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**OBSERVATIONS**

ON THE

**WATER SUPPLY**

OF

**MAURITIUS,**

BY CAPTAIN J. R. MANN.

To L. BOUTON Esq.,

*Secretary Royal Society of Arts and Sciences.*

My dear Mr. Bouton,

I send you the paper we were speaking about yesterday. I am afraid you will find it more bulky than valuable, but if you think that it is not likely to interest the members of the Society, pray destroy it or do what you please with it.

Yours very truly,

J. R. MANN.

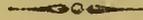
7th February 1860.



# OBSERVATIONS

ON THE

## WATER SUPPLY OF MAURITIUS.



The subject of Wood and Water has been much written and spoken about, but the question does not seem to have been yet exhausted. No great variety of opinion has been elicited on the subject; most of those who have the want of a better supply of water have made up their minds that the Forests must be in one way or other preserved, yet the public opinion is far from being decided upon the manner in which this should be done, or as to the extent to which the principle which has been so generally admitted, should be carried out.

In this, as in other cases, there are two sides to the question, and besides those who are calling out for more water, there are many who are wishing for more sugar. On one side of the question are those who connect the destruction of Forests with the cessation of rain, and on the other side those (who perhaps happen to be proprietors of Forest lands fit for cultivation), who are anxious to clear and plant canes, either disbelieving or disregarding the popular theory of the connexion between the existence of Forests and the fall of rain.

The object of the following observations, is to bring together some of the considerations bearing upon the question of water supply; in the hope that some help, however slight, may be thereby given to the determination of the principle which should be our guide.

The endeavour to follow out to precise mathematical results the phenomenon of rain, would be met by at least as many difficulties, as would a similar attempt, in the case of any other of the natural phenomena.

The great number of agents at work in the production of rain, and the manner in which they act and re-act upon one other, each being at the same time influenced by local circumstances in an infinite variety of ways, makes the phenomena of atmospheric condensation extremely complicated.

For instance, suppose the process to have just commenced, by the influence of a cold mountain summit upon a warm and humid atmosphere, the first step is the transformation of the vapour into the watery vesicles of which clouds and fog are composed, simultaneously the latent heat of the condensed vapour becomes sensible, and is distributed around, tending to check the energy of the scarcely begun process. Then, the opaque clouds assumes a power which the transparent vapour had not;—it becomes capable of losing heat by radiation, as well as of intercepting the radiant heat coming from the sun or earth, or neighbouring clouds.

Again, the two component parts of the atmosphere, namely the aqueous and the dry, have different affinities for heat; that is they are not equally affected by the same increment or decrement of temperature, so that when a change of temperature takes place a disturbance of their relations ensues, and each component part of the atmosphere acted upon, has to go and seek a new place of equilibrium in the vertical column.

Besides all this, the act of condensation is accompanied by electrical action, which no doubt introduces new modifications into the result.

Thus each step of the process causes the introduction of new agents to the work; all acting upon one another and tending to modify the energy of action of each of the forces in play.

Of course, there is nothing like chance, or accident in the ever changing action of these mingled forces; they are all wonderfully adjusted so as to produce a result beneficial to man, namely, a well regulated supply of rain. Each of the agents mentioned, and perhaps many others of which we are

ignorant, works in its appointed course, performing with unerring certainty the precise amount of work allotted to it; all of them together contributing to a result so unfailling that it might be expressed by an algebraic formula, did we know perfectly the whole of the influences at work, and the laws by which their varying energies are regulated.

But though we cannot hope to reach a mathematical determination in so complicated a process, yet we may with tolerable certainty foretell, in general terms, the result of certain given conditions; by considering one by one, the most active of the known causes of atmospheric condensation, and tracing the probable manner and amount of influence exercised upon each, by the conditions stated.

The chief, if not the only way in which forests and vegetation in general, can affect atmospheric condensation, in the formation of rain, must be through their influence upon the temperature of the soil.

Close vegetation affects the temperature of the soil it covers in two ways.

*Firstly.*—It causes the evaporation of moisture, and consequent cooling of the surface of the ground, to proceed slowly, and continuously; instead of allowing the direct rays of the sun to first dry up such moisture suddenly, and then to raise the temperature of the ground to a high degree: so that in this respect the tendency of the vegetation is to keep the temperature of ground it shelters *lower* than that of ground exposed and bare.

*Secondly.*—Vegetation acts precisely in the same manner as a clothing of a bad conducting medium; preventing the communication or loss of heat; so that it checks variation of temperature, and tends to keep the soil at a mean degree of heat.

During the hot part of the day, ground so protected will be cooler than a naked surface of rock or earth, but at night it will in general be warmer. On the one hand, the foliage will prevent the full force of the sun's rays reaching the earth; the intercepted heat being returned into space, partly by reflection from the surfaces of the leaves, which in tropical plants are often highly polished; and partly by radiation from

those portions of the plants which have received any heat. On the other hand, whatever heat which finds its way to the soil, is there preserved by the vegetable covering from loss by radiation, a process by which exposed surfaces are reduced to very low temperatures, when the sun is below the horizon.

We may therefore conclude, that as a general rule, the temperature of ground protected by forests, will be within the extremes of temperature reached by exposed surfaces; and further that the mean temperature of the sheltered land will be rather below that of the other.

Now, the following are the most important of the recognized causes of atmospheric condensation.

*First.*—The mixing together of bodies of vapour having different temperatures.

*Second.*—The rising of vapour from low to higher and colder strata of the atmosphere.

*Third.*—The increase of pressure.

*Fourth.*—The cooling of clouds through the effect of radiation.

The first mentioned of these causes, namely the mixing together of vapours of different temperatures, is no doubt a very common cause of rain. The condensation in this case results from the law by which the capacity of the air, for holding moisture in suspension increases and decreases more rapidly than the temperature; so that when two masses of air saturated with vapour, at different temperatures, have been mixed the total quantity of vapour is necessarily greater than the mean temperature can support, and the surplus is thrown down as rain. If the masses of air are not sufficiently saturated to cause rain, the effect of the mixing will be to increase the degree of humidity, and perhaps to form light clouds or mist.

In this operation the different masses of air are brought together by some of the numerous causes of disturbance always present in the atmosphere, such as the meeting of different winds; sometimes perhaps differences in the electric state of clouds; the action of rotatory storms; and the variations in temperature of mountain masses, caused by the change of position of the sun.

We have frequent opportunities in Mauritius of observing the operation of some of these processes, and especially of the last mentioned. During the heat of the day, the Trade wind is often met, and partly overpowered by a sea breeze, drawn towards the island from the Westward, by the upward current of air, caused by the great heat of the mountain masses. The transparent air allows the sun's rays to pass through it without intercepting much of their heat; but the earth on which they fall is quickly raised in temperature; and it then imparts heat, by actual contact, to the air brought near to it, which at once expands and rushes upwards. From this cause we may often see the phenomenon of a Westerly wind in the Harbour and neighbourhood of Port Louis, at the same time that the Trade is blowing over the flat and windward parts of the Island. At such times the mixing of the two winds is accompanied by clouds and mist; sometimes presenting the appearance of heavy banks of clouds, driven back by the wind from the sea, and heaped up above the Island, until their elevation brings them again within the influence of the Trade wind. The clouds are more or less dense, according to the degree of humidity of the air, and in general they deposit rain; the horizon to the Westward being all the time clear.

In the evening the mountains cool, by radiation, the upward draught of air ceases, and the clouds disappear, or seem to be swept away by the trade.

The exciting cause in this operation is evidently the variable temperature of the earth, in relation to the surrounding air. The transparent air cannot receive heat from the sun's rays, nor part with it by radiation; the air can only be affected by actual contact with bodies of a different temperature, whereas the earth is soon treated by the sun, and as readily cooled by radiation, when the sun is not in a position to act upon it.

There is only one way in which forests can affect the causes which bring together different bodies of air, that is through the influence they exercise upon the temperature of the soil; but from what has been said upon this subject, it is clear that the forests will in no way assist the process, but will rather tend to impede it, by preventing those changes of temperature which give rise to the opposing currents of air.

The *second* cause of condensation which has been mentioned, is the rising of vapour from low to higher and colder strata of the atmosphere.

In Mauritius, the formation of the ground causes frequent illustration of this process also. The saturated winds which come to us along the surface of the sea, are pushed, as it were, up an inclined plane, until the masses of vapour have reached great heights, (1400 to 2000 ft.) in passing over the elevated lands in the central parts of the Island. The greatly increased cold, due to the elevation, condenses the moisture and produces rain in great abundance.

By way of example, let us suppose the air at the sea level to be saturated; with the Thermometer at  $85^{\circ}$  and Barometer at 30 in: and that on the high lands of the interior the Thermometer is at  $75^{\circ}$  and Barometer at 28.8 in: Under these conditions, each cubic yard of the atmosphere at the sea level would contain in the form of vapour, 1.34 cubic inches of water; though when expanded by the diminution of pressure from 30 inches to 28.8 inches, at the high level, each cubic yard of the atmosphere would only contain 1.31 cub. in. of water; but simultaneously with the diminution of pressure at the high level, the temperature will be there reduced to  $75^{\circ}$  at which temperature, each cubic yard could support in a state of vapour only 0.995 cub. in. of water, so that the difference, namely 0.315, or nearly  $\frac{1}{3}$  of a cub. in. of water must be thrown down, in the form of rain, from each cubic yard of the atmosphere which passes over the high land.

This is no doubt a favorable instance, for the air as the sea level was assumed to be saturated, which will not often be the case; but the example nevertheless serves to shew the dependence which may be placed upon the source of rain under consideration.

It will be seen that the quantity of rain will depend upon the degree of humidity of the wind, and upon the difference of the temperatures of the lower and higher levels, and that it is altogether independent of the action of forests. The rain drops due to the increased cold, have their origin at a great elevation above the ground, and altogether beyond the influence of the trees the rain drops increase in size, gradually,

as they descend, partly on account of their originally low temperature, which enables them to condense additional moisture as they fall ; and also on account of their power of collecting by attraction the smaller watery particles amongst which they pass, in the same manner as a globule of mercury may be seen to attract to itself and agglomerate the smaller particles brought near to it. It is from these causes that a rain guage placed on the ground collects a much larger quantity of water than on top of a tower.

Another way in which vapour is raised from low to higher strata, is by the ascending currents already spoken of, caused by the heating of mountain masses.

An extensive conflagration, likewise, often causes such an upward draught, that masses of vapour, after having been heated and expanded, rise to great heights, where the temporary accession of heat is lost, and much of the moisture condensed. Those who have witnessed extensive fires may have noticed the irregular gusts of wind approaching from all quarters, often accompanied at intervals by light showers of scattered drops of rain.

There can be little doubt that ascending currents take place during rotatory storms, and it is perhaps to this circumstance that the lowness of the Barometer in the vortex is due.

The *third* cause of rain which has been referred to is increase of pressure.

If the air be saturated, any increase of pressure, when unaccompanied by increase of temperature must cause condensation of moisture.

Variation of pressure may result from atmospheric changes, though in this case, within such small limits that it can be scarcely considered an active cause of rain, in itself ; though it may assist or retard the action of other causes.

Increase of pressure may also take place when a strong wind, saturated with vapour, strikes with unbroken force against a mountain range, sufficiently abrupt and extensive to arrest the onward motion of the air. In such a case, increase of pressure will be caused, and maintained by the constant motion of the wind, which continues to arrive faster than the

compressed air can escape, by rising and passing over the mountain.

The great quantity of rain observed to fall on the Windward side of mountain ranges, in many parts of the world, has been attributed to the cause described; but it seems probable that the actual increase of pressure has had less to do with the result than the circumstance that the vapour was forced to ascend to cold altitudes, before it could escape over the mountain; also the air must frequently suffer a loss of heat, by contact with the mountain, which, by reason of the constant radiation will often be lower in temperature than the air, which latter maintains more nearly a mean temperature. Although the idea is not without supporters, it seems to be quite out of the question that the slight impediment offered to the wind by a forest, or by a line of trees, can cause sufficient compression to produce rain; the forest could only affect the motion of a thin stratum of air, allowing the chief mass of the wind and vapour to pass onward above, altogether unimpeded, so that under the most favorable circumstances, only a few drops of rain could be deposited, near the border of the forest. Neither could the amount of condensation resulting from the contact of the vapour with the trees, (supposing the trees to be colder than the air) be great, considering how very slowly the air is changed in a forest, even when a strong breeze is blowing over the tops of the trees, and consequently how very small a portion of the vapour which supplies us with rain is ever brought into actual contact with the trees.

The *fourth* cause of condensation and the last which it is necessary to consider, is the cooling of the clouds through the effects of radiation.

When once an opaque cloud has been formed, their radiation commences, and the cloud is constantly parting with heat, and at the same time intercepting heat from other bodies; the loss may often exceed the gain, and the consequent increase of condensation will cause the rain to fall.

The general effect of forests being to impede radiation from the earth's surface, the presence of the vegetation would be in most cases favorable to the cooling of the clouds; but as the

total supply of rain from this cause alone cannot be very great, the trifling increase of quantity due to the action of the forests cannot be worth taking into account.

It may be said that trees have some influence upon the electric condition of the atmosphere, but to what extent the quantity of rain may be modified in consequence, it is not easy to determine; it is generally considered, however, that electric changes are more often the consequence than the cause of condensation.

Now as there is no cause of rain which may not be traced ultimately to one, as to the combined action of several of the processes which have been mentioned, it seems sufficiently clear that the extent of the forests has very little to do with the actual quantity of rain.

It will be seen, further, that the permanent physical conditions under which the Island of Mauritius is placed, render it positively certain that large quantities of rain must fall, whether forests exist or not. We have huge masses of rugged mountains, supporting elevated table lands in the centre of the island, the whole surrounded, to a great distance in every direction, by an ocean, yielding a constant and enormous supply of vapour, under the influence of a tropical sun; it necessarily results from these conditions, that from which ever direction the wind arrives, it comes in a very humid state, and almost always at a high temperature, such winds must deposit rain when passing over the elevated and cold parts of the island.

It would have been very interesting to have procured reliable statistical evidence shewing the quantity of rain that has fallen at different periods, during a long series of years but that has not been possible, and it would require many years of carefully conducted observations, made simultaneously in different parts of the island, to enable any positive deductions to be made from that source, as to the relation between the extent of forests, and the quantity of rain.

As far as the evidence of former legislation may be taken, it would appear that a periodical scarcity of water has always, from the earliest times, seemed to be quite as imminent as it is now; and at very distant periods measures have been taken

or recommended, for preventing the cutting of timber, for the sole purpose of ensuring a sufficient supply of rain; but though these measures have been ineffectual, and an immense amount of clearing has been done within the last 60 or 70 years, there is not the slightest ground for supposing that any change has taken place in the quantity of rain which falls in the course of a year.

So far back as the year 1771, it was found necessary to undertake the construction of the Bois Rouge Canal, a work of great magnitude, for the purpose of conveying water from the upper part of the Rivière du Rempart to the flat and Northern parts of the Island; and this great expense was incurred to supply the wants of a population probably less than one tenth of what it is at the present time.

In the year 1810, the British troops suffered great hardships on account of the want of water, whilst penetrating the thick forests which then extended nearly the whole distance from Grand Bay to Port Louis; and the expressions of General Abererombie's Despatch imply that the deprivation of water was not a temporary or accidental occurrence, but that that part of the Island suffered from a permanent scantiness of supply. The formation of the ground moreover, proves that no streams, besides those now in existence, have ever traversed that part of the country.

In comparing the quantity of water now in the rivers with what is stated or supposed of their condition at some distant period, allowance must be made for the enormous consumption of the present day caused by the great increase which has taken place in the population of the Island, and in the extent of cultivation. We must expect to find less water in the rivers when we consider the number of extensive plantations crowded along their banks, and remember the great number of men and animals to be supplied, and the large quantities of water made use of in carrying on the improved processes of manufacture and cultivation.

The simple recollections, or general impressions of persons, on the subject of the effects of clearing, upon the water supply, are very likely to mislead. For instance, the assertion that a certain stream had never before been dry, at that particular sea-

son, does not prove the quantity of rain to have diminished; the *average* flow of water may be unaltered, although a different distribution of the total quantity may have taken place, between the several seasons of the year; and with respect to general impressions on the subject, they would no doubt be in general, founded on the circumstance of the two conditions of abundant moisture and luxuriant vegetation being commonly found together; the effect being mistaken for the cause, and the plentiful rain being considered the consequence of the very vegetation which it has produced and nourished.

Mauritius revels in all the conditions necessary to exuberance of vegetation. With a fertile soil, a genial sun, and a humid and stimulating atmosphere, it is inconceivable that the conversion of the humidity into rain should be the only thing to continue wanting for the completion of one of the great works of Providence, namely the preservation and multiplication of organic life, in the vegetable creation. We cannot suppose the laws of nature to have been so disposed that rain is forbidden to fall until some human hand shall have first planted and nourished trees to invite it. Such a theory would be altogether contradicted by the wonderful systems of self-regulation and compensation which may be observed in all the operations of nature.

The foregoing considerations seem to shew conclusively that trees have little or nothing to do with the quantity of rain, and that Mauritius will always receive a fair and sufficient supply, whether forest exist or whether they be swept away altogether.

The real value of trees, in connexion with the water supply, consists in their power of preserving and husbanding the rain water after it has fallen.

When rain falls upon land not sheltered by forests, it rushes down the slopes of the ground, at once, without opposition, to the water courses; they are suddenly swelled into torrents, but will soon be left dry, as before.

The very small quantity of moisture which has time to penetrate into the parched ground, or which remains upon the surface, is quickly dried up by the sun, and the water courses

will receive no further contribution until the fall of another shower.

Where forests abound, the case is different. The rain is received by a soft and spongy soil, chiefly composed of decayed leaves, mosses etc. ; it is there preserved from evaporation by the shade of the trees, and as it cannot rush down the surface of the slope with great velocity, time is given to the water to soak well into the ground, which it penetrates to a greater or less depth, according to the nature of the soil. The water is then collected and drained away gradually, according to the arrangement of the subjacent strata, or the formation of the rocky bed upon which the vegetable covering and porous strata lie, and the water ultimately contributes a well regulated supply to the rivers, often shewing itself as a spring at the side of a mountain slope, or even on a plain, at a considerable distance from its origin, and wherever the course of the hidden natural drains may lead it.

Sometimes the gradual soakage from the higher levels is stopped by hollow or flat formations of the ground, where the water accumulates and forms marshes or lakes, which serve as reservoirs, for the regular supply of constantly flowing streams.

Mauritius abounds in examples of these processes.

On the shoulder of the Pouce mountain is a constantly running spring, which is due to the gradual draining off of the large quantity of moisture received from the atmosphere, by the cool summit of the mountain, all the year round. Were all the vegetation stripped from the mountain top, it would nevertheless continue to receive from the atmosphere as much moisture as before ; but the spring instead of producing a nearly regular and a constant flow, would become intermittent, and would be sometimes dry and at other times overflowing.

The Table lands of Vacoas and Savanne also furnish illustrations of a good deal that has been said. These lands on account of their elevation \* receive a great deal of rain from

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\* The approxim. altitude above the sea of Mare aux Vacoas is 1706 feet.  
" " " of Grand Bassin is ... 1978 "  
" " " of Bassin Blanc is ... 1360 "  
" " " of the highest part } 2279 "  
of the ridge between Grand Bassin and Bassin Blanc }

the humid winds which pass over them from the sea level. The water is collected and preserved in extensive marshes and lakes, whence are derived the sources of three considerable rivers : the Rivière Tamarin, the Rivière du Rempart and the Rivière du Poste, and whence a gradual but constant supply of water is furnished at all seasons of the year. The progress of cultivation, and the demand for timber are quickly bringing about the clearing and draining of these lands ; when once they have been cleared and cultivated, the constantly flowing streams already somewhat reduced during the dry season, will undergo still further change, and in their place will be seen swollen torrents in rainy weather, and dry channels during the rest of the year.

Now such being the real action of forests in connexion with the water supply, it follows that we must either maintain our forests, at any cost, or adopt artificial means which may serve the same purpose, in the preservation of the rain, after it has fallen.

The choice between the alternative courses open to us will not be difficult, for it is easy to see that it will be utterly impracticable to maintain any sufficient extent of forest land, whereas there will be little difficulty, and ultimately less expense, in establishing artificial reservoirs.

The forest laws now in force affect a very small portion of the existing forests ; and yet if we are to depend upon forests for the preservation of the water it is clear that present extent of forest land must not only be reduced, but must be added to ; for the call for more water has long been heard, during the dry season, and it will certainly become more and more urgent, with the increase of population.

All the advocates of the forest system acknowledge this ; and though no one has been bold enough to advocate the total prohibition of any further clearing of forest lands, yet it has been proposed to add to the extent of forests *under the protection of the law* by requiring each proprietor to set aside a certain proportional part of his land for the purpose, so as to divide the burthen equally amongst all. But such isolated patches of trees, scattered about the Island could have no appreciable effect upon the water supply ; not only is it ne-

cessary that the forests be massed together, on a large scale, to be of any service, but the forests which should be preserved are those particular forests of Moka, Plaines Wilhems, Vacoas and Savanne, and no others will answer the same purpose. It would be useless to establish forests about the lower parts of the rivers and at the same time leave the sources naked and exposed. The forests must be regarded as reservoirs, and as by far the greater part of the rain falls on the high lands, the forest intended to preserve it must be placed there, and not on the low ground; for by the time the water reaches the low ground it will have been collected into large streams, having velocity sufficient to rush onwards to the sea, no matter whether it has to pass through forests or not. A reservoir placed near the mouth of a river would merely supply a small quantity of fresh water to the sea, but if placed around and about the source, it would give a large and regular supply to the whole line of country through which the river might flow. Nothing short of a positive prohibition of all future clearing on the high table lands before mentioned, will meet the views of those who trust to forests, for the maintenance of the water supply, but if these lands are to be protected by law, they must be purchased from the proprietors, and doomed to be forever unprofitable. Considering the extent and the value of the land, such a measure would seem both impolitic and impracticable. If we wish the Island to advance in material prosperity, we must adopt an opposite policy, and find means to throw open to cultivation as much land as possible.

As facilities and inducements for extending cultivation increase, so will the impracticability of maintaining so much forest become more evident.

A simple calculation will show that each individual of the population must use something like one cord of brush wood or other fire wood in the course of a year; in all about 240,000 cords; taking the produce of one acre of land at 75 cords, the consumption will be equivalent to the produce of 3,200 acres every year. Now it is probable that more than this quantity of fuel is consumed at the various Sugar Manufactories, Distilleries, Lime Kilns etc., and probably as much more is

used annually for various building purposes, so that it does not seem unreasonable to conclude that in one shape or another wood, equivalent to the produce of between 9,000 and 10,000 acres is cut every year; land so cleared, must be considered as permanently abstracted from forest land.

Now if forests are to be kept up, this enormous amount of clearing must be stopped altogether, and those who advocate the measure must be prepared not only to pay indemnities to the proprietors of the forest lands, but also to throw upon the colony the immense expense of substituting other fuel, and other timber for building purposes, in place of the fuel and timber now used.

But even when left to themselves, and when no active steps are taken for their destruction, there seems to be a gradual decay of the forests, which it is difficult to explain. The number of dead trees in some of the most important forests is very great. It may be that the soil is exhausted of the nourishment required by that particular description of tree, and that some other species of vegetation may hereafter spring up, to take the place of the dead trees, but at present there are no signs of such a process having commenced. A particular kind of long grass is the chief species of vegetation which at present flourishes near the dead trees.

In fact it seems certain that everything deserving of the name of a *forest* will sooner or later disappear from Mauritius, either by the operation of natural causes, or to supply the pressing wants of the inhabitants.

The condition of Mauritius, in regard to the maintenance of forests exhibits an exceptional case, on account of the unusually large proportion which the number of inhabitants bears to the extent of the Island. The population of Great Britain and Ireland, (by no means thinly peopled countries), amounts to 233 to the square mile, whereas in Mauritius we have about 354 souls to the square mile, or more than one half as much again as in England. In France the population is only 175 to the square mile, or less than half that of Mauritius.

Our case therefore is more nearly assimilated to that of a collection of villages, than to that of a rural district, and ac-

ordingly there is a greater probability of the forests which still remain being made to disappear.

Instead, therefore, of struggling to prevent a result which appears to be, for so many reasons, inevitable, our wisest course is to consider beforehand, now whilst there is time, the measures which must be adopted to ward off the difficulty.

These measures evidently consist in the formation of artificial lakes, or reservoirs, which may serve the purpose of forests, and preserve for use during the dry season the rain which falls during the wet months.

By taking advantage of the form of the ground, and throwing one or more dams across the opening of a valley, the surface drainage of a large extent of country may be easily collected and retained.

The irregular features of most parts of this Island offer many suitable sites for the construction of such reservoirs, which with proper canals for the distribution of the water, would ensure a constant and sufficient supply.

On large estates, planters would in very many cases find it to their advantage to form reservoirs on their own account; in other cases, where the wants of a large district have to be supplied, they might be formed by the Government or by Companies, or by the cooperation of the Government with the parties interested — as is now done in the case of Branch Roads.

There are no great practical difficulties to be overcome; all that is requisite is the exercise of judgment in fixing the position of the dam; and care during its construction to render it impermeable to water. In introducing this system of water supply on a large scale, it would be desirable to give careful consideration to method by which the shares of water should be measured out and distributed, a point of some difficulty and importance, which is but imperfectly attained at present.

In addition to the argument in favor of the reservoir system founded upon the probability of the gradual disappearance of our forests, there is another argument quite as forcible, which leads directly to the same conclusion.

It has been already observed that on account of the increase

of population, there are many parts of Mauritius which have quite but all rural character.

The inhabitants and establishments are so closely concentrated in some of these places, that in dealing with them, in all that relates to drainage and water supply, they must be treated as parts of a town.

Formerly, when the population was more thinly scattered, little harm was done to the purity of the water of the streams the drainage and impure matters belonging to a few people being easily disposed of, without polluting the streams; at present the case is far different, and in places where men and animals, and manufactories are in such large numbers, the impurities which result cannot be got rid of so easily; it is altogether useless to enact that manufactories and objectionable establishments shall be placed at not less than a given distance from streams. Whenever there is a great and *continuous* deposition of impurities, such impurities will necessarily find their way to the water courses, unless carried off to the sea by an artificial system of drainage.

The water courses are the natural lines of drainage of the country, and are necessarily the lines of lowest level available. If the surface from which the drainage is collected be unoccupied and clean, the stream will of course be pure, but if the water course runs through a densely peopled district, it is impossible, but that the surface drainage will pollute the stream.

Again, people must wash themselves and their clothes. How is this to be done, in a crowded district without pollution to the stream?

In order to overcome this difficulty, it has been proposed by some that small basins should be constructed at chosen spots near the rivers, in which basins people might wash, without defiling the streams, but it does not seem to have been considered, what is to become of the dirty water of the basin. It cannot be got rid of, except by allowing it to flow back into the river lower down.

There are many other ways in which the water of small streams which traverse populous districts must necessarily be rendered impure and unfit for drinking; and this more es-

pecially in a tropical climate. Almost every pedestrian will stop at the stream to cool his feet, animals wade through the water and drink, &c. It is quite useless to stop and prevent all this, by passing laws which can never be enforced, for to put a stop to defilements of this nature would be impossible without almost as many Police Constables as there are inhabitants. The very attempt at interference seems cruel, these streams are provided by nature for the benefit of all ; any interference with the reasonable use of the privilege, can only be at the expense of cleanliness health and comfort.

We do not hear in other countries of prohibitions against bathing or washing in rivers. The reason is that when it is found that such pollutions have become (in consequence of increase of population) too common to allow of the water being made use of for domestic purposes, another and an independent source of supply is sought for, and provided. The same course must evidently be followed in our own case.

In Mauritius, the water for domestic purposes, must be supplied in populous parts of the Island, by means of canals or pipes, in connexion with reservoirs, as already described. Wells can only be made use of to a limited extent, on account of the geological formation of the Island.

The following conclusions seem to be established by what has been said :—

1st. That forests are not indispensable to the maintenance of water supply.

2nd. That it would be impolitic to attempt, and impracticable to secure the permanence of any great extent of forest in Mauritius.

3rd. That the density of the population in many parts of the Island requires that means be adopted for supplying pure water, independently of the rivers and streams.

These conclusions point to the establishment of reservoirs, and the extension of the Canal system, as the necessary and simple means of avoiding both present and prospective difficulties.

Protective laws might be applied with vigour to preserve from waste or pollution the water of the reservoirs and canals ; but there would then be no need to prevent proprietors

from cultivating their own lands, nor to inflict penalties upon those who have only made a reasonable use of the streams of running water which Providence has provided for them.

The work of establishing reservoirs and canals is one which might proceed gradually; it is only requisite that the necessity be appreciated, and means will soon be found for carrying on the work. The projected restoration of the Bois Rouge Canal, is an important step in the right direction, and if followed up by similar works in other parts of the Island, will assuredly tend to the great object we all have in view—the prosperity of Mauritius.

J. R. MANN.





## RAPPORT

Sur le Mémoire du Docteur Henri Sénèque, intitulé : " Quelques Considérations sur le mot Tambave," lu à la Société Royale des Arts et des Sciences, le 31 Aout 1861.



Messieurs,

Le Docteur Henri Sénèque a communiqué à la Société un Mémoire intitulé : *Quelques Considérations sur le mot Tambave*. Nous avons été chargés, les Drs. Philip Ayres, Ed. Lejuge et moi de vous en rendre compte.

Messieurs : Tous les préjugés du monde sont venus chercher à Maurice, un droit d'asile qui ne leur a été que trop facilement accordé. Entre cent autres, il en est un que nous qualifierons d'homicide, car il porte une atteinte funeste à la santé publique. Il est un mot, dérivé de nous ne savons quelle langue, que chaque mère prononce avec épouvante au chevet de son enfant. Ce préjugé, ce mot fatal, cet épouvantail dont chacun parle, mais que personne ne peut décrire, c'est le Tambave.

Port-Louis possédait une Société Médicale. Cette Société n'a survécu que deux ans à l'homme intelligent qui l'avait fondée. Théodore Poupinel avait proposé à tous ses confrères l'étude difficile des caractères particuliers que peuvent offrir les maladies à Maurice, et celle, non moins difficile des vertus spécifiques ou autres des plantes médicinales du pays, dont la Flore est si riche sous ce rapport.

La Société Médicale, pour remplir son mandat, avait mis à l'étude, en 1849, la question du Tambave. Chacun voulût participer à l'accomplissement d'une œuvre aussi importante. Les travaux commencèrent, puis comme nous l'avons déjà dit, cette Société cessa d'exister.

Le Docteur Sénèque, un des anciens membres de cette Société, s'est chargé à lui seul de réaliser ce que tant d'autres avaient voulu faire en commun, et c'est le fruit de son travail qu'il est venu vous offrir, après bien des années de patientes observations. Voici l'analyse de ce travail.

Dans un avertissement, M. Sénèque passe en revue les opinions émises sur le Tambave par un certain nombre de médecins qui ont fait partie de l'ancienne Société Médicale. Nous n'avons pas à les réfuter.

Le premier chapitre a pour titre : *Du mot Tambave et de sa signification vulgaire.*

“ Le mot Tambave, dit le Dr. Sénèque est, dit-on, dérivé  
“ du malgache, et sert à désigner chez ce peuple, une cer-  
“ taine maladie des enfants.” Et plus loin : “ On appelle  
“ vulgairement Tambave dans cette colonie, tout état patholo-  
“ logique présentant le caractère débilitant et chronique, ac-  
“ compagné de troubles dans quelques-unes ou dans toutes les  
“ fonctions organiques, principalement dans l'assimilation, la  
“ nutrition et les sécrétions, et caractérisé extérieurement par  
“ l'amaigrissement ou la bouffissure, par des éruptions diver-  
“ ses et des excretions morbides.

“ Ainsi sont généralement appelés Tambave, par le vul-  
“ gaire, 1o. le ramollissement gélatiniforme de l'estomac ; 2o.  
“ la gastro-entérite chronique et l'entéro-colite chronique ;  
“ 3o. la lientérie ; 4o. le Carreau ou tuberculation des glandes  
“ mésentériques ; 5o. les affections syphilitiques, dartreuses  
“ et scrofuleuses des enfants, héréditaires ou acquises, mais le  
“ plus souvent héréditaires ; 6o. les inflammations chroni-  
“ ques essentielles ou qui succèdent à des états aigus ; (les  
“ engorgements glandulaires) (foie parotide etc.), les épan-  
“ chements (hydrocéphale) ; 7o. aussi, certain cas de choléra  
“ sporadique, des éruptions aphteuses, pseudomembraneuses,  
“ phagédéniques etc.”

A ce tableau de l'auteur, nous ajouterons : le ramollisse-

ment intestinal qui succède quelquefois à l'entérite chronique, la diarrhée catharrale et l'entéro colite aiguë.

“ On voit donc par l'énumération que nous venons de faire, dit l'auteur, que le médecin appelé pour voir des enfants malades que les parents disent atteints de Tambave, y trouve des maladies fort différentes, et que de tous les états pathologiques qualifiés de ce nom, il ne s'en rencontre pas un seul à l'état aigu, car toutes les maladies qui ont ce dernier caractère ne sont pas regardées comme Tambave; elles ne prennent cette dénomination que lorsque l'état chronique y succède.

“ Pour notre compte, nous avons été appelé pour un très grand nombre d'enfants qu'on disait atteints du Tambave, et nous avons trouvé chez eux des maladies très connues dans la nosologie des auteurs et très différentes entr'elles. Ainsi, entr'autres cas, nous avons trouvé :

“ 1o. Une hydrocéphale congéniale chez un enfant de 8 mois, dont la mère suivait un traitement contre le Tambave.

“ 2o. Une syphilis constitutionnelle congéniale.

“ 3o. Une dentition difficile avec constipation et fièvre lente.

“ 4o. Un ramollissement de l'estomac.

“ 5o. Un cas de Carreau.

“ Plusieurs cas de diarrhée provenant d'ulcérations intestinales, accompagnées d'éruptions aphteuses à la bouche et au pharynx.”

Et enfin, l'auteur termine son premier chapitre par des considérations sur la question du Tambave, comme maladie des parents : le complément du préjugé. Tout ce qui est écrit dans ce chapitre est, à notre point de vue, Messieurs, la relation hélas trop exacte de ce que les médecins du pays ont journellement sous les yeux, et, si nous ne craignons de grossir inutilement ce rapport, nous y ajouterions nos observations personnelles.

Dans son deuxième chapitre, *Du Tambave comme entité morbide*, l'auteur passe en revue les spéculations des empiriques, l'incertitude fâcheuse de certains membres du corps médical, qui se trouvent en dissidence d'opinion avec leurs confrères, et une faiblesse coupable chez quelques uns d'entr'eux,

en outre il fait déjà voir l'impossibilité de reconnaître le Tambave comme une entité morbide. Nous ne saurions trop insister, Messieurs, sur les sages réflexions que M. Sénèque a renfermées dans ce chapitre, là surtout où il a parlé de personnes habiles à saisir tout moyen de lucre et qui ne craignent pas de spéculer sur le sentiment maternel. Nous reviendrons d'ailleurs sur cette question.

Le troisième chapitre, *Du Tambave sous le point de vue scientifique*, peut se résumer dans ces deux phrases de l'auteur lui-même : “ La science ne connaît point ce mot.” . . . . . “ Toutes ces considérations démontrent l'impossibilité de faire entrer ce mot dans la science, comme désignant une maladie spéciale, accompagnée de ses caractères particuliers.”

*Réfutation des opinions des médecins, sur la maladie dite Tambave* : Tel est le titre du quatrième chapitre, dans lequel nous trouvons les deux paragraphes suivants, auxquels nous adhérons complètement :

“ Nous affirmons donc que quelques maladies de notre localité peuvent, parvenues à une certaine période, celle de cachexie, de marasme, états auxquels nous synonymisons le Tambave, être empreintes d'une physionomie particulière qui peut mériter une dénomination quelconque sans que cela soit rigoureusement nécessaire, et à laquelle nous conserverons celle de Tambave que le vulgaire lui a déjà consacrée.”

“ Mais nous nions qu'on puisse faire du Tambave, qui n'est qu'un état particulier dont les influences climatériques, hygiéniques et alimentaires locales impriment le cachet à des maladies très différentes dans le début, et qui conservent toujours leur nature primitive, malgré cette physionomie nouvelle, nous nions, disons-nous, qu'on puisse en faire une entité morbide ayant sa nature, son étiologie, sa symptomatologie et sa thérapeutique spéciales ; cette ressemblance pathologique que revèlent des maladies différentes arrivées à la période que nous avons dit être celle de cachexie ou de marasme, est due à la coïncidence des influences climatériques avec leurs éléments spéciaux.

“ Le Tambave demande-t-il un traitement particulier,” dit

l'auteur dans son cinquième chapitre intitulé *Du Tambave sous le point de vue thérapeutique*. “ Les éléments primitifs qui constituent cet état pathologique étant très variés, la réponse à cette question est indubitablement négative.”

Le dernier chapitre est plein de conseils judicieux, il a pour titre *Traitement prophylactique*. C'est un exposé des moyens prophylactiques que doivent employer les parents pour arriver à détruire l'état pathologique appelé Tambave.

Terminons cette analyse, un peu succincte peut-être, par une petite critique. Il s'agit du titre du Mémoire que nous avons examiné : *Quelques considérations sur le mot Tambave*. A ce titre qui nous semble trop restreint, l'auteur aurait pu ajouter : *Des maladies que l'on désigne vulgairement sous ce nom, et du traitement prophylactique de l'état particulier qu'il sert à désigner*. Mais l'imperfection d'un titre est peu de chose assurément, et c'est l'œuvre en elle-même qu'il s'agit d'apprécier. Sous ce rapport, hâtons-nous de le dire, l'auteur a heureusement accompli la tâche qu'il s'était imposée. Médecins et malades trouveront leur compte dans le Mémoire du Dr. Sénèque, et le sentiment de modestie, joint à un noble but d'utilité qui y domine, est aux yeux des membres de votre Commission, un attrait trop rare aujourd'hui à Maurice, pour qu'ils n'y applaudissent de tout cœur.

En conséquence, votre Commission a l'honneur de vous proposer :

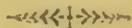
1o. De remercier le Docteur Sénèque de son intéressante communication ;

2o. D'insérer son Mémoire dans les *Transactions* de la Société.

Permettez-nous, Messieurs, de terminer ce Rapport, en faisant le vœu que la population de Maurice, malheureusement égarée par un préjugé que nous avons qualifié d'homicide, comprenne enfin que le moment est venu où justice doit être faite de l'influence d'un misérable charlatanisme, sur la singulière crédulité d'un grand nombre de personnes de notre communauté. Crédulité augmentée par les prétendues guérisons de Tambave qu'on peut expliquer par la nature médicamenteuse, si puissante chez les enfants, et quelquefois aussi, par la cessation de moyens intempestivement employés.

Chacun de nous ne sait-il pas que là où le mal est *parfaitement défini*, et où l'homme de l'art avoue son impuissance, l'empirisme a tous les droits possibles ; mais en vérité, que penser de l'effet de certains simples réputés inoffensifs, quand ceux-là qui savent en tirer un si beau profit pécuniaire ne savent même pas distinguer entr'elles les nombreuses affections auxquelles ils les appliquent et qu'ils confondent sous le nom tant de fois prononcé dans ce Rapport et par lequel nous terminerons : “Tambave.”

DR. C. RÉGNAUD,—*Rapporteur*.  
PH. B. AYRES, M. D.  
DR. LEJUGE.



## INFLUENCE DES GRANDES PLUIES SUR LA VÉGÉTATION.

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La note suivante est communiquée par le Secrétaire dans la séance du 22 Mars 1860 :

“ Les pluies abondantes que nous avons eues, et l'excessive chaleur qui s'est fait sentir pendant les intervalles où a reparu le soleil, toutes conditions si favorables à la végétation tropicale, ont produit sur les plantes un développement luxueux de rameaux, de tiges et de feuilles.

“ En résumé, c'est un grand bien, du moins il faut le prendre ainsi, quoiqu'il arrive parfois qu'à côté du bien se trouve le mal, occasionné souvent par la même cause.

“ Dans certaines parties froides et élevées de l'île, les cannes nous l'avons entendu dire, ont évidemment souffert de ce surcroît outre mesure d'eaux pluviales. L'expérience et les faits ont appris que dans les terrains où le sol n'absorbe pas la quantité d'eau qui tombe et où le soleil, caché par les nuages, ne peut l'enlever par l'évaporation, il survient chez la plante séjournant longuement dans un sol trop humide, une décoloration des feuilles qui prennent une teinte jaunâtre; plus tard le tissu de la plante subit une décomposition dont la mort est la conséquence indubitable.

“ Cette couleur jaune, dit le Dr. Lindley, provient, d'après quelques chimistes, de la destruction par l'eau d'une matière bleue particulière à la plante, laquelle mêlée de jaune produit la couleur verte naturelle à la végétation.

“ Dans quelques cas, quand l'humidité se prolonge, les articulations de la tige se séparent; dans d'autres cas, la plante pourrit dans la terre par les racines. Ces résultats varient en raison du plus ou moins d'affaiblissement de la lumière et d'abaissement de température dans le sol. Decandolle est d'opinion que la quantité d'eau qui séjourne autour du collet de la plante, intercepte à l'oxygène de l'air tout accès aux racines.

“ Quoiqu'il en soit, trop d'eau peut nuire à la plante, soit en

produisant la décomposition dont nous venons de parler, soit en lui donnant des dimensions en dehors de ses formes et de ses habitudes ordinaires, et la transformant en monstre, phénomène dont l'ananas que je présente ici, est un exemple.

“ On y voit le pédoncule principal considérablement renflé vers la base, se subdivisant en d'autres pédoncules qui se bifurquent, et se terminant par de tout petits fruits dont quelques uns sont soudés par leurs ovaires les uns aux autres. Ces fruits sont surmontés comme d'ordinaire par le bourgeon central ou couronne qui a pris un assez grand développement. L'ensemble de toutes ces couronnes terminales a l'apparence d'une touffe de jeunes plantes sortant du sol.

“ Un autre inconvénient peut provenir de cet excès de pluie et nous en avons vu des exemples.

“ On a pu remarquer que certains de nos fruits à pulpe charnue, la mangue, par exemple, ayant perdu sa saveur accoutumée, avait, comme on dit communément, *goût d'eau*. Les melons gorgés de suc aqueux en ont absorbé plus que leur état physiologique le leur permet. La transpiration si nécessaire à la plante n'a pu s'effectuer dans les conditions voulues et les fruits se sont fendus, ou ont coulé.

“ C'est quand les fruits sont au moment de mûrir que les arrosements doivent diminuer et cesser; et le contraire a eu lieu ici: “ The quantity of water in the soil, dit Lindley dans “ dans son traité d'horticulture, should be diminished when “ succulent fruit is ripening.—Not only is the quality of such “ fruit impaired by a wet soil, but, because of its low perspiratory power, the fruit will burst from excess in moisture, “ as occurs to the Plum and Grape in wet season.”

“ Les plantes à racines charnues et nutritives ont également souffert dans ce sens que toute la végétation s'est portée sur les tiges et les feuilles qui se sont développées d'une manière prodigieuse au détriment des racines réduites à des filets grêles. On en a des exemples dans des tiges de patates qui se sont élancées comme de grands *Convulvulus* sur de jeunes arbres qu'elles ont entortillées et couvertes de leurs feuilles trop abondantes et trop touffues.”

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La Société Royale des Arts et des Sciences s'est réunie mardi, 3 Avril 1860 à la Chambre d'Agriculture.

Le but de la séance a été la communication faite par l'hon. M. Fropier du Rapport qu'il avait été chargé de préparer sur l'Exposition Intercoloniale d'Août et Septembre derniers.

Le Rapport a été adopté séance tenante, et le Secrétaire a promis d'y faire les additions nécessaires, telles que la liste des jurés, celle des objets exposés, etc., et entrer dans d'autres détails dont M. Fropier, pressé par le tems, n'a pu s'occuper.

Ce Rapport sera immédiatement traduit et imprimé, et un exemplaire adressé à S. E. le Gouverneur, pour être transmis au Secrétaire d'Etat.

Au moment de lever la séance, le Secrétaire a demandé la parole et s'est adressé à la Société en ces termes :

“ Messieurs,

“ Nous ne devons pas, ce me semble, rester silencieux en présence du départ très prochain de notre Président, l'Hon. M. Fropier ; pour ma part, j'ai cru de mon devoir, en ma qualité de Secrétaire de la Société, d'exprimer à notre Président nos regrets sincères au moment d'une séparation dont les effets seront vivement ressentis et par notre Société et par le pays lui-même.

“ Je commencerai donc par souhaiter à notre digne Président l'entier accomplissement de tous ses souhaits dans le voyage qu'il va entreprendre, la réalisation du but qu'il se propose, son arrivée prompte et heureuse en Europe et par dessus tout son retour encore plus rapide et non moins heureux dans ses Pénates.

“ Mais autant cette absence sera-t-elle regrettable pour la Société, autant la Société doit-elle souhaiter, comme compensation de ses regrets, que le Président ne laisse échapper aucune occasion de lui être de quelque utilité.

“ Le souvenir des services qu'il lui a rendus sera religieusement conservé, mais il peut être appelé à lui en rendre de bien plus grands encore, si les circonstances lui permettent d'approcher de ceux dont dépendent les destinées du pays.

“ Notre Président sera probablement en situation de faire remarquer au Congrès où il aura pleine liberté de formuler ses

opinions et sa pensée, les faits merveilleux auxquels sous le point de vue statistique, Maurice sert de théâtre. Il excitera sans doute quelque attention quand il parlera d'une île mesurant à peine 150 miles de circuit, et donnant à elle seule plus de produits, dépensant plus d'argent que ne le feraient, réunies ensemble, d'autres colonies beaucoup plus grandes qu'elle ; recevant et consommant tous les tributs qui lui sont payés par l'Europe, l'Asie, les deux Amériques et plusieurs points de l'Afrique et de l'Australie, et entretenant dans cette enceinte de 150 milles de circonférence, une population de trois cents mille âmes, c'est-à-dire, comme l'a déjà remarqué un des membres distingués de notre Société, 354 individus par mille carré, quand la Grande-Bretagne n'en contient que 233 et la France 175.

“ Notre Président ne manquera pas non plus de faire observer que cette population se compose principalement d'hommes arrivés pauvres et ignorants du dehors pour simplement gagner leur vie en travaillant. Qu'elle contient une faible proportion d'êtres *pensants et raisonnants*, dans l'acceptation que nous donnons ici à ces mots, quand tous les autres au contraire cherchent à réaliser les instincts qui les poussent à jouir de la vie matérielle, tout en sauvegardant leurs intérêts pécuniaires.

“ Notre Président dira le peu qui a été fait en vue d'assistance intellectuelle à donner à une population aussi considérable qu'est devenue celle de Maurice, et comment et pourquoi cette population se montre de son côté si peu soucieuse de recourir à cette assistance.

“ Il fera voir d'un autre côté, et en présence de ces masses humaines, la partie éclairée, quelque peu inquiète parfois de l'attitude que ces masses pourraient prendre, et faisant tous ses efforts pour résister à un choc ou prévenir une collision, qu'elle cherche à éviter en se maintenant et en maintenant ses enfans dans la voie devenue si étroite du progrès et des lumières.

“ Notre Président fera observer que sous ce point de vue, notre Société a droit à tout encouragement, et qu'il est de toute raison, comme de saine politique, de la soutenir. Mais nous n'avons pas besoin d'indiquer à notre Président les

points qu'il aura à traiter, il le sait mieux que nous et s'en tirera mieux que nous.

“ Nous terminerons donc en le priant de nouveau de garder souvenir de notre Société, et de la recommander ainsi que notre Muséum à ceux qui pourront leur être utiles et améliorer leur situation. Il se peut faire que ces deux Institutions jouissent en Europe, ou du moins auprès de certaines Sociétés d'Europe, de plus de crédit et de considération que dans le pays où elles ont été fondées. Il se peut donc que la voix de M. Fropier soit comprise et entendue. Il se peut même qu'en s'adressant à ceux qui ne connaissent de Maurice que ses produits en sucre, M. Fropier remarquera la double surprise qu'ils éprouveront en apprenant d'abord, l'existence de semblables Institutions dans une île si éloignée du centre des lumières, en même temps que la faible assistance donnée à l'une et à l'autre.”

L'hon. M. Fropier a remercié la Société, s'engageant autant que ses moyens et les circonstances le lui permettront, à faire tout ce qui pourra dépendre de lui pour être, pendant son séjour en Angleterre, de quelque utilité à la Société.

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## OBSERVATIONS SUR LA CULTURE DE LA CANNE.

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Messieurs,

Je vais entamer un sujet de grande importance pour notre colonie, c'est-à-dire que je vais vous exposer un petit travail théorique et pratique sur la canne, fruit de mes études de plusieurs années et d'expériences successives. Ce travail ne sera pas, je le pense, sans suite, car les champs de l'expérience et de la science sont vastes ; une fois la bannière levée, les moissonneurs y entrent en masse, comme l'a fait judicieusement remarquer M. le Dr. Fressanges dans son travail sur les désinfectants, à la séance du mois de septembre dernier.

La canne est une plante épuisante, parce que c'est surtout dans le sol et dans les engrais, qu'elle prend la quantité d'azote qui fait partie de sa tige et de ses feuilles ; de là vient la nécessité de renouveler sans cesse par de nouveaux engrais les matériaux nutritifs qu'elle absorbe. Ainsi, en résumé, les principes élémentaires qui constituent la plante dont nous nous occupons, sont : le carbone, l'oxygène, l'hydrogène et l'azote qui lui sont fournis, tant par le sol que par l'atmosphère, mais plus par celui-ci que par celui-là.

En outre, et indépendamment de ces principes élémentaires et constitutifs de la plante, on trouve dans cette plante des matières salines, sous des formes, de soude et de chaux à acides variés qui, lorsqu'on la brûle, constituent la majeure partie des cendres qu'elle laisse pour résidu. Les matières minérales ont toutes

été puisées dans le sol, toutes sont également nécessaires à la constitution de la plante. Quant aux acides, ils peuvent changer à l'infini de bases, ou être réduits et remplacés par les acides organiques que la végétation engendre.

Il est donc de toute nécessité que les racines trouvent ces sels minéraux dans la terre, soit qu'ils y existent naturellement, chose douteuse, puisque la canne les épuise, soit qu'on les y ajoute dans un engrais. Aussi, les engrais n'agissent-ils pas toujours par les matières azotées qu'ils contiennent, mais encore par les sels qui y sont contenus. De même encore la nécessité d'employer des cendres qui, placées à propos, impriment à la végétation languissante une vigueur, une activité que les engrais seuls ne pourraient lui communiquer.

Le carbone, l'oxygène, l'hydrogène et l'azote sont les véritables aliments de la canne, comme ils le sont de toutes les plantes ; mais une fois qu'ils y sont entrés, ils ne restent plus isolés les uns des autres. Par suite des phénomènes de la végétation, il s'opère de nouvelles et de nombreuses combinaisons ; les éléments de la plante en s'unissant deux à deux, trois à trois, ou même tous les quatre ensemble, donnent naissance à tous ces principes immédiats qui y existent et qui s'y sont formés de toutes pièces par les seules forces de la végétation unies avec les sels, les oxydes ou leurs radicaux réduits ; tels que soufre, phosphore, etc., seules matières qui soient empruntées par la plante aux milieux dans lesquels elle vit et se développe.

L'Agriculture de Maurice laisse encore beaucoup à désirer ; il y a des propriétés où l'on ne s'occupe pas des engrais préparatoires ; pourtant, un sol ne peut pas toujours produire, s'il n'a pas les éléments voulus pour cet effet ; je pourrai dire à ceux-là ce que le fameux chimiste Liebig répondit aux paysans qui avaient été le trouver pour s'enquérir auprès de lui, de la cause qui empêchait leur sol de donner toujours les mêmes récoltes, qu'ils voyaient diminuer tous les ans. “ Rendez au sol, leur dit ce célèbre chimiste, ce que vous lui prenez en principes, et vous n'aurez pas de déceptions à la fin de vos récoltes. ” Selon ma conviction, je dirai : Ne laissez pas votre sol s'épuiser en y laissant les souches de vos cannes vieillir ; ne plantez vos cannes que sur un bon engrais que

vous pouvez aisément fabriquer, car toutes les matières dont vous avez besoin se trouvent chez vous et vous les laissez perdre.

Je ne citerai, à l'appui de ce que j'avance que l'établissement *Bonne Mère*, à Flacq. Cet établissement qui marche en première ligne à Maurice et qui, avec le peu d'étendue de ses terres, donne de très beaux produits, n'entreprend jamais de plantations que sur un bon purin, composé des détritux de la propriété; l'herbe ne pousse jamais dans ses champs; ses plantations sont achevées lorsque les voisins pensent à commencer les leurs. Aussi, quels sont les résultats qu'on en retire? Ils sont, au dire des personnes intéressées, invariables; les terres s'améliorent chaque année; le même sol, après les deux seules coupes que l'on se contente d'y faire, est retrouvé avant même que les racines de la plante n'aient pu s'étendre; peu après, le carreau est replanté et les cannes y viennent toujours avec une végétation nouvelle.

Je vais maintenant vous parler de la propagation de la canne à Maurice. Les premières plantations sont généralement faites avec de bonnes têtes; plus tard on prend tous les plants, quels qu'ils soient, pour les confier à la terre; quelquefois, on va chercher au milieu des carreaux abandonnés, des cannes épuisées par l'herbe, dans laquelle on les a laissées grandir pour les planter. Quels sont les rejetons de ces mauvais plants, que font-ils voir en se montrant au jour? Des cannes dégénérées. Ce fait seul dénote les taches de maladie qui ont eu lieu dans plusieurs localités sur la canne Bellouguet et qui menacent cette espèce d'une destruction prématurée.

J'ai pensé aussi à une chose qu'il est de mon devoir de signaler à la Société, afin que l'on puisse la mettre en pratique, si la chose est jugée convenable; c'est de faire l'échange des têtes entre les quartiers secs et les quartiers humides. Je crois que cette alternation serait encore d'un grand secours pour empêcher la dégénérescence complète de la canne Bellouguet qui est la seule, jusqu'ici, qui ait pu remplacer la canne blanche avec avantage, par sa richesse en vesou. La sommité de ces cannes dans les quartiers humides est d'une belle venue, mais quelquefois trop tendre pour être plantée dans le lieu qui lui a donné naissance; car, pour peu

qu'il fasse pendant la saison une grande quantité de pluie, elle pourrit et la plantation manque ; car cette tête contient en elle assez d'eau pour que, alimentée par la chaleur atmosphérique des mois favorables à la plantation, elle puisse germer et faire la canne végéter en attendant que ses racines puissent atteindre le sol et s'y nourrir. Au contraire, dans les quartiers secs, il arrive, lorsque le plant subit une sécheresse, que la plantation manque ; parce que la tête des cannes dans ces quartiers où la végétation est tout-à-fait arrêtée lorsqu'arrive la coupe, est naturellement sèche et tend encore à sécher par le soleil ardent sous lequel elle est née ; c'est pourquoi je propose l'alternation des plants, essai déjà fait à Flacq, sur l'établissement *Mon Rêve* et qui a parfaitement réussi. Il est évident que les têtes tendres des quartiers humides, plantées sur un bon fumier pousseront mieux dans les quartiers secs, réchauffés par le soleil, et que celles des climats secs qui ne demandent que de la pluie, fructifieront mieux dans les conditions où elles se trouveront. Quant à la question du Borer, les quartiers humides en seront toujours exemptés par les pluies qui les arrosent, et ils diminueront dans les quartiers secs par les têtes saines que leur fourniront les quartiers élevés. D'ailleurs, la chose est prouvée par l'usage établi en Europe de faire venir les semences d'Égypte, parce que ce pays produit de plus beaux grains, par le fait du renouvellement du sol et par les dépôts qu'y apporte le Nil pendant la crue des eaux et qu'il y laisse en rentrant dans son lit. De même, la tête de canne des régions humides jouissant d'une végétation continue est plus belle et promet de plus beaux résultats aux quartiers secs en y apportant ses premiers éléments de végétation, et la tête des quartiers secs, en retrouvant dans les quartiers humides les éléments nourriciers dont elle a besoin. Ce moyen employé à l'unisson régénèrera continuellement notre espèce de cannes et la rendra exempte des maladies sous lesquelles la canne blanche a succombé.

Pour abrégé ce travail déjà assez long, je vais vous parler des engrais. Commençons par l'engrais préparatoire qui doit être formé par :

1. Les herbes de vos champs, pour rendre à vos terres les principes que ces plantes y ont puisés.

2. Les produits de vos écuries qui serviront à rendre au sol les substances qu'il a perdues, et qui sont fournis par la nourriture que l'on donne aux mules, par leurs excréments et les urines qui imbibent les litières et dont voici, d'après deux chimistes, l'analyse telle qu'elle est donnée dans la chimie organique de Liebig :

<i>Crottin de cheval ou de mulet.</i>	<i>Urine de cheval ou de mulet.</i>
(Jackson.)	(Vauquelin.)
Phosphate de chaux..... 5,00	Phosphate de chaux..... 11
Carbonate de chaux ..... 18,75	Carbonate de soude..... 9
Phosphate de magnésie... 36,25	Hippurate de soude..... 24
Silice..... 40,09	Chlorure de potassium... 9
—————	Urée ..... 7
100,00	Eau.....,..... 940
	—————
	1000

3. Les produits du parc à bœufs et de l'étable dont la composition chimique est :

<i>Urine de vache.—(Blande.)</i>	<i>Bouse de vache.—(Haidhlen.)</i>
Chlorure de potassium et sel ammoniac..... 15	Phosphate de chaux ..... 10,9
Sulfate de potasse..... 6	„ de magnésie... 10,0
Carbonate de potasse ..... 4	„ de fer ..... 8,5
Carbonate de chaux..... 3	Chaux..... 1,5
Urée ..... 4	Sulfate de chaux..... 3,1
Eau ..... 968	Silice et perte..... 66
—————	—————
1000	100,0

4. Cendres à bagasse, écumes de vesou, recouverts, dans la proportion d'un pied d'épaisseur, d'un pouce de chaux et noyés dans une lessive composée en même proportion d'eau douce, d'eau salée et de sirop. Cet engrais doit être fabriqué dans un bassin et ne doit être employé que trois mois après, pour donner le temps à l'acide acétique produit par la fermentation de se combiner avec d'autres substances pour former des sels utiles à la végétation ; deux ou trois livres de cet engrais suffisent pour un fossé.

L'analyse de plusieurs échantillons de terre de différentes localités m'a suggéré l'idée de vous parler encore des engrais que vous employez dans vos plantations ; il m'a fallu compa-

rer l'analyse du vesou, celle du sirop, celle du sucre, pour me rendre compte de ce qui manque et des moyens d'y pourvoir.

Généralement nos sols contiennent de la silice, de l'alumine, peu de silicate de chaux, peu de magnésie. Les parties hautes de l'île contiennent du fer en quantité notable, mais les parties du littoral ne laissent voir que des traces de ce métal.

L'analyse de la canne varie en :

Silice . . . . .	de 40 à 50
Acide phosphorique . . . . .	„ 3 à 9
„ sulfurique . . . . .	„ 5 à 12
Chlorure . . . . .	„ 1 à 10
Chaux . . . . .	„ 4 à 15
Magnésie . . . . .	„ 2 à 16
Potasse . . . . .	„ 10 à 28
Soude . . . . .	„ 1 à 5

Cependant les terres de Maurice, à l'exception de la silice, ne peuvent guère fournir à la plante ces éléments que vous avez tous chez vous et qui se trouvent en pure perte et qui fourniraient à la canne la nourriture dont elle a besoin.

Peu de planteurs savent profiter de ces avantages, qu'il leur serait facile d'utiliser. Les herbes de leurs champs, les pailles de leurs cannes, les cendres, les sirops, les écumes, voilà des éléments qui se perdent et qui pourraient leur rendre de grands services.

Ils pourraient avoir des plateformes sur lesquelles seraient dressés en meules, tous les produits qu'ils pourraient réunir ; préparer des lessives composées de leurs sirops, d'eau salée, de chaux et d'écumes de vesou ; l'arrosage par cette lessive fixerait les sels qui se perdent. Cependant on néglige de rassembler ces produits, qui formeraient une grande partie des substances dont la canne est composée et dont elle a besoin pour se nourrir.

Les cendres conservées dans des endroits, à l'abri de la pluie, appliquées en Janvier ou Février donneraient à la plante une végétation luxuriante. Les charbons des usines joints au fumier imprimeraient une grande amélioration au sol, qui deviendrait plus riche, pourrait facilement supporter les engrais commerciaux et doublerait la valeur des produits.

Le sirop desséché produit environ cinq pour cent de cendres dont une partie est composée pour 010 de :

Carbonate de potasse .. .. .	30
„ de chaux .. .. .	15
„ de magnésie .. .. .	15
Oxide de fer .. .. .	6
Chlorure de potassium .. .. .	22
„ de sodium .. .. .	9
Acide sulfurique .. .. .	3
	—
	100
	—

Voilà les matières dont la canne a besoin pour se nourrir ce sont celles qu'il faut rendre au sol.

Ne pouvant m'étendre plus longtemps sur ce sujet, je me mets à la disposition des personnes qui auraient besoin de plus amples renseignements.

Je prierai en terminant M. le Président de faire un appel à MM. les planteurs pour leur demander des échantillons du sol de leurs propriétés, pris entre quatre et six pouces de profondeur, ceux que j'ai eu et dont je fais connaître plus bas la composition n'étant pas assez suffisants pour l'étude d'une question importante à l'agriculture de Maurice et à la fabrication d'engrais spéciaux.

*Analyse d'un échantillon de terre de l'établissement BELLE MARE sur lequel on venait de couper des cannes de repousses.*

Alumine .. .. .	26
Silice .. .. .	72
Magnésie .. .. .	1,06
Chaux .. .. .	04
Fer .. .. .	Trace
	—
	100,00
	—

*Etablissement ARGY.—Terre en friche.*

Silice .. .. .	75
Alumine .. .. .	10
Chaux .. .. .	2,06
Magnésic .. .. .	1,06
Humus.. .. .	5,08
Fer .. .. .	5
	<hr/>
	100,00

ATE. PARUIT D'ESMERY.



## NEW ZEALAND FLAX.

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(COMMUNICATED BY MR. J. M. DIORÉ.)

This plant is indigenous to New Zealand, and was known from the time Tasman discovered these islands in 1642. This fact is so true, that the New Zealand Flax is to be found throughout the land, both in the North and in the South. It is employed by the Natives (Maories) for the manufacture of their garments as well as for various packages in which they make up the Wheat, Gun, Potatoes, &c., which they grow for their bartery with the European settlers.

The Natives equally make use of it for “fishing Nets” and “fishing Lines,” and is frequently exported to Europe where it is mixed with Hemp for the purpose of making Ropes.

I have no doubt that this plant would be well adapted for making bags in which Sugar could be packed; it being much stronger and more supple than the Vaeoa, the brittleness of which is sometimes the cause of heavy losses to shippers and exporters.

The New Zealand Flax will grow in any middling good soil, provided it be pretty well watered.

The ordinary mode of planting it is to place three or four seeds in a hole of about eight inches in diameter and four in depth, covering the same with not more than one inch of soil, taking care, at the same time, to place the holes at a distance of three feet one from the other. When the shoot is sufficiently long, it should be earthed up in order to give it support.

The plant attains the height of seven feet two years after the sowing of the seed, at which time the leaves are fit to be cut;—and, after the first crop, every eighteen months;—but different from the Vaeoa, it does not grow any branches, the leaves shooting from the stem out of the earth; these leaves grow in a bushy (touffu) form and are abundant.

When the leaves are cut, they are split like the Vaeoa into

proper widths and dried during two or three days by hanging up in a *shed* or in the *shade*, (and not in the sun) previous to manufacturing the mats or packages. The Flax must not be too dry when manufactured, and cutting the same three days before employed will be found quite sufficient. Soaking the leaves for a couple of hours after drying in the shade, is also a great assistance for softening the fibres.

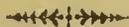
The accompanying specimens of Native workmanship, namely :

1. A war cloak,
2. An ordinary cloak,
3. A kit (Maorie name for a bag),

will give an idea of the use made of the New Zealand Flax.

Having resided during a period of five years in New Zealand, and returning to my native land, I ventured to import a small quantity of this seed with the view of demonstrating its utility for agricultural purposes, and, shall be satisfied if a trial thereof should prove successful.

In conclusion, I may mention that this seed is abundant and easy to be procured.



London, 19th November 1860.

*To the President and Gentlemen of the Royal Society  
of Arts and Sciences.*

Gentlemen,

Nothing but confusion exists in the accounts of the early navigators in reference to the islands now called Bourbon and Mauritius, and there is even no authority for proving that they were discovered by the Portuguese at all; though if discovered by them it was decidedly not in the first year of the Governor Almeida in India, as is clearly proved by the extracts from the works of Faria Y Souza already transmitted to the Society. Nothing is clearly distinguishable until the first real settlement on the island of Mauritius by the Dutch under Van Neck in 1598. Grant is the authority for all the subsequent English writers on the subject who copy his pages without any trouble whatever to verify his statements; but it is quite clear that Grant had no original documents to consult for the early Portuguese portion of his history. So with the French writers; even in the excellent map *Afrique* published by Sanson in 1674, the island is put down as "Ile Maurice" though at that date it could only be known by the name of Cirne or one of its many corruptions, as it was not until 1698 that any appellation like that of Mauritius was bestowed upon it; a fact which proves either the ignorance of Sanson, or that the map cannot be so ancient as marked, viz. 1674. As the Society has a copy of this map, as far as I can remember in the collection of maps made the originals by Mr. E. Froberville, the Society can consult it for themselves.

With regard to the term 'Cirne,' it has no relation whatever to the Portuguese word signifying "Swan" on account of the number of the "Dodos" seen on the island, but is simply a misconception of the geographical position of the ancient "Cirne," and can be clearly seen from Mr. Lemaire's notes to Pliny (Nat. Hist. IV. 9) as well as from the very learned dissertations of Falconer on the voyage of Hanno. (Greek Text, explained from the accounts of modern travel-

lers; London 1797.) With regard to the term 'Apollonia' this also is an imaginary one, though having no reference to the ancient town Apollonia, of which there were 33; but to the St. Apollonia whose feast is in December, and it being the common practice of the Portuguese to attach the names of saints to places they saw, or imagined they saw. With regard to the dates of the first discovery of this 'Cerné,' they vary in a remarkable manner, such as 1500, 1507, 1505, 1528, 1545, 1502 etc. evidently showing there was no certainty in the matter. It was even called "Diego Roys" by some navigators; and was even confounded with 'Juan de Lisboa,' though in the early charts, (some rare copies of which I shall be able to forward to the Society next month) Juan de Lisboa is placed many degrees to the South of it, and even of the south point of Madagascar. In some of the very early maps "Cerné" is even represented as North East of Madagascar, Mascarenhas lying between them and St. Apollonia (sometimes San Polonia) a smaller island, holding a North West position of Mascarenhas towards Madagascar. In an ancient chart of 1546, this is their relative position:—

Juan de Lisboa lying so far to the South, may possibly have been what is now called "Amsterdam Island."

In some of the early charts, an island holding the position of Bourbon is designated under the name of "*Dimobaz*," and '*Cerné*' under that of "*Dinaroby*;" in others of rather later date, *Cerné* is also named under the following: *Ilhada Cirne*; *Do Sirne*; *Do Cirn*: *Le Arone*; *le Arcne*; *Cygnœa*; and the geographers of the 16th century have mentioned, what I fancy from its position, must be intended for Mauritius, under the following names: *Ilha Draarco*; *Alhadaarco*; *Daladlarco*; *Y Daladia*; *Y Darca*; *I de l'arca*; *Do Aro*; *Aliadoro*; *Aldabarne*; *Adarno*; *Area*; *Atces*; *Atques*. These strange names are not found in the Portuguese Historians, but only in their charts, and exemplifies that tendency to corruption of names of which Dr. C. Régnaud has given an interesting instance in the "*Quelques mots sur le véritable nom de l'île Diégo Garcia*." (*Sec Transact.* 1860, p. 280.)

The *Ilhas de Mascarenhas* give their name to a group of islands near the Equator; and tracing the route of the earliest Portuguese navigators, these, it seems to me, must have been the islands they came across in the Viceroyship of their first governor in India, *Almeyda*; and not *Bourbon*, which lay quite out of their track, which was to *Coast Africa* all the way, visiting *Natal*, *Cape Corrientes*, *Quiloa*, *Mombaza*, up to *Aden*, at which point they seemed to have kept a strict watch on all merchant ships, which they obstructed in their passage up the *Red Sea*, importing by this way their commerce into *Europe*. They then crossed over to the *Coromandel* and *Malabar Coasts*, and naturally came early upon *Taprobana* or *Tapropana*, now *Ceylon*; from this island they directed their course through the straits to *Bantam* and the various spice islands, *China* etc. On the return voyage they followed the same route, unless driven by contrary winds, as they were invariably in pursuit of other ships richly laden with similar merchandise to what they carried, and which were steering their course to the *Red Sea*. It was only by *chance* that the *West Coast of Madagascar* was visited by *Soarez*, his ship having been driven too far *Eastward* in making his way up *Mozambique Channel* to *Quiloa*. *Juan de Nova* is, I fancy,

one of the Comoro group, or some rock to the Southward of them, and should be, according to the ancient Portuguese charts, placed between Quiloa and Mozambique. Some set down *two* different islands for Juan de Nova; but the island between Madagascar and Africa is that usually accepted as Juan de Nova; it is quite clear, however, that the early navigators, such as Juan de Nova, Mascarenhas, Acunha etc. were in the habit of giving their names to different islands. Such gentlemen, are a few observations on this obscure point; the maps which will reach you next month, and which are of great rarity, will be an additional confirmation; but the whole of the early Portuguese portion of Mauritian history requires to be re-written.

I remain, gentlemen, very truly yours,

JAMES MORRIS.

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8 Gt. Ormond street, Queen Square,  
19th December 1860.

*To the President and Members of the Royal Society  
of Arts and Sciences.*

Gentlemen,

Since my last communication, I have carefully examined four important Portuguese Historians at whose disposal, for the purpose of composing their various histories, the whole of the papers preserved in the Archives of Portugal were placed. Little relating to early Portuguese history may be supposed to remain in Lisbon and elsewhere which has not been seen by the historians of whose works I am about to speak. In addition to this I have been allowed to inspect and have copied some of the unique and rare maps in the collection of the British Museum, and I have received some valuable information from the learned Curator of that department, whose admirable work on early Anstralian History has already been published by the Hakluyt Society. All the information I

have collected, goes to prove most incontestably that Mauritius was not discovered by the Portuguese, either by the persons, or at the time mentioned by all the modern writers on the subject. No mention of such a discovery, or of such an island appears in the great Historians from whose works I have copied those passages which, while detailing the lives and exploits of the persons supposed to have made the discovery, prove collaterally by the silence of the Historians, that such was not the case.

Barros, the author of the *Asia Portuguesa*, is always reckoned the greatest and fullest of the Historians of Portugal; it is an extremely rare work, and rarer still to meet with all the Decades complete, as Decade VI for instance, was nearly all destroyed by fire. Only the First Three Decades also are by Barros; the rest are by Diego Couto up to XII, and the XIIIth is by A. Bocarra. The First Decade begins with the first voyages to India under Vasco Gomez, Pacheco, Cabral etc., and the voyage of Governor Aln.eida (1505) to India as the first Viceroy, does not begin before the 8th Book of the First Decade. The whole of the principal events and voyages to and from the Indian Ocean in his time which were in any way near Madagascar, or connected with the discovery of that Island, or Ceylon etc. have been copied. The names of the various captains of the different fleets sent out to explore in these seas, have also been added. Those chapters containing nothing bearing on the subject, have had merely their contents put down, so as to connect them with the rest of the history. The voyage of João Gomez D'Abreu, (one of D'Acunha's fleet), to the River Matatana on the East Coast, where he was left behind with some of his men who afterwards set out (it is said) for Mozambique, is evidently the only time they were likely to have come across the islands of Bourbon or Mauritius, though no mention of such islands, by any names whatever, occurs, as will be seen by the Extracts copied from the *Decada Sequerela* liv. I. C. I and II etc.

The voyages and adventures of the famous Albuquerque and other celebrated captains have been extracted; at Ch. VII is mentioned his ship which is called the *Cirne*; and also in Book V. C. III. In Book VII Decada II occurs the first

mention of Dô Garcia Noronha, in whose fleet of 16 ships which left Portugal in 1511, the name of Pedro Mascarenhas, one of his captains first occurs. (Cap. II.) This Chapter is, of all others, the one most bearing on the point, and his voyages in these parts, as well as his route from Madagascar is copied in full; and his whole career up to his return to Portugal in 1527, is extracted. In this Cap. there is mention of a ship called *Galega*; but not the most distant intimation of anything bearing on the discovery of the Islands, afterwards Bourbon and Mauritius, is to be found.

CASTANHEDA (1552.)

This historian is one of the most complete and elaborate of the Portuguese writers. The extracts made from his work, particularly from Books II and III at the time of the Governorship of Almeida when Bourbon and Mauritius have been set down as having been discovered by Mascarenhas; the account of the discovery of Ceylon and Madagascar, showing how they reached those islands and by what route they left them, will show what authority there is for any such assertion. No mention is made of these islands under any of their many names, nor does the name of Mascarenhas occur at all, even as a subordinate, in any of their ships, of which, at the commencement of every expedition, it was the custom to record the names of the commanders and officers in full. Some writers, Strickland among the number, surmise that it is possible the Portuguese may have come across those Islands when they reached the River Matatana on the East Coast of Madagascar, at which point they were the nearest to them, being nearly opposite to Bourbon: (See Extracts C. XXIII C. CVII Book II.) Near this point some of the ships were dispersed. (See also Barros, Dec. II Cap. I and VI of lib. 1.) In this expedition, there was no Mascarenhas, nor does his name occur until Book VI Cap. CI. One of the ships of the expedition was called *irne*, (Book II Cap XXXV.) A list of the Islands known at that time to the Portuguese, is appended, selected with considerable trouble from Castenhe-da's Great History.

If Mascarenhas was rewarded, as Grant, and other writers affirm, for his discovery of these two islands in 1505, it was certainly long after the time he is said to have discovered them. He was more likely rewarded for his warlike and courageous attack on Bantam and other places which he subjected to the authority of Portugal.

There is also another group of Islands near the Equator which bear his name; it was common among the early navigators either to name, or have named after them, various islands, and this circumstance has tended to increase the geographical confusion so prevalent at this period. There is no entire translation of Castanheda, except the extremely rare one into Italian by Ulloa; the first Book only has been translated into German 1554, and into French, by Grouchy 1553. This Book only has also been translated into English.

#### OSORIUS.

The principal parts of this learned and copious historian have been extracted, and translated mostly from the latin for this occasion, bearing in the viceroyship of Almeida in India. The whole of the chief events, voyages and discoveries during his governorship in India; the voyages of Albuquerque, and all that is mentioned of Pedro Mascarenhas, until he returned to Portugal in 1527. (Bks. VIII to XVII) He went out, Osorius says, in the fleet of Garcia Noronha, the nephew of Albuquerque, as Captain, about 1511. It appears singular that at Cap. XVII there is a mention of the Admiral's flagship as the *St. Denis*, in which the Governor Sampayo wished to sail, but was forced by his rival, Mascarenhas, to go into another. The names of the two other vessels were also singular,—the *St. Louis* and the *Zamorin*.

The work of Osorius contains more details of Mascarenhas than even the other historians. At the end of the extracts is appended a list of all the islands then known and described in this very voluminous work of 20 books, all of which have been carefully gone over by me.

SAN ROMAN.

This likewise is one of the early and important Historians of Portugal. The extracts from his "Historia" comprise only a short resumé of the time of Almeida, and the chief points in the career of Mascarenhas, which completely confirm the view taken above, as no mention of the Islands or any discovery of them, is anywhere made.

MAPS.

The Maps sent are all extremely rare, and are facsimiles Pigafetta, and a few others deny that Taprobana is Ceylon, (see Blactin Behaim's Map.) The Map of the early part of the 16th century, is an Arabic one and very curious; the names, Din Aroby and Dimo-Bay seem to be the Arabic position for the islands afterwards Bourbon and Mauritius. Juan de Lisboa must evidently be some rock or islet to the South of Mauritius, for the place of this island is the same in all the early maps. I fancy that Apolonia (Apolina etc.) is a much more ancient name than *Cirne* or Mascarenhas, and is found on much earlier maps than either of these, and has been given to Bourbon, and probably comprehended both the islands together. Madagascar, in most of the early charts, is the real *Cirné* (Othiopica) Vel Insula Manuthias, Vel Manupias. The Illuminated Chart from the grand Vellum Atlas of Diegus Homen (1558) is unique, and is carefully preserved in the King's Library. Sir Frederick Madden gave me special permission to have it copied. This map is one of the first in which these Islands are called "Mascarenhas." The other Illuminated Map by Johann Rotz, the most ancient Portuguese Portulan in England in which the name "Mascarenhas" is given to these Islands. It has been copied from the vellum original in the King's Library, the only copy extant. In this Map, Bourbon is called *Apolina*, and Mauritius, *Mascarenhas*. The Arabic Maps and Books will be examined by me when I can find time; for the above researches have occupied me an entire month, and I have had the work copied in the most economical manner possible for the Society, consistent with

the care required in making the extracts etc. which have to be done by regular and competent copyists. I wish to call attention to one Map of the Froberville Collection, "*Extrait de la Novissima Africa descriptio*," Amsterdam, Apud I. Blaeu 1569. There must be an error of date here, for this Map is nearly 100 years later. The curious papers connected with the French Revolution shall also be examined when I can find time.

I remain gentlemen,

sincerely yours,

JAMES MORRIS.



## SUR LE MODE DE RÉPARTITION DE CERTAINES PLANTES A MAURICE.

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J'ai pu constater, dans une tournée que j'ai faite il y a quelques mois à la *Nouvelle-Découverte*, en suivant la route qui forme au sommet d'une des chaînes de la Montagne des Calebasses, le passage appelé la *Coupée*, la marche qu'ont suivie certaines plantes tant exotiques qu'indigènes, sur la crête de la montagne et tout le long du chemin. Les unes ont adopté une marche ascendante dans leur mode de reproduction ; d'autres au contraire, semblent être descendues du haut de la montagne pour venir s'établir dans la plaine, et jusqu'à une assez grande distance au bord des rivières.

Je parlerai d'abord du *Tridax procumbens*, connu sous le nom vulgaire de "Herbe Caille." Cette plante est aujourd'hui disséminée sur presque tous les points de l'Île, et croît même dans les rues de la ville, sur les murs et les montagnes avoisinant Port-Louis. Son point de départ vers 1830 ou 1831, a été le Jardin Botanique des Pamplemousses, où elle avait été cultivée dans le parterre du Directeur, comme plante d'agrément, à une époque où l'on se montrait probablement moins difficile qu'on ne l'est aujourd'hui, dans le choix des fleurs propres à orner un jardin. De là, elle a pris son vol pour aller s'ébattre partout où les vents ont transporté ses aigrettes, qu'ils ont disséminées dans toutes les directions.

L'autre plante également introduite dans le pays et qui semble offrir dans son mode de reproduction plus de difficulté que la première, puisque son fruit est une baie charnue que le vent ne peut enlever, sortie également du Jardin Botanique des Pamplemousses, s'est d'abord répandue dans les plaines au bas de la montagne et s'est progressivement élevée jusqu'au sommet. C'est le *Daphne viridiflora* ou *Wickstrœmia viridiflora* Meisn. in DC. P. Elle s'est également propagée sur d'autres points, en suivant toujours une marche ascendante.

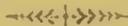
Une troisième plante, l'*Elephantopus scaber* suit une ligne diamétralement opposée à celle du *Wickstrœmia viridiflora*,

c'est-à-dire que de nombreux individus sont sortis des forêts élevées à l'ombre desquelles on en rencontre des masses, pour descendre et s'établir dans les plaines, au bas de la montagne. J'ai pu en observer jusqu'au bord de la Rivière des Calebasses. Cette dernière plante est indigène à Mauricie.

Dans une exploration subséquente, j'ai pu constater l'envahissement dans les forêts d'une espèce de *Rubus* originaire de l'Inde ou de Java, le *R-Hamiltonianus* introduit à Mauricie il y a une trentaine d'années, et d'un *Passiflora P. foetida* qui se sont aussi considérablement répandus sur les limites des forêts. On peut se rendre compte de la propagation du *Rubus* en question par la dissémination des graines faite par les oiseaux. Il est plus difficile de se rendre compte de la naturalisation du *Passiflora*.

Ces plantes sont devenues si communes dans plusieurs localités de Mauricie, qu'on pourrait les croire indigènes. Toutes cependant sont exotiques, à l'exception seulement de l'*Elephantopus scaber*, et j'ai tenu à signaler ce fait, afin que les botanistes dont nous recevrons plus tard la visite, pussent se tenir sur leurs gardes et ne pas confondre ces plantes avec celles propres au pays même.

L. BOUTON.



## ÉTUDES SUR LA PLANTE.

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*(Article communiqué par un membre de la Section d'Histoire et de Littérature.)*

L'homme a, dans tous les temps, voué à la plante une sorte de culte. Si vous remontez à l'origine des siècles, dans les temps fabuleux, vous voyez chaeune d'elles ou du moins les plus utiles d'entre elles, placées sous les auspices de divinités protectrices. Pour parler le vieux style, nous vous dirons, par exemple, que Flore et Pomone produisaient pour nous leurs bouquets et leurs fruits—que Cerès, semblable à une mère nourricière, nous offrait ses gerbes de blé ; Bacchus, ce Dieu consolateur, sur lequel toutefois il ne faut pas trop se fier, nous donnait ses raisins à pressurer, tandis qu'Esculape préparait de ses mains des remèdes aux maux que devait nécessairement susciter, à des créatures, loin d'être aussi raisonnables qu'elles le sont de nos jours, l'usage immodéré de tous ces dons prodigués par les Dieux.

La plante n'en est pas moins restée jusqu'aujourd'hui l'objet d'une vive sollicitude de notre part. Elle s'étend cette sollicitude ou plutôt elle se concentre sur cette foule de végétaux si nécessaires à nos besoins, sur nos cultures de grains, de blé, d'orge, d'avoine et ici à Maurice sur nos champs de cannes à sucre. Partout c'est un hommage rendu à la plante et comme un devoir que nous remplissons envers elle ; c'est un soin religieux donné à son entretien et à sa culture, source intarissable de nos richesses, de notre bien-être et de nos jouissances.

Et cependant quel que soit l'hommage qui lui est rendu, la plante, sous le point de vue où nous voulons l'envisager, n'est pas placée dans l'échelle de la création au rang qu'elle devrait occuper—du moins nous le pensons—et voilà pourquoi nous voudrions la réhabiliter, et nous assurer si cet être croissant, vivant, souffrant et mourant comme les autres êtres placés plus haut que lui, n'est pas en définitive quelque chose de

mieux qu'un être inerte—insensible—passif—s'il n'est pas enfin, tranchons le mot, doué d'une sensation quelconque.

“ Les végétaux sont des corps qui se nourrissent et peuvent se reproduire, mais qui ne sentent, ni ne se meuvent volontairement.” Telle est la définition que les botanistes nous donnent de la plante—selon eux, la plante est donc indubitablement un être vivant, mais attachée par ses racines au sol où elle puise sa nourriture, et se développant à sa partie supérieure, et vers le ciel en tiges, en rameaux et en feuilles.

Le professeur Lindley, un des plus grands botanistes de notre époque, la décrit ainsi :

“ A plant is a living body composed of an irritable, elastic, hygrometrical matter, called tissue. It is fixed to the earth by roots, and it elevates into the air a stem bearing leaves, flowers and fruit. It has no power of shifting its place except when it is acted upon by wind or other external forces ; it is therefore peculiarly susceptible of injury or benefit from the accidental circumstances that may surround it, and having no free agency, it is above all other created beings submitted to acknowledge the power of man.”

“ La plante est un corps vivant, formé d'une substance irritable, élastique et hygrométrique appelé *tissu*. Elle est fixée à la terre par des racines et s'élève dans l'air en une tige supportant des feuilles, des fleurs et des fruits. Elle ne peut changer de place, excepté par la force du vent ou par toute autre cause extérieure ; elle est conséquemment exposée à toutes les influences bienfaisantes ou nuisibles provenant des circonstances au milieu desquelles elle se trouve. Et ne possédant aucun libre arbitre (*no free agency*) elle est plus que tous les autres êtres de la création, soumise à la volonté de l'homme.

Mais les racines de la plante, ne sont-ee pas comme des pieds sur lesquels elle se tient ? Son tronc, si c'est un arbre, ou si c'est une herbe modeste, sa tige, n'est-ee pas un corps ? Ses rameaux et leur épine, ce sont ses bras, c'est sa tête qui s'élève plus ou moins haut, selon le rôle humble ou superbe qu'elle est appelée à remplir sur la terre.

Vivre et se multiplier ! telle est, disent encore les botanistes, la destinée des plantes. Triste ou joyeuse destinée, sans

doute, selon les circonstances où se trouve placé le végétal, mais en tous points conforme à celle prédite autrefois aux enfants du premier homme : Allez, croissez et multipliez-vous. Précepte scrupuleusement suivi sur toute la surface du globe, depuis le plus humble d'entre nous jusqu'aux maîtres de la terre. Et il n'y aurait sous ce rapport aucune différence entre les descendants de la première plante et ceux du premier homme.

Les plantes croissent et vivent, a dit notre maître Linnée, *vegetabilia crescunt et vivunt*, mais elles ne sentent pas, *non sentiunt*. Cependant, il nous semble les voir passer dans le cours de leur existence, et de même que les autres êtres de la création, par toutes les phases des plaisirs et de la douleur. Tantôt arbres grands et majestueux, ils développent au soleil leurs feuilles humides encore de la rosée du matin, et rayonnant de force et de santé, semblent se complaire dans les jouissances qu'ils nous donnent.

Tantôt ces mêmes rameaux s'affaissent sur eux-mêmes, leurs feuilles contournées se renversent, dans certaines saisons de sécheresse et de chaleur, comme pour demander au ciel de la fraîcheur et de l'eau, ou bien leurs corps tombés sous la hache meurtrière et couverts de blessures saignantes, accusent par leur attitude toutes les souffrances qu'ils éprouvent.

Ces signes ne sont-ils pas suffisants ? faut-il pour se faire comprendre, et quand de profondes blessures déchirent et font mourir la plante d'une longue agonie, comme dans la canne, par exemple, qu'elle exprime sa douleur par des cris, ou que sa joie s'échappe par de bruyantes acclamations, quand verte et luxuriante elle charme tous nos sens à la fois ? Plus sage que nous, elle sait jouir tranquillement du bonheur qui lui tombe en partage, et mieux que nous elle sait se résigner à la maladie, aux souffrances et à la mort. “ Le cœur de la femme, dit Léon Gozlan, est un sanctuaire ignoré où se célèbrent souvent des joies inconnues et où plus souvent encore les plus nobles sacrifices se consomment sans que les cris de la victime se fassent entendre au dehors.” En serait-il ainsi de nos plantes si précieuses et de leurs fleurs si délicates ?

Et cependant, il est convenu, scientifiquement parlant, que la plante ne sent pas. “ Charles Bonnet et Smith, dit M.

Decandolle ont soutenu il est vrai la sensibilité des plantes, mais ils l'ont fait par un sentiment vague et poétique de leur cœur et par l'idée qu'il était conforme à la bonté de Dieu de distribuer la connaissance et la jouissance de leur propre existence à tous les êtres ; tandis que d'autres la repoussent en soutenant qu'il était contraire à la bonté de Dieu et presque blasphématoire d'admettre que des êtres fussent doués de la faculté de désirer le bien sans pouvoir l'atteindre et de sentir le mal sans pouvoir l'éviter."

Mais en appliquant ce principe sur une plus grande échelle et en l'étendant jusque sur la race humaine, il s'ensuivrait que le bien est aisément accessible à tous tant que nous sommes sur la terre, et le mal facile à éviter. Les annales historiques des nations, les événements qui se sont passés et qui se passent encore sous nos yeux, sont là pour prouver la grande difficulté d'atteindre le bien, ou du moins de faire que le bien puisse dominer, comme aussi l'autre grande difficulté de se soustraire au mal et d'en éviter les effets.

Cependant Decandolle dit plus loin et en donnant une description physiologique de la sensibilité : " On ne peut sentir qu'à l'aide d'une pulpe nerveuse ; cette pulpe nerveuse forme un volume assez considérable chez les mammifères, dans tous les animaux dits, articulés, vertébrés. Mais elle devient impalpable pour ainsi dire chez les molluques et les zoophytes où elle est disséminée dans tout le système. Elle peut l'être également dans la plante, du moins dans certains de ces *végétaux qui se rapprochent du règne animal par la complication de leur organisation.*" C'est presque un aveu que l'auteur est sur le point de faire ; il est au moment de reconnaître, malgré l'absence d'une pulpe nerveuse, quelque chose comme de la sensation dans certains végétaux. Ces lignes, du reste, ont été écrites il y a près d'un quart de siècle, mais la science semble avoir pris depuis ce temps des allures plus franches et plus dégagée.

Un chimiste célèbre de nos jours, M. Boussingault, à propos d'expériences tentées pour forcer certaines de ces plantes, si utiles à nos besoins, à y pourvoir peut-être au-delà de leurs moyens à l'aide d'engrais excitants, a émis cette pensée : „ Vous admettez que la nourriture que nous allons donner à

cette plante lui convient ; mais avant tout l'avons-nous consultée et connaissons-nous son opinion ? ”—L'opinion d'une plante est quelque chose d'assez étrange !

Cette personnification de la plante formulée par un homme tel que M. Boussingault, m'a frappé et me semble d'une grande justesse.

Et en effet, comment M. Boussingault accoutumé aux analyses chimiques, et voyant dans des combinaisons d'êtres incertes, inorganiques, dans des gaz, dans des acides, des minéraux, tout un système d'affinité et de répulsion, ne reconnaîtrait-il pas dans le végétal l'expression de ce même système se reproduisant en degrés plus élevés de sympathie et d'antipathie, en une sorte de sentiment.

On est convenu d'appeler ce sentiment principe vital ; c'est ainsi qu'on nomme également le principe qui existe chez nous et chez les animaux.

“ Une des causes, dit Lindley, qui ont le plus entravé la marche et le progrès de la culture, c'est d'avoir méconnu ou de ne point apercevoir chez les plantes le principe vital. Parce que les plantes ne marchent, ni ne fuient, ni ne reculent, parce qu'elles ne résistent pas, nous sommes alors trop disposés à oublier qu'elles existent, et à les traiter conséquemment comme si elles étaient des morceaux de fer ou de cuir. Mais du moment où l'on aura reconnu que ce sont des êtres vivants, qu'elles respirent, bien que nous ne leur voyions pas de bouches ; qu'elles digèrent, quoiqu'on n'y découvre pas d'estomac, et, par-dessus tout, qu'elles *sentent*, quelque minimes que soient leurs sensations, la moitié des modes de culture suivie par des jardiniers ignorants deviendrait autant d'erreurs palpables.

“ Démontrez seulement que les plantes sont douées d'une existence identique dans sa nature à la vie animale, et le premier soin de l'homme sera alors d'étudier cette existence et d'éloigner tous les moyens qui en pourraient compromettre la sûreté et le maintien. Cela une fois bien compris, le jardinier n'empoisonnera plus ses plantes en les renfermant dans une atmosphère insalubre, délétère, il ne les paralysera plus par des immersions abondantes d'eau froide, ou ne courra pas le risque de les voir suffoquer en les plaçant dans des lieux

dépourvus d'air—comme aussi il ne les réduira pas à la famine en ne leur donnant pas toute la nourriture dont elles ont besoin—ou ne les gorgera pas sans cesse d'aliments d'une digestion difficile, propres à en faire des gloutons prédisposés à l'apoplexie.”

“ Because plants neither walk, nor fly, nor crawl, because they are not endowed with the sense of pain or pleasure, because they neither struggle nor shriek, we are too apt to forget that they are alive, and consequently to treat them as if but rods of metal or plates of leather.

“ Once grant that they are living beings, that they breathe although we see no mouths, that they digest although no stomachs are discoverable by common eyes, and above all things, that they FEEL, however low their sensation may be, and half the modes of cultivation employed by unskilful gardeners will stand conspicuous as palpable errors. Only show that plants are endowed with a life, identical in its nature with that of animals, and men must necessarily make it their first business to study the history of that life, and to master all which interferes with its healthy exercise. Such a step once taken, no cultivator would poison plants by a contaminated atmosphere, or paralyse them by an eternal footbath of cold water, or suffocate them in places where no air can reach them or starve them by withholding the food without which they cannot exist, or cram them with incessant meals of heavy indigestible matter, which can but reduce them to the condition of an apoplectic glutton.”

“ La puissance qui force le bourgeon à se développer, qui fait la feuille s'ouvrir, le pollen se mouvoir et transforme la semence en embryon, cette même puissance qui fait que la plante respire, se nourrit et croît, celle qui distingue tous les êtres organiques de la matière brute dont ils sont composés, est la même qui constitue chez l'homme les hautes attributions de sa nature—c'est la VITALITÉ—mot dont les soit-disant philosophes peuvent rire, dans leur ignorance et leur présomption, mais qui n'en est pas moins en réalité, la force inconnue qui contrôle la matière dans son énergie et la conduit à ses fins.”

“ That power which causes the bud to sprout, the leaves to

form, the pollen to act, the seed to produce its embryo; which enables vegetables to breath, and feed and grow; which distinguishes all organised beings from the brute matter of which they consist, is the same as what gives to man the high attributes of its nature. It is VITALITY, a word which so called philosophers in their ignorance, or presumption, may sneer at, but which in truth is the unknown force that controls the energy of matter, and directs it to special ends.”

Et l'auteur ajoute en faisant l'application de ce principe à la culture des plantes :

“ It is only when cultivation is conducted with a full appreciation of this fundamental truth that Horticulture rises above the level of unreasoning custom, and acquires a solid base upon which the *rationalia* of the practices which experiences seem to sanction can be permanently secured.”—(Lindley *Theory and Practice of Horticulture*. p. 12.)

Bernardin de St. Pierre qui voyait la vie partout, et jusqu'à des êtres animés dans la création même, a imaginé cette hypothèse que les plantes pouvaient être de même que les madréporcs l'ouvrage de myriades d'insectes imperceptibles. En admettant cette poétique et gracieuse idée, l'ouvrage ferait honneur à l'ouvrier, et la créature à son créateur.

Nous allons voir tout à l'heure et par des recherches plus récentes qu'il y a dans la plante une action, un mouvement qui semble être l'effet d'une volonté, et qui la rapproche de l'animal. Cherchons des exemples sous nos yeux mêmes.

Il y a, chacun de nous le sait, tendance de la part des plantes, à tenir une des pages de leurs feuilles tournée vers le ciel et l'autre vers la terre. Quelque effort que vous fassiez pour obtenir un résultat différent, vous n'y réussirez jamais. Si vous abaissez l'extrémité d'une branche vers la terre, de manière que l'ordre du feuillage soit interverti, c'est-à-dire que la page inférieure regarde le ciel, ses feuilles se contournent sur elles-mêmes pour reprendre leur position naturelle. Or quelle est l'action, quelle est la cause qui opère ici, ne voit-on pas une volonté, comme celle qui nous pousse à changer de place, quand notre corps a pris une position qui n'est pas naturelle ?

Il y a des plantes grimpantes qui s'enroulent toujours de

droite à gauche et d'autres dans un sens inverse, c'est-à-dire de gauche à droite. On ne parvient jamais à leur faire prendre une autre direction. D'autres encore ne semblent-elles pas se mouvoir volontairement, quand leurs feuilles et leurs sarments s'accrochent d'eux-mêmes aux branches et qu'elles grimpent sur les arbres placés à de grande distance et vers lesquels elles savent si bien se diriger ?

Les racines franchissent le plus souvent pour trouver la nourriture de la plante, tous les obstacles qui s'opposent à leur marche. On en a vu s'allonger d'une manière extraordinaire dans le sens horizontal, passer au-dessous de fondations de maisons, de murailles, percer des puits, des tuyaux en terre pour la conduite des eaux et en entraver le cours ; plusieurs exemples semblables sont arrivés ici aux tuyaux des deux canaux qui conduisent l'eau à la ville.

On cite l'exemple d'une racine qui, pour pénétrer dans l'épaisseur d'un tuyau, s'était amincie comme une feuille de papier, et une fois dans l'intérieur du tube avait repris son volume ordinaire, et par le développement d'un épais cheveu arrêté le cours de l'eau. C'est à peu près comme un de ces souples animaux le chat, le serpent, l'anguille s'amincissant aussi pour passer par un trou en apparence plus petit que le diamètre de leur corps.

Il existe encore un rapprochement singulier entre les spongioles des racines, ou du moins entre les fonctions qu'elles remplissent, et celles de certains animaux à la recherche de leur nourriture. Laissons encore parler Lindley : “ Roots, being furnished with the power of perpetually adding new living matter to their points, are then enabled to pierce the solid earth in which they grow, to insinuate themselves between the most minute crevices, and to pass on from place to place as fast as the food in contact with them is consumed, so that plants although not locomotive like animals, do perpetually shift their mouths in search of fresh pasturages, although their bodies remain stationary.” (Theory of Horticulture p. 19.)

On verrait donc, si cela se passait sous nos yeux, les spongioles des racines, comme autant de bouches appartenant à autant d'animaux, s'avancer vers leur nourriture et semblables aux troupeaux qui paissent sur la terre.

Il vient de se faire un grand pas en Sylviculture. Je vous ai parlé de la hâche dont l'homme est armé, et qui, dans des mains souvent inhabiles, menace de destruction les arbres de nos forêts. Il n'y a pas longtemps qu'en France même et en Angleterre on abattait, on coupait les bonnes et les mauvaises branches. Aujourd'hui on traite les nobles représentants de nos forêts d'une façon moins brutale, on agit plus humainement, s'il est permis de s'exprimer ainsi.

On ne veut plus les faire souffrir. M. de Courval s'occupe de la taille des arbres et de leur élagage, et s'y prend de la même manière qu'on le ferait pour enlever à l'homme lui-même, les parties inutiles qui se développent aux dépens des parties principales et indispensables.

On ne doit donc pas hâcher, amputer, faire à un arbre des blessures profondes sinon pour lui venir en aide ; de là il en est résulté cette conséquence, que les arbres ont maintenant, comme les hommes, leur chirurgie.

Voici ce qu'on lit dans un journal de Paris du 28 Juin 1860 : “ Le vieux système d'élagage sous forme de chicots, moignons et rabats, chirurgie forestière empirique, aussi grossière dans son nom que dans ses procédés, cède la place à tout un système de soins préventifs, de tailles progressives et de pansements délicats qui préparent et facilitent le travail réparateur de la nature.”

“ Après avoir créé l'orthopédie végétale, M. de Courval est encore l'intelligent praticien qui succède aux empiriques. Il arrache des mains de l'ignorant et brutal ouvrier la serpe commune à bec recourbé, pour lui donner d'abord le léger ébranchoir, puis la serpe d'élagueur renforcée et confectionnée par un de nos plus habiles fabricants d'instruments, M. Arneither. La griffe de fer, qui multiplie des plaies souvent incurables, est remplacée par l'échelle. Le mot que Schiller met dans la bouche de son Guillaume Tell : “ Sous les coups de la hâche le sang jaillit du tronc des sapins,” ce mot est pris à la lettre par M. de Courval lorsqu'il s'oppose aux barbares mutilations par lesquelles la sève, véritable sang des végétaux, s'écoule avec leur force vitale. Enfin, c'est par un habile pansement au coaltar qu'il ferme et cicatrise complètement les plaies que le vieux système laissait béantes et difformes.”

Son système est par lui appelé : “ Taille et conduite progressives des arbres à haute tige, forestiers et autres.” Cette vitalité dont parle Lindley n’est-elle pas ici bien constatée ? n’est-elle pas considérée comme douée des mêmes principes, remplissant les mêmes fonctions, et semblable en tout à celle qui existe dans l’homme et l’animal ?

Passons à d’autres exemples et continuons nos rapprochements. Quand des pluies excessives ont profondément mouillé et détrempé la terre et appelé à la vie les semences qui y sont depuis longtemps déposées, toutes se développent à la fois. Les plantes soumises à une culture régulière, et placées au haut rang de la hiérarchie agricole, dont elles constituent l’aristocratie, sont assaillies par le nombre toujours grossissant, serré, menaçant, je dirais, des plantes dites adventives composant le peuple, la foule, la multitude, la populace—donnez-lui tel nom que vous voudrez. Tout cela sort de terre, comme le jour d’une émeute, ou comme la faim fait sortir le loup du bois. Aux plus vigoureux l’assimilation des principes nutritifs que le sol élabore et dont s’emparent les plus affamés et les plus hardis *absorbeurs* de ces végétaux. Tel le grain que l’on jette à un essaim de poulets, les plus forts s’en emparent, les faibles et les timides n’ont rien, comme dans les affaires et les querelles des hommes, et sont repoussés à coups de bec. Il faut qu’une main puissante vienne ici intervenir, et de là cette nécessité urgente de nettoyage après les grandes pluies et l’extirpation des mauvaises herbes dont la nourriture et l’entretien s’opèrent aux dépens des plantes utiles.

En continuant ma comparaison, j’ajouterai que les soins de l’homme tendent à préserver les champs soumis à la culture, de l’invasion des plantes nuisibles—comme on repousse ceux d’entre nous qui troublent l’ordre public—et comme les peuplades sauvages disparaissent et se retirent devant les nations civilisées.

Maintenant, si notre attention se porte sur ce que j’appelle l’aristocratie chez les végétaux, ou plutôt sur ceux de ces végétaux qui, soumis à une méthode de culture, représentent la partie éclairée de la population chez les plantes ; nous verrons quels soins elle réclame, quelle extrême propreté il faut entretenir dans son feuillage, quelle éducation il lui faut don-

ner pour la conservation de sa race, pour qu'elle puisse se maintenir à son rang et ne pas dégénérer.

C'est surtout chez les plantes annuelles et délicates que la préservation de la variété ou de la race est difficile et exige tous les soins et toute l'habileté du cultivateur. "Si une plante, dit Linné, peut avoir certaine tendance à dévier de son état originel, elle en a une bien plus grande encore à retourner à l'état sauvage." Il en résulte cette conséquence, que si l'on venait à abandonner pendant quelques années seulement, la culture des plantes, et qu'on les laissât livrées à elles-mêmes, toutes les variétés annuelles de nos jardins, remarquables par l'éclat et la beauté de leurs fleurs, nos arbres à fruits etc. disparaîtraient pour être remplacés par les mêmes plantes retournées à l'état sauvage. Ce seraient autant d'individus chétifs, rabougris, insignifiants—en tous cas inutiles—et peut-être même à charge et dangereux.

Le même résultat ne s'ensuivrait-il pas également dans la branche supérieure du règne organique, si par exemple, on venait à fermer dans les contrées éclairées les collèges, les universités, à suspendre toute espèce d'enseignement; ou si les gouvernements étant débordés, les lois qui concourent au maintien de l'ordre et de la civilisation cessaient d'exister. Les hommes alors ne retomberaient-ils pas dans l'ignorance et la barbarie ?

D'un autre côté il semble que certaines de ces plantes auxquelles l'homme donne tous ses soins, le paient de reconnaissance. De même qu'il est des personnes que leur vocation pousse au professorat, à l'éducation, à l'instruction de la race humaine, de même aussi il en est d'autres que leur amour pour les plantes tient enchaînées, toute la vie.

Pourquoi, demandait-on à l'un de ces hommes, vos légumes et vos fleurs viennent si bien, et qu'il n'en est pas ainsi chez votre voisin ? C'est que j'aime mes plantes, je les soigne, répond le jardinier, et elles me paient de retour.

Voici ce qu'un autre jardinier, André Fair Service dit à Francis Osbaldistone dans le Rob-Roy de Walter Scott : " Il ne m'appartient pas de parler de mon savoir-faire, je connais mon état—et à vrai dire, voilà vingt-quatre ans que je vais de terme à terme, mais quand le jour arrive, il y a tou-

jours quelque chose à cueillir que je voudrais voir cueilli ou quelque chose à mûrir que je voudrais voir mûr, ou quelque chose à semer que je voudrais voir levé—et comme cela de la fin d'une année à la fin d'une autre. Et si je vous disais que pour sûr je quitte à la Chandeleur, je n'en serais pas plus certain qu'il y a vingt ans ; après tout je me retrouverais encore ici bêchant mes plates-bandes.”

L'histoire de Fair Service est celle de tous les jardiniers ; attachés au sol qu'ils ont cultivé ; et identifiés à la plante qu'ils ont mise en terre, ce n'est qu'à grand'peine qu'ils consentent à s'en séparer.

Aussi quelle admirable transformation s'opère sous la main habile et intelligente du cultivateur.—Allez visiter ces magnifiques serres de Londres et de Paris—Allez à Kew, au Jardin des Plantes, examinez toutes ces pépinières.—Les végétaux élevés dans tous ces établissements ne sont-ils pas supérieurs en grâce, en élégance, en force et en santé, à ces mêmes plantes qui croissent sans soin et sans culture ? Ce sont les bienfaits de l'éducation, ce sont les résultats d'une solide et brillante instruction, comme celle donnée dans les collèges et dans les universités à ces hommes qui en sortent au-dessus des autres hommes.

Maintenant, pénétrons plus en avant, allons jusqu'au cœur de la plante, et nous verrons qu'elle a comme les autres êtres vivants ses amours et ses mariages. Vous savez que Linnéc a pris pour base de la classification le nombre des maris et celui des femmes. Vous savez qu'il est des arbres qui portent dans la même fleur les deux époux, comme il est d'autres arbres où les époux vivent éloignés les uns des autres. Il est des dattiers mâles et des femelles, des papayers mâles et des papayers femelles. Les amours n'en ont pas moins leur cours, l'air en est la messenger ; ces amours sont bien simples, bien touchants. Le mystère s'accomplit à l'ombre d'une corolle, dont les pétales se referment quand a sonné l'heure de l'hymen.

Dans certaines plantes, comme dans les Arum ou Songes qui croissent au bord de nos rivières et dont l'attitude froide et compassée cache une ardeur concentrée, l'amour se trahit

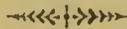
par de vives et chaudes étreintes et ces plantes dégagent pendant leur floraison une chaleur remarquable.

M. Hubert, à Bourbon, a été le premier à faire remarquer à Bory de St.-Vincent, une élévation considérable dans la température peu de temps avant la fécondation de l'ovaire dans l'Arum.

Un thermomètre placé au centre de 5 spadices a marqué  $131^{\circ}$  p. et au centre de 12 spadices  $142^{\circ} \frac{1}{2}$  quand la température de l'air ambiant était à  $74$  ou  $75^{\circ}$ .

La température varie dans le cours de la floraison ; quand le spath s'ouvre, les étamines émettent la plus grande chaleur, et lorsque le pollen a été détaché, cette température baisse et la partie supérieure des spadices devient chaude. On a aussi remarqué que les organes mâles de l'Arum avaient une température plus élevée que les organes femelles.

Ici je m'arrête, avec l'intention de revenir plus tard peut-être sur cette question. Nous dirons donc avec Lindley que les faits recueillis jusqu'ici par ceux qui ont étudié la physiologie de la plante démontrent l'existence chez elle, sinon d'une sensibilité, du moins d'une vitalité d'un ordre plus élevé qu'on ne l'avait supposé. De sorte que ce n'est pas trop s'avancer d'émettre aujourd'hui cette opinion que certaines classes du règne végétal occupent un rang tout aussi distingué dans l'échelle de la création que beaucoup d'êtres organiques appartenant aux ordres inférieurs du règne animal.



On **FROPIERA**, a New Mauritian Genus of Calycifloral Exogens,  
or doubtful Affinity.

BY J. D. HOOKER, ESQ., M. D., F. R. S., F. L. S.

[From the *Journal of the Proceedings of the Linnean Society*, v. V p. I.]

In a letter lately received by Sir William Hooker from M. Bouton in the Mauritius, that gentleman announces the despatch of specimens of a remarkable plant, which he is unable to refer to any genus, and which, if new, he desires should be published, and bear the name of the Hon. Mr. Fropier, member of the Legislative Council of the Mauritius, and a liberal and zealous promoter of science. On the arrival of the specimens, they proved to be specifically identical with a plant of which there are two specimens in the Hookerian Herbarium,—one in an indeterminable state, and referred to *Mecycylon* by its sender, Prof. Bojer; the other, also in bad condition, collected by Sieber (Fl. Maurit. ii No. 123). This latter I had already examined, and, being unable to determine its affinities, had placed it amongst the *Plantæ Dubiæ* of the Herbarium. An analysis of the specimens sent by M. Bouton have enabled me to draw up a complete character of it, but not to indicate its nearest affinity with any certainty.

The habit of *Fropiera* is very much that of some *Ilicineæ*; and the pure-white bark (of the branches) and foliage resemble, very closely indeed, those of *Leucodermis*, in the same family with which genus, however, *Fropiera* has no other character in common. The dotted leaves and sepals, close-set parallel veins, intramarginal vein, and entire coriaceous leaves very greatly resemble those of a *Eugenia* and other *Myrtaceæ*; but its superior fruit entirely removes it from that Order. Upon the whole, I am disposed to regard it as anomalous ally of *Myrtaceæ*, but do not place any confidence in this conclusion. The structure of the flower and fruit is remarkably simple, and presents no salient characters of any kind.

FROPIERA, *Bouton, MSS.*

*Calyx* 5-fidus. *Petala* 5. *Stamina* 10, disco perigyno inserta filamentis subulatis æstivat. subincurvis, antheris oblongis. *Ovarium* liberum, 3-gonum, 3-loculare, stylo brevi, stigmate trilobo. *Ovula* ∞, placentis axillaribus affixa. *Bacca* globosa, calycis basi suffulta, stylo persistente terminata, 3-locularis. *Semina* ∞, exalbuminosa, minima; testa crustacea, profunde cancellata; embryone ovoideo, carnosus, oleoso; cotyledonibus plano-convexis, radícula magna obtusa. — Arbuscula Mauritianá; ramis *teretibus*, *ramulorum cortice albo*; foliis *alternis, exstipulatis, coriaceis, integerrimis, pellucido-punctatis, margine incrassatis*; floribus *parvis, pedicellatis, fasciculatis, vel in racemos breves axillares dispositis, ebracteolatis.*

FROPIERA MAURITIANA, *Bouton, MSS.*

*Hab.*—Sylvis montanis Insulæ Mauritius, *Carmichael, Sieber, Bojer, Bouton.* Nom. vern.: “Bois sans écorce.”

Arbuscula 20-pedalis, ramis teretibus cortice lævi rufo, ramulis lignosis cortice albo. *Folia* 2-4” long., 1¼-2” lat., coriacea; *lamina* supra lucida, subtus pallida, costa margineque sicco rufescentibus; venis utrinque junioribus inconspicuis parallelis, intramarginali margini proxima; petiolo brevi 1/6” long. robusto. *Flores* vix 1/5” expans., pedicellis ¼-½” long. *Calycis* lobi breves, rotundati. *Petala* parva, sessilia, late orbiculata, coriacea, pellucido-punctata, breviter unguiculata. *Stamina* brevia, filamentis post anthesin elongatis recurvis; antherarum loculis 2 parallelis, dorso intruso affixis, rimis latis dehiscentibus. *Pollen*... *Ovarium* sessile, trigonum, stylo brevi trifido. *Bacca* subpedicelata, grosse punctata, ½” diam.; stylo brevi; stigmate late discoideo, 3-lobo, *Placentæ* bifidæ, lobis divaricatis. *Semina* atraminima. *Embryo* pallide flavus, mollis.



## ANNUAL REPORT

*Of the proceedings of the Royal Society of Arts and Sciences  
1859-60, read at the meeting held on the 13th December  
1860.*

Your Excellency—Gentlemen,—

The last Annual Meeting of the Society was held on the 1st December, and its labors of the present year were commenced on the 23rd January. The principal share fell to Dr. Ayres, Capt. Mann, Mr. Bernard, Mr. Paruit, Dr. Sénèque and the Secretary.

Several rather interesting communications were also addressed to the Society by its correspondents and the section of History, in particular has been enriched by fragments of old works of voyages to Mauritius by the Dutch, the English and the French, extracted from the large public libraries of London and at Radcliffe's Library Oxford.

Thanks are due to the agent of the Society in London, for the trouble he has taken. It is to him that the Society owes the extracts that it possesses from the exceedingly rare work of Van Neck. There will only remain to be procured the early voyages of the Portuguese and the Society will then have the earliest and most curious records relative to the Colony.

The researches made by our agent in London in the old documents relative to Mauritius induce him to acknowledge this fact that all the early part of its history will have to be rewritten—for the confusion of names, persons and place is so great that there is nothing positive until the time of the Dutch. All the English writers have copied from Grant who had no Portuguese authority for what he states about Almeida and Mascarenhas and to prove this, says our agent, I ordered the Asia Portuguese to be translated in which the reign of that great man is recited, as Steven's translation was

a paraphrase more than a translation, it has been newly and exactly done. In no part of the Asia Portuguese is there the smallest mention of any thing that indicates such an Island as Mauritius under any of its names.

Nevertheless these communications still remain incomplete. Events which took place here in latter time and to which the records are in the archives, can only be properly appreciated after consulting the documents relating thereto. The Society has requested through its Secretary, that the archives office containing so many precious documents concerning our Island, should be open to those members who are occupying themselves with writing the history of Mauritius ; and the answer received from the Colonial Secretary was that arrangements were in contemplation to put into order the papers deposited in the archives and that the moment had not yet arrived when they should be made accessible to the public. The Society respectfully manifests to Your Excellency its ardent desire to see the archives restored to such order as would enable the Section of History soon to obtain access to them.

Amongst the fragments of works received from London is one most curious, viz. : an account published in 1811 on the taking of the Island of Mauritius—it is styled : account of the conquest of Mauritius, with some notices as to the history, soil, products, defences and the political importance of his place, to which is added a very curious sketch and map explanatory of the Military operations, by an officer who served in the Expedition.

The work is dedicated to His Royal Highness the Duke of York and the author whose name is not known has adopted for his epigraph this thought of the Abbé Raynal which he translates into English ! “ Policy foresees that if the Isle of France were abandoned, the English would drive all foreign nations of the Seas of Asia and would possess themselves of all the riches of these vast countries.”

Another interesting extract is taken from the journal of the voyage of the Dutch under the command of the Admiral Jacques Cornille Neel in 1598.

This Expedition left Holland in March ; on the 15th Sep-

tember,\* five ships out of eight under the command of Vice-Admiral Warwick sighted the Island “Do Cerné” and anchored on the 20th of the same month in the harbour of Grand Port. They named the island Mauritius and the Bay Warwick Bay, after their vice-admiral.

“Ladite île, acordingly to the old french translation, est “inhabitée, et n’a jamais (comme nous semblait) esté habitée, “car nous fismes maint marcher; mais n’avons trouvé personne, sinon qu’expérimentions par l’approvisionnement des “oiseaux, qu’elle fut inhabitée, à cause qu’on les print en “grande abondance de la main.”

The Dutch when they explored the Island found not only no human beings but no quadrupeds. “Par diverses fois avons envoyé aucuns gens au pays pour trouver aucun peuple sur quelque autre cartier du pays, mais estaient à la fois trois ou quatre jours en voye sans trouver n’y veoire personne, n’y a aucun animal à quatre pieds.”

There were at that time in our forests neither stags, nor monkeys, nor wild pigs and the other quadrupeds now so common as also the quadruped that sports on the highest peaks of our mountains did not then exist.

There can be no doubt therefore that the stag was introduced into the island, but when and by whom? It is really a pity that we are still ignorant of the name of the man who procure every year such noble sport to the wealthy and happy of our time. His name would have figured conspicuously on the Obelisk at Pamplemousses.

Thick forests covered the Island and damp vapours issued from it, the rains were probably at that time, more abundant than they are now.

“Les Palmistes et Palmiers prévalent les vallées, les montagnes sont si hautes que le pays est quasi-entièrement couvert

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\* This month of September is remarkable in our annals. It is in 1598 on the 20th of that month that the Island received from the Dutch the name it still bears. It was in that month also that the French under the command of Dufresne took possession of it, 20th September 1715 and changed the name of Mauritius, into that of the Isle de France. On the 20th September 1816 Governor Farquhar celebrated at the Royal College the hundredth anniversary of the taking of possession and five days afterwards, half the town of Port Louis was consumed by fire.

des nuées, et à la fois voit-on monter si espesse fumée qu'on ne peut à peine veoir.

“ Il y a aussi une grande multitude de tortues d'incroyable grandeur, veoire si grandes que nous pouvions marcher à quatre sur une tortue, et y rampa encore et pouvions à dix asseoir es escailles.”

The Dutch and those who followed them consumed these Turtles at such a rate that the species has almost disappeared. Their bones only remain at Flacq specially where the Dutch afterwards established themselves. These bones are incrustated with calcareous deposit and numerous specimens are to be found in our collections.

It is unfortunately not so with the bird which the Portuguese found in large numbers, and mistook for swans “Cirné.”

“ Aussi d'autres sortes d'oyseaux de la grandeur de nos cygnes, estrangement testus, et sont sans ailes mais au lieu d'aîsles, ont-ils 3 ou 4 plumes noires et au lieu de cap, ont-ils 4 ou 5 plumettes crespues de coulcur grisâtre. Ces oyseaux furent de nous nommés oiseaux de Nausés, partie pour ce qu'ils devoient si longtemps cuire, fort coriaces, mais estaient médecine pour l'estomach et la poitrine, partie par ce qu'eusmes assez des tortercelles qui estaient beaucoup plus délicates et savorables.”

It was therefore the Dodo, or Dronte (*Didus Ineptus*) and perhaps also the Solitaire which is another species of the same genus, birds, as you are aware, of an extinct race, confined to the three islands of Mauritius, Bourbon and Rodrigues.

Our Society has been fortunate enough on two occasions to send to Europe remains of this singular bird, the Dodo. In 1830, the Secretary the late Mr. J. Desjardins addressed to G. Cuvier the fragments which had been discovered in a cavern at Rodrigues and consisting of a sternum, a cranium and 4 bones of the extremities.

In 1849, the Secretary forwarded to Mr. Strickland who accepted them with lively gratitude, two very perfect tarsal bones supposed to have belonged to the Dronte but ascertained to have belonged to the Solitary bird, and also discovered at Rodrigues.

Dr. Ayres just found in a cavern at Black River fragments of bones of several animals, amongst them one which appears to correspond with the drawing given by Strickland of the Tibia of the Solitary bird. This fact, until further information is important, inasmuch as the existence of the Solitary bird in Mauritius has not been established by the old voyagers; Leguat found it, indeed at Rodrigues, and on his arrival at Mauritius only saw the Dodo; other voyagers who followed Leguat did not find the Solitaire at Mauritius, or at least only mentioned the Dodo.

In examining the bones of the Turtle deposited in the Museum, the attention of the Secretary was directed to two bones which appeared to him to approach the one fig. I. plate XV of Strickland's work and which in that case would be a fragment of the right Tibia of the Solitaire. The other bearing a resemblance to fig. 20 of the same plate would be the right metatarsal bone of the same bird; but a part of the inferior articulation and the whole of the superior is wanting.

The two fragments of bones were sent to London by the mail of the 3rd November with the request that they might be examined and that the result of the examination might be communicated to the Society.

Several questions have been addressed officially through the Colonial Secretary to the Secretary of the Society and Curator of the Museum. They emanate from the Secretary of State for the Colonies and tend to confirm the belief that it is intended to be ascertained if sufficient materials are in existence to write the natural history as complete as possible, of all the colonies belonging to the British Empire.

These questions relate to Botany, Zoology and Geology.

The information desired is whether such and such Colony possesses a Museum or Scientific Societies, and whether any works have already been written in it on the several branches of natural science. Information is also sought for on Meteorology, the Tides, Magnetism etc.

The Secretary has answered some of the questions which are within the attributions of the Society, and if the contemplated work is to be carried out, there are men in its ranks

who are competent to perform it. It might undertake to write the Flora as well as the Fauna of Mauritius.

Sir D. Barclay and M. V. de Robillard might undertake, at least we entertain this hope, to describe the Conchiliology and Crustacea of the Island. Mr. Lienard although absent from the Colony has collected important materials for the history of fishes—Mr. E. Newton might treat the subject of Ornithology. The Mammiferæ would take up but little time. The insects could be consigned to the care of Mr. Furse.—Dr. Ayres, Mr. Meldrum or Mr. de Closets would undertake the geological part of the Island. Then the Society would respond to the call of the Metropolitan Government, and accomplish the task confided to it without the humiliation of seeing strangers not more competent, arriving from abroad to make use of the materials.

We here invite the attention of the Council of administration of the Society to the subject, as well as that of our Honorable President and above all the powerful influence of Your Excellency, Patron of the Society.

An Exhibition of colonial produces was held under the auspices of the Society, on the 24th August. Before speaking of the results of this Exhibition which did not fail to attract a large crowd of visitors, although during the race week, let us look at the reverse of the medal.

And as everywhere and always the question of pecuniary resources is the most prominent in all things and in every kind of enterprise, let us mention the fact that the monies received at the gate could not cover the expenses in spite of the economy of the Agricultural Committee, thus leaving a balance against the Society which our worthy Treasurer not without grumbling, was obliged to pay over to the Committee.

Yet there was some dissatisfaction among a few Exhibitors, who would have no objection always to receive prizes, and convert these meetings of harmless and disinterested rivalry into a source of profit and speculation.

The Committee intended upon the suggestion of Dr. Regnaud to invite those influential persons whose position might enable them to assist the Committee in supporting these Ex-

hibitions, to follow the example of Your Excellency and offer prizes to certain classes of Exhibitors. This may however be another delicate question to raise.

Very interesting collections of plants from the Pamplermouses Garden and the gardens of Mr. Constant Vanskirbisk and Kittery were noticed at this Exhibition.—Of new plants introduced into the colony, and remarkable for the beauty of its foliage, the *Farfugium grande*, a native of China where it was discovered by Fortune, brought from London by the care of the Secretary was exhibited by Mr. Levieux.

A few fine vegetables were also remarked. But attention was principally attracted to the photographs and products of art. The Vanilla exhibited by Mr. Levieux, carried off the gold medal of the Society, and we readily join in the praise bestowed upon them by the juries for the beauty and perfect preservation of the Pods. They will certainly bear comparison in London or Paris with the Vanilla of Brazils.

The Society has received from Mr. Payet through the Honorable Ch. Wiehe, the seeds of a plant known at Bourbon under the name of Tan, the flowers of which are sought by the bees who yield the odorous honey known under the name of Green Honey. This plant which is the *Weinmannia macrostachya* grows in the forests of Mauritius. Mr. Fleurot struck with the odour exhaled by the seeds, made an analysis of some, and found them to contain the same odoriferous principle which exists in the Tonquin Bean, in our Faham and in a few other plants, the substance known amongst chemists as “Caumarine.”

To Dr. Ayres, Lejuge and Regnaud was entrusted the task of reporting on the Memoir presented by Dr. Henry Sénèque, the title of which is a few remarks on the malady called Tambave.

This word Tambave which appears to belong to the Malagassy language was probably introduced from that Island (Madagascar). If we believe Dr. Chapotin, the appellation did not then (in 1810) as it does now, apply to certain affections to which children are subject. The Malagassy females, “says he, are subject to a peculiar alteration of their milk, in which that fluid assumes a yellowish tinge, and no longer

possesses the necessary properties for the nourishment of their infants. This malady is commonly known by the name of 'Tambave.'" Later the old medicine practitioners say that Tambave is the translation of *Carreau* that is the enlargement of the mesenteric glands to which children are subject.

Confusion has been the result and several different maladies are now mentioned by the creole empirics under the name of Tambave.

Science does not recognise this name, of course, Dr. Sénèque very justly observes and all these considerations shew the impossibility of the name being accepted by science as applying to a special disease, presenting peculiar characters.

And yet observes Dr. Regnaud, there is a word, which every mother pronounces with terror at the cradle of her infant, that prejudice, that fatal word, that bugbear of which every one speaks but no one can describe is the Tambave."

At all events the maladies which arise and to which quacks attach that name of Tambave, are we must admit, of the gravest nature, since the very names by which they are vulgarly known is sufficient to cause a mother to tremble for her children.

Dr. Sénèque has been able to establish the existence of six different diseases in a great many children supposed to be afflicted with Tambave, the greater part of them of the most serious nature, such as hydrocephalids, softening of the stomach, enlargement of the glands of the mesenter etc.

Therefore the only criticism of Dr. Regnaud refers to the title of the Memoir which would have stood better thus "On the maladies commonly known by the name of Tambave and the prophylactic treatment of the particular state they indicate.

" But adds Dr. Regnaud the imperfection of the title is a mere trifle assuredly and it is the work itself that we are called upon to judge. We may briefly say that the author has happily accomplished his self imposed task; physicians and patients alike will derive benefit from the perusal of Dr. Sénèque's Memoirs, and the modesty as well as the noble object of utility which predominate throughout, are in the eyes

of the Committee, an attraction too rare in our days at Mauritius, to allow them to withhold their heartfelt applause.”

Dr. Ayres has communicated a most valuable memoir “Comparative observations on diseases, as occurring among Europeans and Indians in Mauritius,” without however recommending any particular mode of treatment for the several cases. His aim was rather to present a table of medical statistics, a return of the diseases which fell under his notice at the Civil Hospital, than the treatment and cure of those diseases.

At all events this work for which the thanks of the Society are due to Dr. Ayres, may be presented to other medical men as an example to be followed. The substance of their observations would form a mass of facts which would be highly valuable to the Medical Statistics of the Island.

Mr. Channell, on the part of Mr. Joachim Dioré, has presented observations on the cultivation of the New Zealand Flax together with some seeds of the plant and several articles prepared from its fibres. Mr. Dioré would wish some experiments to be tried at Mauritius with this plant of which one or two individuals are growing in the Pamplémousses Gardens.

Rather considerable alarm prevailed in September last among the growers of Vanilla. It had reference to a disease prevailing in Reunion on this precious plant, giving rise to the most fatal effects.

The Society hastened to give notice to the parties interested, inviting them to abstain from the use of cuttings of Vanilla imported from Reunion. These precautionary measures were afterwards abandoned when it was ascertained that no malady existed in the Vanilia plantations, and the accidents which had happened to one of them had been caused by the imprudent destruction of the trees which protected them. Then exposed to the direct rays of the sun the leaves had become yellow and the stalks had withered up.

The Society has published the second Part of the first volume of its Transactions “New series” embodying the principal articles communicated last year. Several numbers have

been addressed by the Secretary to the principal Scientific Societies in Europe.

It is a subject of complaint in London, and may easily be understood here to be the opinion of Sir William Hooker, that the volume is poor in botanical matter. "Botanical science, he says in a letter, does not flourish in that Island. There are no earnest attempts towards a Flora yet tho' so peculiar in its vegetation, and though frequented and inhabited by botanists nearly 100 years; whereas we are now printing a Flora of Hong-Kong before it has been 20 years occupied by the British. No resident Botanist can do all that he ought to do without communicating largely with scientific men in Europe. Nothing would contribute so much to the knowledge and uses of plants as a well written and well arranged and complete Flora."

"In British Guiana, Sir W. Hooker adds, the Government in Council have responded well to our call for a Flora of that extensive region, and they have appointed a first rate German Botanist to explore and collect and send home ample collections to be worked up into a Flora, giving him a salary for his services.—Ere long, by the increased and increasing cultivation, the native vegetation of the Island of Mauritius, as in St. Helena will be destroyed."

This is true, but the execution of such a work in Mauritius, as well as other similar works of a great extent, would have been impossible if left entirely to the resources of the person who would undertake it. The heavy cost of printing and the chance of not finding a sale for the work must have been a bar to the best intentions.

But if the circumstances were more favorable and the expenses as we heard to be borne by the local and metropolitan governments, the task would soon turn to be more easy, and the alluded work might therefore be commenced immediately.

An extract from the Report of the Secretary on the diminution of rivers and the drying up of springs, has been published in the "Gardeners' Chronicle of London" of the 15th September, with the following reflections: "If the Island should in time become barren, instead of remaining one of the

most fertile in the waters of Africa, it will only undergo the fate which universally attends the destruction or absence of forests in countries exposed to great solar heat.”

We may here, without digressing too much bring in Mr. Bernard's memoir pointing out the destruction which threatens the species of fish fit for food. The mode of fishing which spares neither the spawn nor the small fry, and the best means to be employed in order that sea may not soon be as empty of fish as the island will be of wood.

But however great the interest attached to the memoir, however good the means suggested to remedy the evil, what can the Society do? It is not mere preventive police regulations that can stop such abuses! Such measures moreover are very difficult to carry out with a daily increasing population naturally attracted to those places where life is easy and living cheap.

We can do no more than express our approbation to the author and thank him for his courage in encountering a host of private interests and even recommending that they should be sacrificed to public interest.

It would be cruel indeed, one day to see Mauritius, with her millions of sugar, dependent on foreign countries, for the means of existence of her inhabitants, not only their meat and their drink, but their fuel also.

We have had the regret to see our President, the Hon. G. Fropier leave our shores. His absence it is hoped, will be short and we may expect soon to see him again among us.

Capt. Mann on the eve of his departure left us an interesting souvenir, viz., an excellent memoir entitled “Observations on the water supply of Mauritius” containing elevated and sound views. His ideas suggest high intelligence blended with principles of great liberality. Setting aside the question of the destruction of woods with reference to our forests, he insists upon the urgent necessity of advantage being taken of our watercourses for the public utility—at the same time he is unable to understand the situation of the proprietors who are interdicted the use of the rivers bordering their estates.

“Protective laws, he says, might be applied with vigor to preserve from waste or pollution the water of the Reservoirs

and Canals but there would be no need to prevent proprietors from cultivating their own lands, nor to inflict penalties upon those who have only made a reasonable use of the streams of running water which providence has provided for them.”

The attention of Capt. Mann was naturally directed to those parts of the Island, the northern parts for instance, which are entirely deprived of those rivers with which the South of the Island is so abundantly provided, and he recommends that certain works should be performed to restore the Canal which formerly supplied with water those localities now so dry.

The projected restoration of the Bois Rouge Canal, according to the opinion of Captain Mann, is an important step in the right direction, “and if followed up by similar works in other parts of the Island,” he says, “will assuredly tend to the great object we all have in view, the prosperity of Mauritius.”

Mr. Paruit has presented a work on the cultivation of sugar cane, in which he lays particular stress on the nature of the manures to be employed in order to obtain good results.

He does not approve of the plant been cut several times, and would like to see the roots taken up and a new plantation made after the second crop.

In support of his opinion, he cites the “Bonne Mère” Estate at Flacq, on which the plantations are always made with manure to which Guano is afterwards added and are renewed every two years. By this way, a very small extent of land has for years past yielded regularly heavy crops. The example is seductive, we must confess, and easily followed; and we refer the question to the study of our planters.

Mr. Paruit also suggests an exchange of cuttings from the dry to the wet districts and *vice versa*.

His opinion being that cuttings from the damp districts being gifted with very strong vegetative powers would retain their vigor in the dry quarters, whilst the cuttings from the latter would derive fresh strength in the well watered districts.

It may be right. It is a principle in agriculture that a careful selection should be made of the parts of plants, seeds, cuttings etc., intended to be confided to the earth and that they should always be healthy and sound. It would there-

fore be the vigorous shoots from a rich soil that should be taken rather than the weak and often stunted from the dry quarters.

We should never lose sight of the rule laid down by Professor Lindley :—“ It is a general rule that seedling take after their parents, an unhealthy mother producing a diseased offspring and a vigorous parent yielding a healthy progeny in all their minute gradations and modifications.”

Mr. Paruit closes his work with the enumeration of those ingredients which may be found at hand to compose a manure which he recommends to the attention of sugar cane planters.

We cannot devote too much time to this question of Manure in Mauritius. It is as old as the world it is true, but an inexhaustible subject to treat.

In fact, manure, machinery and water are the three great productive powers on which depends the progress of European as well as of Colonial and tropical agriculture.

The Secretary read a notice which he intitled “ Researches on plants ;” his object was to discover in the phenomenon which constitute the vitality of plants, something which might denote, not exactly the sensibility possessed by man and those organic beings which approach him, but any kind of sensation and in some cases the exercise as it were, of a will by the plant, manifested by tendency towards light, the direction of its roots towards the water, etc.

He also noticed the mode of repartition of certain plants in Mauritius, some of which have followed a rising course, such as the “ *Daphne viridiflora*,” the point of departure of which was the Pamplémousses Garden, and which may now be seen on the mountains at Villebague and Nouvelle Découverte whilst others on the contrary have followed in their dissemination a descending course, such as the *Elephantopus scaber*, which from the heights of the forests has come to grow on the borders of rivers at a pretty considerable distance from its usual habitat.

The Secretary has been fortunate enough to consecrate to the memory of his friend, the Hon. G. Fropier, a plant native of our forests. The genus *Fropiera*, although its floral organs

are very simple, presents a great difficulty as to the natural family of plants to which it belongs.

Dr. Hooker finds in it a certain affinity to the family of Myrtaceæ and the Secretary thought it related to that of Memecylaceæ; at all events the plant has been described and figured under the name of *Fropiera Mauritianæ* in the journal of the proceedings of the *Linnean Society* of London, Vol. V. p. 1.

The discovery of a new genus amongst the phanoregamous plants of Mauritius and in forests so often explored, is an epoch in the history of Science, as well as the discovery of a fossil bone belonging to an extinct race of birds, the inexhaustible subject of study of the most celebrated naturalists.

In this point of view, the discoveries of Dr. Ayres and the Secretary's without any dispanagement to the labours of the other members of the Society are really scientific facts, in this sense that they occupied the attention of European Societies and without any doubt be mentioned.

This is the only rational course to pursue as being likely to lead to useful results. It is by following it up with perseverance that we may succeed in filling up the blanks left by those naturalists who have preceded us and in arranging the facts and observations collected by them.

The Hon. Mr. Kerr communicated a letter from the agent of the Society in London proposing the introduction into Mauritius of the spawn of the Salmon, remarking however, upon the probable difficulty of acclimating in a hot country a fish which generally, after having deposited its spawn in the rivers, seeks the high seas.

The Secretary brought back to our recollection that the same proposal was made to the Society in 1843. The idea originated in Belfast with Dr. Mc Donnell and was communicated to Mr. C. R. Telfair the son of the late President and founder of the Society. Instructions were drawn up by a Committee to ensure the safe transport of the spawn, but the project could never be carried out.

With the means of prompt communications which now exist, the chances of a successful trial are now greater than they were before. The Hon. Mr. Kerr is of opinion that other

fishes besides Salmon, such as the Tench for instance, might be introduced with a chance of success and it was resolved that the sum of £ 10 should be expended by the Society by way of experiment. The greatest difficulty would be the care required by the spawn on its arrival at Mauritius, and the selection of the persons who would be entrusted with it.

The abundant rains which fell at the beginning of the year and the excessive heat which prevailed during the intervals of sun, conditions so favorable to tropical vegetation, have produced in plants a luxuriant development of branches, twigs and leaves.

The Secretary observed that it was a great good, at least that it should be looked upon as such, since it often happens that good and evil are side by side, although resulting from the same cause. Now, if the rains produced salutary effects in the dry parts of the Island, principally the sea sides, the sugar canes in certain of the cold, damp and elevated parts have evidently suffered from the excessive rains. Experience has proved that in lands which do not absorb all the water that falls and where the sun veiled in clouds cannot carry it off by evaporation, the plant being retained too long in a damp soil, a discoloration of the leaves takes place, which assume a yellowish tinge, decomposition of the tissue followed and death inevitably ensues.

The Secretary also brought to notice that the plants with fleshy and nutritious roots have equally suffered in this sense that vegetation was directed to the branches and leaves which obtained a prodigious development at the expense of the roots and tubercles reduced to mere thin threads.

Your Excellency in a visit to the Museum seemed to express surprise that donations are not oftener made, which would show the interest attached to it by the public. But it is easily answered that besides the Museum there are scientific persons who possess collections to which they devote most part of their time and for which they spend money. They are obliged to purchase in order to increase their collections, but they never give away. They are misers who keep and lock up their treasures right or wrong. On the other hand there are collectors who make their trade of reselling the ob-

jects which they have purchased. Those never give away but they sell.

This trade is carried on a large scale at the Cape, in Australia, at Madagascar even. In a report on the resources of Victoria published in August 1860, we find in the statement of exports from that rising colony during the year ending 31st December 1858, 50 packages specimens of natural history of the total amount of £ 1,238.

However every rule has its exceptions and in the course of the year which has just gone by, the Muscum and Library of the Society have been enriched. Mr. E. Liénard has presented on behalf of his father a collection of fishes from Mauritius, minerals from the Pyrenees, and shells from different countries. Messrs. Ch. Telfair, T. Meadows, O. Desmarais, Chasteauneuf, Dr. Brooks have presented specimens of reptiles, crustaceæ, fishes, Lythophits from Seychelles, India and Mauritius.

The Library has been increased by the addition of a very fine work illustrated with plates and entitled: "The Works of Fogelberg," dedicated to the King of Sweden, presented by the Editor, Mr. Casimir Leconte, "as a token, of gratitude for the reception he found in the beautiful and hospitable Mauritius."

Dr. Boott has also sent us from London a copy of the magnificent work which he has just completed: Illustrations of Genus Carex.

And Capt. Mann about the time of his departure presented us with a work in 2 volumes, a Mathematical and Philosophical Dictionary, by Charles Hutton. Dr. Ch. Beke also lately sent us from England the work which he published himself "on the sources of the Nile," and lately Mr. E. D'Unienville has also sent the Library two rather rare books and Mr. Paruit 3 volumes of the Anatomie comparée of Cuvier.

The Curator believes that he has introduced an improvement in the mode of preservation of certain Zoological specimens. He has entirely discarded the practice of keeping certain natural products, by steeping them in spirits, particularly fishes, the beautiful and brilliant colours of several species of which are so difficult to retain by the process.

The mode he has adopted consists of emptying the fish through the mouth and gills without making any incision, and then laying over the skin a sort of varnish.

This varnish put on as soon as possible revives the colour of the fish and gives them that appearance of life which you may notice in the specimens placed before you.

This mode is much more advantageous than the preservation of specimens in glass bottles, where fresh spirits must be continually added to replace the evaporation, thus requiring great care and expense.

These specimens were preserved by the preparator of the Museum, and the Secretary in presenting them, has obtained that a remuneration should be given to this man who has assisted the Curator for several years past, and who really deserves a mark of encouragement and a reward at the hands of the Society.

The members admitted in the course of the year are in the order of their admissions.

Messrs. Ed. Douglas, Léon Pitot, W. Bathfield, Hon. G. Dickson, Hon. E. Remono, Messrs. Pakenham, Ed. Lebrun, Dr. Bazire, Messrs. J. Regnard, Henri Pilot, Henri Pastor, Dr. Colin, Messrs. O'Toole, Alex. Lyall, A. Montgomery as resident members.

Mr. Paul Madimier at Paris, Dr. Ferdinand Hoehstetter Vienna, Mr. E. Laporte at Bordeaux, Mr. Samuel Hannaford, Dr. Müller at Melbourne as corresponding members, and Dr. Boott of London as Honorary member.

These recruits increase the number of the members of the Society without however increasing in a sensible way, the figure of the receipts, and as we are once more compelled to face the question of finances, we cannot do better than terminate by requesting more willing readiness on the part of some members in the payment of their subscriptions.

This annual gathering of the funds of the Institution is the means of also bringing together many new friends and supporters and keep alive the interest of the Society among those who are truly the working bees of the hive.

Port Louis, 13th December 1860.

L. BOUTON,—*Secretary.*

## PROCES-VERBAUX DE LA SOCIÉTÉ.

SÉANCE DU JEUDI 23 JANVIER 1860.

L'hon. F. Bedingfeld occupant le fauteuil.

L'hon. C. C. Brownrigg, l'hon. C. Wiehé, Dr. Riccard, MM. J. Caldwell, Hazlitt, Ed. Newton, Paruit.

Les communications suivantes sont faites par le Secrétaire :

1. Une lettre de M. Laporte fils, de Bordeaux, officier d'administration de la marine, sollicitant un diplôme de membre correspondant. Cette lettre est accompagnée de deux ouvrages offerts à la Société par M. Laporte.—1o. *Souvenirs d'un Voyageur Naturaliste dans la Guyane* ;—2o. *Faune ichtiologique du département de la Gironde*.

2. Une lettre de M. A. Rey, chancelier du Consulat de France, présentant de la part de M. Casimir Leconte, et *comme un témoignage de reconnaissance pour l'accueil qu'il a trouvé dans la belle et hospitalière Ile Maurice*, un magnifique ouvrage dont il est l'éditeur : L'ŒUVRE DE FOGELBERG, dédié à S. M. Oscar 1er., roi de Suède et de Norwège. Le Secrétaire est chargé d'exprimer à M. Rey pour être transmis à M. C. Leconte, les remerciements de la Société.

3. Une lettre de M. Diard, informant le Secrétaire de son arrivée à Batavia, et annonçant l'envoi de deux caisses d'arbres fruitiers de Java.

Malheureusement la plupart des plantes qu'elles contiennent ont beaucoup souffert pendant la traversée. On n'a pu sauver que quelques individus des *Durio Zibethinus*, *Nephelium lapaceum*, un ou deux *Mangifera opposifolia Roxb.* Cette perte est d'autant plus regrettable que l'envoi se composait en général d'arbres à fruits rares à Maurice ou même inconnus, et qui avaient été choisis à Java par M. Diard, avec le soin minutieux qu'il met d'ordinaire dans ces sortes d'envoi. Ces deux caisses contenaient en outre plusieurs boutures de cannes désignés dans la note de M. Diard sous le nom de *Saccharum edule*, dont les sommités se mangent comme légumes, dit-on, et ont le goût du choufleur. Autant que l'état de ces boutures a pu le permettre, la plante aurait quelque assimilé avec le Sorgho.

4. Un exemplaire d'une monographie du genre CAREX : *Illustration of the Genus Carex* est présenté de la part de l'auteur : Francis

Boott M. D. Trésorier et Vice-Président de la Société Linnéenne de Londres. Le Secrétaire propose à la Société de conférer à l'auteur le titre de " membre honoraire."

5. Une lettre de l'hon. Secrétaire Colonial, en réponse à celle qui lui avait été écrite par le Secrétaire de la Société, pour lui annoncer que les collections destinées au cabinet d'Histoire Naturelle de S. M. l'Empereur d'Autriche étaient prêtes, et demandant à qui elles devaient être adressées. Le Secrétaire est informé que les caisses doivent être envoyées aux agents coloniaux à Londres pour être tenues à la disposition du Secrétaire d'Etat.

6. Lu une lettre de M. Colvile Barclay accompagnant deux spécimens d'un coleoptère jusqu'ici inconnu à Maurice, et recueilli à la Savane dans les environs de *St.-Aubin*.

7. Une lettre de M. Liénard père, de Paris, faisant savoir que son portrait, sur l'invitation de la Société, avait été fait, et qu'il le ferait parvenir à une prochaine occasion.

8. Une lettre laissée sur la table de la Société et adressée au Secrétaire, par le Dr. Ferdinand Hochstetter, se rendant en Europe, par le steamer *Benarès*, qui n'est resté à Maurice que peu de temps. Le Dr. Hochstetter faisait partie de l'expédition scientifique de la frégate autrichienne *Navara*, dans les parages de l'Australie. Il exprime le désir de se mettre en relation avec la Société à son arrivée à Vienne.

Le Secrétaire est chargé de lui écrire à ce sujet.

Une lettre de M. Charles Zill, écrite de St.-Denis, Réunion, annonçant son départ pour l'Inde pour plus tard se rendre en Australie et exprimant le regret de ne pouvoir effectuer son projet de retour à Maurice.

10. Le Secrétaire dépose sur la table des échantillons de reptiles, de crustacés et d'insectes envoyés des Iles Seychelles par M. Ch. Telfair. Il communique également à la Société divers ouvrages reçus par la Malle, et de la part de M. F. Dick valve du genre *Perna* contenant une exsudation de matière nacréée et recueillie à Belombre.

Le Secrétaire fait savoir qu'il a reçu de M. Le Brun auquel la Société ou plutôt le pays est redevable d'une certaine quantité de bananiers envoyés de Madagascar, une caisse de plants provenant de la même île et dont M. Jules Levieux a bien voulu se charger.

Sont proposés comme membres résidents :

1<sup>o</sup> M. Edouard Douglas, par M. Ed. Newton, secondé du Secrétaire.

2<sup>o</sup> M. Léon Pitot, par le Secrétaire, secondé de M. Ch. Wiché.

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SÉANCE DU JEUDI 16 FÉVRIER 1860.

L'hon. G. Fropier occupant le fauteuil.

L'hon. Ch. Wiché, le Dr. Ayres, MM. Doyen, P. Furse, Paruit.

Après la lecture faite par le Secrétaire du procès-verbal de la dernière séance, on procède à l'élection de MM. Ed. Douglas et Léon Pitot qui sont admis en qualité de membres résidents.

Le Secrétaire fait savoir que les collections du Museum se sont enrichies d'un specimen de poissons de l'ordre de chondroptérygiens, de la famille des Raies et appartenant au genre *Cephalaptera* de Duméril. Ce poisson de très grande dimension a été pris à l'embouchure de la Grand'Rivière du Port-Louis.

M. Paruit lit un mémoire sur les améliorations qu'il suggère d'introduire dans la culture de la canne. Il propose de faire des échanges de têtes de cannes entre les quartiers secs et les quartiers pluvieux de l'île dans le but, dit-il, de prévenir la dégénérescence de la plante. Il conseille également de planter les têtes sur un fumier pouvant être préparé à peu de frais avec les litières des étables, les détritux de plantes, cendres à bagasse, écumes de vesou que l'on recouvrirait d'une couche de chaux mêlée à une lessive composée d'eau douce, d'eau salée et de sirop.

Le Capt. Mann communique par l'intermédiaire du Secrétaire, un mémoire intitulé : *Observations on the Water Supply of Mauritius*, que la Société fera insérer dans le prochain No. de ses *Transactions*.

Le Secrétaire est chargé de transmettre au Capt. Mann, au moment de quitter Maurice, les remerciements de la Société,

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SÉANCE DU JEUDI 22 MARS 1860.

L'hon. W. W. R. Kerr occupant le fauteuil.

Dr. Ayres, MM. J. Caldwell, J. R. Fernyhough, Fleurot, Paruit.

L'hon. W. Kerr communique une lettre de l'agent de la Société à Londres, M. J. Morris, proposant d'introduire à Maurice du frai de Saumon, tout en faisant observer les difficultés qu'il y aurait d'acclimater dans le pays un poisson qui d'ordinaire, après avoir déposé ses œufs dans les rivières, gagne la pleine mer.

Le Secrétaire rappelle qu'une proposition semblable avait été faite à la Société en 1843. L'idée en avait été donnée par le Dr. Mc' Donald, de Belfast à M. Robert Telfair. Des instructions avaient été rédigées à cet effet par un Comité composé de MM. Liénard père, Bojer et du Secrétaire ; mais le projet n'a pu être réalisé.

M. Kerr est d'opinion que d'autres poissons que le Saumon, tels par exemple que le Tanehe et le Brochet pourraient être introduits avec plus de chances de succès, et il a été résolu que le Conseil de la Société serait prié de voter, à titre d'essai, une somme de £ 10 pour être adressée à M. Morris à l'effet d'obtenir du frai de ce poisson ou de poissons vivants.

Le Secrétaire présente le premier No. des *Annales de l'Agriculture des Colonies et des régions tropicales*, journal publié à Paris sous la direction de M. Paul Madinier.

Sont proposés comme membres résidents :

1<sup>o</sup> M. W. Bathfield, proposé par le Secrétaire et secondé par M. Kerr.

2<sup>o</sup> M. Henri Pilot, proposé par M. Paruit et secondé par le Secrétaire.

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SÉANCE DU MARDI 3 AVRIL 1860.

L'hon. G. Fropier occupe le fauteuil.

L'hon. W. Kerr, MM. F. Dick, V. Robillard.

Le but de la réunion est la communication faite par l'hon. Fropier du rapport de la Commission nommée pour rendre compte de l'Exposition intercoloniale, tenue à l'Hôtel du Gouvernement, le 31 Août, 1er. et 2 Septembre 1859.

Après la lecture de ce rapport, et sur l'observation de M. Fropier que des pages en blanc restaient à remplir en ce qui touchait à plusieurs détails que M. Fropier n'a pu intercaler, le Secrétaire a été chargé de combler ces lacunes et d'achever le travail laissé par M. Fropier.

Au moment de lever la séance, le Secrétaire a demandé la permission d'exprimer au Président, M. Fropier, sur le point de quitter la colonie, les regrets de la Société et de le remercier des services qu'il lui a rendus.

MM. W. Bathfield et H. Pilot sont reçus membres résidents.

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SÉANCE DU JEUDI 10 MAI 1860.

Le Dr. Uleoq occupant le fauteuil.

L'hon. C. Wiehe, Dr. Ayres, MM. J. Caldwell, F. Dick, Paruit, V. Robillard.

Sur la proposition de l'hon. M. Bedingfeld, secondée par le Se-

Secrétaire, l'hon. G. Dickson, Procureur-Général, est admis, séance tenante, comme membre résident.

L'hon. Ed. Rémono est également reçu en cette même qualité, sur la proposition du Secrétaire, secondée de l'hon. E. Dupont.

Le Secrétaire soumet à la Société la liste des noms présentés par un Comité nommé à cet effet pour être inscrits sur l'obélisque envoyé par M. Liénard. Ce sont les suivants :

Labourdonnais, Poivre, Cossigny, Commerson, Céré, Lejuge, de Maudave, Rochon, l'abbé Galoys, de Reine, Baudin, Magon, Brenier, La Haye, appartenant au dix-huitième siècle.

Stadtman, Sir R. T. Farquhar, Ch. Telfair, Dr. Burke, Ed. Blackburn, W. Bojer, J. Desjardins, J. Genève, Ad. D'Epinay, de Chazal, appartenant au dix-neuvième siècle.

M. F. Dick fait la proposition d'inscrire sur le monument le nom de M. John Newman, de son vivant directeur du Jardin des Pamplemousses, et qui a introduit plusieurs plantes à Maurice, notamment l'Ananas Victoria. Le Secrétaire rappelle aussi le nom de M. Jules Giquel, auquel le pays est redevable de la canne Penang, de même que celui du Dr. Thompson, qui avait visité Madagascar et rapporté de cette grande île à Maurice plusieurs plantes intéressantes.

D'autres noms ont encore été suggérés par le Comité ; celui de Fusée Aublet qui a donné ses soins pendant son séjour à Maurice aux plantes qu'il avait transportées au Réduit. Enfin le Secrétaire a proposé d'ajouter à tous ces noms celui du Dr. Nils Bergsten qui, le premier, a eu l'idée, après l'émancipation des esclaves, de suppléer au manque de bras dans le pays, en recourant à l'Inde. A ce titre, il aurait rendu à l'agriculture coloniale un service incontestable, et son nom a autant de droits que tout autre à être gravé sur le monument de M. Liénard.

Sur la proposition de M. L. Bouton, on arrête que le socle du monument portera cette inscription suivante, comme l'expression d'une pensée de Bernardin de St.-Pierre : " Le don d'une plante utile me paraît plus précieux que la découverte d'une mine, et un monument plus durable qu'une pyramide." Le Secrétaire est autorisé à se mettre en rapport avec un graveur à l'effet de faire inscrire sur l'obélisque les noms cités plus haut. Le monument sera ensuite transporté au Jardin des Pamplemousses pour y être érigé selon le vœu exprimé par son donateur.

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SÉANCE DU JEUDI 14 JUIN 1860.

L'hon. F. Bedingfeld occupant le fauteuil.

L'hon. W. Kerr, l'hon. C. Wiché, Dr. Ayres, Dr. Régnaud, Dr. Uleq, MM. Channell, Desenne, F. Diek, J. Fraser, F. Herchenroder, V. Naz, Paruit.

Après la lecture du procès-verbal de la dernière séance, le Secrétaire soumet à la sanction de la Société la liste des noms devant être inscrits sur l'obélisque. Celui de l'abbé de la Caille est proposé par l'hon. F. Bedingfeld, mis aux voix et adopté. Il en est de même pour le Dr. Bergsten.

Le Dr. Uleq ayant fait valoir tous les titres de Victor Gallet, en rappelant l'excellent système de culture suivi par lui dans la plantation de cannes, il a été résolu que le nom de V. Gallet serait inscrit.

Les noms à inscrire s'élèvent à 29.

Ceux appartenant au 18e. siècle seront inscrits sur une des faces du monument dans l'ordre suivant :

Labourdonnais,	L'abbé Galoys,
Poivre,	De Reine,
Cossigny,	Baudin,
Commerson,	René Magon,
Céré,	Brenier,
Lejuge,	La Haye,
De Maudave,	L'abbé La Caille,
Aublet,	Dr. Stadtmann.
Rochon,	

Les noms des personnages du 19e. siècle seront placés sur une autre face, ainsi qu'il suit :

De Chazal,	J. Desjardins,
Sir R. T. Farquhar,	J. Genève,
Ch. Telfair,	Ad. D'Épinay,
Dr. Burke,	Dr. Thompson,
G. R. Blackburn,	Dr. Bergsten,
W. Bojer,	V. Gallet.

Le Secrétaire donne communication d'une lettre du Dr. Sénèque accompagnant des exemplaires d'une brochure qu'il vient de publier : " Quelques observations sur le mot Tambave." Un Comité composé des Drs. Ayres, Lejuge et C. Régnaud a été nommé pour rendre compte de ce travail.

Une lettre du Dr. C. T. Bcke au Secrétaire est aussi communiquée. M. Beke annonce par cette lettre son départ pour l'Angleterre et exprime le désir d'être toujours considéré comme membre de la Société.

Le Dr. Colin et M. H. Pastor sont proposés comme membres résidents par le Secrétaire et M. Naz. M. O'Toole est proposé par l'hon. M. Kerr, secondé du Secrétaire.

M. Channell présente à la Société un mémoire de M. C. Bernard, dont le but est d'appeler l'attention publique sur la réduction des poissons sur nos côtes, par la pêche telle qu'elle se pratique, et l'insuffisance de la loi qui régit cette matière. Ce mémoire a été reproduit dans un No. du *Commercial Gazette*. Il est à supposer que la Société prendra ce sujet en sérieuse considération, et qu'elle nommera un Comité chargé d'examiner le travail de M. Bernard, et d'aviser aux moyens de suggestion propres à arrêter la destruction d'une substance aussi importante qu'est le poisson comme objet d'alimentation publique à Maurice.

Le Dr. Régnard présente une brochure de M. John Robertson de Londres, sur l'anatomie du *Phalax dactylus*.

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SÉANCE DU JEUDI 12 JUILLET 1860.

Le Dr. Ulcoq occupant le fauteuil.

L'hon. C. Wiehé, Dr. Ayrce, Dr. Lejuge, MM. Caldwell, Channell, Doyen, Paruit, Robillard.

Le Dr. Colin, MM. H. Pastor et O'Toole sont reçus membres résidents.

Le Secrétaire, secondé du Dr. Uleq, propose en cette même qualité M. Jules Régnard.

M. Paul Madinier est reçu membre correspondant à Paris.

Le Secrétaire communique une note où il fait connaître les dépenses que la Société a été obligé de faire pour l'Exposition Internationale, et d'autres frais encore qu'elle a encourus ; et cependant, a-t-il fait remarquer, il lui faut s'occuper de l'impression du Rapport de M. Fropier sur l'Exposition tenue à l'Hôtel du Gouvernement. Il demande donc que ce Rapport soit publié le plus tôt possible avec les annotations qu'il y a ajoutées.

Le Dr. Ulcoq donne avis à la Société qu'il croit savoir que l'Editeur du *Commercial Gazette* serait disposé à imprimer gratis ce travail. M. F. Channell, présent à la réunion, répond qu'il se chargera volontiers et sans rétribution aucune, de l'impression du Rapport de M. Fropier et des notes qui y seraient ajoutées par le Secrétaire.

Le manuscrit lui est immédiatement remis par le Secrétaire, et le Président prend la parole au nom de la Société pour remercier M. Channell.

Le Dr. Brookes présente, pour être déposés au Muséum, des spécimens de crustacés et de couleuvres recueillis à l'Île aux Frégates, une des îles Seychelles et une espèce de poisson du genre *Fistularia*.

M. Channell communique de la part de M. Joachim Dioré des renseignements sur la culture du Lin de la Nouvelle Zélande (*Phormium tenax*) et suggère l'idée qu'un essai en puisse être fait à Maurice.

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SÉANCE DU VENDREDI 31 AOUT 1860.

Le Dr. Ayres occupant le fauteuil.

Dr. Barraut, MM. Fleurot, Herchenroder, Dr. Lejuge, MM. E. Liénard, E. Mellish, Paruit, Dr. Régnard.

M. J. Régnard est reçu membre résident.

Le Dr. Ayres, secondé du Secrétaire, propose le Dr. Bazire, et le Secrétaire, secondé du Dr. Ayres, propose MM. Pakenham et Ed. Lebrun.

M. Mellish et le Dr. Ayres proposent comme membres correspondants à Melbourne, M. Samuel Hannaford et le Dr. Mueller.

M. Alexander Lyall, fils de feu le Dr. R. Lyall, l'un des fondateurs de la Société, est admis comme membre résident, sur la proposition du Secrétaire.

Entre autres brochures reçues par la Malle, le Secrétaire présente un extrait du journal de la " Société Linnéenne " de Londres, contenant la description et la figure d'une plante de Maurice décrite sous le nom de *Fropiera Mauritianana*. B. MSS.

Le Secrétaire rapporte qu'après une excursion faite dernièrement dans les forêts du haut de Moka, il avait rencontré un arbrisseau en fleurs dont il n'a pu réussir à déterminer ni le genre ni l'espèce. Des échantillons desséchés de cette même plante ou d'une espèce voisine, existaient dans l'herbier du Muséum ; ils avaient été recueillis par M. Bojer et étaient étiquetés du nom vulgaire de " Bois sans écorce. " Le Secrétaire joignit les échantillons qu'il avait lui-même préparés à ceux de M. Bojer, et les adressa à Sir W. Hooker, à Londres, avec prière d'en faire l'examen, exprimant le désir si la plante était nouvelle, d'en former un genre auquel le Secrétaire proposait de donner le nom de son honorable ami, M. Fropier.

Les échantillons furent examinés avec soin par le Dr. Hooker, fils de Sir William, et la plante fut décrite et figurée sous le nom de *Fropiera Mauritianana* dans le journal de la Société Linnéenne de Londres.

M. Ch. Wiehé présente de la part de M. O. Payet des graines du *Tan-rouge* qu'il a recueillies à St.-Pierre, Île de la Réunion ; c'est de

la fleur de cet arbre que les abeilles retirent le *miel vert*, dont le parfum est si remarquable. Cct arbre existe également dans les forêts de Maurice ; c'est le *Weinmannia macrostachya* D C. Prod.

Le Secrétaire offre de la part de M. O. Begué une souche de tiges du *Restio-tectorum* provenant du Cap de Bonne-Espérance. Cette plante sert au Cap de couverture aux cabanes et aux chaumières, et dure, dit-on, un temps considérable. Mr. Begué désirerait que ces tiges fussent essayées dans le même but à Maurice, et propose d'en faire venir du Cap des graines pour être plantés dans notre île. Le *Restio-tectorum* croît dans les lieux marécageux.

Le Dr. Ayres lit un mémoire fort intéressant sur les diverses maladies auxquelles sont sujettes à Maurice les races européennes, de même que les créoles et les indiens. C'est un résumé, une sorte de statistique médicale dont il a présenté le tableau, le résultant de ses observations sur les maladies qu'il a eu l'occasion d'examiner à l'Hôpital Civil.

Le portrait de M. Liénard père, ancien Vice-Président de la Société, et peint par M. Boulanger est présenté et mis en place dans la salle des réunions. Ce portrait avait été demandé à Paris, à la suggestion de M. Ev. Dupont, comme un témoignage des sentiments de souvenir et d'affection de la Société, pour la personne de M. Liénard.

M. E. Liénard offre au Muséum une boîte contenant des échantillons de minéraux des Pyrénées, et une autre renfermant des coquilles de diverses localités. Les remerciements de la Société sont transmis à M. E. Liénard par le Président.

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SÉANCE DU MERCREDI 5 SEPTEMBRE 1860.

L'hon. F. Bedingfeld occupant le fauteuil.

Dr. Ayres, Dr. Kirsten, Dr. Régnaud, MM. Desmarais, Durhône, J. Levieux, Paruit, H. Pitot, V. de Robillard, W. Telfair.

On procède à l'élection du Dr. Bazire et de MM. E. Lebrun et Pakenham qui sont reçus membres résidents.

Le Dr. Mueller et M. S. Hannaford sont reçus membres correspondants à Melbourne.

Le Dr. Régnaud fait la lecture d'un Rapport qu'il a été chargé de faire conjointement avec le Dr. Ayres et le Dr. Lejuge sur un mémoire adressé à la Société par le Dr. Sénèque et ayant pour titre : "*Quelques considérations sur le mot TAMBAVE.*"

Le Rapporteur conclut en invitant la Société à remercier le Dr. Sénèque de son intéressant travail et à l'insérer dans les compte-rendus.

Le Secrétaire soumet à la Société, de la part de M. Th. Meadow quatre pièces en cuivre d'une monnaie fort ancienne qu'il s'est procuré dans l'Inde.

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SÉANCE DU JEUDI 4 OCTOBRE 1860.

L'hon. F. Bedingsfeld occupant le fauteuil.

Hon. Ch. Wiehé, Dr. Ayres, MM. Fleurot, E. Liénard, Paruit, Target.

Le Secrétaire donne communication des lettres suivantes :

1. De M. Elie de Beaumont, Président de l'Académie des Sciences de Paris, en date du 17 Août, accusant réception du dernier No. des Transactions de la Société.

2. De Sir W. Gomm, Patron honoraire de la Société, remerciant de l'envoi qui lui a été fait du même No. des Transactions.

3. De M. Paul Madmier, rédacteur des Annales d'Agriculture des Colonies, remerciant la Société du titre de membre correspondant qui lui a été conféré, et se mettant à sa disposition pour tous les renseignements que désirerait avoir la Société, en ce qui concerne la spécialité de ses travaux et de ses recherches en agriculture.

4. De M. Ed. Lebrun, à Tamatave, accusant réception de son diplôme, et offrant ses services pendant le temps de sa résidence à Madagascar.

5. De M. C. Westwood, membre correspondant de la Société, désirant avoir des specimen des insectes destructeurs de la canne à sucre, dans leurs différentes phases.

6. Du Secrétaire Colonial, annonçant le vote d'une somme de £ 40 destinée aux frais d'édification au Jardin des Pamplemousses, de l'obélisque de M. Liénard.

Le Secrétaire lit une notice intitulée : Etudes sur les plantes.

M. Fleurot présente une matière odorante qu'il a extraite des fleurs du Tan (*Weinmannia macrostachya*), et qu'il a reconnue pour être la *Caumarine*, substance qui avait été d'abord trouvée dans la Fève-Tonquin, Tonquin-Bean (*Dipterix odorata Willd.*) et qui a été depuis découverte dans le Melilot, l'Aspérule odorante, l'*Anthoxanthum odoratum*, le Faham (*Angraecum fragrans*) et l'*Orchis fusca*. Ce serait donc à cette substance existant dans le Tan qu'est dû l'arôme particulier du miel connu à Bourbon sous le nom de miel vert.

Le Dr. Ayres, secondé du Secrétaire, propose M. Alex. Montgomery, comme membre résident.

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SÉANCE DU JEUDI 8 NOVEMBRE 1860.

Le Dr. Uleog occupant le fauteuil.

Dr. Ayres, Dr. C. Régnaud, MM. Doyen, Fleurot, H. Finness, E. Liénard, A. Lyall, Paruit, W. Telfair.

Le Secrétaire présente de la part de M. Barbeau un specimen de Guano provenant de Hobson's Bay et dont M. Fleurot est chargé de faire l'analyse.

Le Dr. Ayres présente un fragment d'os qu'il a découvert dans une des cavernes de la Rivière-Noire et qu'il croit appartenir au fémur d'un *Solitaire*; du moins d'après la comparaison qu'il en a faite avec les os figurés dans l'ouvrage de Strickland.

Le Secrétaire lit une note sur le mode de répartition de quelques plantes de Maurice. Il rappelle ensuite que la Société touche au terme de ses séances mensuelles, et que la réunion à venir doit être la séance annuelle. On arrête que le Gouverneur en sera averti, afin qu'il veuille, comme d'ordinaire, fixer le jour de cette séance.

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SÉANCE ANNUELLE.—JEUDI 13 DÉCEMBRE 1860.

Son Excellence le Gouverneur occupant le fauteuil.

Honbles. Bedingfeld, Ch. Wiehé, G. Dickson, W. Kerr, H. Lemièrre, Drs. Ayres, Bazire, Donald, Riecard, Ulcoq, MM. Caldwell, Channell, De Closets, Desenne, F. Dick, Doyen, Fleurot, Hazlitt, Herchenroder, Lebrun, L'Estrange, E. Liénard, Mc' Kerrell, Meldrum, Mellish, E. Newton, O'Foole, Redl, Telfair, L. Bouton,—*Secrétaire*.

La séance est ouverte par la lecture que fait le Secrétaire du Rapport des travaux de l'année.

S. E. le Gouverneur après être entré dans quelques détails sur divers sujets mentionnés dans le Rapport en propose l'adoption qui est acceptée.

Leecture est donné par M. Fleurot du Rapport des Auditeurs.

Le Gouverneur s'étant alors retiré, la Société a procédé à la nomination des officiers devant composer son bureau pour l'année 1861, et le scrutin a fait connaître les élections suivantes :

MEMBRES OFFICIELS.

Hon. F. Bedingfeld.— <i>Président</i> .	MM. L. Bouton,— <i>Secrétaire</i> .
— C. Wiehé, } <i>Vice-Prési-</i>	— F. Dick, } <i>Vice-Secré-</i>
— G. Dickson, } <i>dents</i> .	— H. Finness, } <i>taires</i> .
M. A. Desenne,— <i>Trésorier</i> .	

MEMBRES INOFFICIELS.

Hon. W. Kerr, Dr. Ayres, Dr. Ulcoq, MM. Caldwell, E. Mellish,  
Ed. Newton.

Le Président désigne comme Auditeurs pour l'année MM. Fleurot  
et O'Toole.



## SOCIÉTÉ ROYALE DES ARTS ET DES SCIENCES.

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*Prix décernés à l'Exposition tenue dans le Bazar du Port-Louis, le  
 24 Août 1860.*

### Animaux.

Juges : L'Hon. W. W. R. Kerr, MM. Robinson et Woodlock.

	£	s.
La meilleure vache (importée), Mme. Rousset, Port-Louis...	2	
„ „ (coloniale), Mme. Hodoul, „ ...	2	
Anesse et son petit, P. Geneviève, Montagne Longue... ..	1	
Le meilleur bélier (importé), Jourdain, Port-Louis ... ..	1	
„ „ (colonial), S. Nalletambic, Port-Louis ... ..	1	
La meilleure chèvre et ses 3 petits (importée), D. Pellegrin, Port-Louis. ... ..	1	
La meilleure chèvre (coloniale), Mme. Muscarel, Port-Louis	1	
Vérat, A. Shaw, Port-Louis... ..	1	
Lapins, W. Foster, Port-Louis ... ..		10

### Prix Extra.

Jument et son poulain (importée), P. E. de Chazal, Port-Louis	1	
Poney (colonial), N. Bolger, Port-Louis, <i>preuve à fournir que c'est de provenance coloniale</i> ... ..	1	
Poney, jument (coloniale), J. Valerydouce, Pamplémousses, <i>preuve à fournir que c'est de provenance coloniale</i> ... ..	1	
Chèvre laitière et ses 2 petits (coloniale), S. Nalletambie, Port-Louis ... ..		10

### Volailles.

Juges : MM. C. Bourgault, C. Barclay, Forget et Dr. Pastourel.

	£	s.
La meilleurc paire de canards de Manille, J. Caldwell, Port- Louis ... ..		10
Poules de Cochin-Chine, Deputy Commissary General, Routh, Port-Louis... ..		10
Coq et Poules, A. Pitot, Port-Louis ... ..		10
La meilleure paire de pigeons, W. Jacques, Port-Louis ...		10

**Prix Extra.**

	£	s.
Poule de Cochin-Chine, une poule et 9 ponlettes, Deputy Commissary General Routh, Port-Louis ... ..	5	
Oie, M. Brunet, Port-Louis... ..	5	
Coq et poules, J. Caldwell, Port-Louis ... ..	10	
Poule (de race) de l'Inde, G. Devienne, Port-Louis ... ..	5	
Pigeons, F. Gaspard, Port-Louis... ..	5	
„ E. Denis „ ... ..	5	
Une paire de poules (duvet). Geffroy, Port-Louis ... ..	4	
Une paire de poules de <i>bataire</i> ... ..	5	

**Légumes.**

Juges : L'Hon. C. C. Brownrigg, MM. Dunean, Tribe et Liénard.

La collection la mieux assortie, J. Fraser, Plaines-Wilhems	} Méd. d'argt.
2me. „ „ Gilbert, Réduit... ..	2
3me. „ „ P. Armstrong, Vallée des Prêtres ... ..	1
Asperges, Sinna, Montagne Longue... ..	5
Choux, E. Pipon, Grand Port ... ..	10
Carottes, P. A. Wiché, Arsenal ... ..	10
Laitue pommée, Maingard, Pailles ... ..	10
Tomates, l'Hon. W. W. R. Kerr, Plaines-Wilhems ... ..	5
Pois, Maingard, Pailles ... ..	10
Radis, Lejuge, Pamplémousses ... ..	5
Capsicum, Tessier & Cie., Flacq ... ..	5
Navets, Bretonnache, Petite-Rivière ... ..	10
Oignons, L. Pondard „ ... ..	5
Epinards, Maingard, Pailles... ..	5

**Prix Extra.**

Collection, P. A. Wiché, Arsenal ... ..	} Méd.. d'argt
Oignons, E. Herchenroder Cassis ... ..	5
Poireaux, F. de Monterville, Bambous... ..	5
Cho-cho (très beau), J. Fraser, Plaines-Wilhems ... ..	10
Pois, H. C. Bury, Moka ... ..	10

**Fruits.**

Juges : MM. E. Duvivier, O. Bégué et Dr. Régnaud.

Mangues, E. Faoulaize, Port-Louis ... ..	10
Cœur-de-bœuf, E. Herchenroder, Cassis ... ..	10

	£	s.
Fruits à pain, E. Herehenroder, Cassis ... ..	10	
Coeos, „ „ „ „ „ „	10	
Raisins, G. Collard, Port-Louis ... ..	1	
Ananas (Victoria), E. Cahagnet, Montagne Longue... ..	10	
Bananes, Tessier & Cie., Flacq ... ..	10	
Sapotes, J. Agaisse, Port-Louis ... ..	10	
Bibasses, E. Duvivier, Pailles ... ..	10	
Areek, Mme. A. Levieux, Port-Louis ... ..	5	

**Prix Extra.**

Mangues, Mlle. L. Bégué, Port-Louis... ..	10
„ G. Collard, „ „ „ „ „ „	10
Cœur-de-bœuf, F. de Monterville, Bambous ... ..	5
Pommes, E. Michel, Petite-Rivière ... ..	1
Bananes, A. Chasteauneuf, Petite-Rivière ... ..	10

**Fleurs.**

Juges : MM. Levieux, Bouton, C. Pitot et de Kïmorvant.

Le meilleur assortiment d'arbrisseaux ou plantes en fleurs, } Ment. J. Dunean, Pamplémousses... .. } Hon.	
2me. meilleur do., R. Hardy, Port-Louis ... ..	2
3me. „ „ V. Bernard „ „ „ „ „ „	1
Arbrisseaux et plantes, C. Vankersbilek, Moka... ..	1
Le meilleur bouquet „ „ „ „ „ „	1
2me. „ J. Lincoln, Port-Louis ... ..	10

**Prix Extra.**

Fleurs coupées, J. Dunean, Pamplémousses... ..	6
2 nouvelles plantes (Farfugium grande et Begonia Res.) } Méd. Levieux, Port-Louis ... .. } d'argt.	
Nouvelle plante (pour couverture, du Cap <i>Restio Tectorum</i> ), O. Bégué, Port-Louis ... ..	10

**Graines, Racines et Fèves.**

Juges : MM. Bartlett, Bonieux et Fleurot.

Riz (créole), E. Maugendre fils, Briquerie ... ..	10
Avoine, A. Latour, Pamplémousses ... ..	10
Graines de millet, E. Australia, Flacq... ..	10

	£	s.
Pommes de terre, Gilbert, Réduit ... ..	2	
Manioc, Pelletier, Rivière du Rempart ... ..	1	
Patates douces (9 qualités), C. Fontenay, Savane ... ..	2	
Cambares, J. Valcrydoucc, Rivière des Callebasses ... ..	1	
Graines d'oignons, E. Herchenroder, Cassis ... ..	1	
Café, J. Fraser, Plaines-Wilhems ... ..	1	
Pistaches, Doger Veckranges, Rochebois ... ..	1	

**Prix Extra.**

Pommes de terre, Hawes, Plaines-Wilhems ... ..	1
„ J. Fraser, „ ... ..	1

**Produits Divers**

Juges : MM. E. Bérichon, E. Harel, Salaffa, P. Morillon, Dr. Ayres.

Vanille, J. Levieux, Port-Louis ... ..	} Méd. d'or.
„ Gachet, Pamplemousses... ..	
Achards, Mmc. Morcy, Port-Louis ... ..	} Ment. Hon.
Arrowroot, E. Cahagnet, Montague Longue ... ..	
Cigares, Rivière aîné, Port-Louis .. ..	10
Beurre, Mmc. Kerr, Plaines-Wilhems ... ..	1
Vermicelle, M. Martial, Grand' Rivière ... ..	} Méd. d'argt.

**Prix Extra.**

Vanille, E. de Chazal, Port-Louis ... ..	1
Tabac à nez, W. G. Smith & Cie., Port-Louis ... ..	1
Fruits conservés, E. Martial, Plaines-Wilhems ... ..	1
Gelées, Mme. Bardin, Pailles ... ..	10
Achards, Mme. Toussaint, Pailles ... ..	8
Sauces, Mmc. J. Maric, Port-Louis ... ..	10
Arrowroot, M. Béchard, Montagne Longue ... ..	8
Miel, Célestin, Bois-Rouge ... ..	10
Engrais Mauricien (Guano), Paruit D'Esmercy, Port-Louis	} Ment. Hon.
Beurre, Mme. Dickson, Plaines-Wilhems... ..	
Cire, Célestin, Bois-Rouge ... ..	5
„ D. D. Chauvin, Bambous ... ..	10

**Manufactures Coloniales.**

Juges : MM. Hounslow, De Closets et Walmsley Standley jeune.

Peignes (écaille), A. Ligeac, Port-Louis	... ..	} Méd. d'argt.
Modèles de navires, L. Michel, Port-Louis	... ..	} Ment. Hon.
„ Rogers, „	... ..	„
„ A. Cavasso, „	... ..	„
Cuir préparés, Villecollet & Cie., Port-Louis	... ..	} Méd. d'argt.
Ouvrages d'ébénisterie, Marchand, Port-Louis	... ..	„
Mécanisme pour détacher une voiture des chevaux emportés, Durand, Port-Louis	... ..	„
Carrosserie, Goron, Port-Louis	... ..	} Ment. Hon.
Forgeronnerie ayant rapport aux voitures, Langevin, Port-Louis	... ..	10
Modèle d'une machine à vapeur, H. Smith, Port-Louis	... ..	} Ment. Hon.
Machinerie, Mauritius Iron and Copper works, „	... ..	} Méd. d'or.
Harmonomètre, Olivier père, „	... ..	} Ment. Hon.

**Tableaux et Dessins.**

Juges : L'Hon. E. Bedingsfeld, Col. Cockburn, Royal Artillery, MM. E. Liénard & Wimphen.

	£	s.
Aquarelle, M. Tunks, Port-Louis	1	
„ H. Collard, „		10
Peinture à l'huile, Demianée, Port-Louis	1	
Architecture et mécanique, A. Rolando, Port-Louis		10
„ „ H. Rousset, „		10
Pastel, E. Sapet, „	1	
„ A. Standley, „		10
Crayon et Encre, Le Balloche, „		10
Ecriture, C. Macarthy, „	1	
„ Doger Veekranges, Rochebois		5

**Ouvrages de Dames.**

Juges : Madame Stevenson, Mines. Grant, Carter et Laeaussade.

Broderie (Plumetis), Mlle. Méry, Port-Louis	... ..	1
Broderie (point d'armes), Mlle. S. Ollier, Port-Louis	... ..	1

	£	s.
Broderie soie et laine, Mlle. Lctourneur, Port-Louis ...	1	
Tapis en crochet, Mlle. Maclauchlin, „ ...	1	
Fleurs artificielles, Mme. Vve. Rouxelin, „ ...	1	

**Prix Extra.**

Tapis en crochet, Mlle. Pignéguv, Port-Louis ...	10
Tricot (crochet), Mme. Duncan, Pamplémousses ...	10
Broderie (point d'armes), Mme. Royer, Port-Louis ...	10
„ (soie et perles), Mlle. Bonucfin, „ ...	10
„ „ Mlle. Hewctson, „ ...	10
Fleurs artificielles, Mme. Bonnefin, „ ...	10
„ Mlle. Aubin, „ ...	10
„ Mlle. Deroullède, „ ...	10
Ouvrage de dentelles, Mme. Barlow, „ ...	1
Ouvrage à l'aiguille (chemise) Mlle. M. Capiron, Port-Louis ...	10

W. W. R. KERR,

*Président du Comité d'Agriculture.*



**PRESENTED**

**12 DEC 1950**









PRESENTED

22 DEC 1950

TRANSACTIONS

OF THE

ROYAL SOCIETY OF ARTS AND SCIENCES

OF

MAURITIUS.

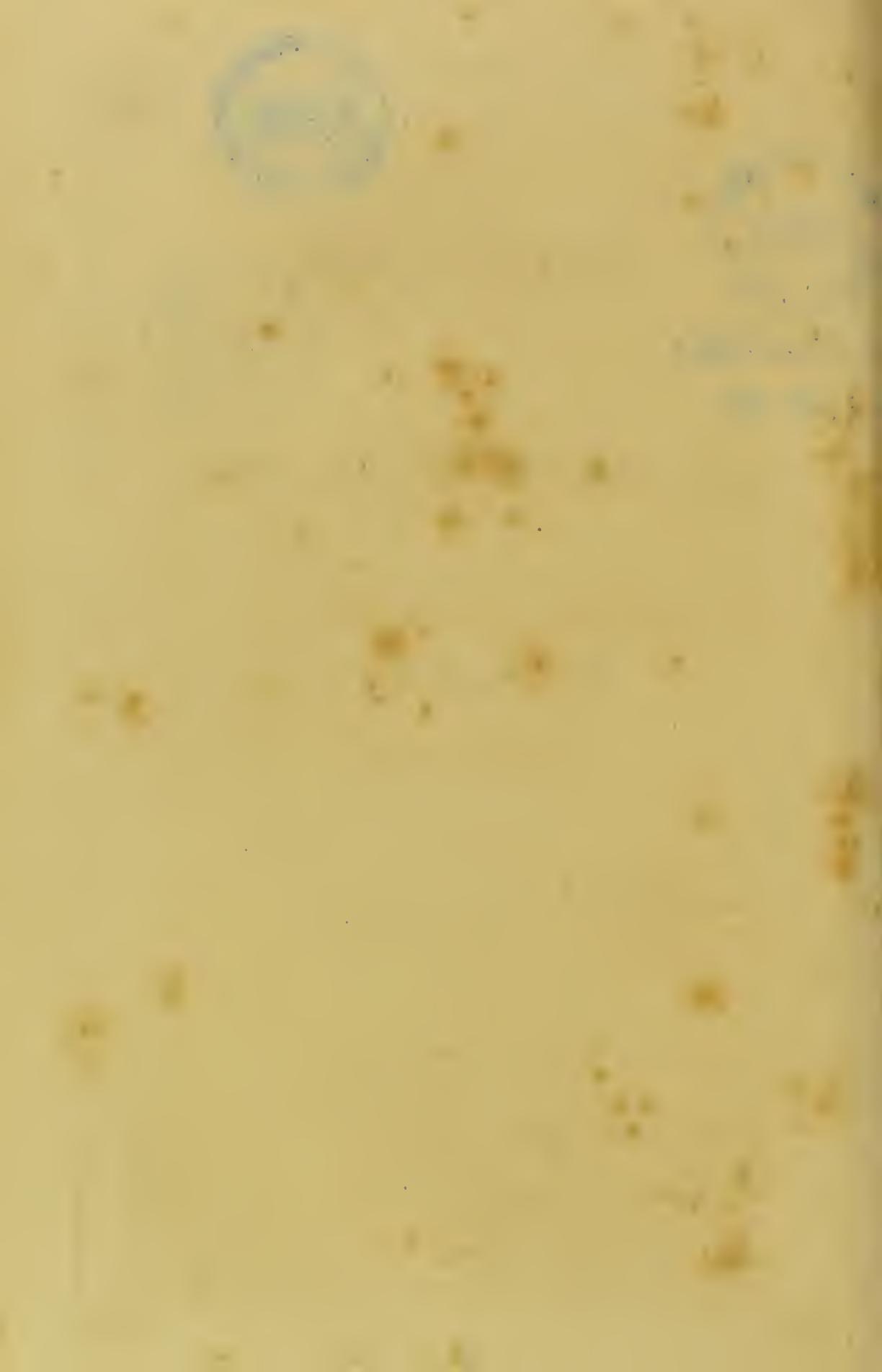
[ NEW SERIES. ]

[ PART II. VOL. II ]

MAURITIUS.

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1865.





# ON DROPS

BY

FREDERICK GUTHRIE.



In the following investigation the word drop is used with a more definite meaning than that which is usually fastened to it. In common speech it includes every mass of liquid matter whose form is visibly influenced towards the spherical by the attraction of its parts, and whose sensible motion or tendency is towards the earth. This definition includes drops with which we are not here concerned, and excludes others which we shall have to consider. We shall have to measure the size of drops; and it can only be of avail to measure the size of such drops as are formed under fixed and determinable conditions.

Many drops, according to the usual scope of the term, are formed under indefinite conditions. For instance, a rain-drop depends for its size upon such circumstances as the quantity of

vapour at the time and place of its formation ; the stillness and electrical condition of the air ; the number and the size of the drops it meets with in its course ; the amount of vapour in the air through which it passes, etc. ; all of which are fortuitous, or at least immeasurable conditions.

With such drops we have here nothing to do, but only with those which are formed under fixed circumstances. On the other hand we shall have to consider upward moving drops.\* Drops of the latter kind are so seldom seen, that while an upward moving drop appears an incongruous expression, yet no distinctive name has been given to them.

Without attempting an exhaustive definition, it will be sufficient to define a drop as a mass of liquid collected and held together only by the attraction of its parts, and separated from other matter by the attraction of gravitation. This definition will exclude such drops as those of mist or rain, and will include the upward moving drops referred to above.

Such being the definition of a drop, it follows at once that the size of a drop may depend upon and be influenced by variation in :—

1. The self-attraction and cohesion of the drop-generating liquid ;
2. Its adhesion to the matter upon which the drop is formed ;
3. The shape of the matter from which the drop moves ;
4. The physical relation between the medium through which the drop moves, on the one hand to the liquid of which the drop is formed, and on the other to the matter on which it is formed ;
5. The attraction of the earth or gravitation upon the drop-

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\* Owing to the numerical preponderance of downward moving drops, we are prone to associate the ideas of drop and down. How far I may be justified philologically in using the expression " drop up " must depend upon the relative primitiveness of the noun and verb drop. Once for all I beg permission to use the term in the extended sense.

Of course, in the absence of positive levity, an upward drop can only be caused by the downward motion of the medium in which the drop moves.



forming liquid, and upon the medium ; A as influenced by their respective and relative densities, and B as influenced by variation in the attractive power of the earth.

In order to study systematically the influence which each of these causes exerts, each must be varied in succession while the others remain constant.

Denoting the three states of matter solid liquid and gaseous by the symbols S, L, G respectively ; and considering the symbols in the order in which they are written, to denote respectively, the matter from which the dropping takes place, the drop and the medium, we get a convenient notation.

As we are speaking at present exclusively of liquid drops, L must always hold the middle place in the symbol of the symbolically possible variations.

(1)      (2)      (3)      (4)      (5)      (6)      (7)      (8)  
SLS, SLL, SLG, LLS, LLL, LLG, GLS, GLG,  
(1), (4) and (8) are physically impossible on account of the superior cohesion of liquids over solids : (6), (7), (8) are physically impossible on account of the superior density of liquids over gases.

SLL, SLG and LLL are therefore the only cases we have to consider. That is :

SLL, from a solid, a liquid drops through a liquid.

SLG, from a solid, a liquid drops through a gas.

LLL, from a liquid, a liquid drops through a liquid.

Of these three cases, two, SLL and LLL, are invertable : that is, the motion of the drop may be either to or from the earth. The gravitation of the drop may be greater than and overcome the gravitation of the medium, the drop descends : or the gravitation of the medium overcomes that of the drop. the drop ascends. The case LLG cannot be inverted because, at all events at the same pressure, every known gas is lighter than every known liquid.

It will be convenient to consider the case SLG first, because instances of it come more frequently under our notice than of

the other two and because it will be convenient to consider together those cases which are capable of inversion.

As we are considering the physical aspect of the question, we will only discuss those cases where no chemical action takes place between the terms and where either no solution takes place or where it is so small as to be negligible, or of such a kind as to admit of experimental elimination. This limitation of course excludes a vast number of combinations, but it must be made in order to study the purely physical and definite influences which determine the size of a drop.

I.—*SLG, From a Solid, a Liquid Drops through a Gas.*

The variable factors are :

1. The self attraction and cohesion of the liquid.
  - A. dependent upon its purely chemical constitution.
  - B. dependent upon the proportion between its heterogeneous parts.
  - C. dependent on temperature.
2. The adhesion between the solid and the liquid.
  - A. as in 1.
  - B. as in 1.
  - C. as in 1.
  - D. dependent upon the shape of the solid.
3. The adhesion of the gas to the solid.
  - A. B. C. as in 1.
  - E. dependent on atmospheric pressure.
4. Adhesion of the gas to the liquid.
  - A. B. C. E. as in 3.

One of these factors, namely, Temperature, though varying in different cases, may be supposed, in the same case to be the same for the different kinds of matter present.

Another factor in the same predicament is the locally constant gravitation at the place where the dropping takes place. Lastly, a condition of great influence is the extent of the time interval between the successive drops. This interval we shall call for brevity the growth-time of the drop, and represent by *gt*.

If the above conditions are exhaustive, we may assert that a drop of liquid will always be of the same size if it is formed of the same liquid substance and falls from a solid of the same size, shape and substance, provided that the barometric tension, temperature, and attraction of gravitation remain the same and that the growth-time be constant.

The size of the drops may be most conveniently determined by weighing a noted number of them. This gives the weight of a single drop. On finding the specific gravity of the liquid at the same temperature, the weight of the water is deduced whose volume is equal to that of the drop. Hence and from the known expansion of water at different temperatures, the volume of the water and therefore of the drop is found.

The whole arrangement employed is shown in Fig. I.

The globe A full of the liquid under experiment is inverted into the cylinder B containing the same. The mouth of A is supported by a tripod stand D just in contact with the surface of the liquid in B. A and B are carried on a table which may be raised or lowered at pleasure. A siphon E leads from the reservoir B. and is rigidly held by the clamp F. The longer limb of E from which the liquid flows, is turned up at the end which touches a plug of cotton-wool G. The sphere II from which the dropping takes place is hung by three thin wires from the ring of a retort stand. The upper half the sphere is clothed in wool which reaches up to the plug G. The whole arrangement is placed upon a board, which is separated from the table by six inches if tow so as to diminish any accidental vibration. The drops which fall from II enter the funnel L whose lower end is slightly bent so that the drops are thrown out of the vertical and every upward splashing avoided. The rapidity of the flow through the funnel and consequent dropping from II is entirely regulated by raising and lowering the table C. The vessel A acts as a regulator for keeping the level of the liquid in B at a constant height.

The first series of experiments was made with the double ob-

ject of determining how far the rapidity of dropping influenced the size of the drops and to establish the uniformity of the size of the drops which drop at equal intervals of time.

In these experiments cocoa nut oil was taken as the liquid, an ivory sphere as the solid, and atmospheric air as the gas. The ivory sphere was washed in hydrochloric acid so as to deaden its surface. Immediately before, and after each batch of drops, the same number of drops was counted and their time of falling compared with the time which elapsed in the actual experiment. In no case however, was there a difference between the two of a single second, so that *gt.* may be considered in each case to be precisely given.

TABLE I.

T = 28°.5 C.—Rate = 60 drops in 60''

Number of Drops.	<i>gt.</i>	Weight of Drops.
		Gramme.
60	1''	3.9817
60	1	3.9841
60	1	3.9784
60	1	3.9807
60	1	3.9742
60	1	3.9730
60	1	3.9735
60	1	3.9682
	<i>gt.</i>	Mean weight of single drop
	1	0.066279

Preliminary experiments having shown that the size of a drop is greatly affected by the rate at which the dropping takes place, that is, by the time occupied by the drop in its formation, the following experiments were performed to establish the connexion between the two.

It may be here remarked that, with some liquids, a continuous stream of liquid by no means implies a faster delivery of it than may be achieved by a succession of drops. On the contrary, just as by walking more rapid progress may be made than by running, so may dropping deliver more liquid than passes in a stream. A uniformly rapid series of drops may be converted into a stream and reconverted into drops under certain restrictions, at pleasure. We shall return to this fact in the sequel.

TABLE II.

T = 28°. 7 C.

Number of Drops:	Time between fall of first but one and last Drop.	Weight of Drops.	Number of Drops.	Time between fall of first but one and last Drop.	Weight of Drops.
60	26''	4.5212	60	38''	4.3678
60	26	4.5173	60	38	4.3628
60	26	4.5265	60	38	4.3682
60	26	4.5316	120	76	8.7403
60	30	4.3676	60	38	4.3646
60	30	4.3668	60	42	4.2342
60	30	4.3593	60	42	4.2357
60	30	4.3665	60	42	4.2362
60	34	4.4827	60	42	4.2368
60	34	4.4731	60	42	4.2330
60	34	4.4643	60	42	4.2378
60	34	4.4779	60	46	4.1487
60	34	4.4681	60	46	4.1438
60	34	4.4752	60	46	4.1499
60	38	4.3778	60	46	4.1471

From this table is deduced the following Table III, which shows *gt* in seconds and the corresponding drop-weights in grammes; the latter being the mean of the results in Table II. *gt* is got by dividing the time lapses of Table II by the number of drops.

TABLE III.

T = 28° . 7 C.

<i>gt.</i>	Weight of Single Drop.
0.433	0.07540
0.500	0.07275
0.567	0.07455
0.633	0.07281
0.700	0.07059
0.767	0.06912
1.000	0.06627*

From Table III, to which Table I may be joined as a continuation, it at once appears that, on the whole, for oil, within the above limits, the weight or size of a drop diminishes as its growth-time increases. Further it seems that between the rates *gt.* = .57 a minimum occurs: that is, instead of there being a continuous diminution in the weight as the growth time increases, there is at first a diminution, then an increase and finally a continuous diminution: so that drops of the rate *gt.* = .51 have the same size as those of the rate *gt.* = .64. In order to establish more precisely the position of this minimum and the general relation between rate and size, a more minute division of the time must be made and the table must be more extended. From this short Table however may be gathered how extremely sensitive the size of the drop is in regard to the time which it takes to form.

\* Table I, T = 28°. 5.

TABLE IV.

T = 29° C. Sp. Gy. = 0.9195,

Number of Drops.	Time between fall of first but one and last Drops.	Weight of Drops.	Number of Drops.	Time between fall of first but one and last Drops.	Weight of Drops.
60	25''	4.9543	30	34''	4.6013
60	25	4.9613	30	35	4.5340
60	25	4.9608	30	35	4.5334
60	25	4.9604	60	35	4.5420
60	26	4.8463	60	35	4.5309
60	26	4.8448	60	36	4.4021
60	26	4.8423	60	72	8.8066
60	26	4.8432	60	36	4.4013
60	27	4.9112	60	36	4.3925
60	27	4.9107	60	37	4.3932
60	27	4.9121	60	37	4.3891
60	27	4.9100	60	37	4.3925
60	28	4.7530	60	37	4.3938
60	28	4.7534	60	38	4.3934
60	28	4.7515	60	38	4.3940
60	28	4.7459	60	38	4.3932
60	29	4.7594	60	38	4.3907
60	29	4.7588	60	40	4.3857*
60	29	4.7607	60	40	4.3560
60	29	4.7591	60	40	4.3564
60	30	4.8105	60	40	4.3565
60	30	4.7123*	60	45	4.2319*
60	30	4.8099	60	45	4.2623
60	30	4.8111	60	45	4.2619
60	31	4.8184	60	45	4.2588
60	31	4.8084	60	50	4.1442
60	31	4.8055	60	50	4.1400
60	31	4.8095	60	50	4.1420
60	32	4.7714	60	50	4.1398
60	32	4.7782	60	60	3.9644
60	32	4.7785	60	60	3.9627
60	32	4.7786	60	60	3.9622
60	33	4.6194	60	60	3.9619
60	33	4.6177	60	90	3.7294
60	33	4.6141	60	90	3.7294
60	33	4.6126	60	90	3.7296
60	34	4.5960	60	90	3.7291
60	34	4.5964	60	120	3.5920
60	34	4.5996	60	120	3.5913

TABLE IV (continued,)

T = 29° C. Sp. Gy. = 0.9195.

Number of Drops.	Time between fall of first but one and last Drop.	Weight of Drops.	Number of Drops.	Time between fall of first but one and last Drop.	Weight of Drops.
60	120"	3.5916	60	300"	3.2813
60	120	3.5926	60	300	3.2811
60	180	3.4243	60	300	3.2811
60	180	3.4263	20	240	1.0400
60	180	3.4268	20	240	1.0402
60	180	3.4278	20	240	1.0402
60	240	3.3379	20	240	1.0399
60	240	3.3348	...	...	...
60	240	3.3358	...	...	...
60	240	3.3371	...	...	...
60	300	3.2814	...	...	...

From this Table the following Table V is derived. Column I shows *gt.* the growth time of the drops, column II shows the corresponding mean weights of the single drops. Column III shows the rate of delivery per second in grammes. It was found impossible to arrest an exact number of drops when the rate was faster than 60 drops in 25". A few rather discordant results got at the rate of 60 drops in 20" gave a mean of 5.5584, tending to show that at this high rate the drops were considerably larger than at any lower rate.

Towards the end of the Table at the slower rates the error of time becomes so magnified, the least alteration in the adjustment of the instrument makes such a sensible alteration in the entire time lapse that it is nearly impossible to avoid an error of less than 0".5 on the whole time of several minutes. Although the time error thus becomes palpable it remains nevertheless relatively to the whole time lapse, as immaterially small as are the inappreciable errors of the swifter rates of dropping.

TABLE V.

T = 29° C. Sp. Gy. = 0.9195.

I.	II.	III.
<i>gt.</i>	Mean Weight of Single Drop.	Weight of oil passing per second.
	Grms.	Grms.
(0".333)	(0.09264)	(0.27792)
0".417	0.08265	0.19837
0".433	0.08074	0.18631
0".450	0.08185	0.18189
0".467	0.07918	0.16968
0".483	0.07932	0.16412
0".500	0.08017	0.16035
0".517	0.08017	0.15518
0".533	0.07961	0.14927
0".550	0.07693	0.13985
0".567	0.07664	0.13524
0".583	0.07558	0.12957
0".600	0.07334	0.12221
0".617	0.07320	0.11871
0".633	0.07321	0.11560
0".667	0.07260	0.10891
0".750	0.07102	0.09469
0".833	0.06902	0.08283
1".000	0.06605	0.06605
1".500	0.06215	0.04144
2".000	0.05986	0.02993
3".000	0.05710	0.01903
4".000	0.05561	0.01432
5".000	0.05469	0.01094
12".000	0.05201	0.00433

These numbers present several interesting and important facts.

From *gt.* = .333 to *gt.* = .433 there is a diminution.  
 „ = .433 „ = .450 „ an increase.  
 „ = .450 „ = .467 „ a diminution.  
 „ = .467 „ = .500 „ an increase.  
 „ = .500 „ = 12.000 „ a continual di-  
 minution.

The most prominent fact is that, *on the whole*, the drops undergo a continuous diminution. To such an extent is this the case that the most rapidly falling drops of the above Table are nearly twice as heavy as the most slowly falling ones. The cause of this is probably to be sought for in the circumstance that when the flowing to the solid is more slow, the latter is covered with a thinner film of liquid, so that as the drop parts, the solid reclaims by adhesion more of the root of the drop than is the case when the adhesion of the solid to the liquid can satisfy itself from the thicker film which surrounds the drop in the case of a more rapid flow. The influence of rate is seen to extend even to the exceedingly slow rate of  $gt. = 12''$ .

This connexion between rate and weight (or quantity) should not be lost sight of by prescribers and dispensers of medicine, where a certain number of drops are to be given : A Pharmacist who administer 100 drops of a liquid drug at the rate of 3 drops per second may give half as much again as one who measures it at the rate 1 drop in two seconds : and so on.

For our present purpose the effect of rate upon the size of a drop is of great moment, because it proves that there is no such thing as a drop of normal size. At no degree of slowness of dropping do drops assume a size unaffected by even a slight change in the rate of their sequence. Hence, whenever a comparison has to be made between the sizes of different drops, we shall have to eliminate this source of difference by taking drops at exactly the same rate.

About the rate at which the diminution of size takes place for equal increments of  $gt.$ , the table gives us little information, beyond the fact that on the whole, the sizes of the drops at the slower rates are less influenced by equal increments of  $gt.$  than are those of the quicker rates. This however only appears distinctly at and below the rate of about  $gt. = 1''.00$ .

If the connexion between  $gt.$  and the drop size be represented by a curve (Fig. II. A.) the abscissae being the values

of  $gt.$  and the ordinates the corresponding weights, there is no apparent asymptote parallel to the axis of X. The curve presents however in its course two secondary maxima and minima.

	Secondary Maxima.	Secondary Minima.
(1)	$gt. = .450$	$gt. = .433$
(2)	$\left\{ \begin{array}{l} gt. = .500 \\ gt. = .517 \end{array} \right.$	$gt. = .467$

Although at these minima the drops are less than at the immediately succeeding rates, yet the quantity of liquid passed in a given time is, at every rate of dropping, greater than the quantity passed at a slower rate in the same time. The decrease of rate more than counterbalances the temporary increase in the drop size. This is seen on comparing the numbers of column III with one another. They are found to decrease continuously, though by no means uniformly, as the rate of dropping decreases.

The second maximum (at  $gt=.500$  and  $gt=.517$ ) is in remarkable connexion with the rate at which a series of drops may be converted into a continuous stream. At the rates of dropping from  $gt=.333$  to  $gt=.517$  inclusive the drops may be converted into a permanent stream by pouring a little of the liquid upon the sphere as the drops are falling from it. A stream is thus established which remains for any length of time if it be protected from all currents of air and vibration. At the rate  $gt=.519$  the stream may be established by the same means for a few seconds (about 30''); but the continuous part inevitably begins to palpitate, becoming alternately longer and shorter, thinner and thicker, until at length it draws up and is converted into drops. At the immediately succeeding slower rates of dropping, the same effect follows, but in each case in a shorter time. So that the slowest rate of dropping which may be converted into permanent running coincides with that rate which gives the second maximum size of drops ( $gt=.500$  and  $.517$ ). The appearance of a drop-convertible stream is peculiar, the narrowing which it undergoes

on leaving the solid being remarkably sudden. Curve B, Fig. II., shows the relative quantity of liquid passed in a unit of time. The abscissae give the value of  $gt$  and the ordinates the value of column 3 Table V.

In order to avoid the influence of variations in rate we shall for the future take the rate of dropping in all cases the same and unless the contrary is stated the rate adopted will be  $gt = 2''$ .

The factor, the influence of whose variation on the size of the drop we have next to consider, is the constitution of the liquid of which the drops are formed. For the above experiments concerning the influence of rate coconut oil was employed on account of its non-volatility. On allowing a quantity of it having an exposed surface of about two square inches to stand for 70 hours it was found to have increased about two milligrammes in weight, probably in consequence of oxidation: Its fixedness therefore and its perfect liquidness at the temperature  $28^{\circ} - 30^{\circ}$  C. make it well adapted for this special purpose. Chemically and physically however it is of little interest from the present point of view, because it is a mixture of several substances the proportion between which is indefinite.

It will be of great interest to examine the effect upon the size of drops of the chemical composition of liquids belonging to the same homologous series, such as the ethers, alcohols and corresponding acids. For this purpose and also for examining the effect of solution of solid matter upon the drop-size we must determine the drop-size of water under fixed conditions.

With mere mobile liquids, the Apparatus Fig. 1 fails to give a strictly uniform flow. As the liquid descends in B it adheres by capillary action to the lip of A for some time after the level of B is below the lip. The air at last separates the two, enters the flask A displaces the liquid there and restores the level to B. So that although the average height of B is constant yet it undergoes a series of slight but ceaseless

variations. As however this slight variation sensibly affects the rate of flow through the siphon, the apparatus is slightly modified as follows. Between the reservoir B with its flask A and the dripping sphere a second reservoir W is placed. This is kept in a state of continual overflow. The overflow is regulated by means of a few filaments of cotton wool hanging over the edge of the overflowing vessel and so fashioned that the thickest part of the cotton plug is in contact with the edge. Finally the rate of flow is so sensitive that it is impossible to procure an exact and predetermined rate by the ordinary screw adjustment of the holder which carries the siphon. For the final adjustment it is convenient to depend upon the elasticity of the siphon which is at first rigidly fixed so as to deliver the liquid at nearly the required rate. A heavy ring is then slipped on the siphon so as to bend it more or less. A little caoutchouc is wrapped round the ring where it touches the glass so as to prevent it from slipping. See Fig. III.

The following table shows how the size of a drop is affected by the quantity of solid matter which it holds in solution. The liquids examined were solutions of chloride of calcium of different strengths. They were prepared as follows:—

A solution nearly saturated (at 28° C.) was taken as the starting point, Solution 1. An accurately stoppered bottle was twice filled with solution 1, emptied into a beaker and mixed with two bottles of water. This gave solution 2. Half of this was kept and the rest, mixed again with its own volume of water gave solution 3 and so on. In this way without knowing the strength of solution 1: we know that the successive strengths of the solutions whether there be loss of volume, due to chemical combination, or not, are as  $S, \frac{S}{2}, \frac{S}{4}, \frac{S}{8}, \frac{S}{16}, \frac{S}{32} \dots 0$

These numbers give exactly the relative quantity of solid matter in a unit of volume of the liquid. As however solution 1 on dilution evolves heat, the sizes of the drops cannot be derived from their weight directly. The specific gravity of each solution has to be determined.

TABLE VI.

*gt.* = 2'. T = 28° C. Radius of Sphere = 22.1. m. m.

Solution of Cacl.	Wt. of 30 drops.	Mean Wt. of a single drop.	Sp. Gy.	Relative size of a single drop.
S	{ 6.6715 6.7031 6.8347 6.8577 }	0.225558	1.4939	0.15098
$\frac{S}{2}$	{ 6.3120 6.3031 6.3653 6.3771 }	0.211396	1.2786	0.16533
$\frac{S}{4}$	{ 5.8698 5.8841 6.8746 5.8722 }	0.195839	1.1721	0.16742
$\frac{S}{8}$	{ 5.7265 5.7332 5.7279 5.7334 }	0.191008	1.0720	0.17817
$\frac{S}{16}$	{ 5.0241 5.0451 5.0184 4.9790 }	0.167222	1.0383	0.16105
$\frac{S}{32}$	{ 5.2149 5.2175 5.2368 5.2420 }	0.172593	1.0172	0.16967
$\frac{S}{64}$	{ 5.1842 5.1854 5.1904 5.1889 }	0.172907	1.0084	0.17147
$\frac{S}{128}$	{ 5.0275 5.0520 5.0536 5.0433 }	0.168137	1.0039	0.16750
Water $\frac{S}{8}$	{ 5.5534 5.5534 5.5524 5.5584 5.5524 5.5598 }	0.185166	1.0000	0.18517

The column of the relative sizes of single drops (which is got by dividing the mean weights by the respective specific gravities) shows that, under like conditions, a drop of water is larger than a drop of solution of chloride of calcium of any strength whatever. The comparatively small quantity of solid matter in  $S/128$  causes the drop to diminish about  $1/9$  of its volume. We must bear in mind that the successive increments of solid matter affects the size of the drop in several ways. By affecting the cohesion of the water : by asserting its own cohesion ; by its superiority in weight determining a fall of a drop comparatively sooner, and in this case by the chemical affinity of the solid to the liquid, which may be saltatory according to the possible hydrates of chloride of calcium. It is seen that these various influences cause an irregularity in the diminution of the size of the drop as it acquires more solid matter. In fact, it is only when the liquid has the great strength of  $S/8$  that the diminution in drop size becomes continuous. On account of the chemical union which takes place on dissolving  $\text{Ca Cl}$  in water I have not given the absolute strengths of the various solutions. To see how much of the intermediate irregularity is due to the existence of chemical union between the two bodies of which the liquid is composed, we may next take nitrate of potash which as far as is known does not combine with water at all.

Solutions of nitrate of potash were made of the following strengths by weight :—

22	of water to	1	of nitrate of potash.
22	„	2	„ „
22	„	3	„ „
22	„	4	„ „
22	„	5	„ „
22	„	6	„ „
22	„	7	„ „
22	„	8	„ „

These were made to drop from the ivory sphere (Fig. III)

at the rate of  $gt. = 2''$ . In each instance four batches of 30 drops each were weighed.

TABLE VII.

$gt. = 2''$ . T = 28° C. Radius of Sphere =  $\overset{m. m.}{22.1}$

I.	II.	III.	IV.	V.
Solution $\frac{HO}{KNO_6}$	Mean weight of single drop.	Specific gravity by experiment	Relative size of single drop.	Weight of $KNO_6$ in single drop.
$\frac{22}{8}$	0.18022	1.1267	.16014	
$\frac{22}{7}$	0.18611	1.1130	.16723	.05921
$\frac{22}{6}$	0.18254	1.0987	.16618	.04978
$\frac{22}{5}$	0.17805	1.0832	.16439	.04047
$\frac{22}{4}$	0.16917	1.0680	.15840	.03075
$\frac{22}{3}$	0.17714	1.0511	.16853	.02411
$\frac{22}{2}$	0.17908	1.0341	.17318	.01628
$\frac{22}{1}$	0.18613	1.0161	.18311	.00846
$\frac{22}{0}$	0.18517	1.0000	.18517	.00000

On comparing the numbers of column IV with one another we can trace the following effects, bearing in mind that the chief factors are (1) the cohesion of the water to itself, (2) the cohesion of the nitrate of potash to itself. On the addition of the first parts of nitre ( $\frac{22}{1}$   $\frac{22}{16}$   $\frac{22}{3}$   $\frac{22}{4}$ ) the cohesion of the water is successively diminished. Afterwards ( $\frac{22}{3}$   $\frac{22}{6}$   $\frac{22}{7}$ ) the cohesion of the nitre begins to assert itself whereby the size of the drop is partly recovered. There is a stage of dilution in the case of nitre when the Sp. Gy. is 1.1680 where the drop size is a minimum. Further it is seen from column V that the quantity of nitre in a drop

increases continually as the strength of the solution increases, although the weight and volume of the drop both vary.

Inversely the regularity of the variation of drop size in the case of nitre, points to the absence of definite hydrates of that body.

It would be easy but delusive to construct a formula connecting the specific gravity with the drop size or deep weight of the solution. But a graphic representation seems to show the connexion between the variables.

In fig. II the abscissae of the curve C represent the quantities of nitre dissolved in the same quantity of water. The ordinates of curve C show the corresponding weights; those of D, the corresponding volumes of the drops; those of E, the corresponding weights of nitrate of potash contained in a drop.

It is confessedly a matter of great interest and still greater difficulty to determine exactly the relation which exists between a dissolved solid and its solvent. The question may perhaps receive additional light from experiments similar to the above but more extensive and with this special object in view. Comparing the tables VI and VII there can for instance be little doubt that the apparent irregularities in table VI are owing to the existence of definite hydrates of chloride of calcium, while the uniformity of the numbers of table VII show that no hydrate of nitrate of potash exists at this temperature. If this be the true explanation we may certainly make use of the method of drop-weighing to trace the existence or absence of hydrates in solution of salts, or generally the existence of definite compounds in mixtures. And thus perhaps Berthollet's hypothesis of reciprocal recombination may receive confirmation or the reverse.

An investigation of this kind would lead away from the present purpose.

We have next to consider the influence which the variation in the chemical nature of the drop-forming liquid may exercise upon the drop-size in the case *SLG*.

The liquids which were selected for this purpose were cho-

ken as being typical of extensive classes rather than as being connected with one another in immediate chemical relation. They were :

Water; Alcohol; Acetic Acid; Acetic Ether; Butyric Acid; Oil of Turpentine; Benzol; Glycerine and Mercury.

The several liquids were allowed to drop from the same platinum cup. The arrangement of the apparatus was quite similar to that described in I. the ivory ball being replaced by the platinum cup, and the overflow of the cup being determined by strips of paper bent over its edge. The last case, mercury, is the only one which requires some explanation. A few years ago I noticed a fact which has probably been observed by others, but of which I find no mention: namely that mercury which holds even a very little sodium in solution has the power of "wetting" platinum in a very remarkable manner. The appearance of the platinum is quite similar to that of amalgamable metals in contact with mercury. But the platinum is in no wise attacked. Further, the amalgam may be washed off by clean mercury and the latter will also continue to adhere equally closely to the platinum. All the phenomena of positive capillarity are presented between the two. The surface of the mercury in a platinum cup so prepared is quite concave; and a basin of mercury may be emptied if a few strips of similarly prepared platinum foil are laid over its edge: just in the same way as a basin of water may be emptied by strips of paper or cloth; and under the same conditions, namely that the external limb of such capillary siphon be longer than the internal one.

I generally use this curious property of sodium amalgam for cleaning platinum of vessels. It enables us now to examine the size of drops of mercury under conditions similar to those which obtain in the case of other liquids.\*

\* In regard to the above mentioned property of sodium, the following observations may be of interest. At first, the explanation naturally suggests itself that the effect wrought by the sodium may be due to an absorption of oxygen in consequence of the oxidation of the sodium,

After the cup had been used for the other liquids, its surface was rubbed with sodium amalgam and washed with clean mercury. A few strips of similarly prepared platinum foil being bent over the edge and pressed close to the sides of the cup, the mercury could be handled similarly to the other liquids.

The following table shows :

1. The liquids examined ;
2. The number of drops which were weighed ;
3. The weights found ;
4. The mean weights of single drops ;
5. The observed specific gravity at the given temperature ;
6. The relative sizes of single drops.

The experimental numbers obtained are given without omission. They are arranged after experiment in the order of magnitude of the relative drop sizes.

the consequent diminution of the gaseous film between the two metals and the consequent excess in the superior pressure of the air. This however cannot be the true explanation, because it is found that the perfect contact between the two or wetting, takes place equally well in an atmosphere of nitrogen, of carbonic acid and in vacuo. Hence, if I may venture upon a guess, unsupported by direct experimental evidence, I should be rather disposed to assign the action to the effect of nascent hydrogen due to the action of the sodium upon traces of moisture. Perhaps even the least oxidizable metals may be coated with a thin film of oxide which is reduced by the nascent hydrogen at the same moment that the mercury is presented to the reduced metal. It is found that iron, copper, bismuth and antimony are also wetted by mercury if their surfaces are first touched with sodium amalgam. Not only do the latter metals lose this power on being heated (as we might expect in consequence of their superficial oxidation) but platinum, from which the adhering mercury film has been wiped by the cleanest cloth or from which it has been driven by heat, also loses the power. The surface of clean platinum condenses, it is supposed a film of the oxygen; and the removal of this might alter the adhesion between the mercury and platinum. But such a film could scarcely exist in vacuo or in another gas.

TABLE VIII.

m.m

T=26° C.  $gt. = 2''$  — Radius of curvative of platinum cup 11.4

I.	II.	III.	IV.	V.	VI.
Name and Formula of Liquid.	Number of Drops.	Weight of Drops.	Mean Weight of Single Drop.	Specific Gravity.	Relative Size of Single Drop.
Water HO	{ 20	2.9703	0.14828	1.00	0.14828
		2.9923			
		2.9472			
		2.9603			
Glycerine C <sub>6</sub> H <sub>8</sub> O <sub>6</sub>	{ 20	2.9583	0.12804	1.12452	0.1028
		2.5496			
		2.5576			
Butyric Acid C <sub>8</sub> H <sub>8</sub> O <sub>4</sub>	{ 10	1.2877	0.05813	1.0017	0.05803
		1.1616			
		1.1630			
Mercury Hg	{ 20	1.1634	0.78703	13.5728	0.05798
		7.9655			
		7.8984			
		7.7977			
Benzol C <sub>12</sub> H <sub>6</sub>	{ 20	7.8197	0.04778	0.8645	0.05527
		0.9514			
		0.9488			
		0.9579			
Turpental C <sub>20</sub> H <sub>16</sub>	{ 20	0.9644	0.04331	0.8634	0.05016
		0.8675			
		0.8656			
Alcohol C <sub>1</sub> H <sub>6</sub> O <sub>2</sub>	{ 20	0.8653	0.03949	0.8163	0.04960
		0.7890			
		0.7910			
Acetic Ether C <sub>4</sub> H <sub>5</sub> OC <sub>4</sub> H <sub>3</sub> O <sub>3</sub>	{ 20	0.7896	0.04149	0.8930	0.04647
		0.8214			
		0.8300			
Acetic Acid HOC <sub>4</sub> H <sub>3</sub> O <sub>3</sub>	{ 20	0.8381	0.04540	1.0552	0.04302
		1.3636			
		0.9055			
	{ 20	0.9095			

The numbers of column 6; with which we are now exclusively concerned present several points of great interest. In the first place it appears that the specific gravity of a liquid is not by any means the most powerful determinant of the drop-

size. Thus butyric acid which has sensibly the same specific gravity as water, gives rise to a drop of less than half the size of the water drop: while mercury of singular specific gravity has no exceptional drop-size. Lastly it may be observed how that remarkable body, water asserts here again its pre-eminence. The first impression which these numbers make is that there is three groups of magnitude  $n$ ,  $2n$ ,  $3n$ . But it is possible that a change in the nature of the solid might throw these drop-sizes into a different order; and certainly until a very much greater number of bodies is examined in this sense it would be premature to attempt to establish anything like a law.

It is sufficient for the present to point out that the drop-size is not directly dependent upon either the specific gravity or boiling point. Nor does it stand in any obvious relation to what is sometimes called the liquidity, mobility or "thinness" of a liquid. For we find that glycerine and (from former experiments) cocoa-nut-oil both from smaller drops than water, the one being heavier and the other lighter than that body; and both being sluggish. On the other hand alcohol and acetic acid both perfectly mobile liquids give rise to drops about half as large as those of glycerine.\*

Hence it is clear that we are still ignorant of that property of a liquid which determines its drop-size, and are not yet in a position to connect the drop-size with any of the known physical or chemical properties of liquids. We approach the solution of the problem by studying the effects of change in some others of the variables.

The adhesion between the liquid which drops and the solid from which it drops is also affected by the curvature and general geometric distribution of the solid at and about its low-

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\* The evaporation of the more volatile of these liquids is a source of slight error; not so much on account of the direct loss by weight of the drop in falling, as by reason of the cooling which it causes and the consequent variation in density and adhesion. Such source of variation will form a separate subject of investigation.

est point. And the variation in the adhesion between the solid and liquid caused by the variation in the geometric distribution of the solid, may and does in its turn affect the size of the drop.

From this aspect one of the simplest kinds of variation is that offered by a system of spheres of various radii but made of the same matter. And this case is an important one because it undoubtedly offers the key to all drop-size variation arising from a similar cause. To study this point we may make use of any one convenient liquid such as water, and cause it to drop at a fixed rate from spheres of various radii, including the extreme case of a horizontal plane.

This extreme case however presents certain practical difficulties. From a plane it is almost impossible to get a series of drops, uniform in growth-time and in position. A ripe drop hanging from a horizontal plane of a substance which it wets will seek the edge thereof. Several drops may form upon and fall from the same plate at the same time and independently of one another. It is only by employing a plate not absolutely flat that an approximation to the required conditions can be made. Taking  $r$  for the radius of curvature therefore, the first numbers for  $r = \infty$  can only be considered as an approximation. The arrangements for the other cases were quite similar to that described in I Fig. III.

No. 1. A glass plate, fastened to and held by a vertical rod.

Nos. 2, 3, 4. Selected globular glass flasks.

Nos. 5, 6, &c. Perfectly spherical solid glass spheres.

TABLE IX.

Water. *gt.* = 2'' T = 22 ° .5 C.

I.	II.	III.	IV.	V.
	Number of Drops.	Radius of Curvature.	Weight of Drops.	Mean Weight and relative size of single drop.
1	{ 20 } { 20 }	∞	{ 5.3325 } { 5.2873 }	0.26549
2	{ 20 } { 20 }	mm 113.1	{ 4.9226 } { 5.0907 }	0.24808
3	{ 20 } { 20 }	70.1	{ 4.5260 } { 5.5218 }	0.22619
4	{ 20 } { 20 }	47.2	{ 4.2781 } { 4.2249 }	0.21257
5	{ 20 } { 20 }	17.5	{ 3.5055 } { 3.4733 }	0.17497
6	{ 20 } { 20 }	15.1	{ 3.3562 } { 3.3500 }	0.16765
7	{ 20 } { 20 }	11.5	{ 3.0281 } { 3.0206 }	0.15122
8	{ 20 } { 20 }	11.2	{ 2.9803 } { 2.9780 }	0.14896
9	{ 20 } { 20 }	10.0	{ 2.8665 } { 2.8619 }	0.14321
10	{ 20 } { 20 }	7.5	{ 2.6765 } { 2.6660 }	0.13356
11	{ 20 } { 9 }	7.1	{ 2.5752 } { 1.1591 }	0.12877

It appears, therefore that the drop increases in size according as the radius of the sphere increases from which the drop falls; and further that the difference of drop-size brought about by this cause alone may easily amount to half the largest drop-size. For dispensers of medicine this fact is as important as that pointed out in I; where it was shown that the

growth time so materially influenced the drop-size. The lip of a bottle from which a drop falls is usually annuloid. The amount of solid in contact with the dropping liquid is determined by the size of two diameters; one measuring the width of the rim of the neck, the other the thickness of that rim. In most cases the curvature and massing of the solid at the point whence the liquid drops, is so irregular as not to admit of any mathematical expression.

The reason why drops which fall from surfaces of greater curvature are larger than those which fall from surfaces of lesser curvature is surely this: In the case of a surface of greater curvature the base of the drop has more nearly its maximum size; the neighbouring liquid film, from which the drop hangs, is, on the whole, nearer to the centre of gravity of the hanging drop; the contact between the two is more extensive and intimate so that the drop is held for a longer time and therefore grows more. On comparing columns 3 and 5 of Table IX there does not appear to be any obvious law of connexion between the two; nor indeed can the numbers of column 4 pretend to such a degree of accuracy as would justify us in attempting to establish one. This is seen on comparing *inter se* the numbers of column 4. Especially with the spheres of longer radii there is so much difficulty in getting an uniform wetting of the surface whence the drop falls, and this so materially influences the drop-size, that the numbers found are seen to vary considerably. Greater accord is obtained with spheres of less radii. As we might have expected, the same absolute increase in length of radius, takes less effect upon the drop size in the case of longer than in that of shorter radii. The infinite, or at least indefinitely great difference between the radii 1 and 2 produces about the same effect upon the drop-size as the difference of 43<sup>mm</sup>. between the radii 2 and 3, and so on. The following table of first differences shows this more strikingly:

$r$	$-r$	$w$	$-w$
$n+1$	$n$	$n+1$	$n$
	$\infty$	0.01854	
	43.	0.02189	
	22.9	0.01362	
	29.7	0.03760	
	2.4	0.00732	
	3.6	0.01643	
	0.3	0.00226	
	1.2	0.00575	
	2.5	0.00965	
	0.4	0.00479	

The relation exhibited in this table supports the supposition that the size of the drop varies inversely as some function of the figure bounded below by a circular horizontal tangent plane of constant diameter, (less than that of the sphere), laterally, by a cylinder of vertical axis standing on the tangent plane and cutting the sphere, and above by the convex surface of the sphere. Fig. IV.

As the diameter of the sphere still further diminishes, the size of the drop is limited by the possible size of its base: until finally the sphere is completely included in the drop.

It would be interesting, but it would take us too far to consider the various cases of liquids dropping from cones edges, solid angles, cylinders, rings &c. We must content ourselves, in this direction with the fact that the size of a drop is greater the more nearly plane is the surface from which the dropping takes place. If it were possible for a drop to fall from a concave surface we would anticipate a still further increase in its size.

The relation between drop-size and curvature may be more strikingly shown by arranging the spheres one above the other in the order of magnitude Fig. V. Each sphere receives the drops from the higher one. The quantity of water which drops in a given time, is the same for each sphere. Hence in every case the number of drops is inversely as their size. So

that by counting the numbers of drops which fall from any two spheres in the same time, we get at once the relative sizes of the respective drops. For several reasons this plan of comparison is not sufficiently accurate to measure drop sizes, but it offers a method for making the difference of drop size visible to any number of persons at once.

The only other variation in the geometrical relation between the solid and the liquid which we shall consider is the variation in the size of a circular horizontal plane from which drops fall.

Five discs of copper foil were cut of the radii  $\frac{5}{20}$ ,  $\frac{4}{20}$ ,  $\frac{3}{20}$ ,  $\frac{2}{20}$ ,  $\frac{1}{20}$ , of an inch respectively. These were fastened horizontally to vertical wires and having been thoroughly cleaned by momentary immersion in nitric acid and washing, water was made to drop from them as before, at the rate *gt. = 2''*

Table X shows the influence of this kind of variation upon drop size. The want of accord in the numbers of the largest disc is owing to a peculiar tremor which the drops exhibit at the moment of delivery. The same phenomenon occurred also but to a less extent with the next smaller disc. With the remainder it was not noticeable.

TABLE X.

*gt.* = 2". *T* = 23° C. Water.

1.	2.	3.	4.
Radius of Disc.	Number of Drops.	Weight of Drops.	Mean Weight and relative size of single drop.
$\frac{5}{20}$ in.	20	3.3682	0.16325
	20	3.1193	
	20	3.2523	
	20	3.3256	
	20	3.2594	
$\frac{4}{20}$ in.	20	2.9693	0.14915
	20	2.9854	
	20	2.9746	
	20	3.0031	
$\frac{3}{20}$ in.	20	1.9333	0.09666
	20	1.9244	
	20	1.9504	
	20	1.9248	
$\frac{2}{20}$ in.	20	1.4618	0.07332
	20	1.4672	
	20	1.4688	
	20	1.4682	
$\frac{1}{20}$ in.	20	0.8250	0.04107
	20	0.8212	
	20	0.8208	
	20	0.8190	

The curvature and shape of the Solid and its consequent massing towards the liquid is intimately connected with the next phase of variation which we shall consider, to wit, the variation in the chemical composition of the solid from which the drop falls. The influence of this kind of variation is to be studied by examining the size of drops, formed under like

circumstances from spheres of the same size but made of different material. Since, in this case, the liquid remains the same, we must limit the solids examined to such as the given liquid completely wets. In this case variation in the drop size implies a variation in the thickness of the liquid film covering the solid. The latter must be caused by variation in the adhesion between the solid and liquid. Finally such adhesion can only vary through one or both of two causes, namely variation in the density of the solid or in its specific adhesion dependent upon its chemical nature.

The first qualitative experiment was made upon three equal spheres of Brass, Glass and Cork respectively. They were hung one above the other in the manner before described, so that the drops from one fell upon the lower one.\* It was found that, in whatever order the spheres were arranged, when the flow was uniform and not quicker than  $gt = 2''$ , the dropping from the Cork took place with the greatest rapidity, that from the Glass next and that from the Brass most slowly. Showing that the brass gives rise to the largest, the glass to the next largest and the cork to the least drops. From this it would seem that the drops are in the same order as to size as are the solids as to density. We shall find however that this is not always the case: and that some other property as well as density is at work to influence the drop-size. The quantitative experiment, the results of which are given in Table XI confirms the results of the qualitative experiment given above; but shows, at the same time that the joint influences of density and chemical diversity of the solid have only a trifling effect upon the drop-size. The conditions of the experiment were similar to those previously described.

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\* In this kind of experiment there should be a considerable mass of cotton wool on each sphere to receive the drops from the higher one and, by acting as a reservoir, to regulate the flow.

TABLE XI.

Water *gt.* = 22'. T = 22°.9 C.  $r.$  = 7.1<sup>mm.</sup> Number of drops = 20.

Substance.	Weight of 20 drops.	Mean weight of single drop
Cork	2.4816	0.12418
	2.4848	
	2.4832	
	2.4789	
	2.4821	
Glass	2.4877	0.12975
	2.5930	
	2.5985	
	2.5989	
	2.5949	
Brass	2.5953	0.13118
	2.5900	
	2.6225	
	2.6229	
	2.6260	
	2.6295	
	2.6296	
	2.6116	

When a liquid drops from a solid it is not always that the adhesion between the solid and liquid is overcome. The phenomenon of "wetting" implies a superiority of the adhesion between the solid and liquid over the cohesion of the liquid: and in all cases where a liquid drops from a solid which it wets, the act of separation is a disruption of the liquid and not a separation of the liquid from the solid: that is, the separation is a failure of cohesion and not of adhesion. We are not, however, on this account, justified in anticipating that the size of a drop is unaffected by the chemical nature of the solid from which it drops, even in those cases where the adhesion between the solid and liquid is greater than the cohesion of the liquid, that is, where the liquid completely wets the solid: because although it is the liquid which is broken, yet

the size of the broken off part or drop depends in great measure upon the thickness of the residual film, as we have seen in examining the influence of the growth time, and the radius of curvature.

Adhesion may also exist between a solid and a liquid which does not wet it, as when a drop of mercury hangs from a glass sphere. But the cohesion of the liquid in such a case, by its effort to bring the liquid to the spherical form, and the weight of the drop so modify the adhesion between the solid and liquid by altering the size of the surface of contact between the two, that the size of the drop gives no direct clue to the cohesion of the liquid.

We may now examine a few cases in which, the size of the sphere remaining the same and its density in some instances nearly so, the matter of the solid varies; the liquid however wetting it in all cases. This will show whether the differences of Table XI are due wholly to differences of density of the solid or also or wholly to differences of chemical constitution.

Equal spheres of the substances were made by casting them in the same bullet mould. The surfaces of the metals were roughened by momentary immersion in acid: Tin and Antimony in Hydrochloric and the others in Nitric acid. Without this precaution a metallic surface is apt to be wetted only locally, the base edge of the drop is irregular and inconstant and the drop-weight varies. Indeed with some metals such as Tin, a smooth and bright surface is scarcely wetted by water.

As the bodies examined have different coefficients of expansion by heat; and one of them expands on solidification, it was necessary to test the equality of their size and remedy any inequality. This was done by arranging three of them one at each corner of small equilateral triangle drawn on a large piece of plate glass. Another piece of plate glass was then placed upon the spheres so as to rest on all three and was slightly loaded. On passing a gauge between the plates at their edges, the slightest inequality of the spheres could be detected because the gauge lifted the plate off the smallest

of the three balls, which could then be moved. The larger spheres were then reduced in size by brisk agitation in acid. The sulphur and phosphorus were for the same purpose washed with ether.

TABLE XII.

Water *gt.* = 2". T = 23° C. Radius of Curvature = 7<sup>mm.</sup>

I.	II.	III.	IV
Substance.	Weight of 20 drops.	Mean weight of single drop.	Specific Gravity of Solid.
Antimony	2.3905	0.11984	6.80
	2.3980		
	2.3968		
	2.4016		
Sulphur	2.4019	0.12021	2.00
	2.4067		
	2.4046		
	2.4063		
Cadmium	2.4022	0.12185	8.70
	2.4462		
	2.4387		
	2.4374		
Zinc	2.4358	0.12246	6.86
	2.4495		
	2.4481		
	2.4518		
Lead	2.4478	0.12264	11.44
	2.4522		
	2.4525		
	2.453		
Phosphorus	2.4528	0.12274	2.08
	2.4564		
	2.4528		
	2.4584		
Bismuth	2.4580	0.12285	9.90
	2.4589		
	2.4843		
	2.4864		
Tin	2.4829	0.12425	7.29
	2.4861		
	2.4861		

Although there is only slight difference between the consecutive terms of column 3, yet between the extremes of Antimony and Tin, a well-marked difference exists.

This table shows that the drop size stands in no simple relation either to the equivalent, density, or chemical character of the solid : and establishes the existence of a specific adhesion, independent of these. Although the differences of table XI may be partly owing to the difference of density of the solids, cork, glass and brass, yet we see from XII that there is about half as great a difference between the sizes of drops from Antimony and Tin as between those from Cork and Brass : although the difference of density between the first two is small compared with that between the last. Again, Sulphur gives rise to drops intermediate between those of Antimony and Cadmium.

Without therefore venturing to assert that density is without influence on drop-size it is clearly proved that it does not exert the most powerful influence.

We have finally to examine the direction and extent of alteration in drop-size caused by change of temperature. A change in the temperature of the dropping liquid may affect the drop-weight without altering the drop-size, by altering the density of the liquid. It may further alter the drop-size by altering the size and therefore the curvature of the solid. Any error introduced by the first of these sources is eliminated by dividing the observed weight by the specific gravity at the proper temperature as in the case of different liquids at the same temperature : Errors from the second source may be certainly safely neglected, being far within the errors of observation.

In the place where these experiments were made the range of natural atmospheric temperature is very small. From the coldest to the hottest season the difference scarcely exceeds  $10^{\circ}$  C. This circumstance made an extended and minute study of the influence of temperature impossible : by preventing more than one observation at each temperature being made.

The liquid taken was water and the solid was glass. The water was heated to the boiling point and placed in the apparatus Fig. III. The sphere from which the water fell was the bulb of the thermometer which measured the temperature. Fully the upper half of the sphere was covered with cotton wool so that the whole of the sphere was kept wet. The considerable mass of mercury in the bulb of the thermometer or dropping-sphere itself served to make more uniform the temperature of the drops : while the actual contact between these and the spherical bulb insured a tolerably close approximation between the actual temperature of the drops and that indicated by the thermometer. Though the temperatures observed cannot therefore pretend even to approximate positive accuracy : yet they are certainly in the actual order of magnitude. The arrangement is seen in Fig. VI.

TABLE XIII.

Water. *gt.* = 2''  $r.$  = 7.4<sup>mm</sup>. Number of drops 20.

Temperature Centigrade.	Weight of twenty drops.	Weight of single drop.	Relative mean size of single drop, corrected for tem- perature.	
40.3 {	44.1 <sup>o</sup>	2.5564	0.12782 } 0.12897 } 0.12913 }	0.12985
	40	2.5795		
	37	2.5826		
30.6 {	35	2.6083	0.13041 } 0.13052 } 0.13080 } 0.12980 } 0.13032 } 0.13022 } 0.12992 } 0.13029 } 0.13016 }	0.13066
	33.9	2.6105		
	32.6	2.6161		
	31.2	2.5960		
	30.6	2.6065		
	29	2.6044		
	28.2	2.5983		
	28	2.6078		
27.5	2.6032			
20.4—20.4	2.6480	0.13240	0.13262	

The differences of temperature are so grouped together that the means of the groups differ from one another by about  $10^{\circ}$  C. The single drop-weights are correspondingly grouped and the mean of each group is then divided by the specific gravity of water ( $0^{\circ} = 1$ ) at the mean temperature of the group.

It appears then that for a range of  $20^{\circ}$  C. or  $36^{\circ}$  F. the difference in drop-size effected by change of temperature in the liquid is inappreciably small, not being more than

$0.00277$ , a quantity almost within the limits of experimental error as appears on referring to Table XI; when the greatest difference between the numbers for glass, which should be

$0.00043$ , or a sixth of the greatest difference due to variation in temperature.

On the whole then we may conclude that the temperature takes very little effect upon the drop size in this case. No doubt near the point of solidification where liquids have an incipient structure, the drop-size would be subject to sudden changes of magnitude. A few experiments with other liquids, namely turpental, acetic acid and alcohol showed that with them the drop-size was almost equally insensitive to change of temperature; and in all cases as with water the lower the temperature on the whole, the larger the drop.

We have now examined *seriatim* all the chief causes upon which the drop-size depends in the case S L G. They are (1) Rate of delivery; (2) Solids held in solution; (3) Chemical variation of liquid; (4) Radius of curvature a case of geometrical relation between solid and liquid; (5) Density and chemical nature of solid; (6) Temperature.

Our data are however still insufficient for us to predict under all circumstances the relative sizes of the drops of liquids under known external conditions. Clearly the term we miss is closely related to the specific cohesion of the liquid. But what is cohesion? and how can it be measured? It lies

perhaps in the nature of things, it seems at least inevitable that the nomenclature of elementary properties should be vague and unsatisfactory. The properties of solids :—hard, soft, brittle, tough, tenacious, elastic, malleable do not stand in any definite relation to one another. Even the hardness, which resists abrasion, the hardness which resists penetration, the hardness which resists crushing are by no means identical ; so that one body may possess more of the one sort of hardness than a second body does, while the second body exceeds the first in another sort of hardness. Nor do any of the above mentioned properties of solids stand in any simple relation to that resistance to the separation of contiguous parts which is called cohesion.

By no attribution of this single property of cohesion, could we define shell-lac or ice, bodies which are at the same time tough, brittle, elastic and soft.

There appear to be two kinds of solid cohesion, which may be called *stubborn* and *persistent*. These may coexist but are not identical. The one is strong to assert the other pertinacious to maintain. The four following substances may serve to illustrate the possession of these two cohesions in various quantity :—

Talc has little stubborn and little persistent cohesion.

Glass „ much „ „ „ „ „

Gold „ little „ „ much „ „

Iron „ much „ „ much „ „

The necessity for this discrimination exists in a yet higher degree in liquids. If we conceive two liquids of different nature dropping from the same substance which they both wet, and if there be only one kind of cohesion: the one which has the greatest cohesion will tend most strongly to assume the spherical form: and this would tend to cause it to drop sooner or have a smaller drop size than the other. On the other hand the liquid of stronger cohesion will cling most strongly to the film of liquid adhering to the solid: this will keep it longer from falling and thereby in-

crease the drop-size. Hence an increase of cohesion tends to produce two contrary effects. But if there be a similar distinction between the two kinds of cohesion of liquids as above pointed out in the case of solids, we have the following consequence.

It is the persistent cohesion which causes the assumption of the spherical form: the stubborn which resist the separation of the drop. The former tends to diminish the latter to increase its size. As one or other predominates, the size of the drop varies.

Accordingly, the drop-size is by no means a measure of what is generally called the cohesion of the liquid: but rather a measure of the difference between the two cohesions stubborn and persistent: and the law is that the drop-size varies inversely as its persistent and directly as its stubborn cohesion.

In mercury, water and glycerine the stubborn cohesion is greater in proportion to the persistent cohesion than in the other liquids examined: but it by no means follows that persistent cohesion is wanting in mercury or stubborn in alcohol.

When a drop is in the act of falling its stubborn cohesion is in equilibrium with the resultant of two forces; the one, the persistent cohesion tending to produce a spherical form, the other the weight of the drop. Since the former of these component forces is, for the same liquid constant, it seems as though the weight of the drop might be taken as a measure and expression of the stubborn cohesion. But such is not the case, because we have no ground for supposing that the diameter of the drop where the separation occurs, is of constant size: on the contrary, it must be conceded that in large drops, this hypothetical surface of stubborn cohesion is larger than in smaller drops. Further, unless we know the exact shape of a drop in all cases we are not in a position to deduce the size of the surface of cohesion from the drop-size or drop-weight.

In the cases where it has been tried it has not been found

that the nature of the gaseous medium in the case S L G exerts any appreciable or definite influence upon the drop-size. Taking glass for the solid and water for the liquid the medium was changed from air to nitrogen, hydrogen and carbonic acid respectively. The exceedingly slight alteration wrought by this change in the drop size may probably have been due to the different solubility of the gases in water and the consequent alteration in the cohesion of that liquid.

Having traced the effect of variation in the conditions which determine the size of a drop in the general case SLG : or, where from a Solid, a Liquid drops through a Gas : we come to the case SLL, that is where, from a Solid, a Liquid drops through a Liquid. As in the cases of SLG we must, here also, take the three terms of such chemical nature as to be without action upon one another.

### S L L

#### FROM A SOLID A LIQUID DROPS THROUGH A LIQUID.

A preliminary quantitative experiment was made under the following conditions. Water was made to drop from a glass sphere at the rate  $gt.=5''$ . The drops were collected in a tube bearing an arbitrary mark. The number of drops required to fill the tube up to this mark was noted. Then the sphere was surrounded by turpentine and the rate having been brought again\* to  $gt.=6''$ , the number of drops of water necessary to fill the tube up to the same mark was counted. The turpentine being replaced by benzol, the same operation was performed. The entire arrangement of the Stalagmometer † is seen in fig. VII.

X, Y are contrivances described before for giving an uniform flow of water.

The syphon A rests upon the cotton wool covering half of the dropping sphere and thermometer bulb G. The sphere is

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\* A diminution of  $gt.$  is observed,

† Stalagnos, a drop.

held by its stem B in the clamp H. C is half a globular 1 lb. flask, supported by the filter stand K. Through the neck of C passes the tube D. C and D are joined liquid tight by the india-rubber collar L. A few arbitrary marks are made at E. The lip of C. is turned down to a beak at M.

In the adjustment of the instrument to get the required value of *gt.* the holder C is slipped along so that the drops from G fall between C and D and not into D. When the required rate is obtained it is slipped back again. When such liquids as turpental are used, a little water is poured between D and C to protect the caoutchouc. In all cases where a liquid is employed C is filled till it runs over.

In the first experiment of which the results are given in following table, the numbers are subject to two sources of error : The volume filled is rather small and no allowance was made for the meniscus.

In this as in all cases of SLL, care must be taken not to shake the instrument.

TABLE XIV.

Water *gt* = 6'' T = 22° C. Radius of glass sphere = 7.4 <sup>mm.</sup>

	I.	II.	III.	IV.
Medium.	No. of drops of water required to fill a given volumn.		Mean of Column 2.	Relative size of single drops reduced to, through air = 1.
Air . . . . {	58	56	57.0	1. 0
Turpental {	28	27	26.7	2.14
	26	26		
Benzol . . {	7	7	7.0	8.14

There is therefore a greater difference between the drop-sizes of water in Benzol and Turpental than between those of

**Turpental and Air.** The turpental and benzol here employed had the specific gravities of 0.863 and 0.864 respectively they may therefore be considered of equal density. Hence variation in the liquid medium independent of variation in its density produces an enormous effect upon drop-size. We shall have occasion to return to this case.

The influence of the liquid medium on the drop size and the share which the specific gravity of the medium has in determining the drop size will be well seen on comparing the drop size of mercury which falls through various liquid media.

The arrangement of the apparatus for this purpose is seen in Fig. VIII. As far as A it is similar to fig. VII. The siphon A is a capillary tube: its lower end, which is turned vertically downwards rests upon a sphere of brass, R which has been washed with nitric acid and sodium amalgam and allowed to soak for some days under mercury. Mercury adheres perfectly to such a sphere. In every case the sphere was immersed just half way in the liquid. A small capsule S was supported in the liquid on a stand T about half an inch lower than the bottom of the sphere. As soon as *gt* became constantly 5'' the vessel V was moved so that S came under R. Five drops of mercury having been caught the cup was removed horizontally as before, taken out and replaced by a fresh one and so on. The batches of five drops were washed dried and weighed. The results with different liquids are given in Table XVI.

We may here notice with advantage a phenomenon which attends the separation of drops under several circumstances but which can be watched most narrowly in the cases of SLL, because in a liquid the separation of a drop is less abrupt than in a gas.

When water falls from glass through air, immediately after the drop separates, a very minute drop is frequently projected upwards from the upper surface of the drop. I have not traced the conditions under which this supplementary drop is

formed: indeed it is sometimes formed and sometimes not under apparently similar conditions. No doubt the proximate cause is that the drop, at the instant of separation is not spherical: the persistent or retentive cohesion which brings it almost immediately to its normal shape, does not allow time for its more excentric parts to collect to the main mass; they are therefore, by the motion of the main drop, flung off and projected upwards.

The same phenomenon is seen much more distinctly when water drops at this rate ( $gt.=5''$ ) through benzol or turpento. In these cases the persistent cohesion of the liquid medium comes also into play.

But the most striking example of supplementary drops is seen when glycerine forms the medium through which mercury drops. In this case when  $gt=5''$  there are always two supplementary drops of mercury formed. It is impossible to determine whether they both have their origin at the same moment and from the main drop. The probability however is that they have not: but that one is first separated from the main drop and the second from the first. For there is always a great disparity between the sizes of the two supplementary drops: whereas, if they were both formed at the same time and for the same reason we should not expect such a consistent difference. The drops soon separate in falling, in consequence of the difference of their surfaces. The relative sizes of the main and supplementary drops in the case of mercury falling from copper through the glycerine were determined as follows. A number of porcelain cups Fig. IX. were arranged at the bottom of a shallow dish full of glycerine. When the rate of dropping was uniform at  $gt=4''$ , the dish was shifted horizontally, so that every drop with its two supplements was caught in a separate cup. The globules of mercury in each cup were removed by a little copper-foil ladle. Ten of each kind were collected. After washing and drying they were weighed with the following result:

TABLE XV.

Mercury.  $gt = 4''$   $T = 21.3$  C. Radius of sphere = 12.8,

	gms.
10, Principal drops weighed .. .. .	6.3447
10, 1st supplementary ,, .. .. .	0.1242
10, 2nd ,, ,, .. .. .	0.0229
	6.4918
10 complete drops weighed ..	6.4918

In all cases the supplementary drop or drops were collected and weighed or measured with the main drop.

In the Table XVI.

Column 1 shows the medium through which the mercury dropped.

Column 2. The number of drops weighed.

Column 3. The weight of the drops. The weight of every batch of drops is given in order that the approximation between the figures for each liquid may be compared with that between the separate liquids. In two cases, only, marked by an asterisk are the numbers probably erroneous. They are not reckoned in taking the mean.

Column 4. Mean weight of single drop, from column 3.

Column 5. Specific gravity of medium.

Column 6 shows the weight of the drop of mercury *in the liquid*. Since the falling of the drop is determined in part by its weight and since the weight depends not only upon the size of the drop, but also upon the density of the medium in which it is found it is interesting to see how the size of the drop is affected by the diminution in its weight caused by the density of the medium.

If  $W$  = weight of drop of mercury in air.

$W_2$  = required weight of drop of mercury in liquid.

$A$  = Specific gravity of liquid.

$B$  = Specific gravity of mercury.

$$\text{then } W_2 = W_1 - \frac{A}{B} W_1 .$$

The values of  $W_2$  form column 6.

The liquid medium are arranged according to the order of magnitude of the number of column 4.

TABLE XVI.

Mercury *gt.* = 5''    T = 21° 3 C.    Radius of Sphere = 12.8.<sup>mm</sup>

I.	II.	III.	IV.	V.	VI.
Medium through which the Mercury dropped.	Number of drops.	Weight of drops.	Mean weight in air and relative size of single drop.	Specific gravity of Medium	Weight of single drop in respective medium.
Air . . . . .	} 5 5 5 5 5 5 5 5 5 5	3.8123	} 0.76545	0.000	0.76545
		3.8138			
		3.8169			
		3.8389			
		3.8141			
		3.8131			
		3.8182			
		3.8557			
		3.8430			
		3.8105			
3.8535					
Water . . . .	} 5 10 5 5 5 5	3.5037	} 0.69750	1.000	0.64619
		6.9384			
		3.4534			
		3.5047			
		3.4918			
		3.5015			
3.5066					
Glycerine . . .	} 5 5 5 5 5 5 5 5 5	3.4235	} 0.61508	1.245	0.55793
		3.4215			
		3.4235			
		3.4285			
		3.3627*			
		3.4088			
		3.4083			
		3.4329			
		3.4090			
3.3981					
Benzol . . . .	} 5 5 5 5 5 5 5 5 10	2.9418	} 0.59822	0.864	0.56014
		2.4875*			
		3.0773			
		2.9888			
		2.9637			
		2.9549			
		3.0767			
		2.9583			
		2.9352			
6.0144					
Turpental . .	} 5 5 5 5 5 5 5 5 5 5	2.1427	} 0.43497	0.863	0.40715
		2.1900			
		2.1883			
		2.1960			
		2.1820			
		2.1620			
		2.1768			
		2.1791			
		2.1608			
		2.1708			

The salient points of Table XVI are chiefly these :

(1) *The drop-size of a liquid which drops under like conditions through various media, does not depend wholly upon the density of the medium and consequent variation in the weight, in the medium, of the dropping liquid.* Thus glycerine whose density is above that of all the other liquids examined, does not, as a medium cause the mercurial drop to assume either its minimum or maximum size.

(2) The liquids in Table XVI are in the same order as in Table VIII. In other words. *If there be two liquids A and B which drop under like conditions through air ; and the drop size of the one A be greater than that of the other B, then, if a third liquid C be made to drop through A and through B the drop size of C through A is greater than the drop size of C through B.*

(3) Further, on comparing Tables XIV and XVI it appears that whether water or mercury drops through turpental and benzol ; the drop through benzol is greater than the drop through turpental. This we shall afterwards find confirmed in other instances into the law : *If the drop-size of A through B be greater than the drop-size of A through C then the drop-size of D through B is also greater than the drop-size of D through C.*

It is further observed that while mercury exhibits its largest drop when falling through air, water assumes its smallest drop size under this condition.

This method of the examination of liquids by drop size which brings so prominently forward or comparatively slight difference between similar liquids may be used not only to detect commercial adulterations of one liquid by another, but perhaps to distinguish between those remarkably related isomeric liquid bodies, the number of which is quickly increasing ; and between whose terms the difference has until lately escaped detection. Of these bodies the first studied were the two amylic alcohols ; but the greatest number at present known is amongst the hydrocarbons.

We may take an example illustrating the use of drop measurement in approximately measuring the proportion in a mixture of its two chemically and physically similar but not isomeric constituents.

Suppose we had a liquid which we knew to consist wholly of a mixture of *benzol* and *turpental*, and we wished to find the proportion in which these two ingredients were present. We could scarcely approach to an answer by any of the means hitherto employed. The specific gravities of the two liquids are so close (.864—.863) that the density of the mixture would give us no substantial aid. Though there is a considerable difference (80 ° C.) in their boiling points, no one who is familiar with the difficulties of fractional distillation, would place any reliance upon a quantitative separation based upon volatility. Their refractive indices are nearly the same\*. Their vapour densities 2.77—4.76, though comparatively different are not absolutely very wide apart. They are active and passive towards most of the same chemical reagents, and interfere with one another's reactions. If we have recourse to chemical analysis ( $C_{12}H_6, C_{20}H_{16}$ ) a very small experimental error would point to a great difference in the proportion of the two.

To find how far the stalagmometer Fig. VII is applicable in this case, it was filled with five liquids in succession, to wit :

- |      |   |                    |
|------|---|--------------------|
| 1st. | With benzol .. .. .                     | = B                |
| 2nd. | With 2 parts benzol with 1 of turpental | = B <sub>2</sub> T |
| 3rd. | „ 1 „ „ 1 „                             | = B T              |
| 4th. | „ 1 „ „ 2 „                             | = B T <sub>2</sub> |
| 5th. | „ turpental.. .. .                      | = T                |

The time growth being brought in each case to 5'', the number of drops of water required to fill a given volume was counted : allowance being made for the meniscus.

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\* The Refractive index of turpental is 1.476 ; that of benzol does not appear to have been measured ; but that it is almost identical with that of turpental is seen on mixing the two. In those cases in which I propose to use stalagmometer chiefly, namely with isomeric bodies the method by refraction is useless because isomeric liquids seem always to have the same refractive indices.

TABLE XVII.

Through	Air	T	BT <sub>2</sub>	BT	B <sub>2</sub> T	B
	102	51	38	34	31	14
	102	51	37	34	31	14
	101	50	38	33	31	14
		49				
Mean	101.7	50.2	37.7	33.3	31	14

Hence a difference of 16.6 *per cent* in one of the constituents corresponds to an observed difference under the most unfavourable conditions of 3 drops. In other words the stalagmometer is sensitive to an alteration of 6 o/o. By increasing the capacity of the recipient it is clear that the drop numbers and therefore their differences might be increased at pleasure. Thus by counting the number of drops necessary to fill a volume 6 times the size we could tell to within one *per cent* how much turpental and how much benzol were present.

But it is perhaps in the cases of the still more proximate identity mentioned above of isomeric bodies that the stalagmometer may be used rather as a stalagmoseope, to render a difference of drop-size evident, than to measure it.

From Table XVII we gather the general law concerning three liquids which are insoluble in and without chemical action upon one another. *If a liquid A drop under like conditions in sucession through two liquids B and C, then its drop-size through any mixture of B and C is intermediate between its drop size through B and its drop size through C and the greater the proportion of  $\frac{B}{C}$  in the mixture, the more nearly does the drop size of A through the mixture approach to the drop size of A through  $\frac{B}{C}$  alone.*

We have already examined the influences on the drop size in the case S T G of the density of the dropping liquid, its

persistent and stubborn cohesions respectively. Increase in the former two tends to diminish the drop size—increase in the last, to diminish it. Let us examine in like manner the influence of the similar properties of the medium :—

(1.) The density of the medium. Increase in the density of the medium is equivalent to diminution in the density of the dropping liquid and must therefore be followed by a tendency to increase in the drop-size.

(2.) Stubborn cohesion of medium. The resistance to displacement or stubborn cohesion of the medium tends to keep back the drop in its place and makes it necessary for a larger quantity of the dropping liquid to accumulate, that is, it increases the drop-size.

(3.) Retentive cohesion of medium. The same force of persistent or retentive cohesion which causes the drop of a liquid to take the spherical form, would also cause the liquid to give or tend to give a spherical form to an irregularly shaped volume of a solid, liquid, gas or vacuum in it. Thus gas-bubbles, in liquids have an approximaly spherical form not by reason of the cohesion of the parts of the gas, but from the cohesion of the medium which moulds the gas into that form by which the cohesion of the liquids is most gratified. Hence increase in the retentive or persistent cohesion of the medium tends to diminish the dropsize of the dropping liquid.

In all cases of SLL, we may represent the direction the determinants by the following scheme, in which the sign + denotes a tendency to increase, the sign — a tendency to diminish the drop size.

SLL.	
DROPPING LIQUID.	
+	—
Stubborn cohesion.	Persistent cohesion.
	Density.
MEDIUM LIQUID.	
+	—
Stubborn cohesion.	Persistent cohesion.
Density.	

This scheme is verified by the experimental results obtained. Of all liquids, water forms the largest drops in falling through air because in it, the stubborn cohesion prevails to the greatest degree over the joint action of persistent cohesion and weight. In water mercury forms drops greater than in all other liquids because in water (as a medium) stubborn cohesion and weight prevail to the greatest degree over persistent cohesion.

The case SLL may be inverted if the drop forming liquid be specifically lighter than the medium liquid. Thus every case of SLL which we have examined in which a liquid A drops downwards through a liquid B, has a countercase in which the liquid B\* drops upwards through the liquid A.

In order to measure the size of such ascending drops, the stalagmometer fig. VII is modified in form. It is not found possible to cause the dropping liquid to adhere with sufficient completeness and uniformity to a solid sphere immersed in the denser medium in the cases experimented on. The end of the syphon A was turned upwards and served as the solid whence the liquid dropped without the interposition of a sphere or other solid. The measuring tube D was removed from the neck of the cup C a stopper being inserted in its place. The cup C was filled with water and the measuring tube D being also filled with water was inverted into it and held by the holder H.

The modified stalagmometer is seen in fig. X. Care was taken that the end of the syphon A should always be at the same depth beneath the surface of the water in C.

The drop-sizes of the liquids of table XVII were first examined by this stalagmometer.

The following Table XVIII shows the number of drops of the various liquids dropping through water required to fill the measuring tube up to the given mark. The measuring tube here employed was different from that used in

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\* See Introduction.

forming table XVII : on this account and because the delivering solid was quite different in shape and *gt.* = 2'' no immediate comparison can be made between Tables XVIII and XVII. Correction is made for meniscus.

TABLE XVIII.

*gt.* = 2''—T = 24°. 2 C.

286 + 1	251 + 1	228 + 1	204 + 1	102 + 1	minimum.
286 + 1	351 + 1	230 + 1	204 + 1	103 + 1	
286 + 1	250 + 1	229 + 1	206 + 1	102 + 1	
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	
286	250.7	229	204.7	102.7	
287	251.7	230	205.7	103.7	

We gather from this table a law quite similar to that deduced from the measurement of the size of the downward drops of water through these same liquids ; it is as follows :

*The drop size of any mixture of two liquids A and B dropping upwards through a third liquid C is intermediate between the drop size of A through C and that of B through C and the greater proportion of  $\frac{A}{B}$  there is in the mixture the more nearly does the drop size of the mixture approach to the drop size of  $\frac{A}{B}$  alone.*

It is remarkable that supplementary drops are formed in the cases immediately considered, just as in the case of water dropping through these same liquids. But the supplementary drops of benzol and turpental through water bear a much smaller ratio to the main drops than do those of water through benzol and turpental to their maindrops. Judging only from the equality in their rate of ascent through the measuring tube, all these supplementary drops are of very exactly the same size. The supplementary drops were not further examined, but were always collected and measured with the main drops.

Viewed as a means of quantitative chemical analysis, the measurement of the drop size of liquids which drop up through water is yet more sensitive than that of the drop sizes of water falling downwards through the liquids. Thus, from Table

XVII, the least proportional difference of drop number, caused by an alteration in the proportion of the liquids, is between T and B T<sub>2</sub> where a diminution of 33.33 *per cent* in the turpental and an addition of 33.33 *per cent* of benzol causes a difference of 35.3 in the drop number.

Liquid		T	BT <sub>2</sub>	BT	B <sub>2</sub> T	B	
Percentage ..	}	B	0	33.33	50	66.66	100
		T	100	66.66	50	33.33	0
Difference of Percentage ..	}	B	33.33	16.66	16.66	33.33	
		T	33.33	16.66	16.66	33.33	
Difference of drop-number	}		35.3	21.7	24.3	102.0	

Or this stalagmometer shows the composition of the liquid to within 1 *per cent*. Further if the mixture contains less than one-third of benzol its proportional composition can be determined, on an average, to within 0.33 *per cent*.

It may be noticed with regard to SLL that the value of *gt* is of much less influence upon the drop size than in the case of SLG. It is generally sufficient in the former case that the *average* value of *gt* should be constant. This is especially the case when the drops are found from a tube (as the end of a syphon) and not from a convex solid. The reason is obviously that in the former case the thickness of the residual film upon which we have seen the drop-rate depend is at all rates indefinitely great while in the latter it depends upon the rate of supply.

In order to compare the drop size of A through B with that of B through A under quite similar conditions: the syphon A of Fig X was inverted and applied to the cup stalagmometer of Fig. VIII. The arrangement of the end is seen in Fig. XI. In using this form of stalagmometer the end of the delivery syphon must be at first wiped dry, so that the water may not creep back outside the syphon, and so give rise to an irregular base to the drop. Water was made to drop through A Fig. XI at the same rate  $gt=2''$  and through the same liquids as before, to wit T, BT<sub>2</sub>, BT, B<sub>2</sub> T, B. The same

measuring tube was used as in Fig. X or Table XVIII and was filled to the same point. Correction was made for meniscus.

TABLE XIX.

*gt.* = 2''—T = 24° . 5 C.

T	BT <sub>2</sub>	BT	B <sub>2</sub> T	B
256	218	178	162	87
256	220	177	164	86
256	..	..	..	86
..	..	..	..	86
—	—	—	—	—
256	219	177.5	163	86.2

We may now compare Tables XVIII and XIX since the conditions of the experiments whence they are got are identical. The drop sizes are inversely as the drop numbers. Let us use the symbol  $X_y$  to denote the drop size of the liquid X in the medium Y, and  $XZ_y$  the drop size a mixture of X and Z through Y and so on. Comparing first the size of a drop of X through medium Y with the size of a drop of Y through medium X or finding the value of  $\frac{X_y}{Z_x}$  we have, putting W for water.

TABLE XX.

$W_B$	103.7		
—	—	=	1.203
$B_w$	86.2		
$W_{B_2 T}$	205.7		
—	—	=	1.262
$B_2 T_w$	163		
$W_{BT}$	230		
—	—	=	1.296
$BT_w$	177.5		
$W_{BT_2}$	251.7		
—	—	=	1.149
$BT_2^w$	219		
$W_T$	287		
—	—	=	1.121
$T_w$	256		

Hence in none of these cases is the drop size of one liquid through another equal to the drop size of the second through the first. We get the general law that. *That if a liquid X has a larger drop size than the liquid Y in the liquid Z then the liquid Z has a larger drop size in X than it has in Y. Further if a liquid X has a larger drop size than a liquid Y in air ; then the drop size of X through Y is larger than the drop size of Y through X. Further if the drop size of X be greater than the drop size of Y and the drop size of Y greater than the drop sizes of Z, then the ratio between the drop sizes of X in any mixture of Y and Z and the drop size of that mixture of Y and Z through X is greatest when the ratio between Y and Z is unity.*

Further comparing the drop-sizes of Table XVIII with one another or all with  $B_w$  we get :

XXI.

$B_w$	=	287	=	
$\frac{\text{---}}{\text{---}}$	=	$\frac{\text{---}}{\text{---}}$	=	2.767
$T_w$		103.7		
$B_w$		251.7		
$\frac{\text{---}}{\text{---}}$	=	$\frac{\text{---}}{\text{---}}$	=	2.427
$BT_2$		103.7		
$B_w$		230		
$\frac{\text{---}}{\text{---}}$	=	$\frac{\text{---}}{\text{---}}$	=	2.227
$BT_w$		103.7		
$B_w$		205.7		
$\frac{\text{---}}{\text{---}}$	=	$\frac{\text{---}}{\text{---}}$	=	1.983
$B_2 T_w$		103.7		
$B_w$		103.7		
$\frac{\text{---}}{\text{---}}$	=	$\frac{\text{---}}{\text{---}}$	=	1.000
$B_w$		103.7		

In like manner, comparing the drop-sizes of Table XIX with some another or all with  $W_B$ , we have :

$W_B$	=	256	=	
$\frac{\text{---}}{\text{---}}$	=	$\frac{\text{---}}{\text{---}}$	=	2.969
$W_T$		86.2		
$W_B$		219		
$\frac{\text{---}}{\text{---}}$	=	$\frac{\text{---}}{\text{---}}$	=	2.541

$W_{BT_2}$		86.2		
$W_B$		177.5		
$\frac{W_{BT_2}}{W_B}$	=	$\frac{86.2}{177.5}$	=	2.059
$W_{BT}$		86.2		
$W_B$		163		
$\frac{W_{BT}}{W_B}$	=	$\frac{86.2}{163}$	=	1.890
$W_{B_2 T}$		86.2		
$W_B$		86.2		
$\frac{W_{B_2 T}}{W_B}$	=	$\frac{86.2}{86.2}$	=	1.000

Lastly, on comparing these figures with those of Table XXI, we get the remarkable law which it would be difficult to express in words, that

$$\frac{W_B T_w}{W_T B_w} = \frac{W_B BT_2}{W_{BT_2} B_w} = \frac{W_B BT_w}{W_{BT} B_w} = \frac{W_B B_2 T_w}{W_{B_2 T} B_w} = 1 \text{ nearly.}$$

The main results obtained with regard to drops may be collected into the following laws :

1. The drop-size depends upon the rate of dropping. Generally, the quicker the succession of the drops, the greater is the drop. The slower the rate the more strictly is this the case. This law depends upon the difference, at different rates of the thickness of the film from which the drop falls.

2. The drop size depends upon the nature and quantity of the solid which the dropping liquid holds in solution. If the liquid stands in no chemical relation to the solid, in general the drop size diminishes as the quantity of solid contained in the liquid increases. The cause of this seems to be that the stubborn cohesion of the liquid is diminished by the solution of the solid. Where one or more combinations between the liquid and solid are possible the drop size depends upon indeterminate data.

3. The drop size depends upon the chemical nature of the dropping liquid, and little or nothing upon its density. Of all liquids examined water has the greatest and acetic hydrate the least drops.

4. The drop size depends upon the geometric relation between the solid and liquid. If the solid be spherical, the largest drops fall from the largest spheres. Absolute difference in radii takes a greater effect upon the drops formed from smaller than upon those from larger spheres. Of circular horizontal plates, within certain limits the size of the drop varies directly with the size of the plates.

5. The drop size depends upon the chemical nature of the solid from which the drop falls; and little or nothing upon its density. Of all the solids examined Antimony delivers the smallest and Tin the largest drops.

6. The drop size depends upon temperature. Generally, the higher the temperature, the smaller the drop. With water the effect of temperature for a difference of  $20^{\circ}$  C. is very small.

7. The nature of the gaseous medium has little or no effect on the drop size.

#### SLL.

8. The drop-size of a liquid which drops under like conditions through various media, does not depend wholly upon the density of the medium, and consequent variation in the weight, in the medium of the dropping liquid.

9. If there be two liquids A and B which drop under like conditions through air; and the drop size of the one A be greater than that of the other B; then if a third liquid C be made to drop through A and through B, the drop-size of C through A is greater than the drop size of C through B.

10. If the drop size of A through B be greater than the drop size of A through C, then the drop size of D through B is also greater than the drop size of D through C.

11. If a liquid A drop upon like conditions in succession through two liquids B and C then its drop size through any mixture of B and C is intermediate between its drop size through B and its drop size through C, and the greater the proportion of  $\frac{B}{C}$  in the mixture the more nearly does the

drop size of A through the mixture approach to the drop size of A through  $\frac{B}{C}$  alone.

12. The drop size of any mixture of two liquids A and B dropping through a third liquid C is intermediate between the drop size of A through C and that of B through C, and the greater the the proportion of  $\frac{A}{B}$  in the mixture the more nearly does the drop size of the mixture approach to the dropping of  $\frac{A}{B}$  alone.

13. If the liquid X has a larger drop size than the liquid Y in the liquid Z. Then the liquid Z has a larger drop size in X than it has in Y.

14. If a liquid X has a larger drop size than a liquid Y in air; then the drop size of X through Y is larger than the drop size of Y through X.

15. If the drop size of X be greater than the drop size of Y in air and the drop size of Y greater than the drop size of Z in air; then the ratio between the drop sizes of X in any mixture of Y and Z and the drop size of that mixture Y and Z through X is greatest when the ratio between Y and Z is unity.

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## ANNUAL MEETING OF THE ROYAL SOCIETY OF ARTS & SCIENCES.

WEDNESDAY, 29<sup>TH</sup> MARCH 1865.

H. E. SIR HENRY BARKLY, K.C.B., F.R.S., IN THE CHAIR.

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Present at the Meeting :—The Hon'ble Sir Gabriel Fropier ; the Hon'ble C.W. Wiehé, Vice-Presidents; A. Desenne, Treasurer ; L. Bouton, Secretary ; F. Dick, Vice-President.

The Hon'bles H. Lemièrè and H. Pitot, Messrs. E. C. Bewsher, Ed. Bouton, W. Connor, L. Estourgies, E. Fleurot, L. Hugues, J. Kyshe, P. Lemièrè, Ch. Magny, A. Montgomery, V. Naz.

The Secretary read the following Report :—

An apology is due to Your Excellency for the delay in the annual meeting of the Royal Society of Arts and Sciences.

The Committee appointed by Your Excellency from the members of the Society, to carry out the wish of the Secretary of State that Mauritius should not be unrepresented at the Dublin Exhibition, had to enter at once upon the duty of collecting the various products of the Island with sufficient despatch to enable them to reach Dublin in time, as no goods and articles could be received after the 15<sup>th</sup> of April—the Exhibition opening on Tuesday, the 9<sup>th</sup> day of May.

These articles, contained in 16 cases, were successively despatched in the steamers which left on the 24<sup>th</sup> January, 7<sup>th</sup> and 18<sup>th</sup> February. They consist of the beautiful sugars of *Labourdonnais*, *La Gaieté*, *St.-Aubin*, *Bénarès* and *Schœnfeld* Estates—of vanilla grown by Messrs. J. Levieux and N. Brousse ; of cotton and tobacco, both in leaf, in earrots and cigars ; of tanned hides, specimens of textile fibres and medicinal plants ; specimens of rope-making and fancy rattan works by the young Indian Orphans of the Government Asylum at Powder Mills, besides other articles of which the Committee intend to lay a more succinct account before Your Excellency.

Your Excellency kindly acceded to the request of the Secretary that advantage might be taken of the departure of

the Government steamer *Victoria* and of H. M. S. *Rapid*, to form a collection of plants from the dependencies of Mauritius. An old *employé* of the Society, familiar with the occupation, accordingly took his departure, and after an absence of two months, returned with a sufficient quantity of plants to enable us to form an idea of the Flora of Rodrigues, Diego, Peros Banhos, and of Mahé, one of the Sechelles Islands. It is to be regretted that the other islands of the Seychelles group were not explored, but circumstances beyond the control of the collector prevented it.

The plants thus collected have been prepared by your Secretary for transmission to Sir W. Hooker, and the specimens of Ferns from those Islands have already been forwarded to Kew, by the *Orontes*, in care of Dr. Roch, Surgeon, R. A.

Your Excellency encouraged the Secretary to forward to the Director of Kew Gardens, a sufficient quantity of plants to form materials for a Flora of Mauritius. He has accordingly sent at different times a large number of Phænogamous which grow in our forests, and of such as have become naturalised by length of time. Other specimens had already been received, especially those collected by our much esteemed friend the late Dr. Ayres. We also notice, in a Report on the progress and condition of the Royal Gardens, during the year 1863, that the collection made in our Island about 30 years ago by the late Judge Blackburn, one of the former Presidents of our Society, have also been presented to Kew by Admiral Sir W. Bowles, K.C.B.

These successive contributions must have formed a large nucleus of Mauritius plants, and must now supply a sufficiency of materials, notes, and observations for the commencement of a work which is wanting, and which there is no doubt that our Honorable Patron, Sir Henry Barkly, would gladly see undertaken.

An interesting collection and which, of itself, comprises a fourth of the Flora of Mauritius, viz., the Ferns, is in the course of preparation by the Secretary.

This collection also is intended for Kew. Notes and observations, we confidently hope, will not be wanting. Sir Henry and Lady Barkly who have carefully studied the Ferns of our Island and those of the Sechelles and Rodrigues, will doubtless communicate the results of their own observations to Sir W. Hooker.

The wish expressed at our last annual meeting that the Cinchona plant should be introduced into Mauritius, was nearly realised. Your Excellency procured from Madras a case of plants of that tree. Unfortunately, taken up too young,

they were unable to bear the voyage, and died before they reached Mauritius. The disappointment is a great one. Experiments would have been settled or nearly so: whether or not, certain elevated parts of our Island were suited for the cultivation and subsequent naturalisation of the Cinchona.

The Exhibition held in September last, with Your Excellency's permission in the garden attached to Government House, presented rather a brilliant show of fruits, flowers and vegetables.

The committee, under the direction of its President, the Hon. Mr. Ch. Wiehé, and of Mr. Henry Jourdain, its Vice-President, and with the valuable assistance of the Judges, made the arrangements and the disposition of the articles exhibited as complete as possible.

That which had never been accomplished, if we except the Intercolonial Exhibition, was this time effected; the medals and prizes were distributed on the very day of the Exhibition.

The plants and flowers exhibited by Mr. Constant Vankeirsbilck and by Mr. Eug Duponsel, and the cut flowers from La Bourdonnais and other places, were remarkable for their beauty and freshness. Lady Barkly contributed to the pleasure of the occasion not only by her presence, but also by her cooperation,—the collection of Ferns, both indigenous and exotic, was justly rewarded by a medal.

Dr. Guthrie presented to the Society a very interesting paper, which was afterwards printed with the proceedings of the Royal Society of London. He gives an exact description of the various volumes of what are commonly called *Drops*.

“This,” observes Dr. Guthrie, “may at first seem a trivial matter, but it is nevertheless in several points of view, a subject of importance, principally to the physician and pharmacist.” It is evident that the exact quantity contained in a drop should be well-known, when a prescription is made out, in which a substance enters that requires to be measured drop by drop, the more particularly when that substance possesses the most energetic properties. It is the same with the bubble given out by certain gases, which present the same conditions and are subject to the same rules as drops.

The volume of a drop depends upon the nature and quantity of the solid matter held in solution, and the chemical nature of the fluid. Of all the liquids subjected to examination by Dr. Guthrie, water gave the largest drops, and acetic acid the smallest. The instrument used by Dr. G. to measure drops and which was shown by him to the Society was named by him *Stalagmometer*, from the Greek words signifying *Drop* and *Measure*.

Another paper not less remarkable, although of a different nature, viz. : A memoir on the “ Pou à poche blanche,” by Dr. Leery, was presented by the author. It is accompanied with drawings from nature of the insect, magnified by a powerful instrument. It fully deserves the encomiums bestowed by the Society, both on the author and on Mr. Desjardins who executed the drawings under the direction of Dr. Leery.

The “ Pou à poche blanche ” had already been the subject of examination by Mr. Westwood F. L. S., from specimens forwarded to him by the Secretary. Mr. Westwood says it belongs to the genus *Coccus*, of which the species are very numerous. Dr. Leery proposed that it should form a new genus to be called *Gasteralphus*, a name which indicates the protuberance which constitutes the external form of the insect.

The Society, through its President, thanked Dr. Guthrie and Dr. Leery for their papers which were ordered to be printed with the Transactions of the Society for the present year.

The Secretary read extracts from a paper published by Dr. Hooker in a number of the “ Natural History Review,” on a subject which is not new, but to which he attaches great importance, viz : the replacing in countries and colonies which are in frequent communication with European or other countries, of certain indigenous plants by plants from the other countries.

“ It must be long, “ he says”, before facts enough to theorize upon can be collected. Meanwhile, the inquiry appears “ perhaps the most interesting and important in all Biology, “ and as such it is most earnestly to be desired that all that “ are favorably circumstanced to pursue it, will do so both “ systematically and very carefully:”

It has been in the power of your Secretary, so far as Mauritius is concerned, to test the correctness of these assertions. He has been able to point out several exotic plants which have taken possession of our soil, and which have grown in such profusion in retired spots, in the borders of our forests and on our mountains, that strangers to the Flora of Mauritius would believe them to be indigenous.

The Secretary has also pointed out the fruit trees, which adorn our orchards, some of which such as the guava, the mango, the eustard apple, the strawberry and the raspberry are to be seen growing wild in different parts of the island.

On the other hand, several indigenous plants have become extremely scarce, either through the destruction of the forests, or from other cause. The same remarks may have suggested themselves to Your Excellency. There was formally, say, twenty or twenty-five years ago, to be found in the Réduit

Cascade, the *Equisetum elongatum*, the only representative in Mauritius of that genus *Equisetum*, and which is no longer in existence, at least, in that locality. It is the same with some Ferns mentioned in the *Hortus Mauritianus* of Bojer.

Dr. Hooker mentions not only plants, but also animals, some too that occupy no inferior position in the animal kingdom, and which when introduced under favorable conditions, for their reproduction in a country, become in some measure indigeneous.

New insects have increased the number of these in existence in our Island; Butterflies from Madagascar are to be found even in the streets of Port-Louis, in greater number than these that are indigeneous. Other insects including the *Borer* unvoluntarily introduced from Ceylon and the *Pou Blanc*, have increased with such fearful rapidity as to threaten our principal agricultural productions, and spread alarm among our planters.

As for Birds, Mr. Ed. Newton is of opinion that out of about thirty species which constitute the Ornithological Fauna of Mauritius, 15 have been imported and the remainder are indigeneous. Among the latter some as the *Merle* (1), the *Cuisinier* (2), the *Perruche* (3), the large *Ramier* (4), the *Ramier* (5), and the *Cateau* (6), are becoming scarce every year—without it being possible to ascribe any cause for their diminution, unless it is to be attributed to the destruction of our forests. Two others, the *Dutch Pigeon* (8) and the *Hoopoe* (8) which are said to have existed in the Island, have entirely disappeared.

Among the exotic birds, some are more numerous than others. The *Pingo* (9) and the *Bengali* (10) are to be found every where. The partridges (11) are pretty common in many localities. As for the *Martins* (12), this is what Mr. Newton says about it:

“The *Martin* is far the commonest bird, indeed I think it is more numerous than any species of bird I ever saw. That is to say there are more Martins per acre in Mauritius than any other species per acre I have ever seen.”

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(1) *Hypsipetes Olivaceus*.

(2) *Oxynotus Ferrugineus*.

(3) *Agapornis Cana*.

(4) *Trocaza Meyeri*.

(5) *Turtur Picturatus*.

(6) *Palaornis Eques*.

(7) *Alectroenas Nitidissima*.—(8) *Fregulopus Madagascariensis*.

(9) *Munia Punctulata*.—(10) *Estrelida Astrild*.

(11) { *Francolinus Madagascariensis*—*Perdrix Pintadée*.

{ *Francolinus Ponticerianus*—*Perdrix Rouge*.

(12) *Acridotheres Tristis*.

Mr. F. Dick called the attention of the Society to the active principle which would probably be found in the nest and exuviae of an insect belonging to the order of "Nevropters" and known in every hot quarter of the globe where it commits great ravages, viz: the *Caria* or white ant "*Thermes destructor*" of Fabricius.

It is well known that a few years ago, it was made use of as an infusion or decoction for the treatment of certain nervous affections, particularly epilepsy, and that if no cures were effected, the condition of the patients was improved. Mr Dick drew the inference that the matters extracted from the wood by the *Caria* itself might contain some principles similar to those which are found in chloroform or other anesthetics. But, the medical question apart, Mr Dick was desirous that the analysis of the nest should be made, in order to ascertain, what substances are extracted from the wood, which might lead to the discovery of a means of arresting the ravages of this destructive insect. Mr Fleurot was requested by the Society to undertake the task; his analysis has thrown a broad light on the subject, and furnished results very curious and interesting.

It has proved the presence in remarkable proportions and in rather considerable quantities, of formic acid in combination with iron, in the head and mandibles of the insect. Mr Fleurot is of opinion that the sedative effects of the *Caria*'s nest are due to the combination of the iron and formic acid, which produces a formate of iron. The result leaves no doubt as to its value in the treatment of certain nervous affections, and Mr Fleurot considers that it may be ranked as a new therapeutic agent.

The analysis of the nest and of the insect left no traces of soluble salts or common salt, so generally diffused and which is found in all animal substances. Mr Fleurot draw the inference that the nature of the insect being antipathetical to common salt, it may be combated with that substance. He traced a circle of salt, in which he enclosed some white ants and they did not dare to cross the barrier. New facts supported his assertion. He has been informed that in some damp cellars where the white ants caused great destruction amongst the casks of wine and beer, they had been entirely driven away by strewing a layer of common salt under the barrels. He also ascertained that salt meat casks have never been known to be touched by them.

Mr Fleurot has thus established that common salt is the best means hitherto discovered of preservation from the attacks of the white ant. Several products of the analysis of

the *Thermes Destructor*, and a magnified drawing of the insect were presented to the Society.

Mr Fleurot's paper attracted the lively interest of the members. It has established two important points: 1o. The discovery of a new therapeutic substance — formate of iron—with which it is hoped to combat with success certain nervous affections that are so common in our enervating climate and 2o. The discovery of an easy mode of driving away the insect.

On the other and, Mr Beyts has communicated to the Society an extract from the "Gazette of India" dated 8th October 1864, of a letter by Dr. E. Bonavia, honorary Secretary to the Agricultural and Horticultural Society. "In the site," he says", where the central jail is erected, the white ants exist in unlimited numbers, and they eat through the plaster in order to get at the cow-dung, so that the walls require to be constantly re-plastered."

"Some time ago, Mr Marshall, the jailor, was getting some floor made from the fibres of the American aloes (*Agave Americana*), and he found white ants did not touch mats from this fibre. On the contrary, they always destroyed mats made from other materials.

"I then asked him what use he made of the pulp which is separated from the fibre of the aloe leaves. He said it was thrown away. It struck me that it might be very profitably used for mixing up with the clay and cow-dung used for plastering the jail walls, as then probably the white ants would not touch the plaster. The experiment was tried and quite answered the purpose. Plaster which was impregnated with juice and pulp of the aloe leaves has stood for months, and is not yet touched by white ants, while the plaster of walls free from aloe juice becomes covered with white ants, shortly after it is put on."

I crave indulgence for all these details, but if we consider how extensive are the ravages of this insect, and the destruction with which some of our large buildings are threatened, we cannot lay too much stress upon the means of conquering so formidable an enemy, and should seek every possible remedy.

The Society has received through the Colonial Secretary's office, a circular from the Secretary of State, shewing, in a series of tabulated statements, the decreasing importations into the United Kingdom of rosins and turpentine since the American war. The London Board of Trade have considered the matter to be of sufficient importance to be brought to the notice of the Secretary of State with the view of its being communicated to the different possessions of the British em

pire, in order to ensure a supply of these articles being received, the want of which is being felt in England.

We can hardly, now that our forests once so dense, have been thinned, find a sufficient quantity of resinous trees to form an article of trade. The Secretary has however pointed out several that yield rosin, for instance: the *Colophonia Mauritiana*, *Marignia obtusifolia*, *Calophyllum Ratamaka* &c.

Sir Gabriel Propier has reminded us that several plants of the genus *Eucalyptus* have been introduced from Australia. Our former President, Mr. R. W. Rawson, now Governor of Bahamas, being the first to set the example. But they are not in sufficient number to fulfil the ends for which they were introduced into the Island.

As to Turpentine, alcohol is known to be a substitute for it. A legislative enactment has even permitted its introduction into England, duty free, but on condition that it should be mixed with a substance which renders its use loathsome.

Dr. Guthrie has suggested that spirits of wood should be mixed with the alcohol, but Mr. Fleuret remarked that it would only be obtained by the combustion of a considerable quantity of wood, and that Petroleum oil might be used, which is imported in considerable quantities from America.

His Excellency the Governor has also forwarded to the Society a circular from the Society of Acclimatisation of London. A similar Society is in existence in our island. Several of our members belong to it, and overtures have been made to us with a view of placing it in communication with a commission selected from the members of our Society. We must then await a favorable time to furnish our replies to the various questions of the London Society.

Similar questions were addressed to the Secretary of our Society during the administration of the late Sir William Stevenson. His reply is dated 28th April 1862.

Mr. Constant Vankeirsbick presented an Hygrometer of his own suggestion, a filament or *Arista* of the seed of *Erodium Gruinum*, a plant recently introduced by Mr. Constant V. himself, being substituted for hair. This filament from its elasticity and sensitiveness to atmospheric influences, may serve to determine the state of the ambient air. It constitutes an instrument as simple as it is ingenious, to indicate, like the hygrometer, the exact state of saturation of the atmosphere.

Mr. Fleuret presented specimens of Carbonate of Lime from Diego Suarez. Other specimens of this chalk were also collected by Isidore Legentil, at Rodrigues.

It exists, in the opinion of Mr. Fleuret, in sufficient abundance in those Islands to fill the purposes in Mauritius, for

which it is imported from Europe ; either as an improvement to the soil in certain localities or for industrial purposes, in the painter's and glazier's trade, or for the preparation of carbonic acid which is required in the manufacture of gaseous drinks.

Mr. F. Diek called attention to the antiseptic property of the fibrous residue of the Sugar Cane, known under the name of *Bagasse*. This property was accidentally discovered about a year ago by a physician of George Town who had to perform the "post mortem" examination of a man found buried under a heap of Bagasse. His body, instead of being in an advanced state of decomposition, was dried up to a mummy. The result was that the physician carried into practice his discovery.

There happened to be at the time a great number of patients suffering from ulcers in the hospital, and a contagious gangrene had declared itself ; the physician caused several tubs containing cane-trash to be placed in the wards, and the supply to be renewed at intervals. In a short time the atmosphere of the hospital was purified and the contagion ceased.

The Editor of the *Standard*, number of the 2nd April 1864, adds a few remarks which seem applicable to Mauritius, and we think the experiment deserving of a trial in our hospitals.

" Thus, it seems," says this paper, " that Nature itself has provided an antidote for the pernicious effects of heat in tropical countries ; the contagious diseases caught by the heat of the sun, may be neutralized by the Sugar Cane, which is brought to maturity by those very rays."

The Secretary was favored by a letter from Mr. Daniel Hanbury in London, calling his attention to the Columbo root (*Cocculus palmatus*) and recommending its cultivation in Mauritius as a medicinal plant of a great value.

" The Columbo root of commerce, Mr. Hanbury says, is the product of a wild plant growing on the Mozambique Coast, whence it is shipped to Europe by way of Bombay. It is mostly more or less worm eaten and often has been badly dried, so that its bright greenish yellow colour is not well preserved. At the present time, (October 1864) it is remarkably scarce and dear, and a supply of good quality would be really acceptable in the market."

The Secretary was enabled to procure but a very small quantity of the Columbo root at the Botanical Garden of Pamplemousses. He prepared it according to instructions, vizt : cut it in very thin slices and dried it in the shade. It formed part of the collection of medicinal plants forwarded for the Dublin Exhibition.

It would be interesting for more than one reason, to extend in this island the cultivation of the Columbo plant, the growth

of which is very rapid. It could become an article of commerce in the hands of small proprietors.

The following Resident Members were admitted during the year :—

PORT LOUIS :

1. Mr. Charles Rustichelli,
2. — Constant Vankeirsbilk,
3. — E. C. Bewsher,
3. — Henry Magny,
4. Dr. Edwards, General Sanitary Inspector.

HONORARY MEMBER :—Mr. P. Van Shendel, at Brussels.

Several books, periodical papers, &c., have been received from the correspondents of the Society or from foreign Societies. The Cotton Association of Manchester has forwarded, through our Agent in London, five different varieties of Cotton seeds, which have been distributed amongst those of our members who have expressed a wish to cultivate them, namely : Mr. James Currie and Mr. Ch. Pitot.

The Society has been informed of the death of Mr. Diard, one of its honorary members. He has long been known to the inhabitants of the Mascarenhas Islands. They will remember his essential assistance in facilitating the introduction of certain species of sugar cane, the richness of which has in some measure compensated for the loss of the white cane. One of these canes bears the name of Mr. Diard. The life of that eminent man has been devoted to the progress of Natural Sciences. At first in conjunction with Mr. Duvancel, they had both been sent out as collectors by the Museum of Paris. Mr. Diard subsequently entered the service of the King of Holland and the Netherlands, and was employed in Java as Superintendent of Agriculture. It was in that capacity that he was enabled to forward to Mauritius a whole cargo of the Batavian canes, to replace the kind that had been destroyed by the malady in 1848 and 1849. They arrived here in 1850, in the *Reliance*, a ship that had been freighted by a certain number of Planters for the purpose.

Such are, Your Excellency and Gentlemen, the results of our labours during the past year. We may have omitted to mention the name of a few members whose contributions were of minor importance, and beg that they will accept our apology.

There now remains the grateful task of thanking Your Excellency, not only for honoring this meeting with your presence, but above all, for unceasing marks of interest and the kindness which the Society has met with at your hands."

HIS EXCELLENCY THE GOVERNOR then rose for the purpose of moving the adoption of the Report which had just been read, and in so doing said he gladly availed himself of the opportunity of thanking the Society for the valuable assistance it had afforded to the Government in several matters alluded to therein. The principal of these he need hardly say, had been the superintendance of the preparations for sending specimens to the Dublin Exhibition, which he was happy to learn had been effected on a scale that would do justice to the industrial resources of this important Colony. The expediency of its being properly represented at all such great congresses of manufacturing skill, could not in his opinion be overrated, and he had readily applied to the Legislature for a grant on the occasion in question, at the instance of the Chamber of Agriculture. Of course Sugar in some shape or other must, as usual, form the great staple of their contribution, but there were minor products referred to in the Report which might prove both useful and remunerative, among these he was glad to find that samples of Columbo root properly prepared had been forwarded; not long since, Sir William Hooker had written to him to enquire whether this plant, the root of which is now attracting much attention in Europe, as a specific for Dysentery, flourished in this Island. Many of them were aware that this plant the "*Cocculus palmatus*," of Botanists was dioecious, and Mr. Horne had informed him that though both males and females blossom freely, seeds have not yet been produced at the Botanic Garden; he believed, however, that it could be easily propagated by other means and that its cultivation would ensure a valuable addition to their exports. There was another medicinal plant which he hoped to see included among those exports at no distant date, though hitherto the attempt to introduce it had been attended as stated in the report with disappointment, and that was the "*Cinchona*" or "*Quinine Bark Tree*." The plants which he had procured had unfortunately arrived in a dead or dying state, and although they had been at once

removed to the cooler climate of Réduit and attended to by Mr. Horne, they had never recovered the effects of the voyage, or more probably of the previous land journey from the Botanical Gardens at Cotacamund through hotter regions of Madras. They ought not however to despair of success from the failure of one attempt and he had written again to the Madras Government to repeat the experiment, and had only yesterday from his friend, Sir William Denison that another case would shortly be sent with all the precautions that have been suggested.

There was another matter in which the Society also deserved his acknowledgements and that was for the very successful Flower Show held under their auspices in the Gardens of Government House. He trusted that its success was sufficient to ensure its repetition and he would take the opportunity of reminding them that in that case it was not too soon to give public notice to intending exhibitors ; his honorable friend opposite (Mr. Henri Pitot) smiled ; but it was not every one who was ready to enter the lists, like him, at a moment's notice. He would not delay them by referring to other points touched on in the Report ; the original papers contributed, though few in number, appeared to have been of a highly practical character and there was one of them containing the notes of Mr. Diek and Mr. Fleurot on the White Ant of which he should be glad to get a copy, as enquiries had not long since been addressed to him as to the best means of checking the ravages of that destructive insect. He had seen in an English paper, that the impregnation of timber and other substances with Linseed Oil, was recommended for this purpose, but there might be many cases in which common salt or the pulp of aloe leaves might be more suitable or easily procured.

He must congratulate the Secretary on having so nearly completed the task of packing up and sending to Kew the specimens in the Herbarium. They would be returned arranged and correctly named after comparison with those in the

collection there which is now the most extensive in the world, and the commencement would thus be made of an accurate catalogue of the contents of the Museum over the way. On the other hand, the examination of the original Types of Bory, Bojer and other eminent Botanists who had labored on these shores could not fail to prove instructive and interesting to European Botanists who congregated at Kew from all quarters—De Candolle himself having spent several months there last year. It would moreover enable his venerable friend Sir William Hooker, to advise how far the materials amassed here, together with those he has already acquired at Kew, would justify the publication of a “Flora” of the Colony; for that purpose he would not hesitate to ask the Legislature for the necessary vote of £300 or £400 when the proper time arrived, and he trusted that the ground-work would be found to have been laid in the manuscripts of a late eminent member of that Society, just presented to Kew by his Widow. He remembered that the late Dr. Ayres in a letter to Dr. Mueller which he saw before leaving Melbourne, stated that he had then completed the description of six hundred species not including the Ferns. It was worth their while to consider likewise whether the publication of a Fauna of Mauritius might not be much facilitated, and the Museum at the same time enriched, by exchanging duplicate specimens of Birds, Insects and Fishes with the British Museum and other kindred institutions in Europe. He believed it would be found that much less was known at home than was generally supposed of some of the commonest families in the Island, such as the Lacertæ, Crustacæ, Mollusca &c. No doubt a good deal yet remained to be explored also in the Dependencies of Mauritius notwithstanding that, as mentioned in the Report, advantage had been taken of the recent cruise of *H. M. S. Rapid* to send a collector from the Museum among them. In a brief visit of only a few hours’ duration to Rodrigues, one of their members, Mr. Edward Newton had not only disinterred the fossil bones of what he considered

a Dodo (*Didus Solitarius*), but had obtained two species of birds new to Ornithologists ; whilst amongst the Ferns brought from the same Island by Captain Barelly, one had been recognised by Lady Barkly as not previously known to exist either in Africa or India, or indeed anywhere else except Singapore. Such discoveries might appear trival to the unobservant mind, but besides the interest they possessed for students of the particular branch of natural history to which they pertained, they furnished facts for those speculations—for he could hardly call them theories—as to the origin and distribution of species, which were now exciting so much interest in the Scientific World, and the importance of which, in every point of view, could not be disputed. He would detain them no longer, but call upon them to adopt the Report presented.

Sir GABRIEL FROPIER rose and spoke as follows :—

Messieurs,

Permettez-moi de remercier en votre nom Son Excellence le Gouverneur d'avoir bien voulu venir présider votre séance annuelle.

Je me sens toujours très honoré d'avoir à interpréter vos sentiments dans des occasions semblables, mais je suis peiné de devoir aujourd'hui cet honneur à des causes regrettables. Je regrette que mon honorable ami et collègue de la Vice Présidence, préfère s'effacer par excès de modestie, quand sa parole, toujours écoutée avec faveur, le serait aussi avec fruit ; je regrette surtout que notre Président, l'Honorable Rushworth, se sente encore trop affaibli, par sa récente maladie, pour vous représenter en cette circonstance. J'espère du moins qu'il pourra bientôt reprendre sa place parmi nous, comme il a déjà repris ses occupations officielles.

Il est toujours facile d'exprimer des sentiments de reconnaissance, parce qu'ils sont bien sentis, et peu de mots suffisent pour dire à Son Excellence que nous sommes touchés de la nouvelle marque d'intérêt qu'Elle veut bien donner à notre Société. Mais je n'oserais pas, sans préparation, me hasarder

à aborder les questions que vient de traiter Son Excellence et qui font l'objet du Rapport de notre infatigable et zélé Secrétaire. Je m'exposerais sûrement à le faire d'une manière peu digne du sujet et de vous-mêmes. Vous m'excuserez donc de m'abstenir.

Si les encouragements aux arts et aux sciences sont désirables et utiles partout, on peut affirmer qu'ils sont indispensables à Maurice ; et Son Excellence semble l'avoir reconnu par les nombreuses preuves d'intérêt qu'Elle nous donne, et dont son discours de tout-à-l'heure abonde d'un bout à l'autre.

Ce n'est pas à dire que les habitants de cette colonie ne soient pas enclins au progrès, ne soient pas animés du désir de l'étude et de la science, ou soient privés de l'aptitude et de l'intelligence nécessaires pour s'y livrer avec succès. Dieu merci les mauriciens n'ont rien à regretter ou à envier sous ce rapport, et bien des exemples pourraient en faire foi.

Mais il faut bien le reconnaître, si les progrès accomplis dans le monde entier ont créé, pour l'homme des sources nouvelles de jouissance et de bien être, ils ont créé par cela même mille besoins nouveaux et une soif ardente pour les richesses qui offrent seules les moyens de satisfaire ces besoins. Sous ce rapport on peut dire que dans les pays comme le nôtre, la lutte est peut-être plus vive, plus incessante que partout ailleurs. Et, ce qui pourrait être paradoxal pour ceux qui voient dans les habitants de toutes les colonies des hommes mous et désœuvrés, on peut avancer qu'il n'y a pas de population plus affairée, plus occupée que la nôtre. Les résultats n'en sont ni plus prompts ni plus assurés qu'ailleurs sans doute ; nous avons à lutter contre des difficultés inconnues en d'autres contrées ; et si la vie humaine paraît trop courte en ces contrées, pour atteindre le but proposé, c'est bien autre chose ici où le plus grand nombre voudrait accomplir en quelques années, une tâche si ardue pour regagner ses pénates ou espérer un repos qui fuit toujours. Aussi ne trouve-t-on de temps pour rien ; et si j'en excepte l'accomplissement des devoirs d'un

ordre supérieur, chacun se croit dans l'impossibilité d'enlever un moment à ses affaires.

C'est donc un grand service que nous rend notre Gouverneur, non seulement en nous encourageant par ses paroles, mais surtout en nous montrant par son exemple qu'on ne peut mieux reposer son esprit des occupations de la vie publique qu'en l'appliquant aux charmes de l'étude. Et, constatons en passant que cette heureuse alliance de l'étude et des affaires n'a pas été perdue pour Sir Henry Barkly ; et que le témoignage que vient de lui donner la plus influente Société Scientifique de notre Métropole est d'autant plus considérable qu'il est venu le trouver aux confins du monde.

Mais d'ailleurs dans l'intérêt même de la lutte que nous soutenons, ne devons-nous pas, comme nos concurrents d'Europe, demander à la science les moyens d'augmenter et d'améliorer nos produits, et de défendre nos récoltes et nos autres biens contre les causes de destruction qui les menacent ? — Ne devons-nous pas surtout demander aux Arts et aux Sciences les moyens de protéger notre santé, d'éclairer et d'élever notre esprit, d'augmenter le confort et le bien-être de notre existence ? Et disons-le hardiment quelques instants chaque jour, chaque semaine, chaque mois même, consacrés à ce but, nous seraient bientôt amplement rétribués.

Voyez quel vaste champ s'offre à nous : cette année les principaux travaux des membres de notre Société ont porté sur des infiniment petits ; et ont produit cependant des résultats très remarquables.

M. Fleurot, notre habile chimiste, sur les intelligentes suggestions de M. F. Diek, s'est attaqué au caria blanc (Thermite Destructeur) cette vieille et très dangereuse connaissance de nos maisons, de nos meubles, de nos arbres. L'insecte lui-même, sa demeure, son nid tout a été décrit, alambiqué, analysé ; et bientôt il en sortira sans doute des résultats utiles pour la conservation des bois, pour la thérapeutique même.

Le Dr. Guthrie porte son attention sur les gouttes des liquides, sur les bulles des gaz ; et de cette étude patiente,

complète, il sait tirer des indications propres à intéresser l'esprit et fertiles en conséquences pratiques.

Le Dr. Icery s'attache à décrire le pou à poche blanche, ce nouvel ennemi de notre industrie sucrière, le plus infime et peut être le plus terrible, comme si le maître de toutes choses voulait nous montrer le néant de notre orgueil humain en nous faisant trembler devant les plus chétifs des êtres créés. Son étude aussi est complète : les transformations, les mœurs, les habitudes du terrible animal microscopique, tout est minutieusement décrit. Et qu'on l'appelle *Puceron*, *Cochenille*, *Gallinsecte* ou *Gasteralphus* (ainsi que le propose le Dr. Icery), il faut espérer que cette étude conduira à connaître les meilleurs moyens de s'en préserver.

Vous le voyez donc, rien n'est petit dans la nature. Par son importance, le Créateur est toujours grand dans la plus chétive de ses œuvres, et si je ne fais pas allusion à un autre travail du même savant membre, plus important encore, si je passe sous silence les autres travaux de notre Société, c'est pour vous laisser sous cette impression. A l'œuvre donc vous tous ouvriers de l'avenir, vous surtout jeunes hommes qui avez été puiser les éléments des sciences aux sources vives de l'enseignement européen. Faites profiter votre pays de vos connaissances acquises. Augmentez-en la somme par de nouvelles investigations. Considérez combien il reste à faire dans ces pays que n'ont pas encore explorés les maîtres de la science. L'histoire naturelle tout entière, la physiologie végétale et animale, la chimie, la thérapeutique, etc., etc., vous promettent d'abondantes moissons. Venez en faire part à nos modestes réunions mensuelles. La timidité, la modestie peuvent-elles vous retenir ? Sans doute l'esprit de critique peut s'exercer comme partout ailleurs, dans une petite communauté dont tous les membres se connaissent. Mais l'approbation des honnêtes gens, des vrais amis du pays doit vous rassurer. Leur indulgence est acquise à tous ceux qui cherchent le bien, leurs applaudissements récompensent ceux qui y réussissent. Tout nous convie à réunir nos efforts pour rapporter dans

un an une plus grande somme de travaux au Chef bienveillant qui nous honore de son patronage. Nous ne saurions mieux lui prouver notre reconnaissance, qu'en imitant ses exemples. Et est-il seul à nous les donner ? Auprès de lui, une femme distinguée se livre avec succès à cette attrayante étude de la botanique qui offre à notre admiration les œuvres les plus délicates de la nature. Vous venez de l'entendre, un hommage tout récent lui a été rendu par la plus illustre autorité botanique de notre époque : Sir William Hooker a donné le nom de Lady Barkly à une fougère (1) reconnue par elle comme non-décrite et recueillie dans la visite qui vient d'être faite aux îles de notre Archipel. Montrons-nous donc reconnaissants par nos efforts comme par le remerciements que je répète en votre nom à Sir Henry Barkly.

The Society then proceeded to the election of its Council of Administration for the ensuing year and the following result was obtained :—

OFFICIAL MEMBERS :

The Hon. E. E. Rushworth,—*President*.

The Hon. Sir Gabriel Fropier, }  
The Hon. Ch. W. Wiché, } *Vice-Presidents*.

A. Desenne, Esq.,—*Treasurer*.

L. Bouton, Esq.,—*Secretary*.

Fredk. M. Dick, Esq., }  
Henry W. Finnis, Esq., } *Vice-Secretaries*.

INOFFICIAL MEMBERS :

The Hon. H. Pitot,  
John Fraser, Esq.,  
L. Hugues, Esq.,

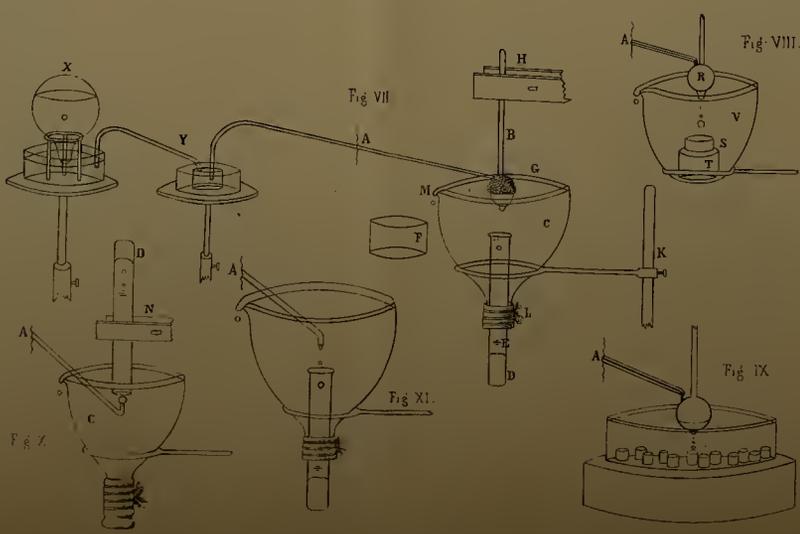
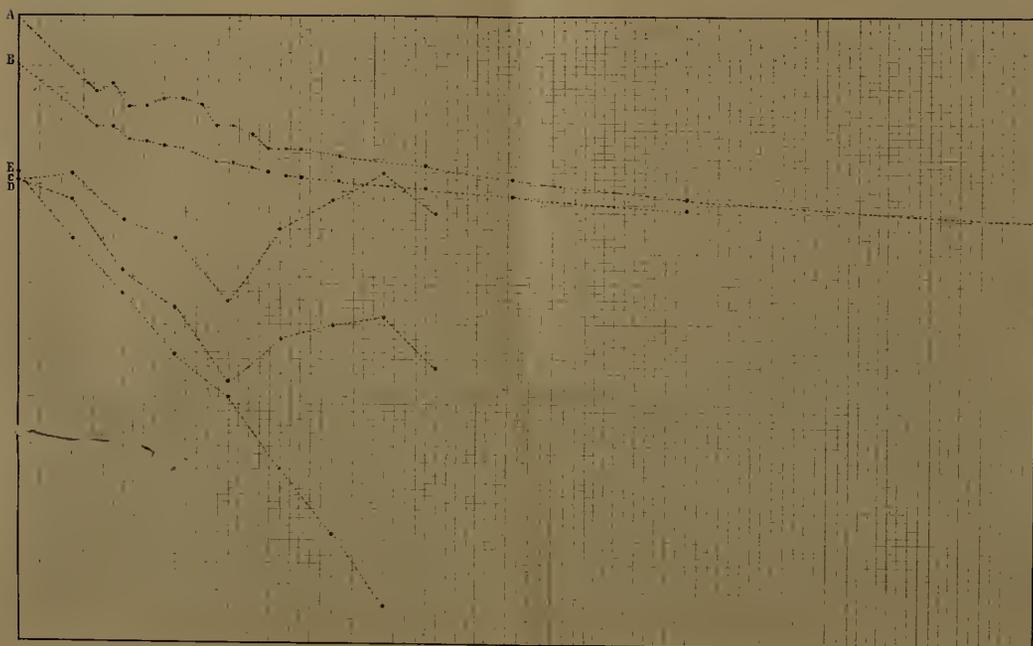
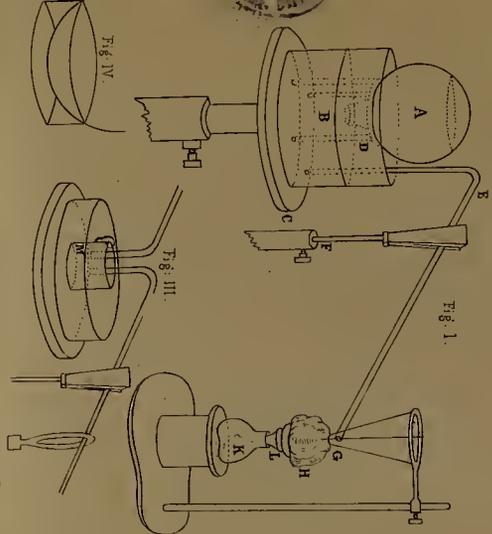
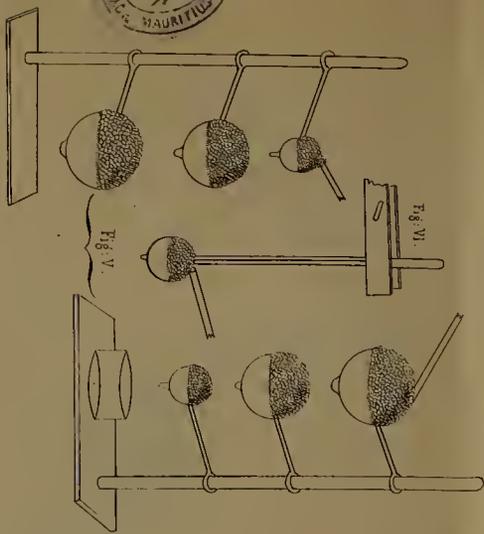
The Hon. E. Newton,  
Doctor Ch. Régnaud,  
,, H. Rogers.

AUDITORS :

E. Fleurot, Esq. | V. Naz, Esq.

(1) Cheilanthes Barklyi.







PRESENTED

12 DEC 1950











