.—But I may offer a supposition.

The ark had remained unremoved at Shiloh since the time of the conquest. (Saml. 4. 7.). The place, the name, and the antiquity of this residence had almost rendered it consecrated as the seat of religious worship; Shiloh was only a day’s journey from the scene of the action, in which the ark was taken, (Saml. 14. 12.) and was most probably abandoned to the enemy; at least we find that Samuel, who had remained at Shiloh during the life of Eli, removed to Ramah, which continued to be his residence during his jurisdiction and till the period of his death, (7. 17. 15. 1.); a removal only to be accounted for on the supposition of the approach of the Philistines, in consequence of their victory. The Israelites *lamented* (S. 7. 2.) then, the loss of the holy city, the consecrated seat of religion, and of its symbols. This city was probably

probably not re-taken until the victories of Saul had humiliated the enemy; at least, it is not, most certainly among those recovered by Samuel, which lay between "Ekron and Gath," (Saml. 14.); while it is exactly adjoining, (a little to the North-west) of Michmash, where the Philistines assembled and were defeated by Saul. (Saml. 13. v. 2. 5. 11. & c. 14. 31.) And it is remarkable that it is mentioned, (14. 21.) that the Philistines were at that time attended by the Israelites of "the country round about the camp," which evidently includes Shiloh. We are to suppose then, that as the defeat was most complete, and, "they smote the Philistines that day from Michmash to Ajalon," (v. 31.) Shiloh was recovered and perhaps the ark removed there, "for the ark of God was at that time with the children of Israel," (v. 18.)—a most forcible evidence for our supposition, particularly if we consider the chronologic characters of it, for this was when "Saul had reigned two years over Israel." (xiii. 1.) Now, granting 16 or 18 years to Samuel alone, as the most distinguished chronologists agree, this was perhaps precisely in the twenty-first year after the taking of the ark, and probably, as it "remained seven months in the country of the Philistines," (6. 1.) it continued, as the disputed text assigns, *exactly* twenty years in the city of Kirjathjearim, and after the death of Saul and the destruction of his host in Mount Gilboa, we may suppose, that the experience of its security made the Israelites, remove it to Kirjathjearim, again, as Shiloh, was too much in the vicinity

cinity of the enemy; from whence it was brought by David, to be finally placed in Jerusalem.

There is one text that might seem to militate with this construction, (c. 14. 3.) in which it is said, that among those with Saul at Gibeah, when he was pursued by the Philistines, previous to his victory, was "Ahiah, the son of Ahitub, Ichabod's brother, the son of Phinehas, the son of Eli, the Lord's priest in Shiloh, wearing an ephod." Since it might be said that, as Ichabod was born at the *commencement* of the jurisdiction of Samuel, his brother Ahitub, could scarcely have had a son at *this* period of an age to minister in the priest's office; but we are to remember that Eli did not commence his jurisdiction until he was 58 years of age, and of course his son, Phinehas, the father of Ahitub and Ichabod, might soon afterwards have attained man's estate and married; and as Eli held the office of high priest and died in the government in his ninety-eighth year, it is by no means improbable that the *eldest* son of Phinehas was *then* the father of Ahiah, who consequently could, at the period we are considering, have attained the requisite age to undertake the duties of the Levites; the early marriages usual in the east, and the privileges of polygamy, render such inequalities in the comparative births of the same family by no means unusual or unprecedented. The histories of the Asiatic sovereigns, were it necessary, would present innumerable instances to parallel and confirm this; and, in the family of David himself,

we



we are almost *certain*, that *it was* realized; he was not perhaps born, when some of his brothers had already attained the military and capitation age required by custom, or by the Mosaic code. It should seem, indeed, that we are not pressing the subject too far in assuming this text to be auxiliary to our interpretation, and that the mention of Eli as "the Lord's priest in Shiloh," is a particular record, that he was the last who there exercised the office or the jurisdiction annexed to it. I do not, however, press the conclusion, that after the victory of Saul, the ark was removed to Shiloh again, perhaps it might have been only placed at Nob, where the priests were dwelling at the time of the inhuman massacre of them by the command of Saul, and from which the son of Ahiah (or Ahimelech, see margin,) escaped to David. The consecration of the sword of Goliah, which was preserved "behind the ephod," (c. 9. 21. 9.) in this city, seems indeed, to afford strong evidence of this, especially since Ahiah, or Ahimelech, was high priest, and, as such, is summoned before Saul, (v. 22. 12.) and accused of "consulting the Lord for David," (v. 10.) in the same city. But from this, it may have been removed again to Kirjathjearim, after the death of the priests, or on the invasion of the Philistines. However, I repeat, that the chronology we support is completely independent of this conjecture.

The next period affords no obstacle or requires no parade of argument: it is universally agreed, that Samuel and Saul reigned:

reigned 40 years, or that the jurisdiction of Samuel is to be included in the 40 years assigned to Saul. In fact, the disputed text, (S. 13. 1.) on which so much learning has been exhausted, and so much fruitless ingenuity thrown away, can in no other manner be explained consistently with the analogy of language, and the natural sense and meaning of Scripture.

Our English translation is pronounced by many learned men inconsistent with the genius of the original; so that it is at most, but an ingenious supposition to explain a difficult passage. The Vulgate has, "*Filius unius anni erat Saul quando regnare cæpisset, duobus autem annis regnavit super Israel.*" Arius Montanus translates it, as he says, word for word, thus: "*Filius anni Saul quando regnavit, in regnando ipsum & duobus annis regnavit super Israel,*" which, I confess, I do not rightly understand. The investigation of this text would of itself require a long dissertation. I shall, therefore, merely refer the reader to the several treatises on this subject, apud Poli, synopsis, Usher, the Vossii, Vignoles, &c. only adding, that after the most enlarged examination of the subject; and consulting as many original authorities, as my opportunities would permit, I think the interpretation most unexceptionable is, that "Saul was forty years old when he began to reign, and reigned 22 years over Israel," agreeable to Josephus, who grants him but 20 or 22 years. The remaining eighteen are to be attributed to Samuel alone.

The last article affords a mean of explanation, why the sacred history does not assign any precise period to Samuel,  
only

only saying "he judged Israel all the days of his life;" his years are to be included in those of Saul.

It is, indeed, true, that Josephus gives to Saul and Samuel eighteen years in conjunction, and after his death, twenty-two years to Saul alone—a supputation which has been adopted by many, and more particularly by Vignoles, whose usual accuracy, discrimination, and research, seems, on this occasion, to have deserted him. His scrupulous adherence to the authority of Josephus, has induced him to overlook the series of facts related in the sacred history, an attention to which would have perfectly convinced him of the infidelity of his guide. After the conquest of Amalek, and the death of their king, (Saml. 14. 33.) we are told, Samuel "came no more to see Saul until the day of his death," (v. 35.); and the next chapter gives an account of the choice of David to succeed Saul, and of the ceremony of anointing him by Samuel. David, at this period, must have been at least 18 years of age, since he was immediately sent for to attend on Saul, and is described (v. 18.) as "a valiant man, a man of war, and prudent in business," a character evidently not consistent with an earlier age, perhaps scarcely with that which we have assigned to him. He became, on arriving at the court of the sovereign, his "armour bearer," which certainly was an office of considerable responsibility and importance. The series of the history proceeds to relate the next war against the Philistines in which David slew their champion, and which

must have taken place some few years after, as Saul did not *then* recognize David, (c. 17. 54. 55.) who had returned to his father, after the king had recovered from his melancholy, and was (chap. 17. 15. & seq.) now acquiring a port and appearance more masculine and imposing, which had altered his youthful aspect and physiognomy; his strength had been developed by his age, and his stature was become most elevated and commanding, as the armour of Saul whose advantageous height is particularly commended, was put on him for the action. (v. 38.) The succeeding chapters circumstantially relate the history of David and the conduct pursued towards him by Saul. (18. 5.) He was made captain of the host of Israel; obtained the daughter of Saul in marriage, (v. 27.); became the object of his jealousy, and *escaped to Samuel*, to Ramah, (chap. 19. 18. 22.) after this to Gath, (chap. 21. 10.) thence to the cave of Adullam, where he assembled a body of mal-contents, who followed his fortunes until he was elevated to the throne. The various persecutions he suffered from the jealousy of Saul are recorded, until, in the cave of Engedi, he spared the life of his sovereign; an agreement was, in consequence, made between Saul and David, after which Saul returned to his usual residence, and David remained in his strong hold. “And Samuel, (the next chapter commences,) died, and all the Israelites were gathered together and lamented him, and buried him in his house at Ramah. And David arose, and  
went

went down to the wilderness of Paran," (c. 25. 1.) which must have been from Engedi, his last resort, and evidently after the death of Samuel. The wilderness of Paran is not far from Carmel, where he soon removed and married Abigail, the widow of Nabal, and immediately after this, he was pursued by Saul, and again saved the king's life from the attempt of Abishai, who accompanied him into the camp. (26. 9.) He fled from thence to Gath a second time, (27. 1.) "And the time that David dwelt in the country of the Philistines was a full year and four months," (27. 7.) which was until the great invasion of Israel by the Philistines, in which David accompanied his benefactor, the king of Gath, (29. 2.) and in the course of which Saul and his sons were slain, and the armies of Israel completely defeated in Mount Gilboa. (c. 31.) David succeeded to the throne of Judah immediately after, being aged 30 years, as we are informed in many texts of Scripture. (2 Sam. c. 5. v. 4.) It is therefore impossible, that there could have intervened more than twelve years from the time he was anointed by Samuel, and was sent for by Saul, which was immediately after, till the recognition of his title to the crown; as many learned commentators suppose, that the cause of Saul's melancholy was the departure of the spirit of God from him, which we are told, settled on David from *the moment* he was anointed by the Prophet, (Saml. 16. 13.) and perhaps, indeed, the interval was not more than five or six years. Vossius and Pezron would read two years in place

of the twenty-two of Josephus, from the death of Samuel, and the present copies of Clemens Alexandrinus, who professes to have followed the system of Josephus with great accuracy, concur in the amendment. (Vide Clemens Edit Sylburgii Lug. Bat. p. 238.) But both may be reconciled by supposing they reigned in conjunction but a very few years, and that the forty years assigned by Saint Paul include the period from the commencement of Samuel till the end of Saul.

Thus, then, stands my calculus:—The building of the temple commenced in the second month of the fourth year of Solomon, (1 Kings, 6. 1. compared with 2. Chron. 3. 2.), so that there are three years in retrospect to the end of David. David reigned 40 years; Saul and Samuel 40; Eli and Samson 40; Abdon, Elon, and Ibsan, 25; Jephthah, Jair, Tolah, and Abimelech, 54; Gideon 40; 40 years in retrospect to the defeat of Sisera; 80, to the conquest of Moab, after the death of Eglon; 40, from thence to the defeat of Chusan; 8, to the beginning of his domination, which affords an aggregate of 410 years; 70 are necessary to complete the calculus, of which we have 30 to the passage of the Jordan, and 40 from thence to the exod.

The several items have been already sufficiently discussed, and the authority for each supported, I trust, with the requisite evidence, to the satisfaction of the candid: the advantages it possesses over the several theories already proposed, to  
solve

solve the acknowledged difficulties of the text, have been briefly indicated, and it only remains for us to clear ourselves from the charge of inconsistency which might be plausibly urged against our admitting the servitude under Chusan to be calculated exclusively, which we do not permit in any other instance. It is because the historian evidently records it to have followed the government of the elders, and from the conclusion of this servitude commenced the peculiar expression, "the land had rest forty years," viz. to the defeat of Eglon. But there is another reason still more valid, viz. that of allotting 25 years to Joshua and the elders from the conquest, as has been usually the principle and opinion of the earlier fathers of the church, in whose time many records still existed, to influence and direct them; and computing all the years of the reposes and Judges together, as we find them recorded in the text with the 84 years of the kings, the aggregate, including the period in the wilderness, is 472 years, 8 less than the period designated in the text, (1 Kings, 6. 1.) which clearly refers to this first oppression, succeeding the authority of the elders.

In a word, by this manner of arranging the supputation of the times, we collect the just calculus required by the text; and independent of the several advantages, already detailed, which it possesses over the systems of those whose principles would lead them to extend the interval; it avoids the inconsistencies which have been remarked in the hypotheses of

Marsham

Marsham and Usher, and it elucidates their cause. It traces through all the involutions of sophistical ingenuity, their various and evident errors, misconceptions, and obscurities, which supported by no authority but conjecture, and a continued *petitio principii*; and resting on no grounds but their ingenious misinterpretation of many texts, to adhere (“quasi obtorto collo,” says Perizonius) to one; first brought the reading (1 Kings, 6. 1.) into neglect, and finally originated the many inconsistent systems, answering equally to every hypothesis that were founded on its ruins. It agrees, without forcing, with the sacred text, in finding nearly three hundred years from the conquest of the Amorites to the age of Jephthah. It grants to Joshua a duration of legislative jurisdiction conformable to the sense and expression of Scripture and the fathers. It allots to the government of the elders and to the fidelity of the Israelites, in the worship of the true and only God, a period which answers the conditions of the interpretation and sense of Scripture, (Jud. 2. 7. & 10. Jos. 24.) where it is said, “Israel served the Lord all the days of Joshua and the elders that over-lived Joshua,” to which (Jud. 2. 10.) it is added, to give a more precise idea of the duration, “all *that* generation were gathered unto their fathers,” &c. The Vulgate reads, in the first verse quoted, “et seniorum qui longe vixerunt tempore post Joshue.” &c. By “*that* generation,” the Scripture can understand only those who were *under* twenty years of age, in the second year of the exod,



exod, (except Joshua and Caleb,) so that those who allow but six or seven years to Joshua, and as many to the elders, will have that generation to be cut off much sooner than the regular course of human life determines. Whereas, my calculus admits some of them to attain an advanced age, those who were fifteen at the delivery of the law, above eighty years, and the others in proportion; thus affording a full and satisfactory answer to the uncandid and disingenuous insinuations of modern infidelity, “that the contemporaries of Moses and Joshua beheld with careless indifference, and contemptuous neglect, the amazing miracles which were continually demonstrating the presence of their divinity; a conduct that on every known principle of the human mind, is irreconcilable to any reasonable belief of their reality and performance,” (Gibbon,\* —*I quote from memory*.) fortified and grounded, as it should appear to be, by the mistaken calculation of chronologists, in allotting so small an interval to Israel’s perseverance in the faith of their religion. This I consider as no small advantage.

But this will be more evident, from a short synopsis which I here subjoin:—

The passage of the Red Sea, 430 years after the promise.

—————Jordan, 470 ——— 40 years after.

Conquest of the land, . . . . 476 ——— 6 years after.

Conquest

\* The passage of the eloquent historian, which I here *substantially* paraphrase, is Chap. xv. p. 270. 271. Octavo, London, 1802. I have thought it better, for obvious reasons, to leave the passage as it was, although a miserable succadaneum for the grace, the spirit, and the ironical insinuation of the original.

Death of Joshua and the elders, and commence- ment of the first oppres- sion, . . . . .	} 500	— 24 years after.
Conquest of Chusan, . . . . .	508	— 8 years after.
End of first repose, by con- quest of Eglon, . . . . .	} 548	— 40 years after.
End of second repose, by conquest of Jabin, . . . . .	} 628	— 80 years after.
End of third repose by con- quest of the Midianites. . . . .	} 668	— 40 years after.
End of Gideon, . . . . .	708	— 40 years after.
End of Jephthah, . . . . .	762	— 54 years after.
End of Abdon, . . . . .	787	— 25 years after.
End of Samson and Eli, . . .	827	— 40 years after.
End of Samuel and Saul, . . .	867	— 40 years after.
End of David, . . . . .	907	— 40 years after.
Foundation of the temple, . . .	910	— 3 years <i>complete</i> af- terwards.

These several epochs may be adjusted either to the Hebrew or Septuagint supputation of the years elapsed since the creation.

From this it is evident, that David, being in his seventy-first year at his death, (1 K. 2. v. 11.) his birth coincides with the 836 year, from the promise to Abraham, and 406, from the exod. Now, we learn from many places of Scripture, (Luke,

(Luke, Matthew, Chronicles,) but particularly from the Book of Ruth, the genealogy of David, which stood thus, (Ruth, 4. 18. &c.) Pharez, Hezron, Ram, Amminadab, Naashon, Salmon, Boaz, Obed, Jesse, David. Pharez, was the son of Judah, by Tamar; Judah, of Jacob; Jacob, of Isaac; and Isaac, of Abraham. Naashon was contemporary to the exod. (Numbers, 1. 7.)

Abraham,	Hezron,	Boaz,
Isaac,	Ram,	Obed,
Jacob,	Amminadab,	Jesse,
Judah,	Naashon,	David,
Pharez,	Salmon,	Solomon.

We may observe, then, that there are seven generations, exclusive, to the exod, and seven to Solomon; the periods must, therefore, be nearly similar, and, in effect, the one is 430, and the other is 406, or rather they also agree exactly; for Isaac was not born till 24 years after the promise. This argument in favour of the 480 years, I hold to be almost invincible; and it is singularly remarkable, that, among the immense variety of authors I have been obliged to consult, in the decision of this question, scarcely one seems to be aware of the nature of a proof drawn from the succession of generations, for which we are indebted to the genius and sagacity of Newton; and none of them dwell upon it.\* If they had

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2 A

understood

\* I was not aware at the time this was written, that Eusebius makes use of this very argument

understood it, we should have heard less of propositions, to read 580 or 680, or, as Pezron would have it, 873 years, enlarging the period of a generation to 80 or even 120 years, when we are expressly informed, that, even in the days of Abraham, it was the immediate interference of Heaven, that granted him his first son, at a much earlier age; and David, (or Moses, as the psalm is ascribed to him,) himself, informs us, that human life was *then* abridged to the present length; but, because, in questions to be solved by inductual proof, we cannot accumulate too many examples in favour of our hypothesis, we will find numerous authorities in synchronizing the genealogies in the Book of Chronicles: we find 17 generations† computed from Levi to Solomon, (c. 6. 1.); but the successions were, in general, of eldest sons, which gives fewer years to a generation. However, it is an interval of above 700 years, which is somewhat more than eight, to 350 years. In  
David's

argument, in defence of the contested text, which he follows, but the enlarged application of the principle, the demonstration of its existence, and the multiplied evidence of its use, still remain, exclusively, the property of the first of philosophers. It is interesting to observe a principle recognized in antiquity from casual associations, suffered thus to lie dormant and unemployed; but when adopted and restated, after the lapse of ages, by superior mind, become the useful instrument in the discovery of important truths.

† Josephus also reckons 13 high-priests from the exod to the foundation of the temple, (Antiq. xx. C. 8. p. 700.) but we are to recollect, that the successions were of men advanced in years, at the time they attained this great dignity; the remaining four were in the 215 years from the descent of Jacob into Egypt, to the exod.

David's line,\* which was not by eldest sons, eight generations amount to nearly 400; the difference is not great, which

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is

\* It is not to be denied that there is a considerable difficulty attending the genealogy of David. Salmon is said to have married Rahab, the woman (as it is generally understood) who preserved the spies in Jericho; (Josh. c. 11.) this many have supposed to be inconsistent with chronology, "as there are then only four generations to David from the exod;" however, we are to consider that Naashon is the only prince of Judah who is mentioned in the Pentateuch, the name of Salmon does not once occur, it should seem therefore that Naashon remained prince of Judah until the last census of the people, taken just before the death of Moses, when there was found none who had been twenty years of age at the exod, (except Joshua and Caleb,) and it is not unlikely that he had died in the plague, immediately preceding; (Numb:36. 64.) Salmon was born a short time before this census, he might perhaps have had a son by Rahab about the 75th year of the exod, when he was 37 or 38 years of age, and she still very young, since in the 41st year of the exod she is described (Jos. 2. c. 13.) "living in her father's house, and pleading for the lives of him and of her mother, from the Israelites; and if she is principally spoken of in the sequel, it is evident, that it was because of the great services she had rendered to Israel: supposing then, Boaz was born in the 75th year of the exod, since David was born in the 410th, there are 335 years between them. If then, Boaz, "a mighty man of wealth, and an elder of the city," (vide Ruth passim) in his 60th year, married Ruth in the 135th year of the exod, and then Obed marrying in his 50th year, or about the 186th year, might have had Jesse in his sixty-fifth, (as he probably was not his eldest son) or about the 200th, who being a "very aged man in Israel, and having six elder sons grown to man's estate, when David was only 16 or 18; the latter might have been born perhaps about 270, but this number is far removed from 405. I know not how to reconcile it, but by supposing that some of the generations in the house of David are omitted; especially, since Boaz is mentioned, as of "the family of Elimelech," (R. 2. 1.) of whom we find no notice taken in the genealogies in the book of Chronicles; but I may observe, however, in diminution of the difficulty, that Rahab is not mentioned by any Scriptural authority, except St. Matthew, to have married Salmon, and it is not clear that the woman of whom I. speaks was the same with the harlot of Jericho. St. Paul and St. James

who

is a further proof of our calculus. In chap. 6. v. 39. we have the genealogy of Asaph, fifteen generations from Levi to Solomon, exactly conformable to the line of David. In the *succession* after David, the same precision and accuracy is preserved; and many other corresponding genealogies might be selected, if necessary. On these grounds, then, I hold to the authenticity of the text, and contend, that, however inaccurate we may have been, in arranging the several items in the total, the aggregate itself; could not have exceeded 480 years.

But it will be expected, that I should make some observations on the various evidence in favour of the contrary supputation,

who mention her with commendations, omit this: Josephus also seems unacquainted with it, and yet he enlarges on the rewards granted to her, and it should therefore seem, that it might have been one of the family of Rahab Salmon married, and that perhaps there were two of the name of Salmon, or of Naashon, a circumstance not unusual in the Jewish families: or perhaps it was rather the *families* of Salmon and Naashon, than the individuals that were meant, of which we may find some remarkable instances in the old testament: thus, in the last census, before the entrance into Canaan, (Deut. 26. 23 and passim) Tola and Pua are mentioned as fathers of families, and in Judges, c. x. i. "Tolah, son of Puah," is recorded as judge of Israel, evidently meaning to specify, that he was of the family of the Tolaites and Punites, which were recorded in the book of the law; and it is equally observable, that the names of the other judges may be similarly traced in the record of the families in the books of Moses. (Vide 1. C. c. 2. and passim, James ii. 25. Heb. xi. 13. Josephus Ant. 5. c. 1.) The argument, however, from the genealogy of the other families, and of the priests, the succession of whom is accurately preserved, both in Scripture and in Josephus, from the archives of the temple, remains unshaken and invincible.

putation, which certainly appears plausible and forcible. I shall therefore examine into the systems of Petavius, Walton, Whiston, (the supporter of the text, but on grounds different from my own) Clemens Alexandrinus, Josephus, and the learned Playfair, whose chronological tables, from their accuracy, completeness, and admirable arrangement, have deservedly acquired a very high degree of reputation, and whose objections, consequently, it is important to examine and refute.

Ist. The system of Petavius has had many able and enlightened advocates, and it appears in itself, so defensible and just, that I think it will be necessary to make some remarks on the several items of his table, which I here submit.

		A. I. P.
	Moses 40 years commenced	3183
	Joshua 14 - - - - -	3223
	Elders 10 - - - - -	3237
1 Opp.	Chushan 8 - - - - -	3247
	Othniel 40 - - - - -	3255
2 Opp.	Moab. 18 - - - - -	3295
	Ehud 80 - - - - -	3313
3 Opp.	Jabin 20 - - - - -	3393
	Deborah 40 - - - - -	3413
4 Op.	Midianites 7 - - - - -	3453
	Gideon 40 - - - - -	3460
	Abimelech 3 - - - - -	3500

Tolah

		A. I. P.
Tolah	23 commenced	3503
Jair	22 - - - - -	3526
5 Servitude	00 - - - - -	00
Jephthah	6 - - - - -	3554
Ibsan	7 - - - - -	3554
Elon	10 - - - - -	3561
Abdon	8 - - - - -	3571
6 Servitude	00 - - - - -	00
Samson	20 - - - - -	3579
Eli	20 - - - - -	3599
Samuel and Saul	40 - - - - -	3619
David	40 - - - - -	3659
Solomon	40 - - - - -	3699
4th year of Solomon	- - - - -	3703
Colliguntur ab anno primo Moysis & Exodo ad quartum Salomonis inclusive anni 520.		

3703

3183

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 520

On this table we may remark,——

1st. That the learned author, is consistent neither with the system, that would account the servitudes, separately and distinct, from the period of the judges; nor with that which would include them in the several reposes and jurisdictions;



dictions; since he reckons the 4 first as exclusive, and the 2 last as inclusive; and whatever authority the two last may have, that they should be reckoned inclusively, it is evident from the whole series of this enquiry, that the first have still stronger claims to be so included.

2nd. The great objection of making the servitudes commence in the very year of the death of the last deliverer, applies with great force against this system, particularly, it makes the servitude under Jabin, *commence* the very year the jurisdiction, or rather repose under Ehud concluded, forgetting Shamgar succeeded him, whose title to the character of a judge, we have formerly established.

3d. Since he reckons the 40 years of the 6th oppression, under the Philistines, as commencing in the year of Abdon's death, and flowing on contemporaneously with the jurisdictions of Samson and Eli, he has evidently neglected the authority of Scripture, which represents Sampson to have been born *after* the *commencement* of this oppression, so that like Marsham, he seems to commence his jurisdiction with his birth.

4. Although Petavius is justified in granting to Eli but 20 years, by the authority of the Sixtine edition of the Septuagint, and the Polyglott of Walton, still there is some reason to hesitate on adopting this reading against the Hebrew, the Chaldaic Paraphrase, the Targum of Jonathan, the Complutensian

plutensian and modern Septuagints, and all the Versions. (Vide Polyglott, of London, and the Complutensian.)

5. He does not distinguish between repose and jurisdictions.

6th. The authority of St. Paul, (Acts 13. 19.) alleged by Petavius, against the text of 1. Kings vi. 1. will by no means accord with his calculus, as we shall see in the sequel, where that text shall be particularly examined. Petav. Vol. 2. p. 44. Edit. Antwerp. 1703.

II. Walton, in his prolegomena, declares for amending the present reading, 1. kings vi. 1. and substituting 580: his table however is liable to all the severity of animadversion—part of it is as follows. p. 9. Prolegom. edit. London.

Entrance into the land 41 year of the exod.

Conquest 46

Division 47

End of Chusan or

1 Oppression 55 the intermediate are reckoned consecutively

End of Jephthah 372

Abdon died 397

End of Phil. 437 after 40 years. Opp.

Samp. dies 457

Eli ——— 497

Sam. and Saul 537

David 577

Solomon 5th. 581

Saul

Little will be necessary to overthrow the authority of this system ;

1st. It commences the oppression of Chusan the year after the partition, contrary to the express and reiterated declarations of Scripture, to which we have so often referred the reader.

2d. Sampson, instead of "judging Israel in the days of the Philistines," succeeds their oppression.

3. Servitudes are made to commence uniformly in the year, concluding the administration of the last judge.

4. Jurisdiction and repose are held to be synonymous—contrary, as we have shewn, to evidence and reason.

III. Whiston, in his Dissertations, prefixed to Josephus, attempts to reconcile the latter to the text of 1 Kings. 6. 1. his system is as follows:—

	Moses	40
	Joshua	25
	Elders	18
1 Ser. of Chushan		8
	Othniel	40
2 Servitude Moab		18
	Ehud	8 vide infra
	Shangar	1

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2. B

3. Opp.

\* It is observable, Walton publishes a letter of one of the Capelli to his brother, approving of this system.

3 Opp. Jabin	20	
Barak	40	
4 Ser. Midian	7	
Gideon	40	
Abimelech	3	
Tolah	23	
Jair	22	
5 Op. Ammonites	18	
Jephthah	6	
Ibsan	7	
Elon	8	
Abdon	10	
6 Op. Philistines	42 $\frac{1}{2}$	Sampson and Eli included.
Samuel	12 $\frac{1}{2}$	
Saul	20	
David	40	
Solomon	3 $\frac{1}{2}$	
	<hr/>	
	480 $\frac{1}{2}$	

1. Whiston, in this table, although it is constructed with great ingenuity, has not avoided the imputation which we have objected to Petavius of inconsistency, since he has neither followed the system of computing the numbers, wholly exclusive or inclusive, as we see at the sixth oppression, he includes Sampson and Eli.

2. The

2. The death of Othniel is 91 years after the passage of the Jordan, which exposes the system to the observations made before on the prolongation of human life.

3. Giving Ehud but 8 years, is against the current of all the MS. versions and translations of Scripture, all the copies of Josephus extant, all the ancient fathers and chronologists who, (except one,) unanimously concur with scripture in granting to the second repose 80 years, and although Theophilus may have read (as is alleged by Whiston) 8 years in his copy, is it to be received against this weight of evidence and cloud of witnesses?

4. Is it to be supposed that Ehud should deliver Israel, and that Israel should relapse into idolatry, as the text expresses, (4. Jud. 1) *after* the death of Ehud, be delivered again by Shamgar; and be subjected to the king of Hazor in the short space of 9 years?

5. The short period granted to Samuel is agreeable neither to scripture, to reason, or to the opinions of the ancient chronologists.

6. If Saul only reigned 20 years, then with the 12 of Samuel, the sum does not accord with St. Paul in granting 40 years to Samuel and Saul, as most understand it, or in giving 40 to Saul alone.

7. The difference of the terms "repose" and "jurisdiction" is not admitted, and the precision of scripture is therefore affected.

IV. The opinion of Clemens Alexandrinus, which has been urged in favour of the lengthened calculus, independent of the particular objections to which it is liable, is contradicted by the various and inconsistent computations which he mentions and neglects, but which at least demonstrate, that the sentiments of those, who rejected in his time, the authority of the Hebrew text, were neither consistent or reasonable. "Many," says he, "reckon from Joshua to David 450 years, but I compute to the death of David 423 years and 7 months: some from Moses to Solomon account 595 years, others 676; but if to the 450, from Joshua to David, you add the 40 years of Moses in the wilderness, as many of David, and the 80 years of the age of Moses at the exod, there will arise 610 years from the birth of Moses, to the end of the reign of David."

450 from beginning of Joshua till beginning of David.  
 40 of Moses in the desert.  
 80 age of Moses at the exod  
 40 of David

---

610

"but more accurately, if to the 523 years and 7 months, to the death of David we add the 120 of Moses, and the 40 of Solomon, the sum will amount to 683 years 7 months.

Y.	M.
523	7.
to the death of David from Joshua	
	120 years

Y.	
120	years of Moses
40	of Solomon

---

683 y.

Again he says, "to the time of Samuel there are 463 years and 7 months;" this sum, subducted from the 523 years and 7 months to the end of the reign of David, leaves 60 years from Samuel to the death of David, so that the calculus of the 463 years and 7 months concludes with the election of Saul, since he uniformly attributes but 20 years to Saul after "the renewal of the kingdom," which, with the 40 of David, completes the 60 years before deduced;—this account will however grant us 643 years and 7 months from the birth of Moses till the death of David.

453 7	from Joshua to the end of Samuel and Saul
20	Saul alone
40	David
120	

---

643 7

Add then the 40 of Solomon, and we derive 683 years 7 months as before; which proves that his present numbers are really those he intended to propose; if we then subduct the 36 years of Solomon and the 80 of Moses, we will derive 567 years and 7 months, as the interval from the exod to the foundation of the temple.

Before

Before I proceed to consider the arguments deducible from this system in favour of our hypothesis, I shall submit a table of the separate items, from which this aggregate is collected; and as Vignoles appears to have laboured with the happiest success on the chronology of Clemens, I shall give his summary in a corresponding column, and insert such of his corrections as appear most judicious and requisite to form the aggregate. The first column is literally transcribed from the edition of Sylburgius (Lug. Bat. 238.) in which there are some inaccuracies that I am uncertain whether to attribute to the errata of the press, or of the MS. but I shall mark them as they occur.

Joshua acted as captain of the host, (bellum gessit) sixty-six years. lat. lxxj. Gr. ἑξήξη which is 68; ξξ would be 66.—It is observable, however, Vignoles seems to have read 65, supposing it combined the 40 years in the wilderness, and the twenty-five which Clemens afterwards assigns to his government, and with which we commence the table. (Vignoles, p. 13. p. 203.)

	SYLBURGIUS.	VIGNOLES
In terra illa bona quievit	25 πεντε και εικοσιυ (vide infra	27
Chusan	8 - - - - -	35
Othniel	50 ἑξήξη v. - - - - -	85
Eglon	18 Lat. 28. - - - - -	103
Aod	80 - - - - -	183
Jabin	20 - - - - -	203
		Ejus



Ejus tempore Debora prophetissa Pontifex Ozius filius Riesu		
	SYLBURGIUS.	VIGNOLES,
Barak	40 - - - - -	- 243
Midianites	7 - - - - -	- 250
Gideon	40 - - - - -	- 290
Abimelech	3 - - - - -	- 293
Tolah (Boleas filius Be-		
dan filii Charran)	23 - - - - -	- 316
Ammonites	18 - - - - -	- 334
Jepthah	6 - - - - -	- 340
Ibsan (Abatthan)	7 - - - - -	- 347
Elon (Ebron)	8 (Gr. 10.) - - - - -	- 355
Abdon (Æglon)	8 vide infra - - - - -	- 263
Philistines	40 - - - - -	- 403
Eli	40 - - - - -	- 443 <sup>M</sup>
Samuel	20 7 m. vide infra (Gr. 27 ys.)	463 7
Saul (renovatus)	20 - - - - -	- 483 7
David	40 - - - - -	- 523 7
Solomon	40 - - - - -	- 563 7
Moses	20 - - - - -	- 683 7

so that from the birth of Moses to the end of Solomon are 638 years and 7 months, and from the commencement of the jurisdiction of Joshua, to the end of the jurisdiction of Samuel, appears to be 463 years and 7 months, as Clemens has himself computed them.

But

But as the reader has doubtless observed some deviations, both from Scripture, and from the present reading of Clemens in the summary of Vignoles, I must subjoin his defence.

1. Clemens, although he assigns 25 years to Joshua in his catalogue, yet immediately afterwards mentions 27 years as the duration of his magistracy, "according to the book that bears his name," and although we do not find any such period in the book of Josephus at present, he probably meant, it was the opinion of the generality of authors in his time, as in effect we see Theophilus, Eusebius, St. Augustine, and Syncellus agree in allotting him this period.\*

2. After the mention of Æglon or Abdon, we read those words in Clemens: "Some join to the forty of Elon, the seven of Ibsan; the reading "40 years" being evidently spurious, Hervetus translates it "four," and Usher agrees in the amendment because three or four is the number attributed to Eglon, by Nicephorus, and for the very obvious reason, that it is to be included in the "seven" of Ibsan as the greater number; but Archbishop Potter and Vignoles propose the simple and evident correction of reading  $\eta' \epsilon\tau\eta$  in place of  $\mu' \epsilon\tau\eta$ , in which I concur.

3. The

\* Probably Clemens might have read such a number in his copy of the Septuagint, into the text or margin of which it might have crept, from the note of the transcriber or the original possessor following the received opinion of his time,—a remarkable instance of which practice, we have in the Sixtine Septuagint, edit. Rome, 1580, where the fortunes of Jeroboam, in Egypt, are related more circumstantially, than in any other Version. Pezron. 229. edit. & ut supra.

3. The original of Clemens bears "Samuel succeeded Heli, and governed 27 years," ἔτη ἕικοσι ἑπτὰ κατασχών. However, no ancient author gives 27 years to Samuel alone, or to Saul and Samuel in conjunction, but a number agree in granting 20 years to Samuel, among whom we may mention the author of the Chronicle of Alexandria, Maximus, Cedrenus, and Chronicon Latino-barbarum of Scaliger: these 20 years are doubtless, those, during which the ark remained at Kirjath-jearim, to which, if we add the 7 months it was in the possession of the Philistines, we have 20 years and 7 months, so that it should appear the passage of Clemens should be corrected thus, "ἔτη ἕικοσι μῆνας ἑπτὰ κατασχών:" By this amendment, we derive the seven months mentioned so frequently by Clemens, a period which is no otherwise deducible. Admitting the corrections of Vignoles, which appear equally happy and just, we collect the sums assigned by Clemens, and the arguments we derive from them in the support of our system, are by no means inconsiderable or unimportant.

I. We remark the supputation of Clemens makes the first oppression succeed *immediately* on the conclusion of the jurisdiction of Joshua, without estimating or admitting the period usually assigned to the government of the Elders, during which, "Israel served the Lord," either in the idea, that the period of the Elders must be the same as that of the jurisdiction of Othniel, who himself was one of them, as being a distinguished warrior at the conquest of the land—or as

including it in the years of Joshua, and understanding the term by which he mentions his administration *after* the conquest for 25 years, viz. "he rested in that good land," as equivalent and identical to that mentioned in the book of Joshua, "and the land had rest from war," which we have shewn to signify the interval succeeding the conquest, to the wars of the elders or to the conquest of Chusan.—In either case it will be evident and admitted that my system is more consistent and just, in granting 30 years to Joshua and the elders conjointly, which adding the six years of war to the 25 of rest, is conformable to the calculus of Clement; especially, as it is evident and *demonstrable* from Scripture, that after the death of Joshua, the elders led out the tribes to successful enterprise, and of course were *not* subjugated in the year of his death, (1. Judg. pass.) and here is no opportunity for the subterfuge, "that the success of some tribes, and the servitude of others\* may have (as is probable in other instances) been partial and contemporaneous, since we are told *all the tribes* consulted the Lord, "who should go up" against their enemies; which shews that they were both united and independent at that period.

2. In granting 50 years to Othniel, in which many of the ancient chronologists concur, it should seem he originally meant

\* Perhaps, indeed, he meant to say, bellum gessit  $\xi\tau\eta$ ,  $\epsilon$ , and that the  $\xi$  is a mistake of the transcriber.

meant to include the 8 years of the first oppression in this period, and to suppose the first repose of 40 years commenced *after* his victory; so that his jurisdiction began probably two years before the invasion of Chusan, to complete the 50 years—agreeably to which, we find the Paschal Chronicle allots him but 32 *years*, in which it would include the first oppression, but inaccurately; as the 8 years of the first oppression are requisite to complete the period in Scripture: If this mode of solution is adopted, it will afford us strong ground of argument for our *more consistent* calculus in accounting the *remaining* servitudes as inclusive to the reposes.\*

3. He omits Jair, evidently intentionally, as it appears by his aggregates, which would be inaccurate by inserting his periods; holding his jurisdiction as I presume, contemporary with the 18 years oppression of the Ammonites. The jurisdiction of Jair was 22 years, (Jud. 10. 8.) and perhaps the two

2 c 2

years

\* This solution may appear dubious, but it is not otherwise conceivable, how so many could have agreed to extend the period of Othniel, as Eusebius (Præp. Evan. x. c. 13.) Sulpicius Severus, Maximus, and Zonaras; or how they could have avoided recollecting, he must have been one of the elders. The two years necessary to complete the calculus, may be the two assigned by several ancient authors, to the jurisdiction of the ancients. (Vide Playfair p. 11.) The amiable and learned reformer Melancthon, seems to have been of an opinion somewhat similar to this, when he granted 8 years to Othniel, supposing, as I understand him, that he was captain against the enemy, during the whole of the oppression of Chushan, which considering his established character, previous to that oppression, is by no means improbable. Chron. Carionis p. 44. Aureliæ Allob. 1610.

years added to Joshua, and the two added to Othniel (if the solution in the last observation is admitted) to complete his 50 above the 40 of repose, and the 8 of the first servitude will grant us the 4 years of Jair deficient; so that adopting those amendments, we might read in the catalogue of Clemens, instead of "the Ammonites 18 years," "Jair 22 years," and the totals would remain unvaried.

4. He evidently agrees with the Scripture and our calculus, in accounting the years of Sampson contemporary to the 5th oppression of the Philistines, since he omits his years.

5. It is clear he does not reckon any interregnum between the conclusion of the jurisdiction of Eli, and the commencement of that of Samuel, and thereby considerably strengthens our arguments on this epoch, against the authority of Vignoles and his followers.

6. Since Clemens does not admit this interregnum, and (as amended by Vignoles) allots only 20 years and 7 months to the administration of Samuel; he grants a great degree of versimilitude to my conjectures on the text (Saml. 7. 2.) on which so much stress has been laid, and shews us it was probably in the second or third year of Saul, the ark was brought back to Shiloh.

7. Admitting the correction of Vignoles in the point of Samuel's government, and adding the twenty years of Saul after the renewal of the kingdom, we derive 40 years and 7 months for the duration of the authority of both, agreeably

ably to our interpretation of St. Paul, (Act. 13: 19.) and to the arguments we have urged against Josephus.

8. In granting only twenty years to Saul, "after the renewal of the kingdom," which was before the rejection of Saul, he is clearly at variance with Josephus, who allots him 20 years "after the death of Samuel;" and still more so, when Clemens declares expressly, "Saul died two years after Samuel," a great authority for the reasoning we have submitted against Josephus and Vignoles.

9. He rejects the supputation of St. Paul, as our system obliges us.

But while Clemens affords us so many arguments in favour of the hypothesis we adopt, he is obnoxious to several of the objections we have urged against the adherents and supporters of the enlarged interval. He has contrary to every rule of sound criticism, made the different servitudes succeed in the very year of the death of the preceding judge; he has confounded the sense and meaning of the term "repose" and "jurisdiction;" he has, in some instances, deviated from the express declaration of Scripture (as in the article of Jair) he has made the 40 years of Eli, *succeed* the twenty of Sampson, which he admits concluded with the Philistine oppression, thus making Sampson complete the deliverance he was only to begin; and he has contradicted the computation of Jephthah to the Ammonites; but if we subduct the years of the several oppressions, and include them in the years assigned to the judges, as our system necessitates and determines, his  
calculus .

calculus, with a very few obvious corrections, completely agrees both with our hypothesis and with the disputed text. (1 Kings, 6. 1.) Thus:—

Y. M.

523 7 from passage of the Jordan to the end of Moses

4 of Solomon

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527, 7

Subduct 111 of Servitudes

---

416, 7

Add 22 of Jair, omitted by Clemens

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438, 7

40 in the Wilderness, preceding the passage of  
the Jordan

---

458, 7

2 deducted from the number assigned by Scrip-  
ture to Abdon

---

480, 7

I have chosen to separate the items, as in the preceding table, in order that they may be more completely obvious and evident to the reader; but it is particularly important and deserving of remark, that Clemens professes in his computation on the subjects relative to the Hebrew records, to follow Josephus with the most guarded accuracy. "Josephus," says he, "reckons from Moses to David 585 years, and from

David



David to the second of Vespasian 1179 years." (p. 341.) it is true, indeed, that the first of those numbers is not at present to be found in Josephus, but the second is still read. (Bellum. Jud. VI. 4. secundum Ruffini distinctionem vero, 18.) It appears to be reckoned from the taking of Jerusalem and the removal of the seat of government there in the seventh year of his reign; and similarly, it should seem, that the first interval is probably reckoned from the exod to the *end* of David, or rather to the association of Solomon in the government, about two years before the death of his father,\* so that the fourth year of his *separate* reign might be as Josephus assigns it,) coincident with the 592nd year of the exod. In this view, the remark of Clemens in regard to the first epoch, whether he derived it from the expression of Josephus, (as is most probable, since the second period is *simply* assigned) or whether he deduced it from the separate intervals of the historian, is particularly important; as it affords a new authority and argument, that the numbers at present read, respecting

\* In another part of the history, Josephus reckons from the "first building (*κτίσις*) of the temple by Solomon, till the second year of Vespasian, 1130 years and 7 months," (Chap. x. Lib. 7. Bell. Jud.) which is above 48 years less than the former account, 1179. Perhaps Josephus meant to reckon from the *dedication* in the 8th year of Solomon, and the 40 of David would make up the deficiency; but this would be inaccurate, as David reigned 7 years in Hebron, before the conquest of Jerusalem; but at all events, his remaining 33, and the 8 first of Solomon afford an aggregate which differs little from the defect of 48 years—the items of the historian, experience has taught us should not be too closely pressed.

respecting the æra of the foundation of the temple, are the same as those, which Clemens followed, and consequently, that in the view of Clemens, Josephus did not admit the interregnum, some have wished to attribute to him between Eli and Samuel, as we may derive that sum from the table in Clemens, without recurring to that interval—Thus, Clemens reckons 523 years and 7 months from the commencement of Joshua to the end of David, the 40 years in the Wilderness make 567 7, and the 23 of Tolah who is omitted by Josephus, make 586 7, while the 22 of Jair, who seems as we have seen to be intentionally omitted by Clemens, give 585 7.\* It is very remarkable, that of the two judges immediately succeeding each other, one should be omitted by Josephus whose period is 23 years, and the other should be omitted by Clemens whose period is 22 years; the insertion of either of whom, grants us the period attributed to the Jewish historian by Clemens; so that subducting the servitudes from Josephus as from Clemens, the interval (1 Kings, 6. 1.) remains.

V. The system of the learned Playfair is more bold, daring, and uncompromising; he is not satisfied merely to suppose an error

\* From this we see the inaccuracy of Vignoles, who would wish to press this testimony of Clemens into his favour, and to suppose Josephus reckoned merely to the beginning of David, in which case the calculus would never answer; whereas we now see it completely agrees. The remaining testimonies of Josephus. (Ant. xx. c. 8. Ruf. & 1. C. 2. Aponi) for reckoning 612 years to the foundation of the temple are consequently corruptions *after* the time of Clemens.

error in the numerical items in the text, he would absolutely reject it as interpolated and suppositious—as the result of Jewish fraud, executed without ingenuity, and open on the simplest enquiry to detection and exposure. His arguments certainly possess much of the plausibility of conviction, and are proposed with all the confidence of success; indeed the author leaves the reader in doubt whether to admire more the singular sagacity and research, which, after the lapse of so many ages, has happily succeeded in rescuing them from the rust of antiquity, and bringing them adorned with all the lights of criticism and philosophy into day;—or the singular fatality that concealed from the enquiries of the learned and the investigations of the wise, truths, at once so evident and so simple, lying as it were embossed upon the very surface of the authorities, from which they were derived, and only requiring to be known and to be recognized, in order to destroy the influence of pernicious or unsubstantiated testimony, both injurious to the authority of Scripture, and at variance with the conclusions of reason;—but I shall state the arguments of the learned author in nearly his own words.

1. The assigned period is not found in any ancient Hebrew or Greek copies, and it is not in the parallel passage of Chronicles, 11. 3. 2.

2ndly. None of the ancient Jewish or Christian chronologers have mentioned it.

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3dly. That all have computed by the times of the Judges, which they would not have done, had the passage under review been known to them; for *that* would have been to have rejected a certain mode of computation in favour of one that is not absolutely so.

4thly. Josephus refers to this text, but found no such number in it. He says, that “ Solomon began to build the temple in the fourth year of his reign, in the second month, 592 years after the exodus of the Israelites out of Egypt.”

5thly. Origen too, in his commentary on John’s Gospel, cites this text without the number, which shews it was not known in his days.

Lastly, That no writer, Jewish or Christian, ever quoted or observed this passage, until Eusebius took notice of it, about the middle of the third century, which makes it highly probable that an interpolation was made not long before that period, founded perhaps on a pretended traditional interpretation of the Jews, that the years of the servitudes ought to be reckoned in the years of the judges.

In

\* He however acknowledges the servitudes of the Ammonites began in the days of Jair, and counts 307 years to Jephthah; “ the last servitude under the Philistines is likewise to be included in the corresponding years of the judges—they commenced about the time of Sampson’s nativity, (Judg. xiii.) and they terminated about the time of his death (Judg. xv. 20); so that he must have judged Israel during the last 20 years of this servitude.” Afterwards there was an anarchy of 20 years, as may be collected from Saml. iii. 1.—iv. 15.—vi. 1.—vii. 1. 2. and viii. 1.—5.) Unless this interval be admitted,

In answer to this formidable apparatus of reasoning and objection, I shall consider, I hope with impartiality and candour, the several arguments that have been detailed, and trust I shall be able to demonstrate, that the intrinsic weight and importance of the whole, should not be sufficient to induce us to reject the authority of the text, or to surrender the principles on which we have attempted to explain it.

I. If, indeed, the *assertion* contained in this statement, was accurate or demonstrable, little would be the resources of argument, or little the hopes of conviction in favour of the passage: Ingenuity might cavil, dexterity might parry, and talent might sophisticate in vain; the weapons of controversy would be wielded without success, and the unbiassed voice of truth must ultimately triumph. But when *I know* that this *assertion* is false, in so much as we can depend on the fidelity of all the versions and all the manuscripts which industry could accumulate or collect during so many ages, and when *I perceive* the learned author, who has proposed it with so much hardihood and decision, has *only* been enabled to derive it as an inductual result from the few circumstances

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mitted, Samuel must have been too young to have succeeded Eli, who died in the beginning of it; and he could not have been in the decline of life when he anointed Saul to be king, 1. Saml. viii. 1. Upon the whole, computing the years of the period upon the principles already pointed out, and assigning 25 years as the term of Joshua's administration, and 2 as the interval between his death and the first servitude, according to Josephus, Apicianus, and other ancient Jewish and Christian writers, the sum will amount 540 years."

of casual variety in the reading of the Scriptures, and casual conformity in the opinions of the earlier chronologists, which he *afterwards* remarks: I feel I cannot too severely reprobate and condemn this total neglect of sound reasoning and candid investigation, which would so far abandon the principles of equitable dissent and justifiable scepticism, or so far surrender the dictates of reason to the suggestions of system; *direct* evidence to *positional* argument; sensible proofs to preconceived principles; the recorded opinions of the learned, to the prejudices of individual persuasion, as to deliver the result of an inductive conclusion for the statement of an admitted truth; as to propose the correction of every known version of Scripture, on the grounds of a few futile and inconsequent deviations, the weakness of the evidence for which, we shall soon expose and demonstrate; and to add the authority of a name, not unknown or unrespected, to a charge of interpolation in the sacred writings, which, *if true*, could only serve to alarm the fears of the timid and the unlearned, who would not stop to examine into the evidence of a statement, delivered with so little hesitation, and recommended by so many titles to credibility and belief; or to enhance the triumph of the infidel, who will not fail to aggrandize with this concession, his catalogue of pious frauds, interpolated passages, important variations, and inconsistent testimonies; but if, as I hope to establish *it is false* and unfounded, what shall be said of the logical accuracy and ingenious reasoning of

the

the writer, who would venture to propose it as a decisive argument, and rely on it as an admitted principle; who lays down his premises in gratuitous assertion, and deduces his conclusion in triumphant demonstration?

Qui cum præsumpserit majorem atque minorem  
Ex male præsumptis urgeat Ergo sequi.

Owen. Epig. 10. 46.

To say nothing of the soundness of that rhetoric, which first proposes the strongest and most unobjectionable of all arguments, by denying the authority of the only record produced against its principles, and then, instead of resting on this substantial invalidation of the contrary testimony, or of dwelling on *this* great ground of authority in its own favour, weakens its force and dissipates its effect, by the addition of other testimonies equally inconsequent and unauthenticated, independent and unconnected; sources, which themselves are unproved, and may be retorted against his conclusion and his cause.

But to consider the remainder of his arguments separately—  
I. It is not in the parallel passage (11 C. 3. 2.) admitted; but the conclusion that it is suppositious in the text, (1 K. 6. 1.) is by no means deducible, because we know there are many passages in each, that differ materially; because there are many facts, circumstances, and statements in the one, not to  
be

be found in the other; many discussed with the minuteness of detail, in the book of Kings, and merely alluded in the parallel passages of the corresponding history; because the evidence of each is independent and *sui generis*; because they are separate records by separate authors, and in many places; evidently derived from distinct sources; because the very parallel verse referred to by the learned author, differs in other points, from the contested text, as well as in the omission of the interval from the exod, which sufficiently shews it was not intended to be even a *partial* transcript, much less a collated copy: It is redundant, for it adds, "and on the second day of the month," which is not in the contested text; it is deficient, for it does not mention the name of the month, which is assigned in the book of Kings. But it is in vain to reason against a point so inconclusive and indefensible; let any person compare the parallel passages of those books referred to, in the margins of the text, and he will then acknowledge, that a casual omission is not to be received as evidence of an intentional disagreement; that the absence of *literal* exactness, is the best test of unstipulated and unbought conformity; and that the purposes of fraud (if any had been intended) would have been more perfectly attained by the addition, equally facile of the omitted number in the parallel verse, than by leaving it to critical acumen, and unhesitating scepticism, like that of the learned author's, to reject with unscrupulous contempt, a passage of one book

as



as “spurious and interpolated,” from the fact of it being omitted in another, where it might naturally occur: but waiving these obvious considerations, we find, I may remark, that in the account of the dedication of the temple, (1 Kings, 8. 21.) that Solomon in his affecting address to the congregation of Israel, assembled to witness the ceremony, informs them that he has now “set a place for the ark, wherein is the covenant of the Lord which he made with our fathers, *when he brought them out of the land of Egypt;*” and in the parallel passage, (11. C. 6. 11.) the latter part of the verse is completely omitted. Is it then inconsistent or extraordinary, that the book referring so particularly to the exod, should determine the exact interval elapsed from that great event; the commencement of the Jewish polity; and the epoch of the national separation, as the chosen people of God. Is it surprising, that relating the grand completion of the edifice of the popular faith, the last best consummation of the promises of God, —the final expectation of Israel,—and the point to which all the ceremonials of religion ultimately converged; he should refer to the period adopted and used as the great epoch of their history and annals? rather it is so familiar, agreeable, and consistent with the usual style and genius of the Hebrew records: It is so far the characteristic of the Eastern writers, that I should much sooner suppose, the interval was omitted by the mistake of the transcriber and copyist, in the book of Chronicles, than draw a conclusion from *this* casual omission, against

against the fidelity of the contested text, where it is yet found. But still farther, the period that the temple was building, the year commemorated by its encænia, or the month of its completion, are not mentioned or even alluded to, in the book of Chronicles, when each is recorded in the parallel history: Is it then, I repeat, inconsistent or extraordinary, that a book so much more precise, accurate, and exact in determining those comparatively unimportant and minute points, should have been equally so, in marking a more necessary epoch? an æra with which, as we have shewn during the progress of this enquiry, the whole course, and series, and substance, and completeness of the Scripture chronology, as affecting the history of religion, and of the national chronology as affecting the history and fortunes of the Jewish state, were intimately concerned; and *this* when the other great epochs are so carefully recorded, and so exactly limited in the Hebrew writings. (v. Ex. 12. 40, 41.) Surely, this argument proposed with so much emphasis, and delivered with so much decision, will no longer be insisted on—it is equally futile, inconclusive, and inconsequent.

2. The next argument is certainly *partially* true, though it has been improperly enunciated; and it should appear not altogether ingenuous in the learned author, to produce as an argument, merely a negative proof, derived almost exclusively from unacknowledged sources, or from brief notices, scattered through the works of later authors by whom they were

were introduced, only as collateral testimonies to some insulated facts they were recording; and which of course were totally independent of the system, or the principles of the writers from whom they had been quoted. *He* surely was aware that the first *professional* chronologist among the Christian writers was Julius Africanus, in the beginning of the second century, and Africanus, I shall shew in the sequel, was well acquainted with the contested verse; and it is clear that the others who may incidentally refer to the chronology of Scripture, are not to be produced in evidence against the existence of the text; any more than the opinion of Petavius or the moderns, who reject its computations while they acknowledge its authority; with respect to the Jews, from the very first they have been unanimous, without a single exception, in supporting it.

3. The third is already answered, in the reply to the last objection. It is indeed true, that the *generality* have pursued the system attributed to them, but it by no means follows, that it was from an ignorance of the contested passage, or a disregard of its authority; it originated in the same spirit of system, the same principles of inductual and problematical reasoning, which have induced many of the moderns to reject or to paraphrase it, according to the particular hypotheses they may have adopted; but it is by no means true, that the ancient chronologists, because they do not follow the supputation of the text, were consequently ignorant

of its existence, or disposed to regard it as spurious or interpolated, as will be very evident to any one consulting Syncellus, who discusses this very question (p. 176. Edit. ut supra) at large, and particularly mentions the reasoning of Eusebius, which he opposes by his own : he acknowledges the authority of the Verse, but contends, for an error in the interpretation of it, because it should be understood “ as separating the servitudes and oppressions, and only recording the periods of prosperity and peace;” and this error, which has been renewed and restated by Vossius and his followers in a later age, was the only cause that the ancient chronologists do not mention, or *seem* to neglect the computation of the book of Kings. We see then the force and value of an argument drawn from their silence against its authenticity; their logic and their criticism, in so paraphrasing the text, may have been inconclusive and inaccurate, and all the reasonings of this essay, have for an object to prove that they were; but their principles of computation were justly founded and deduced from the exposition they premised; and little indeed did these venerable supporters of all *they held* valuable and important in life—the truth and authority of those Scriptures which were the rule of their faith, and foundation of their hopes, little doubtless, when however ignorantly, restoring the chronology of the sacred writings, did they ever look forward to the period when the very systems and hypotheses built on the supposition of this text, and resting *only* on an interpretation which

which they held correct, of its meaning, and design would be urged and brought as evidence against its authenticity and its truth.—I shall in the sequel, assign the probable causes of their exposition of the text.

4. This is a very remarkable instance of an author being brought as evidence against the truth of a record, which his testimony, on the very shewing of the person alledging it, goes to establish and confirm. The authority of Josephus, can, by the last effort of human ingenuity, be considered but in two modes—either he intended (as the learned author has supposed) to refer to the text in question; and *then* he becomes an advocate the more in defence of its authenticity; or he did not, in which case his testimony is quite indifferent to the decision. On the first alternative, it is evident to the simplest understanding, that he *did* find a number and interval in the text, since he has assigned one; and of course that the arguments laid down with so much emphasis and decision by the learned author, to prove *that* the part of the verse in which the period is delivered, is spurious and interpolated, are equally inaccurate and indefensible; that in a word it was read in the history, previously to the *redaction* of the canonical books by the doctors of the Tiberiade, and consequently was not inserted by them, or depending on their traditions; so that the only question that could arise, would be between the comparative accuracy of the Versions and MSS. of Josephus, and those of the Hebrew text; in the decision of which, (more particularly

ticularly in the *numerical* passages,) no one, I believe, will find it very difficult to deliver an opinion, not unfavourable to the principles of our hypothesis. In the second alternative, or that Josephus does not intend to quote or to refer to this verse, his authority is of course, not to be alledged against its fidelity; and the argument of the learned author is not strengthened by producing it. It may be that it is to the parallel verse in the book of Chronicles, which we have examined at length, in our observations on his first argument, that Josephus is alluding, and that the number assigned is his own; in which case we have already seen how inconclusive any hypothetical positions founded upon the corresponding testimony are, for the rejection of the contested verse.

I shall consider the passage of Josephus more at length in the sequel.

5th. This would indeed be a most serious charge, were it just or defensible. I have consulted the commentary of Origen on St. John's gospel; I have examined the different passages he has alledged from the old Testament, and I have found the quotation to which the learned author undoubtedly alludes; with some surprise, I confess, yet with unmixed satisfaction, to discover so little authority for the conclusion which he has hastily deduced. Origen, in the passage under review, is discussing the reason for the answer of the Jews to our Saviour, who was speaking as the Evangelist expresses it, "of the temple of his body" "forty and six years,

was

was this temple in building, and wilt thou rear it up in three days?" Origen enquires into the evidence for this assertion, and the manner by which it can be reconciled to the account in the book of Kings, that the temple was "completed in seven years;" he consequently quotes some verses from the original authority to which he had referred. Would it not have been importunate, redundant, and inapplicable, to produce in the discussion of the question, "*what* period was consumed in the erection of the temple;" an account of the particular epoch and interval elapsed *since* the commencement of the Jewish commonwealth? Origen was not so puerile and unselecting a writer, although by no means a sound or judicious critic, as to be guilty of the unmeaning verbiage, which the learned author would desire from him; he quotes the verse as his authority, but he quotes it without any extraneous, unnecessary, and redundant particulars: he produces from the record, just so much as will bear upon his subject—what will illustrate and not burthen,—what will establish and not overload it. The various adjuncts, which transcription *only* might accumulate and compile, are not, even by the voluminous Origen, *always* brought together, and the learned grammarian, while he may not be displeased at an opportunity of discovering the variety and compass of his reading, is sensible that the quotation of *that* part of an original authority, which serves to explain or enlighten the subject of his enquiry, would  
be

be just as sufficient to display it, as if he introduced what was only accessory and succedaneous. However, independent of this, Origen was by no means so accurate and correct in his quotations, that we may always rely upon the conclusion they would seem to indicate: it is very evident to the inquisitive reader of his works, that he frequently alledges his authorities from memory, and the lapses of which he has been guilty, are obvious *hints* against an unhesitating reliance on the fidelity of his statements.

I shall produce an example of this which is rather particular, I give it in the translation of Vigerus, as *verbal* accuracy is not here requisite or necessary.

Quod autem ipsi (Satanæ) peccator tradatur Paulus te docebit, ubi quidam loquens de Phygello & Hermogene “quos tradidi,” inquit, “Satanæ ut discant non blasphemare. In the passage, however, in which St. Paul speaks thus, (1. Tim. 1. 20.) it is *Hymenæus and Alexander* whom he mentions; and in another text, (2 Tim. 1. 15.) he speaks merely of Hermogenes and Phygellus being “turned away from him.” (Origenis *Commen. in S. S. cura Huetii, Commen. on Jeremiah Hom. 18. Vol. 1. p. 179.*)

As, however, the learned and inquisitive reader may desire to see at length the passage of Origen, on which so much stress has been laid, I have transcribed and collated it with some accuracy, with the Sixtine Septuagint, to which only, and the version in the London Polyglott, does it agree. It may



may be remarked, that like them, it couples the latter part of the chapter in which the period consumed in the building of the temple is recorded with the first verses, mentioning the year of its foundation; while the Complutensian Greek, adheres to the Hebrew reading: it is also not to be overlooked, that Origen denominates the second month "nisan," instead of Zif, which all the MSS. and versions retain without variation, so that, perhaps, we are not pushing the argument of induction too far, in assuming *this*, as another observable instance of a quotation alledged from memory; and if, on a comparison of the parallel passages I have produced, it should appear that the Sixtine version is, *probably* that which was used by Origen, it must not be forgotten, that *it retains* the interval from the exod, which the learned author supposes to have been omitted in Origen's copy:—perhaps a more accurate collation of the passages quoted in his works, with the Sixtine version would go strongly to confirm its identity with the copy he used.

HUETHI ORIGINES PARIS, 1679.

Γεγραπται γαρ ἐν τῇ τρίτῃ των βασιλειων ὡς ητοίμασαν τες λιθες καὶ τὰ ξύλα τρισιν ἔτεσι ἐν δὲ τῷ τεταρτῷ ἔτει μηνὶ δευτέρῳ, βασιλευοντος τοῦ βασιλέως σολομωντος

SIXTINE EDIT. ROME, 1580.

Καὶ ἐγενήθη ἐν τῷ τεσσαρακοσῷ καὶ τετρακοσιοστῷ ἔτει τῆς ἐξοδου υἱων ἰσραὴλ ἐξ αἴγυπτου τῷ ἔτει τῷ τεταρτῷ ἐν μηνὶ τῷ δευτέρῳ βασιλεύοντος τῷ βασιλέως σαλωμων

μαντος ἐπὶ ἰσραὴλ ἐνετείλατο ὁ βασιλεὺς δε αἶρουσι λίθους μεγάλους τιμίς εἰς τὸν θεμέλιον τοῦ οἴκου καὶ λίθους ἀπελεκήτους καὶ ἐπελέκησαν οἱ υἱοὶ Σολομωντος, δὲ οἱ υἱοὶ χειραμ καὶ ἔβαλον αὐτάς ἐν τῷ τετάρτῳ ἔτει, δὲ ἐθεμελιώσαν τον οἶκον Κυρίου ἐν μηνὶ νεισαν καὶ τῷ δευτέρῳ μηνί· ἐνδεκάτῳ ἐνιαυτῷ, μηνὶ βααλ ὅς ἦν μὴν ὄγδοος συντέλεισθη ὁ οἶκος εἰς πάντα λόγον αὐτοῦ, καὶ εἰς πᾶσαν δὲ ἀτάξιν αὐτῆ.

Quomodo quadraginta & sex annis extractum fuisse Judæi dicant templum hoc, si historiam sequamur, dicere non possumus. Nam in tertio regum scriptum est, quod præparaverint lapides & ligna tribus annis. In quarto autem anno, mense secundo, regnante rege Solomone super Israel, mandavit Rex, & tollunt lapides grandes

σαλωμον ἐπὶ τὸν ἰσραὴλ· (α) καὶ ἐνετείλατο ὁ βασιλεὺς ἵνα αἶρωσι λίθους μεγάλας τιμίς εἰς τὸν θεμέλιον τῷ οἴκῳ καὶ λίθους ἀπελεκήτους. Καὶ ἐπελέκησαν οἱ υἱοὶ σαλωμων καὶ οἱ υἱοὶ χειράμ καὶ ἔβαλον αὐτοὺς. Ἐν τῷ ἔτει τῷ τετάρτῳ ἐθεμελιώσε τον οἶκον κυρίας ἐν μηνὶ ξισ καὶ τῷ δευτέρῳ μηνὶ ἐν ἐνδεκάτῳ ἐνιαυτῷ ἐν μηνὶ βααλ τετος ὁ μὴν ὁ ὄγδοος συντέλεισθη ὁ οἶκος εἰς πάντα λόγον αὐτῆ, καὶ εἰς πᾶσαν διάταξιν αὐτοῦ.

(a) *Alius liber non habet illud καὶ.*

Et factum est in a quadragessimo & quadragintessimo anno, exitus filiorum Israel de Ægypto, anno quarto mense secundo regnante rege Solomon, super Israel & mandavit rex, ut tollant lapides magnos preciosos, in fundamentum domus & lapides

grandes lapides pretiosos pro fundamento domus: atque lapides impolitos, & sculpsērunt eos, filii Solomonis, & filii Hiram, jecerunt eos pro fundatione in quarto anno & fundaverunt domum Domini in mense Nisan (is est secundus mensis,) Undecimo autem anno in mense Baal qui est mensis octavus perfecta est domus per omnes partes suas, & juxta cunctam dispositionem suam. Ut ergo etiam præparationem ejus cum tempore structuræ annumeremus, undecim annorum numerus non completur ad structuram templi. Quamobrem quomodo Judæi dicunt quadraginta & sex annis ædificatum fuisse templum hoc? Nisi forte quis qui urgeretur contenderet ostendere

pides (b) non dolatos. Et dolaverunt filii Salomon & filii Chiram, & fecerunt eos. In (c) anno quarto fundavit domum Domini in mense Ziu (d) et secundo mense. In undecimo anno in mense Baal (hic est octavus mensis) consummata est domus in omni ratione ejus, & in omni constitutione ejus."

## NOBILIUS.

(a) Quadragesimo) Comp. ὀγδοηκοσῶν octogesimo ut in Vulg. (b) Non dolatos] ἀπελεκτήτος, sic etiam Theodoretus q. 22. ubi hunc locum tractat. In Comp. in extremo superiore capite ubi hæc habet, sic legitur καὶ λίθους ἀελεκητῶς καὶ ἐπελέκησαν οἱ σολομώντος θεοὶ θελοὶ χειραμ, δε οἱ γιβλίοι δε ἠτοίμασαν, & lapides

ostendere tempus quadraginta & sex annorum compleri ab eo tempore quo David inquit ad Nathan prophetam consulens de ædificationem templi: “ an ego habito in domo cedrina & arca Dei manet in medio tentorio? *and a little after*, he says, Quare si poterit quis ostendere principium præparationis templi fuisse colligente eo materiam convenientem a tempore quinti anni regni sui poterit, si urgeatur de quadraginta sex annis.

lapides dolatos & dolaverunt servi Salomonis & servi chinem & Gibbii, &c. In anno quarto] Hæc usque ad illud “ & domus’ in Comp. leguntur” in extremo hoc capite ut in Vulgata.

I have compared this with the edition of the complut. Greek, Latin, Hebrew, and Chaldaic of Plantin, Ant. 1571. by Permission of Philip II. and I find it correct.

I might, were it necessary here, also remark, that it is rather an unfortunate argument and quotation against the authority of the contested reading, to produce the passage of an author, who evidently mistook the subject on which he is writing, and confounded the second temple with the first,

in

\* He, indeed, mentions the temple of Esdras, as supposed by some to be meant, but rejects it, *since the history of the Maccabees is so uncertain!!!*

in a manner so singularly absurd and incomprehensible, that it detracts very much from the character for learning and research, usually attributed to Origen. Independent of which, the translation of the verse (John 2. 20.) is generally acknowledged to be inaccurate, and that it means "46 years has it been *in building*, and *yet* it is not finished," which should have of itself explained the weakness of his reasoning, and the futility of his parade of objection and solution;—but I trust the argument is now fully disposed of.\*

7. The last argument of the learned author, is equally singular and indefensible as those on which we have already animadverted:—that, "*because* the earlier chronologists do not *expressly* quote the controverted passage, or adopt it as the base of their several hypotheses, *therefore* it must be interpolated," would be a species of argument rather equivocal and inconsequent, even if we could not, as we have done, assign the causes of this *apparent* neglect, viz. that they esteemed the period of 480 years to include and refer merely to the prosperous and peaceful ages of the Jewish confederacy, and *intentionally* to omit the interval of foreign domination,

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and

\* Vide also Joseph. Ant. lib. 15. c. 14. where speaking of the Temple, built or enlarged by Herod in the eighteenth year of his reign, he adds, "we have continued to increase and embellish it, even till the reign of Nero." The *Polyglott* Version of the Septuagint by Walton, (and I believe, the Sixtine also, to which it is usually conformable) omits the very difficult and obscure passage, (1. S. 13. 1.) and begins with the second verse, "And he chose, &c." Is this, I would ask, an argument against the authenticity of *that* passage? I leave it to the reader to make the application.

and national misfortune. We have seen before, that Josephus acknowledged an interval to be delivered in the text, and that consequently, "the interpolation was *not* made a little before the time of Eusebius;" but what will the learned author say, when he hears that the bishop of Cæsarea, Eusebius himself, the author of the monstrous heresy of supporting the authenticity of the text, had for a long time consented to neglect the authority of the contested verse, and to understand it as his predecessors had done, not as representing the true and correct interval, but as recording the period flattering to the national pride, and willingly remembered by its vanity. Eusebius reckoned 600 years, including the servitudes and anarchies, as the true interval from the exod, (Syncellus ut supra p. 175 ) and this even while he acknowledged the existence and authenticity of text, under the limitations of his interpretation: nay more, in his Præp. Evan. (Lib. x. c. 14.) he accounts all the Judges and the Servitudes as exclusively consecutive; and even makes the 20 years of Sampson *commence after the conclusion\** of the  
 Philistine

\* I know that it has been attempted by some, to alledge *this* as a retraction of his first principles, in adhering to the fidelity of the text; because, say they, "his Præp. Evan. was written *after* his chronology;" (Vide Vig. &c.) but it is not; for it is plain by the passage of Syncellus to which I have referred, that he was equally aware of the objections to the verse at the time he wrote his chronological work, and that it was the arguments Syncellus afterwards quotes from him, determined his opinion to abide by the strict  
 interval

Philistine oppression, contrary to the sense, the spirit, and very expression of Scripture, (Jud. c. 13. 14 and 15.) and consequently he cannot justly be accused of an undue partiality for the authenticity of the passage; or a weak bias to the supposed traditional interpretation of the Jews—he has even in the two preceding chapters, quoted with applause, the chronological systems of Josephus and Clemens of Alexandria, who we know, on grounds apparently similar, neglected the authority of the book of kings.

Besides, it is plain that Eusebius was, in chronology, the strict disciple of Africanus, who wrote in the beginning of the second century, and that he found himself constrained to desert the opinion of his master, in this epoch, on grounds that he held to be irrefragable. From this, it is evident, that the contested passage was known to, and acknowledged by Africanus, since Syncellus, *his* zealous follower, and the continual adversary of Eusebius, on every question of the Hebrew chronology, defending the system of Africanus and his own in neglecting the authority of this verse, pleads “that it excludes the servitudes and oppressions,” “that it is inconsistent with the supputation of St. Paul,” so much relied upon in a later age, and “that it is deserted by other  
chronologists

interval of the text: besides, it is evident, that in the *Præp. Evang.* he is only delivering a summary of the Hebrew records from the sacred books, without exercising the criticism of enquiry, or the salutary philosophy of doubt. The passage of Syncellus has been quite overlooked by those who wish to consider Eusebius as a proselyte.

chronologists—with Africanus before him, and intending particularly to support his principles and hypothesis, he does not even allude to the supposed interpolation of text; nay, he is even, it should seem, speaking the very language by which Africanus excused *his* neglect of the *literal* precision of the text,\* The whole of the passage in which Syncellus records the reasoning of Eusebius and his own computation, is worthy of perusal, and I think will satisfy any reader, that the reasoning of the learned author, on the silence of the earlier chronologists, is fallacious and unfounded. I shall only quote a part of it;—“ If,” says Syncellus, “ to the 450 years of Paul, you add the 40 in the wilderness, 27 of Joshua, 18 of the Elders, *twenty* Heli, 20 Samuel, 40 Saul, 40 of David, and the four of Solomon, we will have 659 years from the exod to the foundation of the temple, according to Eusebius 600, to Africanus 740. But, says Eusebius, none of these numbers will accord with the generations, nine from Abraham to Moses in 470 years, and 5 from Naasson to David in above 600? and besides, 6 priests from Eleazar to Samuel, thus Aaron, Eleazar, Phinehas, then Abiud, Mochtei, Ozi, Heli

\* Syncellus before had remarked, that Jephthah reckoned only 300 years to his time, “ excluding,” says he, “ the servitude which is to be observed, and the error of Eusebius, who reckons the years of the judges and servitudes together, (conuuserantio Eusebii Gr. συνυπιδμων) to be avoided.” This is another proof of the reason alledged, why the earlier chronologists *appear* to neglect the text. 1. Kings. 6. 1. Syn, ut supra p. 164.



Heli, Ahitub ; from hence it is evident, that the *one hundred and twenty years* of servitude are to be subducted, in order that the series of the generations and the interval may agree." This latter argument appeared so forcible to Syncellus, that he endeavours to invalidate it. (p. 182.) "Sadoc," says he, is reckoned the eighth high-priest after Aaron, by Eusebius, but to the more correct computation, he is to be placed in the eleventh generation, (*sede undecima reperitur*) in this manner—Aaron, Eleazar, Phinehas, Abiud, Bocha, Ozi, Heli, Ahitub, Samuel, Abiathar, Zadoc." On this solution, I shall only observe, that Eusebius is conformable to Josephus (*An. lib. 5. 12.*) in his catalogue, and refer the reader to Spencerus *de successione Pontif.* who will amply prove to him against Syncellus, that Samuel never was or could have been high-priest, if indeed, it was not sufficiently evident from Scripture, which represents Ahimelech, (Ahitub,) and his son as discharging the duties of that office, *during* the prophet's life ; of course, the answer attempted by Syncellus falls to the ground. It is to be observed, he has not attempted to reply to the argument adduced from the succession in the house of David, the compendious and summary mode invented by the learned author, and which does equal credit to his sagacity and invention,

• I may here observe, that some chronologists lessen the difficulty, by supposing Obed and Jesse had their children at a much *later* age than their predecessors. Vide Wall's critical notes on the genealogy of David, in the book of Ruth: this would increase the numbers mentioned in the former note considerably.

vention, viz. "that some are omitted," doubtless not having suggested itself to his understanding, nor perhaps suiting the unphilosophic genius of his age: but a consideration of the persons who must have been deceived in order to give colour to the charge of interpolation, will the more easily expose its absurdity. Is it to be supposed that St. Jerome, to whom we are indebted for the Latin translation of Eusebius, which is to us the original, and who had collated and compared such a vast variety of exemplars of the Hebrew, and the versions, in order to compile the vulgate edition of the Scriptures, which for so many ages was the only copy known to the western world—who has remarked so many various readings, more particularly in the numerical passages of the sacred records—who has examined and discussed so many questions on the Hebrew antiquities, in works it should seem particularly adapted to this purpose—(his epistles, prefaces, and *Quæst. Hebraicæ\**)—whose learning was so vast, research so unbounded, and opportunities of informing himself so numerous

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\* The author of this work is certainly doubtful, and the learned Benedictines do not scruple to deny, that it was written by St. Jerome; but it has been found among his writings, from a very early age, and the argument which they produce against its authority, though worthy the zeal of the editors, will not be admitted as conclusive by the cold judgment of the critic; for although it does not manifest the extensive erudition of his other works, and particularly of his commentary on Genesis, yet it may have been one of his *first* exercises in sacred criticism; and perhaps the commentary on Genesis, was only an enlarged and corrected edition of his earlier and more unfinished essays.

rous—whose whole life was, at it were, dedicated and devoted to the pursuit of Biblical criticism, and the elucidation of the difficulties that might present themselves to the student: is it not extraordinary that such a man should be deceived—should never have remarked this passage as doubtful or supposititious—should have overlooked the deceitful exposition of the Jews—and should have neglected to reprehend, or to animadvert, upon the adherence of Eusebius to a reading, which he must or ought to have known was spurious and false. In the age of MSS. we know what care and attention was employed, to preserve the earlier and more approved copies of the Scriptures; and is it to be supposed, that Jerome, living for so many years in the \*very centre of the Holy-land, in the principal resort of the whole Christian world, and distinguished as the seat of the cœnobitical institutions of the East, from the apostolic ages, and where of course, many of the oldest copies and versions would have been preserved — could have remained ignorant that the verse, or the interval, was not in the most ancient MS. or was falsely interpreted by the Jewish commentators? We have found it so very easy, to detect the infidelities of the Jews in every other point, where they have attempted by wresting the sense, or falsifying the chronology of Scripture, to elude the application of the prophecies to our Saviour,

VOE. XI. 2 G that

\* At Bethlehem, where he died, aged 90, an. 422, in the reign of Theodosius.

that it is scarcely to be expected, that *this*, alone, should have escaped the exertions of interested research, exercised ingenuity, active zeal, and unsubdued industry;— that it should have crept into *all* the versions and MSS. and paraphrases—that the Greek and the Latin churches, the Oriental and the Western Christians, otherwise, the most remote and discordant in their rituals and sentiments, in their dogmas and their traditions, in their epochs and their chronology, should be uniform and concordant in that alone—that in the third century, the reading should have been so ancient, or so extended, as to escape the researches of Eusebius and St. Jerome; and in the first, should seem to have been acknowledged and paraphrased by Africanus; and *yet* that it is a spurious interpolation, founded on traditional hypothesis, and introduced not long before that period; is, surely, irreconcilable to any known principles of criticism and investigation;— perhaps I should not go too far in stating, that there is not in the Scriptural records, any passage of *merely* chronological importance, the authenticity of which is so clear and well established. But when in addition to all this, we find that the present reading of the Septuagint (440) is as old as Eusebius, and probably as Origen; and when we recollect, that Eusebius himself, after delivering his objections against reckoning the judges and servitudes exclusively successive; remarks, “\*and therefore the reading of the  
1 Kings

\* I paraphrase his language from memory, but his *meaning* is preserved; he prefers the Hebrew reading, and adopts it in his Chronicon.



presenting how inconsistent his admission is, with the principles he has laid down, or with the severe animadversions he has passed on the judgment and hypothesis of the bishop of Cæsarea;—In the same spirit, I shall refrain from observing on the period (2 years) he allots to the government of the Elders, and the interval between the death of Joshua and the first servitude; or its consistency with the tenor of Scripture, or the conclusions of analogy and reason—supposing that the remarks already submitted on this period, in answer to the hypothesis of other Chronologists, will apply equally to this, and be of themselves sufficient to invalidate the reasoning of the learned author.

VI. The system of Josephus is almost the only one that remains to be discussed, but I shall dismiss it in a few words, as being generally inconsistent with himself, with Scripture, and with collateral testimony; as being liable, and exposed to all the remarks we have urged against other authors; from his placing the commencement of the servitudes, in the very year of the death of the preceding judge—from *his* misconception of the different import of the terms “repose” and “jurisdiction”—from the inconsistently short period he has allotted to Samuel; (only 12 years) from the difficulty, or almost impossibility, of making his several items coincide with the aggregates he assigns, it being evident that, as he intends to transcribe Scripture, his separate intervals are of course, to be reconciled with himself, and with it, as the passages

passages of Judges are to be reconciled with the computation of the first book of Kings: but the very passage in which he assigns the interval from the exod to the foundation of the temple, is important, as affording us some argument for our system and supposition: the passage states, the foundation of the temple, was laid "in the fourth year of Solomon, the second month, which the Macedonians call Artemisium, the Hebrews Jar, in the 592d year, after the Israelites departed out of Egypt; 1022 years after the vocation of Abraham; 1440 after the deluge; and 3102d year of the world." The surplus is 112 years above that in the book of Kings, which is properly supplied by the servitudes, amounting *exclusively* to 111 years, so that it was in the second month, or beginning of the 112th year.

If we subduct the 592 from 1022, the difference is 430 years, from the vocation of Abraham to the exod, as assigned in Scripture, and in Josephus himself before. (Antiq. 2. C. 6.) So that it should seem that the number 592, was intended by the historian; but if we subduct 1022 from 1440, the difference, 418, is the interval from the deluge to the vocation of Abraham; a number not agreeing with either Scripture or Josephus, whether we consider his separate items, or his aggregates: (Ant. 1. 7.) the latter of which is conformable to the Hebrew, (292 years,) whereas again subducting the 1022 from the years of the world, 3102, there remains 2080, nearly, according (within three years) to the Hebrew. Again, if we subduct,

1440 from

1440 from 3102, the difference, 2662, is the epoch of the deluge, and this epoch, although not differing from both the Septuagint and the Hebrew, is only 6 years above his own computation, (1. Ant. C. 4.) 2656. The month Jar is not agreeable to the Hebrew, the Septuagint, or any of the versions, which read Zif.\*

It appears therefore from the consideration of this passage alone, that Josephus is consistent neither with himself, nor with Scripture, and that where only he is consistent with himself, (in reading 592 years) he supports the principles of our interpretation, and the fidelity of the text, since it only exceeds the assigned number 480, by the years of the Servitudes, which he has reckoned exclusively; and that the different suppositions of the learned to correct his chronology, do more violence to the fidelity of his versions, than those of any other author ever suffered, since they are compelled to expunge several whole passages, periods, and epochs, scattered through his works, and the more they make him deviate from Scripture, the less they make him consistent with reason, or with himself: that their systems are at best, but approximations, and so unsupported by the readings of the MS. that they ought never to be proposed as authorities for correcting the sacred writings. This is particularly applicable

\* This objection, I admit, is merely verbal, as it is the same month as Zif. Vide auctores citatos in Synopsi Criticorum.



cable to the readings of Vignoles, who defends 648 as the number of Josephus; or that of Hales, his last corrector, who finds equal authority for 622. Again, (Ant. 9. 14.) Josephus states the captivity of the 10 tribes, was 947 years after the exod, and 200 after the jurisdiction of Joshua, as if Joshua ended his administration 147 years after the exod. Supposing we correct the former numbers to 807,\* and understand it to mean, “*after* the beginning of Joshua, in the 40th year of the exod,” we shall derive the same interval; for the 240 he assigns from the end of Solomon to this captivity, being subducted, leaves 667 years, as the interval between Joshua and Rehoboam; taking away the 36 of Solomon, 631 remain from beginning of Joshua, and 591 from the exod to the fourth year of Solomon: subduct, then, 111 years of the servitudes, and 480 remain as before.

Again, he reckons (Ant. 7. 3.) 515 years from the division of the land, to the taking of Jerusalem by David, add 19 of Joshua, 40 of Moses, the sum is 574, which with the 33 of David and 4 of Solomon, make 611 or 12, which in another place he assigns as the interval from the exod, to the foundation of the temple, the 20 years surplus being perhaps the  
time

\* Whiston would correct the reading to 907, inaccurately, as is evident from the account above, which alone, makes the system of Josephus inconsistent.

† The remainder of the 25 he assigns to Joshua, the division having taken place in the 6th year.

time the ark remained in Kirjathjearim. Here then are three different systems, but subduct this twenty, with the 112 of servitudes, and there remains 480, as before.

He tells us, that Samuel died, at the period assigned in Scripture, during the persecution of David, by Saul. (Lib. 6. 14.) after "ruling the people 12 years after the death of Eli, and then 18 in conjunction with Saul;" and he repeats, C. xv. "Saul reigned 18 in the life of Samuel, and 20 after his death. I have already exposed the absurdity of this, when examining the reign of Saul, but I may add here, this does not admit an Interregnum after Eli, it supposes he immediately succeeded him, agreeably to our system, and contrary to that of Vignoles.

He acknowledges the account of Jephthah, computing 300 years from the conquest of the Ammorites to his time, as in Scripture, which is, however, directly at variance with his hypothesis, in reckoning the servitudes successively. (Ant. 5. 9.)

He reckons the jurisdiction of Sampson for 20 years, as *succeeding* the 40 years oppression of the Philistines, contrary to the spirit and expression, both of his own proper narrative, and of the testimony of Scripture. (Ant. 5. 10. It should appear therefore, that the various corruptions which meet in the chronology of Josephus, the inconsistency between his separate items and the aggregates he assigns, the incompatible epochs he frequently delivers, and the different  
supputations

supputations he appears in several instances to follow and support, must be attributed to the *intentional* errors of the transcribers, many of whom, might be willing to correct the copies they preserved, by the reading they judged most conformable to Scripture. As the Septuagint was principally in use, perhaps the ancient fathers had corrected his earlier epochs by its authority, and as the passage under review was understood both in the Septuagint and Hebrew, to be an exclusive interval of peace, without referring to the servitudes, they amended his reading by adding the servitudes, and made up the number we now read. We know that the Grecian fathers attached considerable consequence to impressing the Jewish traditions into the service of religion, and as *they* had declared, the Messiah was to appear in the fifth millenary; the chronology of the Septuagint, as most accordant to this, was most agreeable to them; in this period, from the exod, finding the numbers in the book of Kings, incompatible with those in the Judges, they paraphrased it in the manner we have particularised — and many of them who had engaged in controversies with the heathen philosophers, were anxious to establish the antiquity of the Hebrew books and writers, above any period to which Grecian literature could ascend. This idea, made them too often adopt calculations of rather dubious authenticity, and the interpretation in general, most willingly received, would be that more favourable to the antiquity of the Jewish œconomy

and dispensation. To this we must attribute the general disposition of the earlier writers, to antedate the æra of Moses, and make him contemporary with the Grecian Inachus; a position, however, which it appears clearly from his books against Apion, was not professed or defended by Josephus, who, although anxious for the reputation of his people, is more modest in his pretensions. This supposition of the intentional corruptions, or emendations of Josephus, will receive additional authority, when we consider that the generality of his manuscripts appear to have been almost separately corrected; those of the Latin translator were accommodated more nearly to the sentiments of the Latin church, and many of the original Greek have chronological annotations and summaries to the books and chapters, not reconcilable to the principles of the historian, as they now stand; but evidently marked from the opinions and supputation of the possessor, and which, of course, were adjusted and accommodated to the hypothesis of his church; but the opinion of St. Paul, (granting an enlarged interval to the judges,) was particularly insisted on by the Greek chronologists, and afforded them a strong argument for their computation, and paraphrase of the text. Syncellus concludes his review of the reasoning on this subject, by saying, that he is resolved to adhere to "the *evangelic* calculus;" a term sufficiently indicating both his sense of the authority of the text, and the spirit in which he rejects it.

The

. The reading of many of the Septuagint versions, may, perhaps, be reconciled on a similar supposition of *intentional* correction. Observing that they granted but 20 years to Eli, and omitted the ten, attributed to Elon, and perhaps differed in some other points from the Hebrew; the correctors and transcribers thought they ought to be amended in the aggregate also, and therefore reduced the 480 of the Hebrew to 440. But after the Hebrew calculus came into repute, from the collation of the Scriptures and the more general study of the original language, in the time of Constantine, the Greek MSS. were altered to conform to it, and the years of Elon were *generally* restored, and in the Complutensian collation, the Hebrew reading of 480. Nicephorus grants only 20 years to the Philistine oppression, 3 to Elon, and 20 to Eli; so that he subducts 47 years from the Hebrew, but the MS. he used granted perhaps 440, as the round number, more according with the generality of chronologic periods in Scripture.

It may be here casually remarked, that the items of Nicephorus do not accord with his summation, in computing "630 years from the exod to David;" (p. 396, edit. ut supra) as from the exod to the foundation of the temple, *they* amount only to 563 years, including the years of the third servitude, which have been omitted by mistake. What reliance is then to be placed on such authorities, against the undeviating accuracy of the Hebrew records?\*

2 II 2

It

\* This accuracy is observable, even in the terms used to introduce the mention of the servitudes

It only now remains, that we consider the celebrated text, Acts 13. 19. 20. affording the supputation of St. Paul, which is usually alledged against the authenticity of the contested text, and insisted on by every advocate of the enlarged interval.

1st. On this I would remark, St. Paul either designed to exclude the years of servitudes from the period he assigns to the Judges, or he did not. In the former case, he must have computed the numbers afforded to us by the Book of Judges, separately, and in succession; which would have given him, from the conquest to the death of Samuel, above 500 years, (which Josephus, who reckons all the numbers consecutively, has noticed as the true interval,) a number which is certainly better adapted either to determine the true and exact interval, if that was St. Paul's object, agreeably to the first alternative, or for the purposes of an orator, who usually assigns rather a round and approximating period, than a precise and chronologic one. So that it clearly follows, that St. Paul, if he meant

servitudes, and seem to have a particular reference to the nature of these latter: thus, in some instances, "the Lord sold the children of Israel," seems to denote the servitude to have been only of tribute, whereas "the Lord *delivered* them into the hands of their enemies" more properly indicates a greater severity of subjection, and the circumstances of the oppressions recorded, appear at least, in some instances, to justify this, perhaps hypercritical remark, (Collate Judges 3. 8. 12,) in which the term "strengthened" is particularly apposite, when contrasted with the small success of the king of Moab, (noticed above) chap. 4. 2, 6. 1. 10. 8. 13. 1, on c. 6. 1. we have also observed before.

meant to reckon the periods in succession, either adopted a mean in his calculations unknown to us, or that the number assigned to him is incorrect.

But, if he designed to include the years of servitude in those allotted to the Judges, agreeably to the second alternative, no ingenuity (except that of Pezron and Vossius, who have invented anarchies and interregnums at will,) can deduce such a number from the Book of Judges. It will not amount to more than 340 or 350 as will be clear to any, commencing from the sixth year of Joshua, or the division of the land, and reckoning the numbers assigned to the Judges, until Samuel, separately from the servitudes.

2dly. If St. Paul reckons, according to the first alternative, in succession, his computation will militate with that of Jephthah; for, he would reckon, (as Josephus does,) near 400 years from the fortieth year after the exod, to the time of Jephthah, when Scripture expressly mentions 300 years only to have intervened.

3dly. This calculus enlarges the period allotted to a generation, beyond the natural limits, and, therefore, cannot be admitted.

4th. On these grounds, then, I must admit the correction of the manuscript produced by Beza, which reads 350, *ετεις τε τριακοσις*, and which admirably agrees with my system, and with the remarks I have already made. Nor are we to reject it because it is authorized only by one or two MSS.—The student

student will remember several instances, where the production and evidence of a single or even mutilated MS. has elucidated passages that appeared, otherwise, absolutely irrelevant or contradictory. The numbers in the Books of Kings and Chronicles are evident and numerous instances of this. (Vide Bochart, and many others.) A single MS. has explained a passage in the history of the deluge, which perfectly reconciles all the difficulties that have been alledged on the duration and period of that awful year. I know that critical ingenuity may, and has endeavoured to destroy the force and evidence of this passage, on the grounds that the introduction of the enclitick particle, *τε*, is inconsistent with the genius of the original, “quid non potuit,” &c. But, independent of the answers that might be adduced from the Hebraistic and Syriac idioms and constructions, equally inconsistent with the purity of the text, with which the New Testament abounds, we have the MSS. which afforded Usher and Marsham reason to suppose this period referred to the interval between the promise and the birth of Isaac, and which equally solve the difficulty.\*

But

\* The passage, as quoted by Marsham, is as follows: (p. 309) Κατέκληροδοτήσεν την γην αβτων ὡς ἐτεσι τετρακοσίοις πενήτηκοντα και μετα ταυτα ἔδωκε κριτας. Ita edidit. R. Stephanus, ita habet codex vetustissimus in Bibliothecâ regia; ita vertit *Vulgata*, “Sorte distribuit eis terram eorum quasi post 450 annos: & post hæc dedit Judices. Usher p. 67. Chronologia Sacra ad finem Annalium Editione Barlow, Bremæ, 1686. se scriptum invenisse Johannes Mariana pro editione vulgata. Κατέκληροδοτήσεν αυτοῖς την γην αὐτων ὡσεὶ μετα', τετρακοσια και πενήτηκοντα ἔτη και μετα ταυτα ἔδωκε κριτας.

The



But, assuming the numbers to be correct, if we examine more particularly into the supputation of St. Paul, we shall find that, from the conquest of the land to the government of Samuel, being, according to him, 450 years, he affords us a strong argument for some of the principal items in our calculus. For, if we reckon the years of the Judges, and servitudes, consecutively, as we meet them in the Books of Judges and Samuel, we shall collect *exactly*\* 450 years, from the first year

The Alex. exemplar. in England, reads,

Κατεκληρονόμησεν αὐτοῖς τὴν γῆν αὐτῶν ὡς ἔτεσι μετὰ τετρακοσίοις καὶ πεντηκοντα καὶ μετὰ ταῦτα ἔδωκεν κρίτας. Quod ipsum quoque inter diversas illas lectiones repertur quas Novo test. Parisius an. 1568 Græcè à se excuso Robertus Stephanus subjiciendas curavit; consentiente quoque codice quodam Græco, alio Parisiis item edito & à Beza in annotationibus ad hunc locum producto; et Novi collegii apud Oxonienses exemplari manuscripto altero, nisi quòd hoc, absit pronomèn αὐτῶν potest γῆν, in illo, addatur αὐτός post verbum ἔδωκε. Usher, p. 67

The edition of the New Testament, by Gregorius, has in the notes, the correction of other manuscripts, thus—

ὡσεὶ μετὰ τετρακοσια καὶ πεντηκοντα ἔτη & connectit cum versu sup. Sic N\*. 2 & W†. inderquantur καὶ μετὰ ταῦτα ἔδωκε κρίτας.

\* MSS. Collegii Nov. Oxon. Wecheliî sive Junii.

Curcellæus Amst. 1658 Elzevir reads the same, but from perhaps similar sources.

Maximus Calliopolites, in his Testament, which is published in two columns, collating different versions, one of which he denominates *Neov* reads in the *veov*—

ἕως τετρακοσίων πενήντα. With this last word I am not acquainted. In Coll. Dub.

\* This affords us a very strong argument for the correction of the text; the numbers in the book of Judges, amount *exactly* to the period assigned by the apostle; why then should he use a dubious and qualifying term, ὡσεὶ, quasi, or as our English Translation has it, “by about?” &c. Surely, it was improper, if he meant to adhere to the *literal* fidelity of the text, but it was natural, obvious, and correct, if the amendment of Beza is admitted, for the interval was really “about 350 years.”

year of the servitude under Chusan, to the last of Eli, or commencement of Samuel. It is, hence, plain, that St. Paul (assuming the disputed text to be correct,) must have reckoned *some* of the periods assigned to the Judges and servitudes reciprocally inclusive;\* which affords strong evidence for our more consistent interpretation, in computing them *all* in this manner. But while he thus makes clearly for the principles of our computation, he is decidedly adverse to the sentiments of those who would adduce him in support of their hypothesis for extending the period; since, 1st. supposing that it is the period assigned to the government of Samson, he means to compute inclusively, (as that period is expressly ascribed by Scripture to be contemporary with the dominion of the Philistines); the setwenty years must be the duration he would allot to the government of the elders, or the interval from the conquest to the first servitude under Chusan. But, on what principle, then, can Vossius, Pezron, and the other adherents of the enlarged calculus, quote the passage of the Apostle as their authority for granting fifty years, or more, to the elders, and for afterwards attributing forty years complete to the jurisdiction of Othniel, forgetting that he was himself one of the elders, whose government had concluded, as they alledge,

\* Since he computes, from *the conquest of the land* to the end of Samuel, only 450 years—and he cannot be supposed to mean, contrary to history, reason, Scripture, and common-sense, that the first servitude commenced *immediately* after the conquest.

alledge, before his victory? But, 2dly. this is not the only argument deducible from the authority of St. Paul, against the principles we combat. It is decisive against the opinion of those who would suppose an anarchy to succeed every jurisdiction; and this affords all the requisite evidence in favour of our arguments, that Samuel succeeded Eli, without an interregnum intervening; since, as he evidently computes less, than the numbers in the Book of Judges\*, (which acknowledges no suspension of the government,) would authorize, he cannot be produced as authority, for admitting any intervening anarchies, to prolong the interval. These arguments are decisive against the more daring innovators who would boldly reject the text, and arrange the periods according to their systems and caprice. But the more cautious supporters of chronologic heresy, who, would acknowledge the authenticity of the 1st Kings, 6. 1. while they dexterously evade its authority, by forced glosses and strained interpretations, are equally convicted of inconsistency and error by the calculus of the Apostle. Petavius, who adduces his authority for computing 520 years from the exod to the foundation of the temple, alledging, as we have before remarked, that the term, "exod," is to be taken in the latitude of 40 years, so that the 480 years are to be computed from the entrance into

VOL. XI.

2 I

Canaan

\* This also is the opinion of the Rabbjns. Vide Abrabanel ad 13 Saml. v. 1. apud Usher Chron. Sacra. p. 68.

Canaan, is eminently subject to this censure. His system is clearly either erroneous, or, at least, inconsistent with his authorities, in its principles, for, if to the 450 years of St. Paul, from the conquest to Samuel, we add the 40 years of Saul and Samuel, and the 40 of David, we have 530 years, which sum, with the 40 in the desert and the 24 Pictavius himself allots to Joshua and the elders, completes the aggregate of 594 years, and with the four first of Solomon, 598; a number sufficiently removed from that he would compute on the authority of St. Paul. Whether, then, we reject the numbers of the Apostle, as falsified by the copyists, and substitute, with the exemplar of Beza, 350 years; or whether, with Usher, we distinguish the points of the text, and suppose the period assigned is from the birth of Isaac to the conquest of the land; or, whether, in fine, we consider the Apostle on his own principle of "being all things to all men, that he might gain some," merely stating the computation he knew to be familiar to his auditory, and not his own. In whatever aspect, or point of view, we behold this celebrated text, we shall find, that it by no means authorizes the calculus of our adversaries—that they reject its computation, while they quote its authority, and seem satisfied to force the expressions of the Apostle to countenance and support their dissent from the acknowledged evidence of Scripture, in order afterwards, to extend the principle of rejection even against the alledged advocate of their heresy.

In

In a word, we have seen all the Eastern versions, unanimously concurring in the reading of the Vulgate, the Septuagint differing in some editions, but only to *diminish* the contested interval; the Chronicon Paschale reckoning the years of the first servitude, *inclusively* in the period of the first jurisdiction, “according to the tradition of the Jews;” Eusebius asserting that he acted upon the same principles, and the same authority, and the testimony of each, equally independent and unimpeachable. Josephus, himself, according (where alone he is consistent) with the computation of the text—the series of the priests, of the generations, and of the judges, agreeing to support it; the various collateral circumstances which tend to establish and confirm its authenticity; the inconsistencies and absurdities of the contrary hypotheses; the antiquity of the reading, long before the Jews could have ever thought of abridging the times, in order to elude the chronologic proofs of the Messiah,\* (as is evident from the concordance of the Septuagint) the weakness of the only argument produced against it, in supposing “that the servitudes were intentionally excluded,” when we have the *direct testimony* of Eusebius and the Chronicon Paschale

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that

\* They appear to have began this in the time Rabbi Akiba (contemporary with Adrian) when it was forbidden by the Sanhedrim, to calculate the period of the Messiah.

that the Hebrew Rabbins, expressly included them in the several corresponding administrations ;\* the Chronicon speaking to a particular instance, that of Othniel, Scripture mentioning another, that of Sampson ;† and Eusebius generalizing the principle to the rest ; all thus, bearing on the same point, and tending in harmonious consistency to the same object ; and shall we then hesitate to affirm and declare, that the authenticity

\* Besides, it is the peculiar genius and character of the sacred writers, to use terms, in an *exclusive* sense, when the circumstances of the history and narration, evidently demonstrate, that an *inclusive* meaning is conveyed ; thus, the phrase “ the sojourn of the Children of Israel, in the land of Egypt, was four hundred and thirty years,” which so frequently occurs, we know, is to be understood very differently from the idea, which the *precise* import of the terms, would seem to indicate, for it includes the whole period elapsed from the *promise* to the *Exod*, and the *real* “ sojourn” of the Israelites was only half the assigned one ; as is evident even from the authority of St. Paul, which has been so much relied on, in the discussion of the period more immediately the subject of this Essay. Vide Epis. to Galat. Genebrard and some Jesuits overlooked the testimony of the Apostle, and contended that the Israelites remained 430 years *complete* in Egypt, contrary to every chronological authority, and every Scriptural inference.

† The question has been asked, why “ Scripture should only have mentioned the years of *one* of the Judges, as contemporaneous to the corresponding servitude?” but the answer is obvious and easy ; first, it is false, for as we have seen, it records a similar instance in the case of Jair ; secondly, were it even true, the reason can be assigned which clearly gives additional weight to our system—it was, because the case was singular, as instead of *including*, (like other instances) his years were *included* in the servitude of the Philistines ; because he was born at the *commencement* of their oppression and because it was intended as a commentary on the prophecy which preceded his birth, “that he should *begin* to deliver Israel,” which, of course, was not completed at his death. Bedford has remarked some singular conformities in the history of Sampson, which, however fanciful, perhaps deserve to be transcribed. “ Idolatry first commenced

in

thenticity of the text, and the system by which we have attempted to reconcile and explain it, seem to be established as the conclusion of a great and extensive chain of reasoning and induction; as the natural result which all the preceding arguments and inferences finally indicated; as the point to which all the collateral series of proofs and premises, ultimately converged; as the term and object of the several principles which have guided and directed us; the last link in the concatenation of the several distinct, and independent chains of evidence we have collected, and the final resting place at which all the paths conducting to the temple of truth, meet together.

And, surely, when I have submitted a mode of following the sacred historian, exempt from the errors and mistakes which are usually ascribed to the other supporters of the Hebrew reading, no Christian chronologist will have any hesitation, from

in the tribe of Dan, and that tribe afforded the last of the (lay) Judges to Israel, and it was not permitted to him to redeem his country. The first Idol was made of 1100 pieces of Silver; Sampson was betrayed for the same sum; by treachery the tribe of Dan gained their inheritance; by treachery their judge was surprised. Dan is omitted among the sealed tribes, (Revel.) for their idolatry;" to which he might have added, that Sampson's jurisdiction is, in part, confounded with that of Eli, and was not acknowledged by some of the tribes, probably from the same cause; "Micah of Ephraim, was the first idolator, Samuel of Ephraim, the first reformer:" and as the settlement of the Danites was contemporary with the first act of Idolatry; so as we have seen, the first reformer was contemporary with the Danite judge: these observations are further evidence against the theory of Vignoles, (on the jurisdiction of Sampson) which we have examined so much at length above.

Bedford Scrip. Chron. London, 1723.

from vanity, love of paradox, or adherence to system, to follow and adopt it. For when we can avoid it, Si ad Scripturas sacras admissa fuerint vel *officiosa mendacia* quid in eis remanebit auctoritatis? Tostatus apud Vossium.





### ERRATA.

Page 47 In the figure, instead of the perpendicular "hc," a perpendicular "kii" should be drawn.

49 line 10, add "In Cf capiatur Ck æqualis CF."

line 13, for "fh" read "fk."

75 In the note dele "accurately."

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