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CORRESPONDENCE AND SELECTIONS.

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ERRATUM.

In the Minute of Mr. Willis, at page 13 of *Correspondence and Selections*, seventh line from top, for, "There is an illusion in the measure, which will lead those also made on its base towards destruction,"—*read*, "will lead those who move on its base," &c.

Contents

OF PART II, VOL. IV.

No. 1.

No. 2.

Page.
127
128

No. 3.

No. 4.

Index

TO PART II, VOL. IV.

Correspondence and Selections.

CORRESPONDENCE AND MINUTES CONNECTED WITH THE SOCIETY'S PETITION TO PARLIAMENT FOR A GENERAL REDUCTION OF DUTIES ON COLONIAL AND FREE LABOR FOREIGN SUGARS.

To J. HUME, ESQ. *Honorary Secretary Agri-Horticultural Society.*

MY DEAR SIR,—I beg leave to submit whether, at this great juncture, some prominent steps should not be taken by the Agricultural Society, for the purpose of representing, as truly and as clearly as the matter can be put, the interests of India *in re* sugar. I call the juncture great, not because I would attempt to deceive some by assuming an importance which the question itself does not bear, but because it is intimately connected with the prosperity of India; because, though now at a stand, India, within a few years, increased the produce of sugar to an extent which justified, if it did not exceed, the most sanguine anticipations; because in the course of seven years the supply from India to England increased forty fold; because India now furnishes a fourth of the annual home consumption; and because it has just been announced in Parliament, that the consideration of the sugar duties, with a view to their final settlement, shall remain in abeyance only for about eight months longer. There is nothing by which the production and consumption of colonial produce is so much affected as the rates of customs duties; the emancipation of colonial stains which happened once, and cannot happen again, need not be considered an exception; and I would repeat, for the history of the point is recent enough to be easily ascertained, that the vital and lively success or the drooping failure or stagnancy of colonial agriculture and commerce, is mainly affected by the customs duties at which colonial produce is admitted into the home market. The fittest adjustment, and, if need be, a reduction of these duties, is the only assistance, external to themselves, which East Indian planters can seek to improve the sugar market: the best mode of cultivation and manufacture, they are at all times free to choose; what they reject to-day they may adopt to-morrow: but in a matter which they cannot control, they have only a few months to deliberate, and deliberating, to determine if they have any information to tender to Sir Robert Peel, which, sometime next March or April, might induce him so to modify his new financial scheme as to secure benefits to India, which, without the information thus tendered, would have been lost. Single efforts will scarcely suffice; and it seems to me that the facts which cannot but be available may very properly be digested by, and submitted through, a Society of standing and reputation. Surely India cannot have produced 1,200,000 cwt. of sugar for successive years without supplying facts, known to many, by which the cost of production, and the average of a remunerating price may be illustrated. To produce cheap, and sell dear is the only problem which the planter has to solve; and by this time, as I have said, having already exported 1,200,000 cwt. in a year, he should know something of his charges and his profits.

It seems at this time quite unnecessary to speculate upon, or provide for any other measures than those which are likely to be submitted by the present Government in England. If it were doubtful that the next year's Tariff should be promulgated by Sir Robert Peel or by Lord John Russell, the preliminary proceedings of parties interested in the extension of the export of Bengal sugar would have to be differently shaped; they would then have to consider not only what rate of customs duty, as affecting themselves, is compatible with a remunerating price (which I take to be their foremost question now) but what arguments they could offer, why *all Foreign* sugar should not be admitted on the same terms as their own. But from the relative strength of the Parliamentary parties there is no probability, scarcely a possibility, of differential duties being absolutely abandoned, and on the contrary, we have an assurance clearly foreshadowing the result, that protection will be continued to the colonies of Great Britain.

Could any thing that we have to say, be said without using the word Protection at all? Far before the abstract question of protection, and its interests and duties, personal, national or cosmopolitical, is the question of profit and loss, of cost and price. Freedom in trade, is not necessarily the antagonist of profit. A colonial trade may very possibly be profitable, even when a foreign trade is free, much more if, as in our case, the foreigner must pay a bonus for his admission into our markets. And fully am I satisfied, that looking to the outlay which the production of sugar has cost him, and the prices which its sale has yielded and continues to yield, it far more concerns the planter to endeavour to lighten the burdens which now encompass his speculation with uncertainty and risk, rather than to trace his own losses to the non-prohibition of foreign competition. Let him produce cheaply to those who consume freely: and considering the standing he has already acquired, he may safely postpone foreign restriction to free consumption. I do not like, for example, the mode in which the protection argument seems to have been put by Mr. Mangles, judging from his shortly reported speech. It would have been more satisfactory had he spoken rather of low profits than the outlay which the use of expensive machinery had entailed. To my mind, Mr. James was more practical, who fighting the West India interest at home, while his son managed abroad, declared that every pound he sold at 6½*d.* cost him 7*d.* Quite right was Mr. James to seek something more than 6½ for his 7*d.*; so should the East India Colonist seek an adequate profit upon every hundred weight he produces; and with that end let him curtail every cost that intervenes between the jointing of his seed canes and the purchases of consumers; and first let him attempt to curtail an expence which is not an essential element in the production of his sugar, the duties levied to make him free of the Custom House. Does the planter doubt if this would benefit him? does he think, following the text book of a Political economist, that this tax is paid always, and only, by the consumer, not injuring the producer? Let him calculate the effect of throwing open the consumption of a fixed quantity of his sugar to a million and a half instead of one million of people! Only one million can afford to purchase the offered sugar when the price is enhanced with a duty of 24 shillings; but the duty being reduced to 16 shillings, and 8 shillings in the shape of duty being struck off the price, the commodity which was before open to 1,000,000 is now open to 1,500,000. Then the effect is inevitable. The planter would have been remunerated as much as before, by selling his sugar less the 8 shilling duty, but now the competition of consumers adds 4 shillings to what under the circumstances would have been the market price, and all this is so much gain to the planter's profits.

Next session of Parliament the Sugar duties will certainly be reduced. Sir Robert Peel spoke the other day hypothetically of a reduction of 8 shillings. Now the subject of investigation which, with my merely speculative opinions, I would urge upon the practical wisdom of the Society is, whether or not, it concerns the interests of India to secure a reduction of 8 shillings, or a reduction of 12 shillings, or a reduction of 16 shillings; surely some facts are to be gotten out of the experience of the last 7 or 8 years, some facts producible in India, and not producible in England, which would help a wise and prudent minister to an issue distinguishing justly between eight and sixteen. Not possessing the facts which India alone can give him, facts shewing the circumstances under which sugar planting is impeded, shewing the exact relations which of late years prices have borne to charges, shewing (as I presume may be shewn) how from the uncertainty and insufficiency of the returns, the production of sugar, after so striking a development, is now stagnant, the minister will naturally frame his measure more with reference to the wants of the consumer and to the conditions which he may conceive to be best applicable to his financial operation, irrespective of the necessity which exists, (though it may not have been explained to him) of promoting not indirectly as a consequence of following other good ends, but directly on its own account, the production of sugar in India. It should never be forgotten, that every sixpence, every shilling gained in deduction of duty is a boon to the planter. Supposing Sir Robert Peel ready of himself to offer a reduction of 8 shillings; if an appeal from India should induce him to extend his proposition to 10 shillings, it will be an extension wholly in the right direction. Relax restriction, and you widen the range of competition; block up the gates of your ports, and you throw so much sugar back on the planters' hands. It may be seen in Mr. Porter's "Progress of the Nation," that the consumption of sugar per head in England was twice as much in 1801 as in 1840: in 1801 being 30lb; in 1840, 15lb. Probably during the last year or two it has been 19 or 20lb: there is just as much disposition to consume now as in 1801. Then the duty was 20 shillings. I do not say that a return to the same duty now would raise the consumption 50 per cent; but with reduced duty there springs an aptitude to consume, which certainly would raise the effective demand to that extent: and the continually increasing population opens, day after day, new channels of consumption.

I now leave these remarks in your hands; you are in a much better position than I am to determine if something or nothing should be done in the matter. Shall we help ourselves, or shall we take the chances as they come, measured to us with various fates by the adoption of a series of Parliamentary resolutions?

I am, &c.

A. Sconce.

Chittagong, 3*d Sept.* 1844.

Minutes of the Members of the Special Committee appointed to take the foregoing letter into consideration.

I think we should be represented at home, during the discussion of this important question; but I should like to meet, and exchange a few ideas with my Committee-men, before deciding as to the best way of proceeding.

I do not know what facts we could bring forward to influence the decision of the question. There is an evident leaning at home now to quiet the millions, by giving them, not only cheap sugar, but all things cheap. Should we make out that we cannot without loss sell our sugar much under present prices, we may be told that others can.

Should we, on the other hand, make out that we can supply sugar at very cheap prices, the argument may again be turned against us, and we may be told that we want but a very small protective difference of duty.

All countries would be advantageously interested in the *lowering* of the duties, but our main advantage will be, in the *difference* of duty which we are to pay.

There are three modes now in this country, in which the sugar exported to England is prepared.

1st. The old native method, (by which the bulk of the sugar exported has been manufactured,) which I suppose is precisely now what it was years ago, and will be for years to come.

From all the information I have heard, I believe that from 8 to 9 rupees per maund for the average of white sugar is required to pay those employed in its production; and that when the price approaches 7, the sugar lands fall out of cultivation.

I do not think we can found any thing upon this stationary process.

2nd. The method lately commenced of bringing European machinery and skill to operate upon the raw material, by which perhaps, one half of the losses of the native method are saved; the other half consisting of the cultivation and the expression and reduction of the juice is left untouched.

3rd. The conduct of the whole process, from the sowing of the cane to the making of the sugar, which I conceive is in time destined to supersede the other two, and to give us sugar as cheaply as it can be produced in this country.

I think perhaps our argument should be,—that many parties have engaged in the pursuit, under existing circumstances, and that any sudden change which should very much lower the prices of sugar, would paralyze their efforts, which if encouraged, will ultimately tend both to the advantage of this country and Great Britain.

8th November, 1844. J. Cowie.

I agree generally with the suggestions and opinions of Mr. Cowie, but I think we should base our petition for a greater protection or differential duty, than has been allowed us, on other grounds. It is quite impossible to form here any accurate notion as to the real cost of production of sugar in those countries whose produce, (free grown,) is about to be admitted to home consumption; but, judging from the prices at which, for a series of years, Javas and Manillas are sold in the English markets, say in Bond, good whites, (*clayed*), at 22*s*. 6*d*. to 24*s*.—strong greys at 21*s*. to 22*s*.—yellows at 18*s*, and low browns at 13*s.* to 14*s.* 6*d.* per cwt., I am of opinion that the Act lately passed for admitting these sugars at 34*s.* duty only, will most seriously affect us in this country for some years, and deprive us, in a great measure, of one of the best and safest mediums for the remittance of all dues home, (already a difficult matter from the want or inadequacy of exportable commodities,) apart from other considerations which refer to the prosperity of the country, and the increase of its resources. Doubtless European skill and machinery, with an improved system of cultivating the cane, such as our western colonies adopt, will effect a great change here; and my opinion is, that *eventually*, we shall succeed in producing as good and cheap sugar as any other country where labour is not compulsory; but this must be a work of time and progression. We have advanced but slowly during the last 5 years in production, even with the advantage of protection; and now that this is to be withdrawn from us, I apprehend that the cultivation on the part of natives will retrograde, and much land be thrown out of use. Under these circumstances, I think it is the duty of the Agricultural Society, and also of the Chamber of Commerce,—an imperative one—to petition the legislature for a *reduction* of duty on our *colonial* produce, say to 18 or 20 shillings, (as the free trade notions in vogue forbid all idea of *increasing* that of *foreign*,) and I shall be happy to render any assistance in my power in furthering the views conveyed in Mr. Sconce's letter.

8th November, 1844. J. COWELL.

With Mr. Cowie, I think we ought to be represented at home during the forthcoming discussion upon this most important matter, as we are led to believe it is to be the final settlement of the sugar duties question. It would be well to have a meeting of the Committee as early as convenient, to consult together as to the proper course to be followed.

I am of opinion, that but few sound reasons could be brought forward for the continuance of a *heavy* protecting duty in favor of our colonies, nor do I think it necessary for their prosperity; and after taking into account the enormous sum granted for emancipation, I think we should also have difficulty in finding sound arguments against the admission of free grown sugar from foreign states at a *fair* discriminating duty. Still I think every possible means should be taken to prevent the admission of Slave-grown. I consider it is of the utmost importance to all interested in the production of sugar in this country, that the question of duties should be permanently settled for years, or there will be no inducement for capitalists to invest in expensive machinery and necessary works. If once settled, I am inclined to think, that a protecting duty of even 8*s*. or 10*s*. will be found quite sufficient, especially if legislators could be prevailed upon to lower the sugar duties to something like 15*s*. or 16*s*. (which most probably will soon be the case,) on colonial, and in the same proportion on foreign free grown. This no doubt would cause a great increase in the consumption of the article. The effect of the present new duties, will be to raise the price of free foreign qualities, until such countries have increased their production to such an extent as to cause prices to fall from over-supply. It is but natural to suppose, from the fact of there being very small stocks of sugar held in all the important marts in Europe, that no more has been produced than is just equivalent to the present consumption at the current rates, and I would submit, that some years must elapse before there could be any great reduction of price on the home market from over supply, *especially* if, in the mean time, consumption had increased in proportion to such a reduction of duties as I have before named, and which we may look for.

I believe Rs. 8. in this market, would bring as large a quantity of fine white sugar as is now received, after a lapse of two or three years, which would be required to recover from the check such a sudden fall in prices would cause. Sometime would also be required to equalise the interests of the landowner and ryut—the former would have to come down by degrees to the old rate of fees or rent for sugar land, which I have reason to believe has increased, in proportion to the advance in the price of sugar in this market, and in most instances I believe the landowner, and not the ryut, has been the gainer from high prices.

I know from a considerable amount of information, which I have partly collected myself, that very good sugar, now worth from

Rs. 9 to 11-8 in Calcutta, can be produced by the natives in some districts at 5-8 to 8, and at these rates leave them a fair profit, and in such districts the increase in the production is yearly progressing, and can go on to a very great extent even around Calcutta, where the rent for land is very high; first rate Khaur, which can be shipped as Muscavado sugar, and which sold last season from 6 to 7 per maund, can be produced at 4-8 to 5, and leave to the grower a fair remunerating return.

Mr. Cowell remarks, "that this country has advanced but slowly during the last five years in the production of sugar, even with the advantage of protection, and now that this protection is to be partially withdrawn, he fears we shall retrograde."

I am of opinion that the slow progress made may be attributed more to the continual agitation, and the great uncertainty as to the extent and nature of such alterations, as our Government might think fit to make in the duties, when the question was left from year to year for further discussion, during each of the five years he names; which has tended more to prevent a large amount of capital and skill from being employed, than in lessening the original amount of cultivation, which I believe has remained pretty nearly the same; but the produce has been diverted into other channels, and a much larger amount has been consumed in the country in consequence of lower rates.

I would therefore base any petition to Parliament upon the ground that the late alteration in duties is on the whole an equitable one both to the colonies and the great mass of consumers, and pray for a general and liberal reduction in the duties on colonial and free labor sugar, keeping the protection in favor of our own colonies proportionately as much as by the late alteration; but above all I would petition for such a permanent settlement of the question, as to enable men of capital and skill, to invest their money with confidence of being allowed a fair opportunity to realize a remunerating return.

Under such arrangements, I should consider the interests of this country sufficiently protected; and I do not hesitate to predict that we should see India gradually, but surely, taking her place amongst the foremost upon the list of sugar-producing countries both as regards quantity and cheapness.

I shall be happy to render all assistance in my power to forward any measure which may be proposed likely to be of service to the country, and in furthering the views of Mr. Sconce, as detailed in his letter to the Honorary Secretary.

14*th November*, 1844. WM. HAWORTH.

My colleagues have written so fully on this question, that but little is left to be added. There can be no doubt, that India possesses great advantages as a sugar-producing country, and that year after year, her vast resources are being developed from the enterprise and skill, brought here by those who seek the cultivation of the "Rupee tree," under its various forms. A reduction of duties may be, I think, confidently anticipated, from the disposition now so general, not only to supply cheap food, but also to encourage free trade, for it is well known that the consumer pays the duties, and that the price of an article controls the demand.

26*th November*, 1844. CHARLES HUFFNAGLE.

I am decidedly of opinion that the Agricultural Society ought to petition Parliament, this Government and the Court of Directors, on the subject of the sugar duties, which there is every reason to suppose, will be permanently settled in the ensuing session.

Looking to the strongly expressed opinions of all the great political parties at home, and to the general tone of public feeling, I ec-

For a continuance of the differential duty of 10*s*. between British Colonial and other Free labour sugar.

For a lowering of the scale of duty, say from 24*s*. and 34*s*. to 14*s*. and 24*s*, so that the consumption may be extended to meet the increased supply; which we may safely assert, will be forthcoming from the free labour countries, and we hope from our own Colonies; and finally,

For some assurance, that no change will again immediately take place, and that the adjustment may be permanent for a certain period.

I assume it to be admitted that any measure that would raise the cost of sugars to the British consumers more than 10 per cent, *in bond*, beyond what the foreign continental consumer pays, would not for a moment be listened to, and that even that protection, or tax, would not be submitted to, unless there was some prospect of its reduction by our being able to supply cheaper sugar.

On this point, I beg to say, that from long enquiry and much investigation, I am decidedly of opinion that white sugar produced by natives, cannot be afforded for export, under 8 and 9 Rs. per maund. At any thing, under that, land goes out of cultivation, and the native consumption, especially to the westward, is enormous,. leaving comparatively little for export. Out of the price for white sugar, but a small portion goes to the cultivator of the cane in the Benares Provinces. He almost never sells the sugar in its prepared state, but it almost all passes through the hands of a class of refiners and Mahajuns, and they derive the greatest share of the profit from an increased price in the market, this no doubt also proceeds occasionally, by competition among themselves to pay higher prices for the raw material.

In the lower provinces, the European refineries have taken the place of the class of sugar boilers above referred to; and being able to give higher prices for the raw material, have tended much to increase the cultivation of the cane in Bengal; but it is only from cane cultivated by Europeans, and manufactured by European machinery, that we can hope to supply sugar at prices which will enable India to compete with the produce of other countries.

We have not succeeded hitherto, for out of an annual export of 60,000 tons, *not* 600 (I believe *not* 60 *tons*) are the produce of cane cultivated by Europeans, and *produced at a profit*; but we may ask for protection for a few years at any rate; because great efforts are being made, and large capitals in course of expenditure, for the purpose; and a few years encouragement will prove what can be which are particularly worthy of notice, and could be advantageously made an article of export. Arracan is a remarkably rich and productive forest country, and is I imagine, better situated with regard to facility of timber transport to Calcutta, than any other locality within the same distance. It is fair therefore to infer, that this will eventually become an object of primary importance to the settler, and that any information which can at present be thrown upon the subject will prove interesting to many of the members of the Agri-Horticultural Society, and even to some a valuable reference. Under this impression, I have been induced to draw up a scale (from the most authentic sources) of the prices at which timbers of the largest dimensions are procurable at the Ghaut, for shipping. It will be observed that many of the rates are high, but I have assumed the highest, in order that no disappointment may be subsequently experienced; at the same time I would hold out every prospect of a material decrease upon its becoming an article of more general traffic, as the Mug is peculiarly active with the use of his "Dhow," and many of the more indigent, who are chiefly dependent upon their own manual exertions for subsistence, would gladly betake themselves to a profitable occupation requiring no other call upon them beyond the union of a few. To obtain woods of a superior quality however, it would be essential to detach with them an experienced Native Overseer, in order that the trees might be barked in the spring, and felled when most free from extraneous vegetation.

I have also the pleasure to forward to the Society half a maund of *gurjun* oil, a vegetable matter which issues from tree specimen, No. 85. The Mugs extract it by cutting a cell in the trunk, and placing a fire inside for a short time; an emission then ensues, which discharges itself by a cut at the bottom of the cell into an earthen vessel hung outside. This oil is a great preservative to wood as a varnish, and is an excellent drier in composition with paint, possessing in this respect, when prepared by boiling and clearing off the scum, the properties of turpentine. That which I forward should be distributed amongst those who desire to try it, as it is an article which, when more generally known by Civil Engineers, Builders and others, would considerably supersede the use of both turpentine and varnish, its price being so much less, and quantity so abundant. Many thousand maunds could be procured upon a demand, and the highest price would be about 3 rupees per maund.*

With reference to the mulberry slips, maize and cotton seeds with which you kindly supplied me, I am happy to inform you that I have been successful with all three. From the promising appearance of the slips, I anticipate that next cold weather they will supply sufficient food for as many worms as I shall require at

* The oil here alluded to by Lieut. Nuthall is yielded by several species of the genus *Dipterocarpus*, which abound in many of the eastern parts of India, as well as in Burmah, and the Malay Islands. The mode of extracting the liquid, as given by Lieut. Nuthall, is much the same as that mentioned by Roxburgh, (Flora Indica, vol. 2, p. 613,) who moreover states, that the average produce of the best trees of *D. turbinatus*, during a season, that is, from November to February, is as much as forty gallons; but that the largest proportion of the best sort of oil is obtained frcm *D. incanus*. This oil, or balsam, is well known in all the Indian bazars, and is used for painting purposes of the coarsest description, in godowns and other places where cheap work is sought for rather than good work. Its price, at the present time, ranges from 5 to 7 rupees per bazar maund, which, taking into account the charge for freight and several other contingencies, appears to be too low a rate to admit of this product of Arracan being profitably imported into the Calcutta market. The *Gurjun tale* has been made the subject of various experiments by Dr. O'Shaughnessy, (Vide Bengal Dispensatory, pp. 222 to 224.) By distillation he found it to yield a volatile oil identical in chemical composition with that of the balsam of copaiba, and it has been accordingly extensively used in the hospitals of this city, with exactly the same medicinal effects. The difference of cost between the two,—the essential oil of *gurjun*, being about one-tenth the price of the balsam of copaiba,—is another great point in favor of the substitution of the former for the latter, not only in medicine, but also in the arts, in many of which copaiba is now used. In addition to the above, it is known to be a good solvent to caoutchouc. Its application to this purpose was first brought to the notice of the Society by a member, Mr. Laidlay, whose communication is published in the Transactions of the Society, vol. viii, p. 345. This oil has never, we believe, become an article of external commerce, though in consequence of a communication from Dr. Royle, about five years ago, stating that it was much required in England for experiment by manufacturers, and that it might become an article of commerce if made known there, a member of the Society was induced to transmit about five hundred gallons of it as a speculation. We learn from Dr. Royle, (v. "Productive Resources of India," p. 77,) that the attempt failed from the circumstance of the Custom House Officers having refused to pass it except at the highest rate of duty, namely that for a manfactured article. "The selling price," as he justly observes, "is hence increased, before it is even known, and it may thus perhaps be prevented from becoming an article of commerce."—Eds.

starting. The little of the maize seed I sowed, has come up very strong, although it is not the proper season for it. Of the New Orleans cotton seed, only four have germinated, but they bear such a healthy appearance, as to justify the probability of cotton cultivation answering here. I am aware of large quantities of cotton seed having been tried in Arracan, and I am not acquainted with a single previous instance of its having thrived, this however is to be attributed to the seed (most of which has come under my own inspection) having been mildewed and rotten. I particularly examined that under consideration, and am very pleased at having succeeded with four out of the whole.

Akyab, January 4th, 1845.

List of Woods indigenous to Arracan, forwarded together with specimens to the Agri-Horticultural Society of India, by Lieut. W. F. Nuthall, 18*th Bengal Native Infantry.*

1 Myonk-lók,
2 Myonk-goung,
3 Kan-gan,
4 Hma-yan,
5 Da-bru,
6 Tong-ran-khot,
7 Kro-thá,
8 Swun-khri,
9 Thit-pók,
10 Toung-prá-non,
11 Thit-non,
12 Shon-tha-rát,
13 Ta-lé,
14 Hman-doung-krí,
15 Hma-doung-nge,
16 Pouk-pan,
17 Ta-ruá,
18 Praing-han,
19 Krat-moung,
20 Thit-mwan,
21 Hna-goung-bú,
22 Gran,
23 Kyók,
24 Kiun-lan,
25 Hman-kyè,
26 Praing,
27 Hra,
28 Sék-khí,
29 Saing-thèng,
30 Bók-thá,
31 Rí-than-bon,
32 Prá-wá,
33 Pan-khá,
34 Kyè,
35 S'a-tú,
36 Mran-khyí-shá,
37 Prá-tha,
38 Tan-pa-dá-gá,
39 Nwá-laing-byaing,
40 Khrat-ró,

41 Ri-pra-non,
42 Son-thá,
43 Ngóng-hrevi,
44 Tok-thá,
45 Tha-páik,
46 Lon-paik,
47 Tha-bri,
48 Tri-gon,
49 Pa-douk,
50 Thit-nat,
51 Tha-rat,
52 Than-gou-nat,
53 Ong-dóng,
54 San-wó,
55 Tha-wan,
56 Hmon-thá,
57 T'ouk-krá,
58 Krwat-khyídóng,
59 Pat-thon,
60 Shon-ma-tat.
61 U-shīt-thá,
62 Ta-bwát,
63 Nyoung,
64 Pau-lé-zi,
65 Lat-tok,
66 Ngóng-ni,
67 Eng-zi,
68 Pau-le-ka-thit,
69 Kha-moung,
70 San-brwun,
71 Thit-sa-gá,
72 U-hué,
73 Hnon-bé
74 Khroung-khí,
75 Saing-laing-khá,
76 Lat-pon,
77 Ouk-khan-zá,
78 Tha-dwát,
79 Ka-thit,
80 Shí-shá,
81 Prong-pa-zá,
82 Ra-ma-ni,
83 Pi-nè,
84 Mrát-swá,
85 Kon-gyau,
86 Lek-ró,
87 Rau-khát,
88 Thit-prouk,
89 Khwau-s'at,
90 Son-bè,
91 Khí-hrá,
92 Toung-zi-kon.
93 Toung-hrouk,
94 Ka-zú,
95 Kron-dwát,
96 Ka-moung-krat- sú,
97 Thit-ka-dó,
98 Thit-lan-hnyi,
99 Than-bóng,
100 Ra-zo,

Vowel Sounds.

a short as *u* in *but*, or *a* in *America.*
á as *a* in *father.*
e, *è* as in *men*, *let*.
é as *a* in *name* l*a*

i as in pit, but sometimes the sound thus represented, is pronounced by Mugs as *i* in find.

í as *ee* in feet.

ó as in note.

ou as in l*ou*d, pr*ou*d.

u as *oo* in m*oo*n.

u as *u* in f*u*ll.

y as in *y*outh, *y*oung.

The apostrophe ' denotes an aspiration.

List of the most valuable of the above Woods, with the uses to which they are generally applied by the Natives of the Province, and to which they could be applied with advantage. These are procurable in any quantity, of the undermentioned sizes, and prices, by giving a short previous notice.

No.	Name.	Length.	Girth.	Price.	Uses.
		feet.	ft.		
1	Myonk-lók, ...	21	3	4 0 0	Generally useful.
2	Myonk-goung, ...	21	3	4 0 0	Ditto ditto.
6	Toung-rankhot, ...	21	3	3 8 0	Useful for Posts, Planks, and Architraves.
7	Kro-tha, ...	21	3	3 0 0	Posts, Rafters, &c.
8	Swun-khri, ...	21	3	3 8 0	Ditto.
10	Toung-prá-non, ...	21	3	3 0 0	Planks and Architraves.
13	Ta-lé, ...	21	3	2 0 0	Used for boat-oars, and house building.
22	Gran, ...	21	3	2 0 0	Generally useful.
26	Praing or Iron-wood,	21	3	4 0 0	Possesses remarkable durability and strength, and would answer admirably for Indigo presses.
27	Hrá,...	21	3	5 0 0	Useful for Ship and House building.
31	Ri-than-bon, ...	15	0	2 0 0	Musket butts and furniture.
32	Prá-wá, ...	21	3	2 8 0	Useful for Posts & Planks.
39	Nwa-laing-byaing, .	21	3	3 0 0	Ditto for Buggy Shafts and elastic purposes.
40	Krat-ró, ...	15	3	2 0 0	Ditto for Posts.
42	Son-thá, ...	21	3	3 8 0	The heart of this tree is very durable.
46	Lon-paik, ...	21	3	2 8 0	Posts, Planks & Architraves.

No.	Name	Length.	Girth.	Price.	Uses.
		feet.	ft.		
47	Tha-bri, ...	15	3	2 8 0	Splits in the Sun but useful if not exposed.
49	Pa-douk, ...	21	3	3 8 0	Posts and Planks.
51	That-rat (Mangoe,).	15	4½	5 0 0	For boxes and cases.
52	Than-gou-nat, ...	21	4½	6 0 0	Generally useful "Tilser."
57	Touk-kra, ...	15	3	3 0 0	Planks and Architraves.
62	Ta-bwat, ...	21	3	2 0 0	Very elastic, would answer for Buggy-shafts, &c.
69	Kha-moung, ...	21	4½	6 0 0	A close fibred "Jarroll," used by the Mugs for all purposes, would answer admirably for the beams of Indigo Presses.
76	Lat-pon, ...	21	1½	3 0 0	Used by the Mugs for making Coffins.
77	Ouk-khan-zá, ...	21	4½	3 8 0	Ditto ditto for Dingies and Boats.
81	Prong-pa-zá, ...	21	3	3 0 0	Posts, Planks and Architraves.
82	Ra-ma-ui, ...	21	4½	2 0 0	Generally useful.
83	Pi-nò, ...	21	4½	5 0 0	Used for making Dingies and Boat building.
84	Mrát-swá, ...	21	4½	5 0 0	Generally useful.
85	Kon-gyau, ...	21	4½	3 0 0	Posts, Planks, &c.
94	Ka-zu, ...	21	3	3 0 0	The heart of this tree very durable.
95	Kron-dwát,... ...	21	3	3 0 0	Useful for Masts and Spars.
97	Thit-ka-dó(Toon),	6 to 6½	4½ 6 7½	2 8 0	To be had at this price by taking an equal proportion of each size; very useful for furniture.
99	Than-bong, ...	21	4½	3 0 0	Planks for Boat building.
100	Ra-zo, ...	21	3	3 0 0	For Boat building.

REPORT ON SAMPLES OF COTTON, GROWN FROM FOREIGN SEED IN THE GARDEN OF THE BRANCH AGRI-HORTICULTURAL SOCIETY OF BAUGLEPORE;—AT THE GOVERNMENT COTTON FARM AT GORRUCKPORE;—AND AT BOJEPORE FACTORY, NEAR BUXAR.

Extract of a letter from Major T. E. A. NAPLETON, *dated Bauglepore, 29th October,* 1844.

" I shall have the honor of forwarding some Georgia cotton for presentation to the Parent Society next month. The plants are in fine order, and the white ants, with all their destructive powers, have not as yet assailed our little plantation. In my humble opinion, I think our soil vastly well suited for the cultivation of cotton on an extensive scale, but will wait the result of the Committee's report upon the November samples, before I say any thing more in praise of such a project. In July last, another small cotton field was formed at some distance from the first, and the plants are now in a most flourishing state. A kutcha well has been sunk in it, and the success with which the sinking of this well has been attended is as follows. The first 4 feet from the surface fine rich mould, the next 4 feet a very red clayey soil, and at 13 feet water and a bed of kunkur. There are now about 10 feet of water in the well, the diameter of which is 7 feet 8 inches; not a pucka brick or a bit of mortar is required, and the great facility of irrigation therefore, induces me to think that sugar cane cultivation might also succeed, and whenever our funds will admit of our purchasing a few beegahs more ground for agricultural purposes, it will be an especial object of our Society to promote and improve agriculture in all its branches."

19*th Dec.* 1844.—" With reference to my letter dated the 29th October last, I have now the pleasure to advise you of the despatch, per dak banghy, this day, of one small petarrah of cotton attached to the pods just as it was picked from the plants, and another of prepared cotton, *id est* separated from the seed and carded. The cotton plantation in our Public Garden is merely an experimental one, and we are, before extending the cultivation of it, anxious to be informed by your able Cotton Committee how far we have succeeded, *i. e.* whether the quality is considered good or superior. Will you therefore oblige our Branch Society by submitting the musters now sent for inspection at the next General Meeting, with our solicitation that the Cotton Committee may be requested to report on them. I may add, that the cotton plants are covered with pods, and a *large crop is certain*, and that what will be gathered during the next month will be of superior quality to that now sent.

"The carded cotton is most indifferently cleaned, the people here being very inexperienced in this requisite."

17*th Jan.* 1845.—"I have this day had the pleasure of receiving your letter under date the 13th instant. In reply to the 1st Para. I have to thank you for your intention of submitting the specimens of cotton grown in our public garden here, for the Committee's report. I have this day forwarded another small packet of Georgia cotton, grown on the same plants as the last, but gathered 6 weeks later, and this latter sample kindly have tested at the same time."

Extract of a letter from H. C. TUCKER, *Esq. Officiating Collector of Gurruckpore, dated January* 29*th*, 1845.

"I have the pleasure of sending you herewith small samples of cotton, and cotton seed from the Government cotton farm at this station.

The cotton was originally American Upland, imported 1840-41, and the first crops grown in Bundlekund, so that this is the 3rd years' produce from the original seed.

Mr. Blount speaks highly of the seed; and, in conformity with his wishes, I have made up 28 bags of it, which now await the orders of Government as to their disposal. I should be glad to hear what is the opinion of the Society regarding the cotton, although it is not likely to become a remunerative crop in this district."

Extract of a letter from P. P. CARTER, *Esq. Bojepore Factory, near Buxar, dated July* 7*th* 1844.

"Two years ago, I got a very small quantity of the Mexican cotton seed from the Society, which I made trial of, with such favorable result, that I am inclined to consider it, of all others, the best adapted for this district at least. All the plants are still in the ground, and in a most vigorous state. I counted the pods of three plants taken at random last cold season, and the average number was 127; they were all of them perfectly sound, and came to maturity, producing the most superior description of cotton I have yet seen in this country; each pod was about three times the size of the common "*kuppass*" of the country, and produced five times as much in pure cotton, and the plants were none of them more than from 2½ to 3 feet high, but very bushy. About six weeks after they came up they began to flower, and have continued bearing ever since throughout the year. The cotton produced during the rainy season is of course inferior to that of the dry months.

"18*th Dec.* 1844.—I have now the pleasure to advise you of the despatch of a sample of the cotton alluded to in my letter of 7th July, and will be obliged by your submitting it to the Society, and obtaining me a report on its quality."

REPORT ON THE ABOVE SAMPLES OF COTTON.

Cotton from Bauglepore.

1st. Layer harsh and dry, seed much eaten, and consequently will be more difficult to separate from the cotton. Staple irregular in length, and on the average much shorter than good to fair American Uplands; the bulk of the indigenous "*kuppass*" of Surat and Broach is fully equal to this sample, and is easier to clean by the Churka, or the roller gin.

2nd. Layer is cleaner *kuppass*, and sounder seed; the cotton is therefore more easily separated from it. This cotton is longer, and more regular in staple, and consequently more suitable for manufacturing by machinery.

3rd. Layer apparently the same as the 1st and 2nd.

No. 3. Same description of cotton as that in No. 1, basket packed six weeks later:—The staple of this is not so strong as the 2nd and 3rd layers of No. 1, nor does it equal those layers in color.

No. 2. The above *kuppass* cleaned, by what machine not mentioned. I presume either by the saw gin, or common Indian bow, (called the Dhoonostre) both of which processes are more injurious than the Churka in cleaning such cotton. In all short stapled cotton, it is essential, that what staple there is should be preserved as much as possible. To effect this, the Churka should be used, and the saw gin and Indian bow avoided. This cotton has evidently been much spoiled in the cleaning; it is nibby, and the staple is much broken, and consequently much loss in weight would occur in manufacturing it by machinery in what are called "*flyings.*" The cotton is worse in color than the "*kuppass,*" whereas it ought to appear whiter. If carefully cleaned by the Churka, a much better cotton than that before me, might be taken from *kuppass* such as No. 3.

The Cotton from Mexican seed, grown at Bojepore factory near Buxar, is of a good healthy color, and tolerably regular in staple, and could be used largely in manufacturing by machinery. It has been carefully cleaned, probably by the Churka, (if not hand picked,) and all that is wanted of this description is *quantity* (especially if by careful attention to the cultivation, the staple could be produced stronger,) if it could be laid down in Calcutta at about Co's. Rs. 10-8 per Bazar maund; which at the present exchange and including freight and charges is about 3½*d* per lb. in England, say a quantity increasing from 50,000 bales, (of 3 @ 400 lbs. each) per annum. The greater the quantity sent of such cotton, the more valuable would it become in the home markets, for it is an object with all spinners to adapt their machinery to such descriptions of cotton as they are sure of always finding a market, and therefore less subject to great fluctuations in price.

The "Cotton from American Upland seed, 3rd year's produce from original seed" at Gorruckpore, is a good coloured, healthy looking cotton, and would meet with a ready sale in the English markets, if it could be supplied in large quantities, of uniform quality.

The Agri-Horticultural Society's up-country correspondents might convey some valuable information with reference to these samples now under report; such as the price at which a bazar maund, or any given weight could be laid down in Calcutta, in quantities not less than 2000 maunds. Various up-country subscribers may have sent numberless mere garden samples showing that good cotton *can* be grown; but can such cotton, which I think likely to be useful for manufacturing purposes by machinery, be produced in a season, say to the extent of 5,00,000 maunds; and can it be laid down in Calcutta at Rs. 10 per bazar maund, or equal to it?

JAMES POTTER.

Calcutta, 26*th February*, 1845.

Memoranda accompanying a sample of farinaceous powder prepared from the roots of the Tacca pinnatifida, abounding in certain parts of the province of Arracan. By Major D. WILLIAMS.

I have the pleasure to send you to be laid before the Society, the roots of a plant that grows in the island of Chedooba, of which a farinaceous food is prepared equal, if not superior, to the arrow-root. I send two bottles of the meal or powder prepared by me, after the manner the Mugs prepare it for exportation to the Eastward, chiefly, I believe, for the China market. The Mugs, after removing the peel, reduce the root into a pulp by rubbing it on a fish's skin, then strain the pulp through a coarse cloth, wash it four times in water, and dry the powder in the sun for exportation.

I should like to know what root it is.

I enclose in the box a few specimens of our arrow-root; which grows all over Arracan, and is eaten as a vegetable.*

Kyouk Phyoo, Arracan, Nov. 10*th*, 1844.

* The following is a report by Mr. Speede on both these samples:—

"The sample stated to be the produce of the Maranta arundinacea, or true arrow root plant, is of good quality, but rather foul, and evidently not sufficiently washed, whence it does not mix so freely as is usual with the well manufactured article to which it is apparently in other respects equal.

The second, from a bulb in Chedooba, is in all respects to the eye corresponding to the true arrow-root, is clean and well manufactured, but is far inferior in strength, requiring at least twice the quantity that is necessary of the true arrow root to make the same strength of jelly; hence unless the article can be produced at very much below the rate of arrow-root it would be unprofitable."

I have had the pleasure to receive your letter by the *Ganges*, and am about to collect more of the plants, which I find to be growing all around me here. What I shall bring with me for you by the next trip of the *Amherst*, (if I succeed in obtaining leave of absence) will have been gathered from an island opposite this place, at the mouth of the Kyouk Phyoo harbor roadstead, and it abounds, I hear, on Saddle island, also close by.

The Chedooba people only, I hear, prepare the powder from it, and use it in no other way. At the island opposite there is now a man from Chedooba making a quantity of powder; it is strange they have never (I mean the Mugs) carried it to the Calcutta market.

I will bring with me both root or bulb and the plant itself.*

The plant is named *Pengbwaoo*, in the Birman language, and by the Mugs, *Kyweoo.*

It is not used as a vegetable: of the powder a sort of bread or sweetmeat is made.†

The stalks when old fall down and deposit the pod and seed on the ground, whence, as you may imagine, myriads of new plants are generated.

Kyouk Phyoo, Dec. 20*th*, 1844.

* These have since been received, and referred to Dr. Wallich; and the following is extract from his note:—

"You have gratified me more than I can tell you, by sending me the specimen of this extraordinary plant. It is Tacca pinnatifida; it grows wild in the Malay Islands, Cochin China, &c.; perhaps somewhere in the peninsula of India. I never heard of it so near as Arracan. It is always found near the sea. It is the gigantic size, and the locality, not to mention the fine ripe fruits, that delight me so much."

† Dr. Royle, in his Illustrations of Himalayan Botany, observes in reference to the *Taccaceæ*, "the plants of this family are possessed of some degree of acridity, both in their tubers and in their herbaceous parts, as Rumphius informs us, that the tubers of T. *pinnatifida*, *dubia* and *montana*, are rasped and macerated for four or five days in water, and a fecula is separated in the same manner that sago is, and like it employed as an article of diet by the inhabitants of the Malayan and Molucca islands. In Otaheite and other Society islands, they make cakes of the meal of the tubers of *T. pinnatifida*, which are the *tacca youy* of some navigators: they form an article of diet in China and Cochin China, as also in Travancore, where Dr. Ainslie informs me, they attain a large size, and that the natives eat them with some acid to subdue the acrimony. Dr. Roxburgh (Flora Indica, vol. 2, page 172,) states, that it is "a native of the Moluccas and Malay countries, and from the latter introduced by Dr. Harris of Madras into the Company's Botanic Garden at Calcutta in 1800, where it blossoms in June and July, seeds ripen in October. Root tuberous, perennial, often as large as a child's head, round and pretty smooth; with but few slender fibres from its surface, intensely bitter when raw, but yielding a great quantity of beautifully white starch, of which the best flour for confectionery, puddings, &c. is made."—Eds.

Notice regarding the American Sumach, with a recommendation for its culture in India. By N. WALLICH, *Esq.*, M. D.

Botanic Garden, 21st February, 1845.

I have the pleasure to send you a paper of seeds ripened in this garden, during this week, of the American Sumac, or Dividivi, (Caesalpinia coriaria.) You will find some notice of this very important tree or shrub in your Society's Transactions, vol. 3, p. 92, from which you will learn that the pod contains more Tannin than any vegetable substance whatever, and that it is highly prized for admixture among tanning substances.*

I would strongly recommend the cultivation of the tree to be widely extended. It thrives remarkably well down here. As every one of the seeds will germinate if sown soon, a very small supply will suffice for each applicant.

I also send a quantity of the drug itself, being the pod of the plant.

Yours sincerely,

N. WALLICH.

[Since the receipt of the above letter, Dr. Wallich has obligingly placed a further supply of seed at the disposal of the Society; of which small quantities are available to any parties interested in the introduction of this useful tree, on condition of their communicating the result of their trials to the Society. Dr. Wallich has also favoured the Society with directions for the culture of the tree, which are here appended. Some further account of an interesting local experiment with the produce of this plant, will appear in the next part of this volume.—EDS.]

On the best Mode of treating the American Sumac.

"With regard to your query about the best mode of treating the American Sumac or "Dividivi," I will tell you all I know of the matter. Sow the seeds as soon as they are ripe, because they are subject to the attack of an insect, to a degree exceeding almost any thing I have ever witnessed even among leguminous plants, to

* An extract from the Transactions will be found a few pages further on.

which family our plant belongs. The seeds should be sown in a light garden mould mixed with sand, and rather superficially. They commence vegetating, usually in the course of one week; I have known them come up the sixth day. When the seedlings are a couple of inches high, they should be carefully planted in small pots, singly; and when they have attained say three feet, they may be planted out in the open ground, which ought previously to have been well trenched, and enriched with some manure, if required. The ground must of course be sufficiently high to be exempted from inundations of any sort. In its young state the Dividivi will require a little shading from the too intense sun-rays; but in after years, I mean from the time it has been planted out, I suspect that the less shade is given the more productive will be the return of pod. The distance between the plants should be, at least 12 feet (twelve) in the quincunx-fashion. I should think that, during the first hot season, the plantation may require a little irrigation in very dry and hot weather. I have a notion that the Dividivi would form an excellent shade to coffee trees. It would be worth while trying the experiment."

Comparative return in Liquor and Goor, from certain descriptions of Sugar Cane.

[Extract of a letter from F. Nicol, Esq., dated Chandpoor, Jessore, 16th February, 1845.]

" The following is the return which I got from the various descriptions of Sugar cane, which were cultivated last year upon a small scale.

Name of the Cane.	Average quantity of liquor received from 1 maund of cane by measure.			Average quantity of goor received from 1 gallon of liquor by bazar weight.		
	Gal:	qts.	pts.	Br. Md.	S.	C.
Dholee, ...	4	1	1	"	"	13
*Otaheite, &c. ...	4	0	0	"	"	13¼
Kajolee, ...	3	0	1	"	"	19
China, ...	3	0	0	"	"	15

The Otaheite had been nearly destroyed by the white ants, if I had not cut it early. Not satisfied with attacking the lower part, they got into the middle of the cane, and so eat upwards; a great many withered and died off before the cane got to any size. The Otaheite, Bourbon and Singapore got mixed together in the cutting, *and the above of course cannot be considered as a correct return of* Otaheite alone; in fact, it has not had a fair trial. The cane grew to no height, owing I suspect to the poorness of the soil, which was too sandy and dry. Of the other three descriptions, the Kajoolee was decidedly the best; the cane was quite ripe, and the liquor quickly boiled and showed its saccharine matter. The Dholee cane was not quite ripe when cut, but from the white ant destroying it in such large quantities, I was obliged to take it off the ground; had it not been for this, the best return would have been received from it. The China cane thrived the best, and grew to a great height, quite overtopping all the others. Several plants measured 9 feet high, the white ants did not touch it, and it is certainly the best description for land at all infested by these destructive insects. In a former note I informed you of my misfortune in losing three-fourths of the cuttings, which I purchased from the Society's nursery. This first experiment, therefore, was upon such a small scale, that I kept no account of the quantity of ground which the cane occupied, or the expense of cultivation. For this year I will keep a regular Journal of Proceedings, and let you know the result."

Effect of Galvanism in promoting the growth of Potatoes. Communicated by W. Haworth, Esq.

James Hume *Esq. Honorary Secretary of the Agricultural Society.*

Dear Sir,—I herewith forward you *two* samples of potatoes, being the result of an interesting experiment I have lately had tried in my garden here.

Some time ago, and rather out of the regular season, six *sets*, or cuttings of potatoes, were put into the ground, each having one germinating eye, merely to try if they would produce as good fruit in this soil as the original stock, which were English. After they had been in the ground about 8 weeks, I read in one of the papers, an account of an experiment which had been tried at home, of employing Galvanism to promote the growth of potatoes, and which had resulted very satisfactorily; this information caused me to place three out of the six roots mentioned above, under the influence of Galvanism, leaving the other three roots to grow in the usual way. In about 7 weeks after this, all the roots appeared to have arrived at maturity at one period, as shewn by the gradual decay of the stalk.

I had them taken up yesterday, well washed, and left to dry until this morning, when I weighed them. The *three* roots grown in the usual way, produced together 26 potatoes, varying in size, and weighing 14½ ounces. The *three* roots grown under the influence of Galvanism, produced together 32 potatoes, weighing 27¼ ounces, being very nearly double the weight of the produce of the roots grown in the usual common way. There is nothing extraordinary in the size or appearance of the potatoes; the ground in which they were produced was very hard and poor.

Your's very truly,

Cossipore, 12*th March*, 1845. WILLIAM HAWORTH.

MODE OF PRESERVING GRAIN FROM THE RAVAGES OF THE WEEVIL.

To JAMES HUME, *Esq. Secretary to the Agricultural Society of Calcutta.*

SIR,—" A general meeting of the Society was held at the Town " Hall on the 14th August," at which there was a communication from a person in Gorruckpore, headed " Experiments with the " wheat in the Gorruckpore district ;" now as I differ in my ideas from the writer of the above remarks, I have been induced to give him a hint through you, the Secretary, and in fact to all those concerned, and not to Mr. Bridgman alone, so that he, or any other person, may rectify their error hereafter when they have occasion to store away small quantities of wheat and other grains.

" The fate of the produce may assist in illustrating the effect of " the weevil. The different grains, after being gathered, were put " into baskets, and kept within my own house for a few days, " while new earthen pots were being made to preserve them in."

Allow me to ask the writer this question,—Whether the pots were baked in the sun or in the kiln? If by the latter, it is accounted for; but if on the other hand, I am at a non plus for arguments, so I treat of facts only.

I once bought some wheat for home consumption, and put it into a baked ghoree from the Komars, at the end of the harvest time, or rather at the end of the hot weather; the mouth was well plastered down and air-tight: at the close of the rains or may be after 3 or 4 months, a jar was opened, and found to be eaten by the weevil, fully to the extent of one-half, which was grinded like flour as from a *chukee;* the other, the grain was perfectly whole. I was told by the people of the neighbourhood, that this destruction of the grain was all caused by the jar, (which generally contains 3 or 4 maunds,) being kiln-burnt, for had it been sun-baked, no damage would have accrued. No native ever keeps his home consumption grain in any thing else but the kutcha ones, for the pucka ghoores are all condemned on that account. One, I dare say, might have seen a large square earthen grain storer in a native's house, particularly when he is making a new chopper for his roof, out in the country I mean.

As to accounting for this by theory, why there should be this, or in fact any difference, I am at a loss:—as I have experienced, so I have advanced my assertion.

The concluding remark I have to add is one of theory, that I read somewhere years since; one perhaps whether in much use, or not, I can't say;—before filling the pits with grain (say wheat,) the inside ought to be sprinkled with a solution of corrosive sublimate in a little water, and when perfectly dry, to commence filling; no weevil touches this grain.

Though not having the honour of being a Member of the Society, I trust this communication will not be taken amiss by them, and if agreeable I might go on from time to time, with my ideas.

I am, &c.

G. G. Mercer.

INTRODUCTION OF AMERICAN MAIZE IN AJMEER AND MHAIRWARRA.

To JAMES HUME, *Esq. Secy. to the Agricultural Society of Calcutta.*

SIR,—On my requisition, you were good enough during the past year, to send me a packet of American vegetable and flower seeds, amongst the packets were 5 or 6 kinds of Indian corn, called in this part of the country, Mukka. The seed was distributed by grains to the different Purgunnahs of Ajmeer and Mhairwarra, under my superintendence. Owing to the injury sustained from the ravages of locusts, the seed was only productive at one spot; the small quantity that has been produced, is so superior in produce and grain to the common Mukka of the country, that I am solicitous of obtaining a larger supply than is afforded from the small packets where the grains can be counted. I am not aware whether you have the ability to meet my requisition, but should means exist, I should desire that one seer of each kind be forwarded to me. Mukka is grown very extensively in these districts during the Khureef; it is therefore desirable to supplant the produce of the country by good American seed; which, from the sample I have seen during the past year, promises to be more productive to the cultivator and to the Government than that usually sown. Should you possess the ability, I shall be thankful to you to send me as above requested, about *one* seer of each kind of American Indian corn. Messrs. Cockerell will forward the articles to me either by dawk baughy, or by steamer to Allahabad, and thence by land to Ajmeer. Independently of this solicitation, I would beg to request you will be good enough to send me, through Messrs. Cockerell and Co. a packet of English or American vegetable and flower seeds at your convenience, so as to reach Ajmeer before the setting in of the ensuing rains.

I remain, &c.

Mhairwarra, 26th Jan. 1845.

C. G. DIXON, *Major*,
Supt. Ajmeer and Mhairwarra.

SIR,—I have had the pleasure to receive your note of the 8th ultimo, and have to offer to you my best thanks for the promptness with which you have answered my requisition; the liberal supply of acclimated American maize* you have so kindly sent to me, will be distributed, on arrival, in the different Purgunahs of Ajmeer and Mhairwarra; and in September and October next, on the corn ripening, I shall have much satisfaction in reporting the result of its produce.

I am thankful to you for your offer of a further supply; but as our sowing season commences about the middle of June, the despatch would reach us too late for the season; with the supply you have sent, and with the small stock I have in hand from last year's produce, I hope to reap a harvest of some maunds; thereby obviating the necessity of again troubling you on this score.

Thanking you for your offer to send me a small packet of American and English seeds, flower and vegetable,

I remain, &c.

Ajmeer, 16*th March*, 1845. C. G. Dixon, *Major*.

Report on the Garden of the Branch Agri-Horticultural Society of Cuttack; with an account of Exhibitions of Vegetables held at that Station. Communicated by Capt. W. W. Dunlop, *Secretary of the Society.*

To the Secretary to the Agri-Horticultural Society of India.

Dear Sir,—Agreeably to the intentions expressed in my last letter, I have now the pleasure to forward you a report on the Branch-Society's Garden at Cuttack, together with the result of our prize exhibitions.

Sugar Cane.—Otaheite. The crop very good, although to the latter end of the season attacked severely by white ants. Distributed five hundred canes, and disposed of the remainder in the bazar, as there was no further demand for planting. In fact, there is very little sugar cane grown in this district; that which has been distributed, however, being far superior to the common kind in cultivation, may induce its extended culture.

* This maize is the produce of the Society's Nursery, and though produced out of season, is a near approach, in every respect, to the original stock.

Cotton.—New Orleans $\frac{N.O}{B}$ and $\frac{N.O}{R}$ from seed* received from the Parent Society in a healthy state, and a small quantity collected; a specimen of which, when it comes into full bearing, I will send you.

Maize.—American. Very fine. Besides that distributed as mentioned in my letter of the 25th September, 1844,† I have lately had an opportunity of distributing a small quantity in the villages of the district through which I passed on a shooting excursion.

Tobacco.—Bhilsa, Gibali, Persian, Sandoway, flourishing.

Trefoil.—Bauglepore and Cabool Lucerne, failures, the seeds germinate, but the plant is very stunted in its growth.

Senna.—Tinnevelly, few seeds germinated; the plants from which are healthy. I shall endeavour to save seed from these, and extend the cultivation.‡

Cauliflowers.—Grown from seed saved at Cuttack, very fine and large, far exceeding in size and flavour that raised from seed received from any other place. I am saving a quantity of this seed, and should you wish it, will have much pleasure in sending you some.§

Knolcole.—From Madras seed, good, it will not seed at Cuttack, at least it has not hitherto done so.

Cabbage.—Cape and American seed of several varieties have turned out well.

Celery.—Good.

Pease.—Imperial blue, Marrow-fat, Dwarf, &c. are good, and bear fair crops.

Beans.—Broad Windsor comes into flower, but seldom pods.

Kidney Beans, French, Dwarf Canada, &c. &c., all flourish remarkably well.

* This is the New Orleans seed grown in black and red soils at the Coimbatore Cotton Farms, and forwarded to the Society by Dr. Wight. See Journal of the Society, vol. 2, p. 321—Eds.

† This letter will be found in vol. 3, p. 198. The superiority of the American maize over that of the country, is also referred to by Capt. Hollings, whose report will be found at p. 195 of the same volume. See also Major Dixon's report in the foregoing page.—Eds.

‡ This seed was presented to the Society by Mr. James Cowell. See vol. 2. p. 127, where will also be found some practical remarks on the culture and preparation of this valuable plant, from the pen of Dr. Wight.—Eds.

§ This has since been sent by Capt. Dunlop.—Eds.

f

Potato.—Has hitherto been grown from small bad waxy seed: an attempt will be made this year to remedy this by procuring seed from Nundidroog, in the Madras Presidency, where the potatoes are excellent.

Turnips of all kinds grow well here.

Carrots.—Ditto ditto.

Beet Root.—Ditto ditto.

Radishes.—Ditto ditto, but the fine descriptions of radish do not seed.

Sweet Potatoe.—Nothing particular; some which I brought from Madras, where it is styled the Antilla Potato, and planted in my own garden, has turned out very large and fine, of the white kind. I intend to plant some of it in the Society's Garden this year, and should be glad to send you a few roots, that it might be ascertained whether it is the same Potatoe mentioned in the Journal of the Society of India, as the Mauritius Sweet Potatoe.*

Bush Squash.—American; very fine and delicate; much superior to the Vegetable Marrow.

Onions.—Patna and Surinugur thrive well.

Besides the above, there are large Tomatas, Brinjals, Capsicums, Artichokes, and Jerusalem Artichokes, Asparagus, Endive, Cucumber, Lettuce, &c. &c. all which thrive tolerably well, with the exception of the Artichoke, which produces but a small head, and dies off during the hot winds.

The exhibition of vegetables, &c. took place on the 25th December 1844, 1st January, and 1st February 1845, when the following prizes were awarded; the Society's Garden being excluded from competing:—

Prize for Cauliflowers, ...	Mr. Gilmore's Mallee.
1st January 1845. Best general show of vegetables, divided between —	Captain Dunlop's ditto. Mr. Trevor's ditto.
Peas, ...	Col. Garnault's ditto.
Knole Kole, ...	Capt. Dunlop's ditto.
Lettuce, ...	Dr. Minto's ditto.

* A few roots have since been received from Captain Dunlop, and found to be identical with the Mauritius Sweet Potatoe.

Beet Root, ...		Mr. Gilmore's ditto.
Turnips, ...		Dr. Minto's ditto.
Bouquet of flowers, ...	divided among	Mr. Trevor's ditto. Mr. Gilmore's ditto. Mr. Lacy's ditto.
1st February 1845. Best general show of vegetables,	divided between	Col. Garnault's ditto. Mr. Trevor's ditto.
Show of foreign vegetable, ...		Capt. Dunlop's ditto.
Bouquet of flowers, ...		Mr. Trevor's ditto.
Celery, ...		Mr. Mill's ditto.
Potatoes, ...		Col. Garnault's ditto.
Carrots, ...		Capt. Righy's ditto.
Onions, ...		Mr. Mill's ditto.
Cabbage, ...		Mr. Trevor's ditto.

The medal prizes (given by the Parent Society,) have been reserved for a future occasion.

I am, &c.

Cuttack, 3*d Feb.* 1845.

W. W. Dunlop,
Secretary Cuttack H. Society.

An account of the First Horti-Floricultural Exhibition of the Lucknow Branch Society. Communicated by Captain G. E. Hollings, *Secretary of the Society.*

My dear Sir,—I have the pleasure to forward a list of the prizes given at our first exhibition, which went off more successfully than we anticipated, and I have little doubt that on each succeeding occasion, the Lucknow Agri-Horticultural Society will have more and more reason to congratulate themselves on having resolved to hold periodical exhibitions. The mallees appeared to be delighted with their rewards, which were paid on the spot. Our Horticultural Garden is called by the natives Char Bagh, and it will be seen that one of the mallees employed therein was the most successful candidate.

Some of the specimens were very good indeed, and the celery was very much admired. It was cultivated by Nannoo, under the especial direction of the Chowdry Nundloll Misr, who saw that all the instructions given by different gentlemen who visited the garden, but more particularly by the Rev. Mr. Carshore, were attended to. If any Member would wish to know how the celery was cultivated, I will send you the particulars in English and Hindoostanee.* There was a very small number of strawberries exhibited, but those were of a large size, which affords promise of a fine crop this year. The sugar cane was much finer than the canes you sent to me by the Steamer, which I am sorry to say have failed. I have not been so much pleased with any garden I have seen in India as I was with Colonel Hervey's, nor have I ever beheld English flowers so beautifully cultivated.

I am, &c.

Lucknow, 13*th Feb.* 1845. G. E. HOLLINGS.

List of Prizes paid to different Mallees, on the 12*th Feb.* 1845.

VEGETABLES.

	Rs.	As.
Cabbages.		
Dyal, Residency mallee, ..	2	0
Nannoo, Char Baugh ditto, ..	2	0
Artichokes.		
Dyal, Residency mallee, ..	1	0
Potatoes.		
Sobha, Major Wilcox's mallee,	2	0
Nannoo, Char Baugh,.. ..	1	0
Red Cabbage.		
Nannoo, Char Baugh,.. ..	1	0
Beet Root		
Dyal, Residency mallee, ..	1	0
Nannoo, Char Bagh, ...	1	0
Peas.		
Sukut, Lt. Fenwick's mallee,	2	0
Tomato.		
Sukut, Lt. Fenwick's mallee,	1	0
Dyal, Residency mallee, ..	1	0
Banghun.		
Bukhtowur, Captain Fraser's mallee, ...	1	0
Carrots, orange.		
Nannoo, Char Baugh,.. ..	1	0
Ditto white.		
Dyal, Residency mallee, ..	1	0
Cauliflower.		
Shobha, Major Wilcox's Mallee, ...	1	0
Carried over, ..	19	0

	Rs.	As.
Brought over, ..	19	0
Turnips.		
For size and weight.		
Dyal, Residency mallee, ..	1	0
For colour and smoothness,		
Sobha, Major Wilcox's mallee,	1	0
Knole Cole.		
For size.		
Nannoo, Char Baugh mallee,	1	0
For smoothness.		
Hinga, Residency mallee, ..	1	0
Kohl Rabi.		
Bukhtowur, Captain Fraser's mallee, ...	1	0
Jerusalem Artichokes.		
Dyal, Residency mallee, ..	1	0
Bukhtowur Captain Fraser's ditto, ...	1	0
Onions.		
Sobha, Major Wilcox's mallee,	1	0
Nannoo, Char Baugh,.. ..	1	0
Cabool Capsicum.		
Munsa, Char Baugh mallee, ..	1	0
Lettuces, Green Coss.		
Nannoo, Char Baugh mallee,	1	0
Drum head Cabbage.		
Sobha, Major Wilcox's mallee,	1	0
Endive.		
Dyal, Residency mallee, ..	1	0
Carried over, ..	32	0

* Capt. Hollings has been requested to oblige the Society in this instance.—EDS

	Rs.	As.
Brought over, ..	32	0
Early Bush Squash.		
Nannoo, Char Baugh ditto, ..	1	0
Beans, Long.		
Dhurum Doss, Residency mallee, ...	0	8
Dyal, ditto ditto, ...	0	8
Celery.		
Nannoo, Char Baugh mallee,	3	0
Spinach.		
Dhora Bhugut, ditto ditto, ..	0	8
Yams.		
Munsa, Char Baugh mallee, ..	0	8
Tooraie.		
Bukt, Lt. Fenwick's mallee,..	0	4
Soup Herbs.		
Bukhtowur, Captain Fraser's mallee, ...	0	4
Radishes.		
Sewdeen, Char Bagh mallee,	1	0
Garlic.		
Dyal, Residency mallee, ..	1	0
	40	8

N. B.—The Celery was considered by the judges to be the best specimen they had seen in India.

FRUITS.

	Rs.	As.
Pumplenose.		
Bukhtowur, Captain Fraser's mallee,..	0	8
Strawberries.		
Munsa, Char Bagh mallee, ..	1	8
Sukut, Lt. Fenwick's ditto, ..	1	8
Carried over, ..	44	0

	Rs.	As.
Brought over, ..	44	0
Citron.		
Dhurum Doss, Residency mallee, ...	0	8
Oranges.		
Dhurum Doss, ditto ditto, ..	0	8
Hoolass, Char Baugh ditto, ..	0	8
Plaintains, (Chumpa.)		
Bukhtowur, Captain Fraser's mallee, ...	0	8
Ditto large.		
Munsa, Char Baugh mallee,..	0	8
Gooseberries.		
Sukut, Lt. Fenwick's mallee,	0	8
Bechooa, Capt. Fraser's ditto,	0	8
Sweet Limes.		
Dyal, Residency mallee, ..	0	8
Keerah, ditto ditto, ...	0	8
	48	8

FLOWERS.

	Rs.	As.
Violets.		
Sobha, Major Wilcox's mallee, ...	1	0
Heartsease.		
Colonel, Hervey's mallee, ..	2	0
Geranium.		
Nannoo, Char Bagh mallee, ..	1	0
Indian Pink.		
Heera, Residency mallee, ..	1	0
To seven mallees, Bheekharee, 1st, Munsha, Nannoo, Lokaie, Bhowanee, Sewdeen and Bheekharee, 2nd, eight annas each, and Motee one rupee, ...	4	8
Specimens of Sugar Cane.		
Bisram, Capt. Bird's mallee,..	2	0
Total Rupees, ...	60	0

After the exhibition was over, Colonel Hervey's mallee brought three *dhallies* of vegetables; the specimens of "kohl-rabi," drum head cabbage, lettuce and white banghun, were considered better than those to which prizes had been given; in consequence of which a reward of five rupees was given to the mallee. The splendid collection of flowers from Colonel Hervey's garden was not exhibited.

G. E. HOLLINGS,
Secretary, L. A. H. Society.

Horti-Floricultural Exhibition of the Bhauglepore Branch Society. Communicated by Major T. E. A. NAPLETON, *Secretary of the Society.*

MY DEAR SIR,—I have now the pleasure to enclose an account of our last Horticultural Exhibition, which kindly submit to the Parent Society, with our hope that it may be considered satisfactory.

I remain, &c.

T. E. A. NAPLETON,

Secretary, B. B. A. H. and Floricultural Society.

Clevland House, Bhaugulpore,
the 23*d of January,* 1845.

Bhaugulpore Branch Agri-Horticultural and Floricultural Society, held on the 16*th January,* 1845.

The second show of the season took place at 3 o'clock this afternoon, and notwithstanding the absence from the station of several supporters of the Institution, there was a large assemblage of both subscribers and visitors.

The Umpires were the Rev. J. MacCallum, Captain Don, Muddun Tackoor, Hafiz Surfuraz, Ullee Khan Bahadoor, and the Agga Sahib, who first proceeded to inspect the produce of the Society's Garden, which consisted of several bouquets of rare and beautiful flowers, a few specimens of Agricultural produce, viz., Georgia cotton, Havannah tobacco, mangul wurzul, trefoil and lucerne; and in the vegetable department there was a remarkably fine display, consisting of peas, potatoes, artichokes, vegetable marrow, coss and cabbage lettuce, endive, brinjals, love apples, three sorts of turnips, three sorts of carrots, Cabool capsicums, West India arrow root, beet root, onions, leeks, turnip, and long red radishes, broad and French beans, turnip, cabbage, nohl kohl, and Jerusalem artichokes. The Umpires were pleased to pronounce the above "first rate," and remarked on the rapid and great improvement which has taken place since last year.

Next came the baskets of vegetables, and other specimens intended to compete for prizes. The dallees were so very numerous that the show rooms could not contain them, and several extra tables were arranged under the trees for their accommodation.

Prizes were awarded as follows :—

To Dr. C. Stuart's mallee. For some remarkably fine celery, cauliflowers, cabbage of sorts, lettuce and endive.

To the mallee of G. F. Brown, Esq. For some very fine Darjeeling and Cherra Poonjee potatoes and onions, and for the best euphorbia in the Floricultural Department.

To the mallee of J. Pontet, Esq. For the best artichokes, turnips, leeks, herbs, long red radishes and carrots.

To Mr. J. Piron's mallee. For the best beet root, the best red cabbage, and the best sample of cotton.

To Mr. John Glass' mallee. For the best arrow root, and the best bouquet of myrtle in the Floricultural Department.

To Baboo Gooroo Churn Mitter. For the best mangul wurzul, second best cabbage, turnips, potatoes, cotton, tobacco, herbs, trefoil, brinjals, pumkins, and for the best indigenous beans and turmerick.

To Clevland House mallee. For the best peas, broad beans, crown vegetable marrow, French beans, carrots, clover and lucerne, and in the Floricultural Department for the best roses, [seven, sorts] heleotrope, passion flowers, zinnias, sweet briar, russelias, and verbena.

To Captain Don's mallee. For the best bouquets of geraniums, lupins, nasturtians, mignionette, and larkspur.

To Peerzadah Shaw Enayut Hoossain's mallee. For the best tobacco and spinage.

To Moulvee Mahomed Rafiq's mallee. For 2d best carrots, 3d best potatoes, 2d best radishes, 2d best onions, and for the best bouquets of indigenous flowers.

To Ubdoollah Khan's mallee. For the best chillies.

To Muddun Tackoor's mallee. For the 2d best cauliflowers.

To Moonshee Waris Ullee's mallee. For the 2d best beet root.

To Rajah Oodit Narain's mallee. For the 2d best brinjals.

To Hoollas, mallee of Mr. C. H. Barnes at Colgong. Prizes for peas, broad beans and American squash.

To the mallee of Baboo Oomanauth Ghose. For 2d best bouquet of indigenous flowers.

The Umpires particularly remarked the vast improvement in the various samples brought forward for competition since last year. The setting sun told the assembly that it was time to bend their steps towards home, and in the Fruit department the specimens were not brought forward, owing to the lateness of the evening.

The accurate decision of the Umpires, and the admirable manner in which they discharged their duty, gave general satisfaction, and here closed the second show of the season 1844-45.

It is very gratifying to our Society to be able to announce the names of the following new subscribers, since our last report on the 19th of November, 1844.

Captain B. M. Loveday, A. D. C. to Major General E. H. Simpson.

Dr. Kinsay, Civil Surgeon, Purneah.

G. W. Brown, Esq. Deputy Opium Agent, Purneah.

C. C. Crigan, Esq. 5th Regiment N. I. Dacca.

Basil Landale, Esq. Tirhoot.

Rajah Jye Mungul Sing of Gidhour.

Baboo Bridyebaharee Loll, a large Zumeendar of Tirhoot.

Baboo Fukeerah Misser, a large Zumeendar of Tirhoot.

Baboo Kunhya Chowdry, a large Zumeendar of Tirhoot.

Moonshee Kalleepershaud Pandey, of Kurruckpore.

Moulvee Niyamut Ollah, of Bhaugulpore.

Moonshee Prem Laul, of Bhaugulpore.

The following donations are gratefully acknowledged.

From Baboo Fuqeerah Misser, ...	5	0	0
,, Baboo Bridgebaharee Loll, ...	5	0	0
,, Baboo Kunhya Chowdry, ...	5	0	0

From Muharaj Bedanund Sing. Some grafts of the famous sapota, also a magnificent specimen of indigenous squash for seed.

From the Parent Society, a splendid supply of imperial peas and French beans.

From the Secretary, upwards of a thousand plants for the Floricultural Department.

T. E. A. Napleton,
Secretary.

AMERICAN SUMACH.

To Chemists, Dyers, Tanners, and others.

The American Sumach, of which an experimental cargo is now on its passage to Liverpool, is the product of a tree which grows abundantly in many parts of South America, and possesses properties which render it decidedly more valuable, both to the Dyer and Tanner, than either Oak Bark, Catechu, Kino, Sumach, or the best Aleppo Galls. It contains, according to the able and scientific analysis of Mr. Samuel Rootsey, of Bristol, on a mean of two experiments, 76.25 per cent. of soluble or extractive matter, while Galls yield only 59.166645, Sumach (Common) 40, Kino 40.4167, Catechu 67.08335, and British Oak Bark 30 per cent. Its most important constituent, however, in a commercial point of view, is *tannin*, or that principle which by its union with animal matter, constitutes leather, of which the same experiments shew it to contain a mean of 51.1680 per cent. while the best Aleppo Galls yielded only 35.45835 per cent., Sumach 0.95834, or less than 1 per cent. and the best British Bark 13.4167 per cent. A tabular view of the results of Mr. Rootsey's experiments may be seen in Jameson's Edinburgh Philosophical Journal, and an abstract of these results in the Gardener's Magazine for August, 1834, under the name of *Dividivi*.*

The substance has been largely and profitably employed in the tannery of Mr. John Nethersole, near Kingston, Jamaica, for some years past; and, from trials which have been made in England by skilful professional Tanners, it has been ascertained that one pound of the American Sumach is equal to four pounds of the best British Oak Bark, and tans the leather in two-thirds less time; whence there results a gain of not only two-thirds of materials, but also of two-thirds of time. To the Dyer it will prove still more valuable—while Chemists will find their advantage in substituting it for Galls in the manufatcure of ink, in forming ointments for the cure of hæmorrhoidal complaints, &c. &c. Taking the per centage of tannin as a standard of comparison, the intrinsic value of the American Sumach is equal to 1.443, or about 1½ of the best Aleppo Galls—hence the market value must always be estimated from the current price of that article.

Persons wishing to make trial of this new article, are requested to apply (post or carriage free), to Messrs. Vianna and Jones, Liverpool, to whom the cargo is consigned, to Mr. Samuel Rootsey, Chemist, &c.

* This abstract is appended—Eds. Journal, A. and H. S.

Bristol; to Messrs. Balkwill and Sons, Chemists, Old Town-Street, Plymouth; or to Dr. Hamilton, late Secretary to the Royal Devon and Cornwall Botanical and Horticultural Society, by whom every information required will be furnished, and with whom samples may be seen. As the quantity expected is but small, and the arrival of the cargo may be daily looked for, those who wish to become purchasers are requested to be early in their applications.

Plymouth, October 3rd, 1834.

The *Cæsalpinia coriaria* varies in size according to the richness of the soil, from a shrub to a large timber tree; the timber of which is valuable for many purposes of domestic economy and for building. It grows in the *hottest,* most sandy and arid soils, in which it appears to thrive better than in colder situations. In hot situations plants raised from the seed will flower in the third year of their growth, and will perfect their pods in the following year. In Carthagena, December and January are flowering months, but the plants raised from seed which I sent to Jamaica in 1829, and which was sown sometime about the month of October, flowered for the first time in August, 1832, and in the same month in the following year after flowering, the branches, which are slender, were bent down with the weight of pods. In Carthagena the pods are left on the trees till the high winds in March bring them down, when they must be gathered and housed before the April rains commence. From the experiments made on Oak bark, however, by Sir Humphrey Davy, I should be inclined to think they would be found richer in the tanning principle if gathered by hand about the full moon of the month in which they attain their full growth, but before the sap has begun to descend, and the green colour to give place to the mahogany hue of maturity. Oak bark is found to contain one quarter more tannin in spring than in autumn. The tannin resides wholly in the brittle exterior coat of the pod, all the rest being comparatively worthless; hence after dyeing, the pods should be ground in a mill and the refuse (amounting to one-fourth of the whole) separated by sifting. This refuse, though not worth the expense of freight, may be applicable to many useful purposes for dyeing, &c. on the place of production. In times of scarcity the pods are eagerly devoured by cattle. While young and soft, the pods are punctured by a small active little winged insect of a greenish colour, which deposits its eggs within, where they are hatched, and the young insects bury themselves in the seeds, the farinaceous portion of which they live upon as in the accompanying specimens of hollow seeds.

This insect is, as Mr. Loudon, to whom I sent some for examination, informs me, a species of *Bruchus* similar to that which preys on the seeds of the family of *Brassicæ*, but has not hitherto been described by any Entomologist. I have named it for the present *Bruchus Cæsalpiniæ*, or the Dividivi Bruchus. I have frequently received it alive from Carthagena along with the seeds. A few specimens of dead Bruchi accompany this. How far the depredations of this insect are injurious to the pod itself must be determined by experiment.

In forming plantations of the *Cæsalpinia coriaria* the trees should not be closer than 18 feet; whence an English acre will contain 135; and taking the average weight of produce from each when in full bearing at 100 lbs., the harvest will amount to 135,000 lbs., the nett produce of which when ground and freed by sifting from the refuse, should be at least 101,250 lbs. or 45 tons 4 cwt. and 2 lbs.—a return fully equal to that of the cane, and obtainable from land unfit for producing sugar.

W. Hamilton.

The Dividivi, or Cæsalpinia Coriària, as a Tanning Plant.

A letter from Jamaica, by one of the last packets, furnishes me with important information, which enables me to fix with the greatest accuracy the age at which seedling plants of the Cæsalpínia Coriària come into bearing. Dr. Bancroft's words are as follows:—

"Having recently obtained some particulars concerning the dividivi, I can state that it flowered in August last, for the second time, in about the fifth year of its having been planted: the first time was about twelve months before. There were no pods then produced, but an abundance of them last year, so that the branches were bent down with them. The flowers were yellow." The letter, from which this extract is taken, is dated the 17th of April, 1834. Hence the first time of flowering must have been somewhere about August, 1832, and the second in August, 1833. Now, upon referring to my memoranda, I find that the first supply of seed I sent went by the Emulous packet, which sailed in June, 1829, and reached Jamaica in the course of the following month; so that the seed could hardly have been sown much earlier than August, 1829. Hence, in 1832, the plants were only three years old, and in 1833 only four, not five, as Dr. Bancroft, from forgetfulness, states; though, even taking his estimate, it is more favourable than that of any other staple product of the West Indies, except sugar, which yields its crop in nine months: coffee, it is well known, does not come into bearing in less than seven, nor cacao, in general, under ten years. I shall subjoin a table illustrative of the comparative value of the dividivi, as measured by that of other astringent substances, calculated from the able experiments of Mr. Rootsey of Bristol, and confirmed by the results of experiments made both here and at Sandwich.

	Number of Experiments.	Results of the infusion of 60 grs. in 5 oz. of water. Number of grains of matter which was Soluble.	Insoluble.	Proportion per cent of matter which was Soluble in water.	Insoluble in water.	Number of grains of leather obtained by Mr. Rootsey from half an ounce of the infusion, or 6 grs. of the powdered substance, and a solution of isinglass. Consisting of Grains of Leather	Grains of Tannin.	Grains of Gelatine.	Proportion of tannin contained in 100 parts of each substance, as deduced from the experiments detailed in the 3rd, 4th, and 7th columns of this table.
Dividivi	First	46	14	76·6667	23·3333	7·5	3·45	4·05	57·5
	Second	45·5	14·5	75·8333	24·1667	5·75	3·645	3·105	44·836
	Mean	45·75	14·25	76·2500	23·7500	6·625	3·0475	3·5775	51·168
Nut Galls	First	35	25	58·3333	41·6667	4	1·84	2·16	30 6667
	Second	36	24	60	40	5·25	2·415	2·835	40·35
	Mean	35.5	24·5	59·166645	40·833355	4·625	2·2275	2·4975	35·45835
Sumach	First	25	35	41·6667	58·3333	0 125—melted	0·0575	0·0675	0·95834
	Second	23	37	38·3333	61·6667				
	Mean	24	36	40	60				
Kino	First	22	38	36·6667	63·3333	melted			
	Second	26·5	33·5	41·1667	55·8333	ditto			
	Mean	24·25	35·75	40·4167	59·5833				
Catechu	First	40	20	66·6667	33·3333	melted			
	Second	40·5	19·5	67·5	32·5	ditto			
	Mean	40·25	19·75	67·08335	32·91665				
Oak Bark	First	19	41	31·6667	68·3333				
	Second	17	43	28·3333	61·6667	1·75	0·805	0·945	13·4167
	Mean	18	42	30	70				

W. Hamilton, *Plymouth*, *May*, 1834.

DIRECTIONS FOR CULTIVATING MADDER.

[A fine supply of about two maunds of Madder seed having been lately received by the Society from Avignon, (in accordance with resolutions passed at the general meetings of 11th September and 9th October, 1844) through the great kindness of Messrs. Salavy, & Co. Bankers of Marseilles, and through the friendly agency of James Cowell, Esq. Merchant of this city, and a member of the Society,—with whom originated the present recommendation for attempting the culture of this useful plant in India,—the Committee of Papers consider that a reprint from the transactions of the Society, vol. 2, p. 227, of the following directions communicated by the late Mr. Geo. Hodgkinson, may be useful to parties desirous of making experiments with the seed.]

To JOHN BELL, *Esq. Offg. Sec. Agricultural and Horticultural Society.*

SIR,—I have the pleasure to send for distribution a box containing madder seeds, commissioned by me from Smyrna, and just received from England, along with the following directions for the cultivation of the roots.

" The soil should not be too moist; preparations are first made by digging the ground in the month of March, to the depth of 8 or 10 inches, which is repeated in July and again in August, care being taken to remove all weeds. In March following, the seeds are sown in the manner of corn, and they spring up in May; meanwhile the ground should be well weeded. In July the plants wither, and in October the ground is carefully turned up round them to protect them from the cold in winter: in March following the ground is again turned up or raked, and in June the plants produce seed, and in July they are cut down in the manner of corn. In the third year the roots may be taken out of the ground, but are still small, and if left longer, the quantity is of course increased.

They will produce for ten years or longer, but great care must be taken to rake and weed the ground every year; when the roots are taken up, they are exposed to the sun to dry and beaten to remove the earth, they are then packed in sacks."

With reference to the above, I may add that in France a crop is often reaped within eighteen months without injury to quality; the quantity being only smaller, and it would appear from details published in M'Culloch's Dictionary of Commerce, page 771, that where soil is impregnated with alkaline matter the root acquires a red colour, which is esteemed the most in France; whereas in other cases, the root is yellow which latter is preferred in England. The annual consumption of Great Britain is about 50,000 cwt. of madder, i. e. the roots pounded, sifted and dried, and of madder roots nearly as much. The price (including duty of two shillings per cwt. on madder, and 6*d* per cwt. roots) was in 1834, as follows:—

Prepared madder from 16*s*. to £3 18 0
Roots per cwt. ... £1 16*s*. to £2 16 0

It might be advisable to distribute the present supply of seed in Purneah or in the neighbourhood of Nepal, where a species of madder or rubia tinctorum is cultivated, i. e. the munjeet of commerce. A further supply of seed I can furnish if required.

I am,
Your obedient servant,
Calcutta, 10*th November*, 1835. GEO. F. HODGKINSON.

Notes on Indian Agriculture, as practised in the Western or Bombay Provinces of India; By ALEXANDER GIBSON, *Esq., Superintendent of the Botanic Garden at Daporee.*

I do not offer these notes for perusal in the idea that they communicate any thing very new, neither do I suppose that from their contents can be elicited any thing likely to be of solid benefit to the more enlightened agriculturist of Great Britain; as little do I fancy that they can possess even a tithe of the interest which must attach to a detailed description of the careful cultivation practised by the industrious Chinese husbandman. Still, I deem it possible, that they may in some points not be destitute of interest:

1st. As showing that the agriculture of India is not altogether of so rude or slovenly a character as it is often supposed to be.

2nd. That many of the means and instruments used, albeit simple, are yet well adapted to attain the end in view.

3rd. That much of what is bad in the husbandry of India, is owing rather to the faulty framework of the social system of the Hindùs, than to any natural want of acuteness.

4th. That until the habits of the people as regards their social system, be in some measure changed, little or no alteration in the present routine of practice is to be looked for.

The remarks which have led me to form the above general conclusions, will be found scattered among the details given hereafter. Having premised thus much, I will proceed to notice separately the modes of cultivation of the various Céreal Grains, Legumes, Oil-plants, &c., in common use.

1st, Wheat.—Is grown chiefly above the Ghâts in the Dekkan, Kandesh, and the Carnatic; also most extensively in Gujarat, even to the sea border. Farther south, the climate and soil under the Ghâts, do not admit of its being grown. It is also extensively raised in many level table-lands met with before the Ghâts soften down to the flatter plains, and on such high levels, the same measure of grain is found to weigh about one-quarter more than a similar quantity raised in the more plain country.

Wheat is universally sown as a crop of the cold season. The land intended for it, however, receives its first preparation either in November or December of the previous year, or after the first rains in May of the year in which it is to be grown. In Gujarat, this preparation consists in ploughing three or four times with the two bullock plough. A deeper-going instrument is deemed prejudicial as bringing up an inferior sub-soil. In the Dekkan, the land is most generally prepared with the six bullock plough, while in the more southern districts, bordering on and in the Carnatic, a plough of from twelve to sixteen bullocks is in general use, but is not had recourse to in the same land till after a period of twelve years; and often besides a ploughing with the great plough, the land has to be hand-dug to root out the Haryâlí grass, so destructive to crops.

The land having been thoroughly broken up and cleared of grass-roots by ploughing, digging and hand-picking, is left to be beaten down by the action of the rainy weather. In September it again undergoes a slight preparation by the knife-harrow, koolas, (kulava?) and on the weather being deemed favourable, the seed is sown by the simple drill harrow of hollow bamboos, converging upwardly into a cup, and spreading below, so as to allow of the lower extremity of each being inserted into a thick and hollow harrow tooth tipped with iron. Rain falling after germination is deemed to lessen the value of the crop, but a few heavy showers after it has attained the height of three inches materially assist its growth. The reason of the idea is sound and apparent.

The land best fitted for this growth is the strong black soil, which may be called our oldest alluvial, dating probably from the period when the world was a mass of lakes; hence, where this black soil is found in greatest quantity, the country is a perfect level. In the best tracts of such soil no artificial manure is ever required. The soil itself seems, owing to the predominance of calcareous matter in a state of very minute division, to have the property of converting every leaf-blade and stick which falls, into a substance identical with itself, in a very short space of time. This may be one reason why manure is not required.

Rotation is certainly necessary and universally practised, but not always until two or three crops in succession have been taken from the ground. Wheat is esteemed a very exhausting crop, or as the natives say, "its roots are foolish." A person attempting to take a crop of sugar-cane after wheat, even supposing that he manures largely, is sure to fail. This I have more than once had occasion to see.

In the best black soils, the power of retaining moisture is so great, that a wheat crop sown, will without the aid of any after-showers, but simply by the retained moisture and the action of cold air, turn out full. The rationale of this action of the cold I have not heard explained, but the fact as to its materially aiding in the growth of wheat and other grain is universally admitted. Should rain fall after the ear has begun to fill, the effect is most prejudicial, nay, even the prevalence of a southerly wind, which brings with it the moisture of the sea, is hardly less so. The effect of either of these is to produce a red smut with mildew of the ear, so that in an extent of many acres not one hundred pounds of grain may be reaped.

In some seasons, also, rats are epidemically destructive. For instance, in 1834-5, I recollect that in some districts large remissions of revenue had to be given on this account. The wheat once sown requires no farther care until the reaping season. It is then pulled, bundled, and the shares of the village establishment having been duly paid to them, the remainder is trodden out on the threshing floor. The chaff is carefully set apart as a most necessary provision for bullocks, and stored until the season when other provender is scarce, I believe, that but for this chaff, the cultivation of wheat would be by no means so extensive as it is, for the grain is not so certain a crop as some other crops are. It is also a necessary part of rotation.

Of varieties of wheat which I have seen grown in India, the number is six. Of these may be first mentioned, Bakhshì also called Daood Khani, in allusion, doubtless, to its northern origin; these two are very nearly related if not identical; both give a superior flour, best fitted for white bread, sweetmeats, &c.; the first is always raised on irrigated land; the second is a dry crop fitted only for the best soil. I find that the produce does not generally exceed twelve hundred pounds per acre, and is most frequently short of this quantity; the price at which these wheats sell is higher than that of other wheats; but it varies according to situation, season, &c., from sixty pounds to ninety pounds per rupee, *i. e.*, it may be said to vary from ten to sixteen shillings per quarter. In Gujarat, however, the produce may be larger than that above-mentioned.

The tax on an acre of the best wheat ground, may in Gujarat amount to eight or ten shillings. In the Dekkan and Carnatic border, the rate of such ground, per acre, will probably vary from two to five shillings under the new survey. Each acre of wheat will, in addition to the grain produce, be expected to yield chaff to the value of two rupees.

The other varieties of wheat are,—

2nd, Kathí. Inferior to the last in colour and quality, but rather superior in quantity of produce.

3rd, Pothí, Inferior to the last, but suited to poorer and even to red soil if manured.

4th, Kowrí or Khapale, Do. Do.

5th, Tambari. Inferior to all of the above.

6th, Beardless wheat. Not common here, but grain fine. Said to be common at Delhi.

The tax on the land whereon it is raised may not exceed one and sixpence or two shillings.

As to the storing of the crop, this in a tropical climate, where animals of every description abound, is a most essential part of rural economy. The granaries are always underground pits, excavated in sloping places, or places where the sub-soil is hard and dry; these pits are from six to eight feet in depth, closing to a narrow mouth; and having the bottom well puddled with clay, and the sides lined with thick ropes made of the leaves of sugar-cane, or other dry material, twisted; over these, teak or any other large leaves are carefully built as the filling proceeds; and the mouth is closed by grass beaten down and puddled over with earth. The leaves of the Ním-tree are usually put in along with the grain, as they from their bitter quality, have some power in warding off attacks of the weevil or other insects.

In countries where dry grain is much grown, the number of these subterranean receptacles is so great, that an elephant driver will most reluctantly and carefully pilot his animal through the quarter of a city where the grain shops are, from the fear of the hollow ground giving way under the elephant's weight. In a year of scarcity (and fortunately these are becoming less and less common under our Government,) the value of such receptacles is fully felt.

At present prices, a quantity of wheaten flour sufficient for a meal for two natives, may be purchased for about one penny, and as the wages of labour on this side of India, rule at from four to eight shillings per month, it will be obvious that the number of persons who can afford to feed on wheaten flour, is large. The greater proportion, however of the labouring population seem to prefer as a food, the cereal next mentioned.

Bajri (*Holcus spicat.*)—This grain is a staple of first importance as an article of food for the working classes, and, indeed, many of the higher ranks, especially Mahrattas, prefer Bajri to wheaten bread. It is generally believed to be the best food for a man who has to labour hard.

It is grown extensively in Gujarat, the Dekkan, and Kandesh. It does not flourish below the Ghats southward, neither does it appear to be grown in the Carnatic provinces. The soil which best suits it is a brown mould, partly composed of red and partly of black soil; though this be its most choice habitat, it will be found growing in all the coarser varieties of soil up to the merest detritus of trap rock, forming the lower shelves of hills. In the sandy soils forming the borders of the Northern Desert or Run, it will be found growing luxuriantly.

Bajri land is generally ploughed and turned up as soon as possible after November; it is then ploughed and cross-ploughed, and allowed to benefit as much as possible by the action of the sun in the hot weather; after the first heavy rain of June, and from that time until the 20th of July, the final preparation is given by the knife-harrow twice run over the land. Weeds are carefully collected, heaped, and burned in the land, and manure, if procurable, is then spread. The grain is now sown with the common drill sowing machine, and the ground is then smoothed down by the drill machine inverted, and kept down by the weight of one or more men.

When the crop has reached the height of four or five inches, weeds and grass are removed, and the plants are clustered up by a light bullock hoe, composed of two pairs of horizontal iron brackets fixed in frames, and at such distance as to sweep the edges of each drill, removing weeds in their progress, and also loosening and turning up the earth before them. The cost of a pair of such hoes may be about one shilling; they are very effectual for the purpose intended.

From this time until the grain has eared no farther care is requisite; should timely showers, usually looked for in August, fall, the crop will probably be abundant; but even should these fail at the appointed season, the plant is very tolerant of long drought; much rain is injurious, particularly in the shallower and sloping soils; in these, the under stratum being nearly impermeable to water, this is accumulated about the roots of the plants and speedily rots them, especially when no manure has been given. In parts of the same field, the manured portion may often be seen to retain a dark and healthy green hue, while the unmanured portions are of a sickly and dying yellow. The grain having been formed, the next care is to preserve it from birds, such as sparrows, parrots, &c. These animals are most destructive, particularly if trees happen to be situated near to the field: when this is the case, it must be watched from sunrise to sunset, and for this purpose members of the peasant's family relieve each other on a stage erected in the field, and with cries, slings and stones, keep the birds at bay. The grain having ripened, it is stacked to await the peasant's leisure for threshing.

In threshing, the heads are first separated from the stems; this is performed by women, who, if hired, are paid at the rate of six pounds and a half of grain per one hundred bundles or sheaves of the straw thus separated. It has often occurred to me that a small and simple machine, like the model of a loaded guillotine, might be made efficient in chopping off the heads of grain. The chief obstacle to this, would consist in the different lengths of the straws composing a bundle; a machine of this kind wonld save a vast quantity of manual labour.

The produce of an average crop per acre, will be found to be about six hundred pounds; but in rich districts, such as Gujarat, one thousand pounds will be nearer the quantity.

The straw is in many districts the only resource of the peasant for cattle-forage, and therefore is most carefully stored, but it is very inferior in nutriment to the straw of millet, or Jowari. The amount of straw per acre may be about six hundred bundles, value about one rupee ten annas, or three shillings.

As to the price of the grain itself, I conclude that the ryot can seldom, except in Gujarat, realise a gross product of more than four rupees per acre, and on poor unmanured watery, or rocky lands, about two rupees per arcre.

The tax on land fit for Bajri, may be in Gujarat from two to four rupees per acre; in the Dekkan, &c., at least under the new survey, I believe, that one rupee eight annas may be the maximum, and six annas the minimum, giving an average of fourteen annas; the chaff of this grain is not eaten by cattle.

In the poorer soils along with Bajri, is always sown a small Legume *(Hoolga, hullowla)*;* this is hardly in flower when the Bajri is taken

* Mahrati, Hulagá or hulagí: Dolichos biflorus.—*Editor.*

off; it is left to ripen and may give about one and a half maunds per acre.

In the richer soils, Tur *(Cytisus bajari)*, is commonly sown in the alternate rows, and is also left to ripen after the crop of Bajri is taken off.

The selling price of Bajri in the inland districts can be hardly quoted as higher than one hundred and fifty pounds per rupee; since the abolition of transit duties it has been exported to the coast districts in much larger quantities than was formerly the case, and this has had some tendency to equalise prices. It is reckoned as a very sanatory rotation crop; it is also subject to fewer casualties than are most of other cereal grains. Alone it is not given to horses, being esteemed too heating, but mixed with math *(Phaseolus aconitifolius)*, it forms an excellent food.

Great Millet *(Holcus sorghum)*. Millet is a grain very extensively cultivated in this Presidency, throughout Gujarat, Kandesh, the Dekkan, and Carnatic, but in the narrow strip of coast composing the two Conkans, it is not suited to climate or soil, and consequently is never raised. In the rich black plains of Gujarat or Kandesh it may often, indeed most generally, be seen twelve feet high; in these black soil districts it is the established rotation crop for cotton and wheat.

The first variety, or red Jowari, is sown immediately after the first fall of rain in June. The land requires little preparation, as it had been in former seasons either prepared by trenching or by ploughing, and freed from all weeds; thus, the only farther preparation necessary in sowing Jowari is to run the knife-harrow several times over it, and afterwards to sow with the drill machine before-mentioned. The plant is afterwards earthed up or weeded with the bullock hoe; watching is required as in the case of Bajri, and unless done by the peasant's family, constitutes a considerable item of the expense of the crop; it ripens in October, and is pulled, stacked, and the ear afterwards separated by manual labour.

The second variety, or White Millet, is sown in the end of August or beginning of September; this is a much lower growing grain than the first, but the ear is greatly larger, fuller, and both grain and straw are superior. The straw of this last contains much saccharine matter, and is wholly consumed in forage; whereas, of the first only the leaves and tender ends are eatable, while the entire stem is rejected by beasts. In quantity of grain this cereal is most productive, two thousand five hundred pounds per acre being a common crop in good soil.

The growth of the second variety is confined to the more inland and open country, particularly to those districts, which from their situation, get showers in October or November, the commencing showers of the Madras monsoon. It is a crop which bears a good deal of wet without injury to the straw, particularly when manure is used; cold has a beneficial action on the filling of the ear, but the least excess of it kills the plant, and this blight takes place chiefly in situations near a running stream, where the cold is a degree or two greater than that of the surrounding country. Should frost occur, which is sometimes the case, whole fields are immediately dried up. It is a beneficent provision of nature that the straw of this grain should most abound in the black soil districts in which cotton is raised, and which are generally destitute of pasture ground.

For the transport of an article so bulky as cotton, large numbers of bullocks are required; the Jowari straw can be afforded at a rate so cheap, as to be accessible to the poorest; the price varies according to situation, season, &c., from four to fifteen rupees per thousand bundles, and the size of these may be judged of by the fact that ten of them form a load for a man. The straw, particularly of the second variety, is very nutritive; it is carefully stored up as a resource in case of a bad season. In Gujarat it is stored in houses; in the Dekkan and Carnatic, I remark that it is preserved simply by overlaying the sloping stacks with clods of the black soil; these are beaten down by the rain into a uniform mass, which forms a hard crust over the stack. This straw is the principal food for elephants and camels in countries where trees and shrubs are scarce.

This cereal is often sown solely for the sake of the straw; this is done in districts where other pasturage is scarce, but where the means of irrigation are abundant; when sown for this purpose, sowing takes place in March, in ground well manured; it is sown very thick, as length of straw and not weight of ear is the object. It ought to be fit to begin cutting by May 15th, and a careful husbandman calculates on having a supply sufficient for his bullocks until the first rank grass of the rains gathers some heart and is fit for food; it is cut green, and the quantity required for daily consumption is cut, and the remainder left standing. In seasons when from deficiency of the early rain forage is scarce, this straw can often be sold standing, at the rate of about fifty rupees per acre.

In a poor country, such as that which forms a large portion of our Dekkan province, where there is almost always an under supply of forage, every fair means should be taken to encourage the extension of a cultivation so essential for the preservation of animals as this. It is therefore with sorrow, I remark, that under the new survey now in progress, a tax on wells, even of the most common description, is being re-imposed. Since the total abolition of well tax in the Poonah zilla which took place about seventeen years ago, the ryots have exerted themselves in vastly multiplying the means of irrigation. We may now look for a complete check to this spirit, and it seeems too probable, that even many wells now in use will be thrown up.

The selling price of millet may be quoted as varying from one hundred and forty to one hundred and seventy pounds per rupee. It seems to form the principal food of the inhabitants of large cities, artisans, weavers, and others whose employments are sedentary. A quantity sufficient for two meals may be purchased for about a half-penny.

The roots of the crop of a previous season are thrown into embankments to help in binding together the soil. Every good cultivator constructs such embankments when the soil of his field is at all sloping, and consequently liable to be washed away. Sometimes they are done by the labour of his own household, but more generally under contract with wirdars, a class who travel about the country performing work of this kind.

ELEUSINE CORACANA *(Natcheny, nágali, maud).*—Cultivated principally as a hill grain, but also in the plains. *E, stricta* is the species cultivated in the latter; it is not an article of general culture, but only in garden villages, near and below the Ghâts, where soil is alluvial, and stream water abundant.

The young plants are raised in a bed formed by ash manure; on the ground being thoroughly moistened, which it ought to be by the 10th July, the young plants are taken out and puddled down in the adjacent fields previously prepared by a light plough and harrow. The increase of this grain is very great, in good soil about three thousand pounds per acre; it is a cheap grain; its price may be quoted at from one hundred and fifty to one hundred and ninety pounds per rupee. I believe that the Banyans often refuse it as a return for cash borrowed, a proof of the small value attached to it in proportion to its bulk.

The hill species, *E. coracana*, is a smaller plant and much less productive; it is planted out in July. As the mode of its cultivation is identical with that pursued with the other hill grains (one excepted,) one description may serve for all.

A piece of jungle is cleared of bushes or trees in any of the dry months; the bushes, leaves, and wood, are thickly spread so as to cover the ground intended for the plants; fire is applied in April or May; with the first rainfall seed is sown broadcast. When the plants are sufficiently high, advantage is taken of wet weather to scratch the adjoining ground into furrows, either by hand or a light plough, a person follows in the furrows with a basket of the plants, which are simply dropped in, and left to be brought on by the rain acting on the loose soil. No farther care is required, and reaping takes place in October or November.

On account of the broken nature of the ground it is impossible to estimate accurately the quantity of grain obtained from a given portion of soil, but it is certainly less by three-quarters than that obtained from the garden species above alluded to.

Land thus treated is cultivated for four years in the following rotation.

1st. *Elusine Cor.*, Natcheny.

2nd. Wari, or Kang, (Kangni?) *Panicum Miliare, and P. Itolicum.*

3rd. Harík, Kodroo, (Kadrava,) *Paspalum scrobiculatum.*

4th. Verbesina, Black Til, an oil plant.

These four crops are considered to exhaust the soil, which is left in fallow for twelve years. The straw of Natcheny is indispensable to the Ghât peasant and the Concan cultivator, as a food for their cattle. In those countries the grass, either from the nature of the climate, or the late period at which it is cut, contains little or no nutriment, and cattle fed on it could not labour for any time. The sale of the spare straw is one of the resources of the peasant, and it is largely purchased by the Lingayet and other travelling grain dealers, whose cattle are generally in good condition. The Banjaras again, or Lumans, make no provision of the kind for their cattle, and the consequence is, that of those who come down for salt late in the season immense numbers die.

The straw of the *E. natcheny* is also used for burning bricks when it is intended that these should be large, or of choice quality; it is chopped up and mixed with the brick clay; the effect, of course, is the thorough baking of the brick. The large bricks to be met with in all old buildings of the Mussulman princes of India have been prepared in this way, so that the children of Israel had reason for grumbling in that they were compelled by Pharaoh to make bricks without straw. (*Vide* Exod. Chap. v.)

As the roots are many, the grain is thrown on embankments in order that the plant, as it grows, may bind together the earth and stones.

Other Hill Cerealia.—Of these it may be said generally, that the mode of cultivation is as in that last described; that the produce is quite as cheap or cheaper, and is seldom used as food beyond the districts where it is produced. The patch of rice is chiefly looked to as a mean of paying the land-tax, and the cultivator is fortunate if he has a sufficiency of the other grains to last until the following October.

I remark, that this season locusts appear to have alighted only in villages close to the Ghâts, or in the Ghâts, and in many of these the crops have been so completely eaten up, that the villagers have already begun to feed on the stems of the wild plantain-tree, the wild yam, and the more delicate but rarer root of an undescribed umbelliferous plant named "Peenda."

Before concluding, I will advert to the remarkable intoxicating property found in one of these grains, Harík, a *Paspalum* (frumentaceum ?) I have had occasion to see a large number of inhabitants of a village simultaneously affected with intoxcation, after a meal made from cakes of this flour. Vertigo, a degree of sleepiness and fatuity, rather than active excitement, is the characteristic effect of this grain. The symptoms are sometimes of a character more severe, lasting for seven days and attended with a vomiting of blood; fatal cases it is said sometimes happen, but I have not any case well authenticated; the effect from the grain eaten is not constant. It is most apt to occur when the grain has attained full development owing to late and heavy rain, acting on a highly manured soil.

Its intoxicating property is said to be neutralised by previous steeping in water wherein cow dung has been diffused.

The remedies had recourse to after the effects have taken place are, 1st, A pottage composed of the flour of "Borud," (*Phaseolus mungo*); and 2nd, expressed juice of leaves of "Harsinga," (*Nyctanthes arbor tristis.*)

The action of this grain on the human system is well worthy further investigation. [*Journal of the Royal Asiatic Society of Great Britain and Ireland, No.* xv.]

FURTHER NOTICES REGARDING MADDER.

(From Ure's Dictionary of Arts, Manufactures &c.)

In a Memoir published by the Society of Malhäusen, in September 1835, some interesting experiments upon the growth of madders in factitious soils are related by M. M. Kœchlin, Persoz, and Schlumberger. A patch of ground was prepared containing from 50 to 80 per cent of chalky matter, and nearly one fifth of its bulk of good horse dung. Slips of Alsace and Avignon madders were planted in March, 1834, and a part of the roots were reaped in November following. These roots, though of only six months growth, produced tolerably fast dyes, nor was any difference observable between the Alsace and the Avignon species, whilst similiar slips or cuttings planted in a natural non-calcareous soil, alongside of the others, yielded roots which gave fugitive dyes. Others were planted in the soil of Palud transported from Avignon, which contained more than 90 per cent of carbonate of lime, and they produced roots that gave still faster dyes than the preceding. Three years are requisite to give full calcareous impregnation to the indigenons madders of Avignon.

As to the function of the chalk, valuable observations made long ago by M. Daniel Kœchlin, have convinced him that the combination of two different bases with a colouring matter gave much more solidity to the dye, in consequence undoubtedly, of a greater insolubility in the compound. Experiments recently made by him and his colleagues above named, prove that in all cases of madder dyeing under the influence of chalk, a certain quantity of lime becomes added to the aluminous mordant. In the subsequent clearing with a soap bath, some of the alumine is removed, and there remains upon the fibre of the cloth a combination of these two earths in atomic proportions. Thus the chalk is not for the purpose of saturating the acid, as had been supposed, but of forming a definite compound with alumina, and probably also with the fatty bodies, and the colouring matter itself.

From M'Culloch's Dictionary of Commerce

In France, madder is prepared nearly in the same manner as in Zealand. The following instructive details as to its cultivation, &c. in Provence, were obligingly furnished to us by an English gentleman intimately acquainted with such subjects, who visited Avignon in the autumn of 1829:

"This town (Avignon) is the centre of the madder country, the cultivation of which was introduced here about the middle of the 18th century, and with the exception of Alsace, is still confined (in France) to this department (Vaucluse.) The soil appears to be better adapted for its cultivation here than any where else, and it has long been the source of great wealth to the cultivators. Of late years, however, the prices have fluctuated so much, that many proprietors have abandoned, or only occasionally cultivated this root, so that the crop, which was formerly estimated to average 500,000 quintals, is now supposed not to exceed from 300,000 to 400,000.

"The root is called *alizari*, and the powder (made from it) *garance*. The plant is raised from seed, and requires three years to come to maturity. It is, however, often pulled in 18 months without injury to the quality; the quantity only is smaller. A rich soil is necessary for its successful cultivation, and when the soil is impregnated with alkaline matter, the root acquires a red color, in other cases it is yellow. The latter is preferred in England, from the long habit of using Dutch madder which is of this color, but in France the red sells at two fr. per quintal higher, being used for the Turkey red dye."

(From Library of Entertaining Knowledge; Vegetable Substances.)

Vegetable substances yielding red colouring matter are not very numerous, none of them affording substantive dyes. Among them madder ranks the first in importance. The colouring matter resides chiefly in the roots, and it is this part alone which is employed.

The Madder plant grows naturally in the Levant, in Italy, in the southern parts of France, and in Switzerland. It is much cultivated in Holland, but Macquer observes that the Dutch were first indebted to the Flemish refugees for their knowledge of the method of preparing this plant. Its culture has often been attempted in England, but always without success.

It will live in any soil, but will not yield in every situation an equally fine produce. Dry ground is not favourable to its growth, but it dies if it is flooded. It succeeds best in a moderately rich, soft, and somewhat sandy soil. The root is perennial, having an annual stalk, and is composed of many long thick succulent fibres, about a quarter of an inch in thickness. It is joined at the top in a head like asparagus, and runs very deep into the ground. Many side roots issue from the upper part or head of the parent root, and they extend just beneath the surface of the ground to a considerable distance. It in consequence propagates itself very rapidly, for these numerous side roots send forth many shoots, which, if carefully separated in the spring soon after they are above ground, become so many plants. These roots are covered with a black bark or rind, divested of this they are of a reddish colour and semi-transparent; a yellowish pith is found in the middle, which is tough and rather of a bitter taste. The whole has a strong and peculiar smell. From the roots spring forth many large square-jointed stalks; these are weak and unable to sustain their own weight; they rise in good land to the height of eight feet, but if not propped, they creep along the ground. They are armed with short herbaceous prickles, and round each joint are placed in a whorl six or eight spear-shaped leaves of about three inches in length, and in the broadest part almost an inch wide. The upper surface of these is smooth, but the mid-rib on the under side is armed with rough herbaceous spines. The branches which sustain the flowers proceed from the joints; they are placed by pairs opposite to each other, having a few small leaves growing in triplets towards the bottom and in pairs as they approach the top. These branches are terminated by loose branchy spikes of yellow flowers, which are cut into four parts, and resemble stars.

The madder plant does not bear flowers until the second or third year, when they bloom in June and are succeeded by berries which contain the seeds. It is propagated by shoots. In the beginning of August the land is ploughed in ridges, eighteen inches asunder, and a foot deep; the young plants are placed in these a foot apart from each other. They thus remain for two seasons, care being taken to clear them of weeds. At the latter end of September, when the leaves are fallen off, the roots are taken up and dried for market.

According to an experiment made near Tours, an arpent (48,000 square French feet) of ground produced eight thousand pounds weight of fresh roots of madder; but in general not more than four, five or six thousand pounds are expected from the same space.*

As soon as the roots are dug up, they are taken to a place of shelter, so as to admit the air freely from all sides.

The French distinguish two qualities of madder, that which is prepared from the parent root, and that from the side shoots; the first, when the roots are not too large, is considered the best. These two descriptions of root are kept separate in the dryinghouse, where they are left for four or five days, being turned once or twice during that time, in order that they may dry equally, and that the earth adhering to them may be rubbed off. They are then conveyed to kilns constructed for the purpose, where they are still farther dried. When the roots are sufficiently dried outwardly they are removed to a floor made as clean as possible, and the outer skin is then separated by means of thrashing.

* Elemens d'Agriculture, par M. Du Hamel.

This skin is pulverized by itself and packed up in separate casks. It is known in commerce by the name of *mull*, and being extremely inferior to the other part, is sold at a comparatively very low price.

After the outer skin is thus separated, the roots are again conveyed to the kiln and subjected to a greater degree of heat than before. That this heat may not be injurious to the roots, they are frequently turned and a current of fresh air is blown through the kiln, to carry off the noxious exhalations of the plant, which would otherwise injure the colour. When the roots are sufficiently dried, they are conveyed to the pounding house to be reduced to powder.

In warm climates madder is prepared without the application of artificial heat. It results from this difference of preparation, and perhaps also from the variety of the plant, that two kinds of madder are distinguished, which differ in their dyeing properties.*

The roots are ground either between mill-stones or under knives similar to those of a tan-bark-mill. After the first milling the impurities are separated by means of boulters or fanners. In this state it is so partially cleansed that the French call it *non-robée*,—the residuum consists of earthy matter, epidermis, and bark.

After a second milling what is separated is called *mi-robée*, and finally, after a third milling, the madder *robeé* (signifying cleansed from the husk) is obtained, and which is of the best quality. This substance is employed as a red dye, and also as a first tint for several other colours. The madder used for dyeing cotton in the East Indies is in some respects different from that of Europe. On the coast of Coromandel it has the name of *chat*. It grows wild on the coast of Malabar; the cultivated kind is obtained from Vaour and Tuccoun, but the most esteemed is the Persian *chat*, called also *dumas*.

The madder imported in considerable quantities from Smyrna is more esteemed than the best Dutch madder, which ranks the first of that grown in Europe. The madder produced in the lower part of the Rhine is considered by Berthollet as not inferior to that of Zealand.

This is an adjective dye, but affords a permanent colour to cloth which a few days previously has been boiled for two or three hours in a solution of alum and tartar. The colour which it imparts is not so beautiful as that obtained from kermes or cochineal, but being much less expensive, it is extensively employed for common stuffs. Linen takes this dye with more difficulty than cotton. It is seldom used for silk, but is one of the most valuable dyeing drugs for a variety of purposes. It is an agent for dyeing many colours, and is therefore peculiarly adapted

* Berthollet.

to the process of calico-printing, since by the use of different mordants, a variety of hues may be produced by immersion in the madder bath. One mordant in combining with it, precipitates the colouring matter red, another purple, another black, and so of every possible shade from lilac to black, and from pink to deep red. If a portion of weld or quercitron be added to the madder, every shade from brown to orange may be produced.* Tin, iron, and aluminous bases, as well as other mordants, are used for this purpose, dependent on the colour required.

It is a matter of doubt and speculation with chemists whether these various colours are produced by the combination of the colouring principle of madder with the different mordants, by which a chemical change takes place, or whether several colouring matters are not really contained in the substance itself, and severally precipitated or retained by the varying action of the different agents to which it may be subjected. It is, however, certain that it contains at least two distinct colouring matters, a fawn and a red, and that the admixture of the former with the latter very much injures its clearness and beauty. In consequence of this, two kinds of red are obtained from madder. The first is simply called madder red, which contains the whole of the colouring matter. The other possesses far more lustre, and is much more valued; it is called Turkey red, because first obtained from the Levant. Its superior brilliancy is imparted in consequence of the red colouring matter being alone preserved; and while the tint communicated excels in brightness, it has the additional and great advantage of extreme durability.

The manner of producing this desirable effect was for a long period of time a subject of much interest and inquiry, the process used in Turkey being enveloped in mystery. The industry of the French artisans was stimulated by the interest which their government took in the discovery. Yet attempts at imitating this beautiful dye were long fruitless, and when at length they proved successful, this success was limited to one or two dye-houses. It was only by very slow degrees that it became more diffused, and then each individual who acquired the knowledge jealously guarded his own peculiar secrets which he had introduced in the process.

At length the Abbé Mazeas published the result of his experiments on the subject; and in the year 1765 the French government promulgated all the information which had by its direction been diligently collected. These instructions were entitled 'A Memoir containing the process for the incarnate red dye of Adrianople on cotton yarn.' Ber-

* Parkes' Chemical Essays.

thollet, Vitalis, and other eminent chemists, have likewise subsequently given an account of the course of procedure. All nearly agree in the detail, whence it appears that the process is most elaborate and tedious. Many different ingredients are used previously to applying the madder. Oil, sheep's dung, calf's blood, gall-nuts, soda, alum, and subsequently a solution of tin are employed, and the yarn undergoes seventeen distinct operations before it is finally imbued with its rich colouring. Many of these materials are considered by Dr. Ure as unnecessary, and his opinion has received the confirmation of an eminent calico-printer, who assured him that oil and alumina are the only essential mordants in the process.*

It is said that a dilute super-sulphate of potass is now used with success in France for separating the two colouring matters.

It was not until the year 1790 that the art of dyeing the Turkey red was introduced into our country. At that time M. Papillon, a Frenchman, formed an establishment at Glasgow for carrying on the process. He obtained a premium from the commissioners and trustees for manufactures in Scotland, on the condition of communicating his secret to Dr. Black; it being stipulated on the Doctor's part that it should not be divulged for a certain term of years, during which period M. Papillon was to have the sole use of, and the benefit accruing from his process. The term being expired, the process pursued was published, and found to be very similar to that already given by the French chemists.

Another species of madder has been cultivated in France by M. D'Ambourney, who found it growing wild among the rocks of Oissel in Normandy. On trial it yielded a dye as beautiful as that of Smyrna madder, and he was therefore induced to prosecute its culture. This plant is rather different from the madder grown in Holland. Its roots are more slender and of a less bright colour. They are furnished with few fibres at their joints, and those joints are farther apart; the stalk is not so thick, and the leaves are narrower and of a paler green.

In consequence of the impossibility of drying his roots without fire, M. D'Ambourney was induced to use them fresh after being well washed and cleansed. It is estimated that the root of the madder loses seven-eighths of its weight when dried and reduced to powder. But four pounds of the fresh root were found to be as efficacious as one pound of pulverized madder; therefore, by this plan, twice as much effective colouring matter was obtained; besides which advantage there were many others,—the expense of erecting sheds and kilns for drying

* Note to Berthollet's Elements of the Art of Dyeing, translated by Dr. Ure.

was rendered unnecessary—there was no danger of injuring the substance by improper drying, nor was the cost of a mill for grinding required. Lastly, the roots did not evaporate or ferment, as in the case with powdered madder if not speedily used; but they might be preserved fresh during several months, by laying them in a hole three feet deep, in alternate layers of roots and of earth.* Roots are now imported in large quantities into England, and obtain a proportionate higher price then the prepared madder.

In 1804 the gold medal of the Society for the Encouragement of Arts, &c. was voted to Sir H. C. Englefield, for his discovery of a pigment prepared from madder. He obtained a fine lake by many different processes, and found that the colour produced from the Smyrna was of a deeper and richer tint than any prepared from the Dutch madder. In pursuing his experiments he discovered that the colouring matter might be extracted from fresh madder, and thus not only all the expenses and difficulty attendant on the process for prepared madder might be avoided, but the cost of carriage would be one-fourth less than for the roots: while separated from these the colouring matter might be kept for any length of time without danger of being spoiled. A further advantage would also arise in the quantity obtained, as all the colouring matter could be extracted; while in the manner which the dyers use the roots, a very considerable part of the colour is left in the refuse matter, and consequently wasted.

The following is a slight sketch of the method proposed for obtaining this extract. A given quantity of the roots ground into a pulp is put into a woollen bag. This is then triturated in large vats filled with a certain relative proportion of water; the friction is continued until the colouring matter is entirely washed out of the madder; the water thus loaded with colour is boiled,—an iron vessel must not be used, as a chemical change would take place and the colour would be spoiled. After being boiled it is poured into an earthen receiver, and a solution of alum is mixed with it in given quantities. Then a certain proportion of a saturated solution of mild vegetable alkali is added, which causes effervescence, and the colouring matter is immediately precipitated, from which the supernatant liquor being drawn off, the colour is readily dried for use.

The colouring matter of this plant has a very remarkable affinity to the bones of animals, those eating of the root having their bones dyed of a red colour. This fact was long known to the practical dyer; but as it did not fall in with any of his pursuits, it excited no interest and

* M. Du Hamel.

was disregarded by him, or taken as a matter of course. In the present day, perhaps, this class of persons are somewhat more enlightened, and their minds are not wholly chained down to the immediate objects of their particular avocation.

The average annual importation of prepared madder in England for the last five years from 1828 to 1832 is 67,525 cwts. Of madder roots 46,272 cwts. The former pays a duty of 2*s.* per cwt.; the latter only 6*d.* for the same quantity. The average price of the best madder for the five preceding years was 83*s.* per cwt., and of the best roots 48*s.* per cwt. It is imported from Holland, France, and Turkey.

Correspondence and Selections.

Correspondence relative to the valuable properties of the American Sumach, or Dividivi, (Cæsalpinia Coriaria) as a tanning plant. Communicated by Dr. Wallich.

J. Hume, Esq. *Honorary Secretary, Agri-Horticultural Society.*

My dear Hume,—I am now in a position to furnish you with very satisfactory information concerning the American Sumach.

Enclosed I have the pleasure to send you extracts of two letters from Mr. Teil, dated 6th and 10th instant, and copy of a third letter from that gentleman, received yesterday, dated the 27th; I also send you one-fourth of the beautiful skin which accompanied the last communication from Mr. Teil.

I look upon the information contained in the above several letters from Mr. Teil, as highly interesting and satisfactory; and I doubt not that the Agricultural Society will take a similar view of the matter. The result of the trial that has been made, as far at least as concerns the quality of the accompanying skin, seems to leave nothing further to be wished.

The American Sumach deserves to be extensively cultivated in this country. It seems to thrive remarkably well, requiring very little, if any care, except in its youngest state; and a proportionally small expenditure of money. The tree seems to be contented with a very ordinary sort of soil, and in all probability, when once reared from seeds ripened in the country, it will be as productive as in its own native climate, at least sufficiently productive to make the cultivation of the tree an object of importance.

How far the Dividivi may answer as a Mordant, remains to be seen. Mr. Teil thinks that it will prove admirably adapted for that purpose.

In my first note to you on the American Sumach, of the 21st ultimo,* I referred you to the interesting extracts contained in the 3rd Volume of the Society's Transactions, pp. 83 and 93 (reprinted in Madras Journal for April 1837.) You will find that the 10th Volume of the Gardener's Magazine (for 1834) page 404, is quoted as containing further valuable information.

The tree was introduced by Dr. Hamilton at Plymouth into this garden. Our first plants were raised in December, 1835. The first flowers were produced in November, 1837. In November, 1840, the plants blossomed freely, and furnished some ripe pods. During this present and last month, we have had about twelve seers weight of pods ; and I am quite sure we shall have a larger supply next year. I suspect our trees have been shaded too much—have been too much taken care of.

Again and again, I recommend this Sumach to be widely cultivated in this part of the world. I have sent seeds to Madras, Ceylon, and Bombay, and to many places in Hindustan.† Enclosed I forward to you an additional paper of the seeds.

There is a subject, which I may as well mention here. Five or six years ago I had some correspondence with a French gentleman, who insisted that a cargo of Dividivi had been imported into France from Chandernagore. He produced a sample of the drug, which at once satisfied me that it was genuine, and no mistake. But since it is equally certain, that this Dividivi is a native of South America, and not by any means of this country, it becomes a matter of curious speculation to account for a cargo being exported from hence. Supposing the information to be correct, one would almost be inclined to suspect, that the plant may have been an object of cultivation in this country in former times, only that there is not the slightest vestige of any such thing having ever existed ; and unless I mistake much, I made inquiries at the time at the Calcutta Custom House, but without eliciting any sort of light on the subject.

Yours, &c.

Botanic Garden, 29*th March*, 1845. N. WALLICH.

* This note, as also directions for cultivating the Dividivi, will be found at page 26, of this volume.—*Eds*.

† Dr. Wallich also placed a small supply at the disposal of the Society. The whole of it has been distributed to about forty members, resident in twenty-nine distinct quarters of the Empire.—*Eds*.

Extract of letter from J. Teil, Esq. *to* Dr. Wallich, *dated Kidderpore, 6th March*, 1845.

"I beg to acknowledge the receipt of your note of this day's date regarding the "American Sumach," and to thank you for the communication.

"I shall be most happy to try the effect upon leather, of the *fresh* article you have collected, and to inform you of the result. I have been in the habit of importing the article from America, but whether what I received was too old and dry, or whether it got impoverished on the voyage, I never found it to possess the same astringency and strength as our babool bark for tanning purposes; though, if in these respects, both were exactly alike, still I fear the American Sumach would be found too expensive as a substitute for the country babool bark.

"On account of its want of sufficient astringency and on account of its expensiveness, I have heretofore used the Sumach only in *dressing* and *softening* leather; for which purpose it is, in my opinion, superior to every other substance with which I am acquainted. If the article is extensively cultivated in this country, it will, I have not the smallest doubt, be an important auxiliary to the babool bark both in tanning and in dressing leather.

"I shall be most happy to receive a supply of the Sumach seeds, and have the same put down in my garden."

Letter, dated 10*th March*, 1845.

"I beg to acknowledge, with my best thanks, the receipt of your very kind and obliging communication of last Saturday, the 8th instant, together with a basket of the "Sumach," and a small parcel of seeds.

"I have never seen any Sumach, such as you have been pleased to send me. It is infinitely superior in appearance, cleanliness, beauty, and essential qualities to the American Sumach imported by me. The American Sumach is brought here in a pulverized state, and I beg to send you a small sample of the best I have now in store: but it has not, as you will perceive, the bright, beautiful, greenish yellow color of your Sumach, and the latter, in my opinion, leaves the other at an immeasurable distance behind, in point of strength or astringency. Upon tasting your Sumach I found it to be fully as astringent as the Aleppo-Galls which I use with babool bark in tanning *fine* skins, and I am inclined to think that your Sumach, if it will not be superior, it will at least be fully equal to the Aleppo-Galls for tanning purposes; while I am certain, from its appearance, that it will impart a brighter color to the leather which may be tanned with it: I shall however put it to the test immediately, and hereafter communicate the result with all my operations for your information.

With regard to the proper time for gathering the pods, it occurs to me that you have pursued the proper course in allowing the pods to ripen perfectly before gathering them: and my ground for entertaining this opinion is, that the babool bark, taken off from a *full grown* tree is found to be more astringent and better adapted for tanning purposes than the bark from a young tree.

Letter dated 27*th March*, 1845.

I have now much pleasure in forwarding a Goat-skin which has been tanned solely with some of the Sumach grown by you. The time occupied in tanning this skin was altogether about 48 hours, and not more than 1½ pounds of Sumach was used in the process. I find the tanning principle of your Sumach so very powerful, that I am quite satisfied one pound and a half of it will be sufficient to tan a pound of leather of any description. But the actual time in which a skin or hide may be tanned will depend entirely upon the strength of the liquor used for the purpose.

I have done nothing more to the skin which accompanies, after it was tanned, than simply dressing it with a little fish oil.

From the experiment I have made, it is my belief that, for tanning leather of any description, your Sumach will be an excellent substitute for every other substance now used in that branch of manufacture. Indeed I never found either the Aleppo-Galls or even the American Sumach to impart the same degree of softness to leather, as your Sumach has done to the skin I have tanned with it.

I am tanning some more skins with the remainder of your Sumach, in order to ascertain if I shall obtain the same results as in the instance of the skin already tanned and dressed.

Your Sumach will, I think, be found admirably adapted as an astringent mordant for dyeing purposes.

My dear Hume,—I annex copy of another letter from Mr. Teil, who was kind enough to conduct me, yesterday, over his large and important establishment at Kidderpore. I wish I had a cwt. of the Dividivi to send him for trial. What I had I sent him; some portion I likewise forwarded to other destinations. Mr. Teil has promised to favor me with further samples when they are ready.

Yours sincerely,

N. Wallich.

Botanic Garden, 3rd April, 1845.

Dr. N. Wallich, M. D. *&c. &c. &c. Botanical Garden.*

Dear Sir,—I regret to find, on reading a second time this morning your very kind letter of the 18th instant, that I have accidentally omitted to reply to it, and I must now throw myself upon your indulgence for the oversight.

It is a source of infinite gratification to me to find, that I have at all been instrumental in developing the properties of the Sumach grown by you, and I can have not the smallest objection to your placing the result of my very humble labors before the Calcutta Agricultural Society. Indeed, as one engaged in a branch of manufacture so peculiarly dependent upon any article which may possess tanning properties, I feel naturally and deeply interested, above perhaps all others, in the successful growth of the American Sumach in this country; for your own labor, combined with the result of the trial made in my Tannery, shews beyond all doubt, that it can be cultivated to very great perfection in this country. It may indeed, considering the useful nature of the article, be worthy the consideration of Government, to hold out some specific encouragement for the growth of the article throughout India. I should have liked very much to have had enough of it to try upon the skins of larger animals, such as the bullock and buffaloe hides, but from the result obtained in the skins of smaller animals, there cannot be any room to doubt, that it will prove equally efficacious and successful in all others, whether large or small.

The imported Sumach, such as I have received from America, notwithstanding every possible care in the selection, cannot, as I have before explained, be compared to the Sumach grown by you, either for beauty of color, or for strength in tanning properties. It therefore appears to me either that the soil of India is better adapted for its growth than that of America, or that uncommon care was taken in the growth of the Sumach you were pleased to send me.

I remain, &c.

(Signed.) JOHN TEIL.

Kidderpore, 31*st March*, 1845.

MY DEAR HUME,—Having had some correspondence with the Honorable Mr. Chamier, President of the Agricultural Society at Madras, on the subject of the American Sumach, I am thereby enabled to furnish two very interesting documents, which I enclose, and which I request you will be so good as to submit at the approaching meeting of the Calcutta Society. Namely, extract of a letter from Captain Budd, who has charge of the Establishment at Hoonsoor, dated the 17th ultimo, to Colonel Tulloch, Commissary General at Madras; and copy of a letter to me from Mr. Teil, dated the 10th instant, at Kidderpore.

As the substance of several communications from Mr. Chamier, and of notes to him from Colonel Tulloch, is comprised in the above paper of Captain Budd, I deem it unnecessary to add copies of them. I will only observe, that Mr. Chamier has most kindly and cordially exerted himself in distributing seeds of the tree in question, over the peninsula.

I have the pleasure to enclose also a portion of a small sample of the American Sumach, or Dividivi, imported from England by Mr. Teil, and accompanying his letter to me of the 10th March.

Yours sincerely,

Botanic Garden, 12*th May*, 1845. N. WALLICH.

Extract of a letter from Captain Budd, *dated Hoonsoor, 17th April 1845, to Colonel* Tulloch, *Commissary General.*

I have received one pod, and a packet of seeds of the American Sumach. The seeds I have sown out in different soils and situations; some in the open air, some in the shade. When the larger packet arrives by banghy, I will distribute it in the way you wish. The pod I shewed to Russell, he had no knowledge of it in that state, except from its smell. I then had it pounded to powder, and he then declared it to be in color, taste and smell, identical with the article in common use in England for the preparation of fine skins. He says that if it could be procured in sufficient quantities, at a sufficiently reasonable rate, it would be of the greatest possible use for the *dressing* of *fine* skins: and that by its means, the tendency of our leather to become red on exposure to the sun, might be entirely removed, instead of being only partially corrected, as at present. I should be very glad if some few pounds of it could be supplied to me for experiment, either from the Calcutta garden or from what Mr. Teil imports. I think we could equal, if not surpass, the quality of the piece of tanned Goat-skin from his establishment: and which is, I presume, intended to be an imitation of Morocco leather, such as is used in bookbinding. If Mr. Teil finds that the Sumach corrects the objectionable properties of the babool bark, namely, its coloring matter, and its rendering leather tanned by it liable to crack, it must be a most valuable auxiliary to the Indian tanner: for babool bark, deprived of the above objectionable properties, would be a preferable article to the Cassia we now use, because it is by far the more abundant of the two. The bark we now use is that of the Cassia auriculata of Linnæus. You will find it described at page 190 of Dr. Wight's Prodromus Floræ Peninsulæ Indiæ Orientalis, vol. 1. It is called in Tamil *Avārum chādy*, and in Canarese *Thungādee Giddah*. I send herewith a few of the pods from a self-sown shrub in our tannery compound. We can easily tan with it light skins, such as sheep and goat-skins, in from 48 to 60 hours. I will send you in a few days a specimen of goat-skin, tanned, dressed with oil, grained up, and polished, to compare with Mr. Teil's specimen: the peculiar color given by the Sumach is the only particular in which I despair of equalling it. Russell thinks that Sumach used by *itself*, as a *tanning* substance, would not answer for other than *light* skins: and that for bullock or buffalo hides, it would be less efficient than our bark, because it would not make them swell in the pits. I cannot find here any one acquainted with the tree called *Pee Valy*; so if you will kindly send me up some of the pods from Madras, I can ascertain what, if any, quantity of tanning they yield, and shall perhaps recognise the tree in these jungles, by means of the pods.

No. 273.

Dr. N. Wallich, M. D. *Botanical Garden, &c. &c. &c.*

Dear Sir.—I feel exceedingly obliged by the very interesting papers from Madras, you have been good enough to forward for my perusal, with a parcel of the Cássia pods.

I was aware of the Cassia auriculata being used by the natives of this country for tanning leather, but I have never made use of it myself for that purpose, on account of a deep coloring matter it possesses, and on this account, it will not, I think, be found to surpass the Dividivi, should the latter once obtain as fair a trial as the other has received.

The *Cutt*, or Terra japonica, is doubtless a stronger tannin than the Cassia, or than even the Sumach, but it will never, I think, of itself, or without some auxiliary or adjunct, give the same pliancy or elasticity to leather which the Sumach does, or as your Dividivi will certainly do; while, from its very heating nature, it does not preserve leather so well as I have found the Sumach to do. It has besides the effect of shortening the fibres of the leather, which in itself constitutes, perhaps, the strongest objection to the use of it as a tannin, when other and safer substances can be found to answer the purpose much better, and at, probably, even less cost and trouble.

I have, in my time, when wanting the experience I now possess, made use of the *cutt* as a tannin, but I was obliged, from losses, and other causes, to abandon it, and to resort to the babool bark, the Aleppo-Galls, and the American Sumach, in its stead; each of which I found to be every way preferable to the other.

Of all the substances *hitherto* used by me for tanning leather, the babool bark I have found to have the least coloring matter in it; and I have never found that it had a tendency to cause the leather tanned with it, either to become red on exposure to the sun, or to crack after a short time. These effects, I am led to think, are owing more to the way in which the leather in its raw state is managed, than to the substance used to tan it with, for the foundation of successful and perfect tanning rests entirely on the way in which the hide in the first instance is cleansed and limed, before it is removed to the tan vats; and if this point be ever neglected or mismanaged, it cannot, afterwards, be remedied by the substance which may be made use of for tanning. Our Indian sun is, however, enough to scorch, harden, discolor and crack almost any substance exposed to its effects for any time, and until its rays are mitigated, we can, I fear, never hope to produce tanned leather to wear and retain its color so well in this country as that tanned and used in more temperate climates.

I have in my former communications mentioned that I had not enough of your Dividivi to try upon large hides, though, as it answered so well upon the small skins, there cannot, I think, be any doubt that it will answer equally well upon the large hides. The babool bark, however, has been well tried, and it has been found to succeed admirably well, at least in this place, so much so indeed, that I may mention only one fact, in proof of it. Some years back, for instance, by way of experiment, I tanned some leather with it, and shipped it to London for sale, where, to my surprise, it fetched a penny, and a penny and a half the pound, more than the leather tanned in England with the oak bark !!

I am getting some small skins ready for you, tanned with the babool bark, and also with the American Sumach, which I hope will be found even superior to the skin I before forwarded to you.

I have a small quantity of American Sumach on hand, but it has unfortunately imbibed so much damp, that it is not fit for use, or I would have been most happy to have supplied you with a few pounds for transmission to Madras.

I have the pleasure, with my best thanks, to return the several very interesting papers received for perusal from you, together with the parcel of Cassia pods which accompanied them.

I remain, &c.

(Signed.) JOHN TEIL.

Kidderpore, 10*th May* 1845.

My dear Hume,—I have the pleasure to enclose copy of a letter I received yesterday from Mr. Teil, with a portion of each of the three skins that accompanied it; all extremely interesting and satisfactory. I never met with any thing of the sort more velvetty soft than the two kid skins not tanned with the American Sumach; and the calf skin, which has been tanned with the drug, but not worked or dressed subsequently like the others, affords decisive proof of the superiority of the drug above the Baubul, and Cassia auriculata bark.

Yours sincerely,

N. Wallich.

Botanic Garden, 31st May, 1845.

I have sent Mr. Teil a small remnant of Dividivi, suggesting a trial with it for preparing a kid skin, Morocco fashion—or for using it in any other way he might prefer.

N. W.

To Dr. N. Wallich, *M. D., Botanic Garden, &c. &c. &c.*

Dear Sir,—I was duly favored with your letter, dated the 21st instant, annexing copies of a letter dated the 17th idem, from the Secretary to the Agricultural Society, and of the Resolution referred to in it; and I now beg you will do me the favor to tender to the Society my grateful acknowledgments for the very flattering manner in which, through your kindness, my humble labors in developing the tanning properties of your Sumach, have been noticed by them.

As promised in my letter of the 10th instant, I have now much pleasure in forwarding to you three skins, which I have tanned separately with your Sumach, and with the Babool bark, marked A. B. and C.

The skin marked A. is a piece of calf skin, tanned exclusively with Sumach, with the grain in its natural state, (or without being dressed) in imitation of Morocco leather. The tanning was completed, altogether from the commencement, in 41 hours. It is evident, from the appearance of this skin, that your Sumach, as a tannin, has very little coloring matter in it, and that consequently skins tanned with it, will admit of being afterwards dressed into any color excepting drab and light yellow, for which the original color produced by the Sumach, is a little too deep. This skin has been tanned for the last four days, and I have purposely detained it, until now, to see if exposure to the air has a tendency to make it become red, or to cause it to harden and crack: but I have much pleasure in adding, that no change whatever has taken place, either in the color or flexibility of the skin, since the day it was tanned; so that this experiment, in my opinion, fully establishes the superiority of your Sumach, as a tannin, over the Cassia auriculata used at Madras.

B. and C. are two kid skins, which have been tanned with the Babool bark. They were 48 hours in tanning. B. has the grain in its natural state, or simply raised so as to be adapted for shoe leather. C. has the grain worked in imitation of Morocco leather. These two skins have been tanned for nearly a month, but no visible change has taken place either in their color or softness, since the day they were tanned.

From the experiments now brought to notice, you will perceive that the calf skin was tanned with your Sumach in a shorter space of time than the kid skins were with the Babool bark, from which it may I think be fairly assumed, that the fresh Dividivi, or the Sumach you sent me, is more powerful, as a tannin, than the Babool bark.

The reason why I send you only a *piece* of calf skin, is because, unfortunately, I had not enough of your Sumach to use upon a whole skin.

If either yourself or the Agricultural Society, or the authorities at Madras, should wish me to make any further experiments with your Sumach upon leather, I shall be most happy to the utmost of my ability to undertake them, provided I am supplied with a further quantity of your Sumach—of which, at present, I have none left.

I remain, &c.

(Signed,) JOHN TEIL.

Kidderpore, 30th May, 1845.

CORRESPONDENCE CONNECTED WITH THE FORMATION OF A GOVERNMENT EXPERIMENTAL GARDEN AT KISHENPORE, IN CHOTA NAGPORE, FOR THE CULTIVATION OF COFFEE.

Extract of a letter from Lieutenant-Colonel J. R. Ouseley, *A. G. G., S. W. Frontier, dated Chota Nagpore, 29th April,* 1845.

"I do not know whether you are aware, that the *finest* coffee produced in India, is grown in my own experimental garden. I send you the report on which the Government sanctioned the garden they keep up here: and am anxious that people should know, that the climate and soil agree so well with the culture of coffee."

To the Agent to the Governor General, South West Frontier.

Sir,—With reference to your letter, No. 20, of the 17th May last, and to the accompanying copy of a letter and enclosures from the Officiating Superintendent of the Honorable Company's Botanic Garden, relative to the proposed culture of the coffee plant at Kishenpore, I am directed to inform you that, under the circumstances now reported, the Honorable the Deputy Governor of Bengal is pleased to sanction the experiment on a small scale.

2nd. You are accordingly requested to communicate as before with Dr. Griffith, on all questions connected with the subject, and to submit an estimate of the expense to be incurred for the Experimental Garden.

I have, &c.
(Signed,) A. Turnbull,
Under Secretary to the Government of Bengal.

Fort William, 10th July, 1843.

To T. R. Davidson, Esq., *Secretary to the Government of Bengal, in the General Department.*

Sir,—I have the honor of forwarding a copy of a letter from the Agent to the Governor General, South West Frontier, in answer to my communication to your department, No. 32, of the 4th April last, together with a highly favorable certificate procured through Mr.

C. K. Robison, and the characters and analysis of the soil, supplied by the Honorable Company's Deputy Apothecary.

2nd. As the coffee really appears to be of excellent quality, and as the circumstances connected with the soil, climate, and mode of culture appear so promising as to warrant the expectation of success,—I beg to report in favor of the experimental garden in the manner and on the scale proposed by Colonel Ouseley, which will, judging from Colonel Ouseley's communication, be limited almost to a trifling ground rent.

3rd. It seems to me that the same locality, which promises so well in coffee cultivation, presents many recommendations for selection as a site for a Cotton experiment, in which case it might be deemed advisable to have qualified European superintendence; I cannot however hope for any advantage from detaching a Maliee from this establishment, which does not possess one of the requisite intelligence, activity, and steadiness.

I have, &c. &c.

(Signed,) Wm. Griffith,

Officiating Superintendent.

Hon'ble Company's Botanic Garden, 20*th June*, 1843.

To C. K. Robison, *Esq. Calcutta.*

Dear Sir,—This morning your sample of coffee came to hand, and we consider it as good as any of the plantation coffee shipping from this; the value in London market by last advices being from 85 to 90 shillings per cwt. had the parchment been cleaned properly off the berry; we must look for much lower prices when all the plantations now under cultivation here come into bearing. The yield of good plantations here may be reckoned at from 12 to 17 cwt. per acre, some patches have given 18 cwt. of such coffee as your sample.

We remain, &c.

(Signed) Wilson, Retchie and Co.

Colombo, 28*th April*, 1843.

A few particulars regarding some of the Esculent Roots and Fruits of Central Africa. Communicated by the Rev. DAVID LIVINGSTONE.

To J. HUME, ESQ., *Secretary, Agricultural Society.*

MY DEAR HUME,—About a month before I left the Cape of Good Hope, I had the pleasure to write to you, reporting the manner in which I had tried to execute the Agricultural Society's commission*. The copy of my letter on the occasion to Mr. Livingstone, was sent to you at the time; and I have now the satisfaction to enclose his reply, dated Mabotsa, 18th August last year. It arrived yesterday afternoon per *Phœnix*, (as appears on the outside) having been received in Cape Town on the 11th December. The letter is very interesting, and I have no doubt it will be properly noticed by the Society. I shall only add, that I will send Mr. Livingstone such things from hence as, I may hope, will prove acceptable to him.

Believe me, &c.

N. WALLICH.

Botanic Garden, 10*th April,* 1845.

To DR. N. WALLICH, *Superintendent H. C. Botanic Garden, Calcutta.*

MY DEAR SIR,—Having found your most welcome communication of 22nd March, during a recent visit to Lattakoo, I immediately on returning to my own station, commenced operations in order to a full and hearty compliance with your request on behalf of the Agricultural and Horticultural Society of India. I have employed natives of different tribes situated near the Desert; and hope, by their assistance, soon to obtain most of the esculents, which at this season are in a state fit for transmission. And as I know the Rev. R. Moffat will aid me as much as he can, in conveying them to the colony, it is probable not very many months will elapse before I shall be able to announce my first assortment as thus far on its way to its final destination. Several however of the roots and fruits

* The details of this commission will be found in the Proceedings of the Society for November 1843, published in Vol. II, page 481; and Dr. Wallich's reply, in the Proceedings for June 1844, Vol. III, page 75.—*Eds.*

which, by way of sample, I should have preferred sending first, must necessarily be reserved for a future opportunity. One in particular I regret I cannot send, because I think it would act as a stimulus to induce you patiently to try the effect of cultivation on the whole. It is a tree, and though growing frequently in the most dry and sterile situations, is found of different sizes, from a low bush to a tree thirty feet in height and one and a half in diameter. It yields a small fruit which the natives describe as very agreeable. But the root is the most interesting portion, for when pounded in a mortar, in order to separate the woody fibre from a farina which it contains, an apparently very nutritious article of diet is obtained. This farina is sweet, but has a slight degree of bitterness combined, the latter however is not discernible when (as the Bechuanas use it) it is mixed with fresh milk. The saccharine prevails over the bitter now, and probably by cultivation in India the latter would entirely vanish. But should both be increased in intensity, to individuals requiring a nutritious tonic it might prove a valuable substitute for Tapioca. To such I have prescribed it, but I have not sufficient experience of it to justify any conclusion. The native name is *Omotlope*. I have seen neither flower nor fruit.

Another root, but much less in size than the above, and by no means so agreeable, is relished very highly by a tribe called the Bakwain, whose country is situated on the Tropic; the greediness with which they dug and devoured it at a time when we had an abundant supply of animal food, which to Bechuanas is superior to every thing, induced me to enquire the reason of their preference, and I found that several years ago, when their tribe was attacked and driven into the Desert by another, this root was their chief means of subsistence for many months, and "since that time," said they, "we have always relished the '*Tihopo*'." The "*Makucle*" too, a tuber from which the natives take a name for our potato, could, I hope, also be improved by cultivation. And if we can only get three or four capable of being as much improved by cultivation as the potato, our labour will not be in vain.

It may be proper to mention, that having observed many of the esculents used by the Bushmen and Bakalihari of the desert, in parts which have never been reached by Europeans, who adopt the usual modes of locomotion the country affords, I have found it necessary to send natives to these localities. But though the distances are considerable, I hope by drawing as much as possible on the friendship of the different chiefs whom I know, the expenses will not be very great. Perhaps the largest item in connection with collecting will be that for the fruit and seed of a tree which grows in Lat. 21° S. Long. 28° E.; the fruit is as large as an ostrich egg, and said to be very good, (I cannot speak positively about it, as I only saw the shells of it lying about); the fruit of another tree of truly enormous growth is also said to be very good. For these I have offered presents of the value of three pounds. But I shall be most careful not to abuse the confidence the Society honours me with.

In conclusion, allow me to assure you, that if I can in any other way be of service to you, I shall expect you to tell me how, without either introduction, preface, or apology. For I am always delighted with being employed in that which tends to benefit mankind, and will readily do any thing not inconsistent with the object for which I came to this country.

Believe me, &c.
DAVID LIVINGSTONE.

P.S. I beg leave, in reference to the Indian plants and seeds, to return my warmest thanks for your kind proposition, and as you will be better able to judge what ought to be tried, I shall take an early opportunity to give you some idea of the physical characteristics of the country around my new station Mabotsa, which is situated about 30 miles North West of what are called the Kurrechane Hills.

A List of the Timber trees of the Province of Malacca. By J. W. WESTERHOUT, ESQ., *Assistant Resident. Communicated by* C. K. ROBISON, ESQ.

To J. HUME, ESQ., *Secretary to the Agricultural and Horticultural Society.*

SIR,—I beg to send you a "list of the timber trees of the province of Malacca," prepared by Mr. Westerhout, Assistant Resident there, which I have been requested to present to the Society.

The list was prepared by Mr. Westerhout, at the suggestion of the late lamented Mr. Griffith, and I am authorized to state, that it will shortly be followed by specimens of all these timbers, fit for experiment, and a descriptive catalogue, containing their qualities and uses, some of which Mr. Westerhout considers very valuable.

Mr. Westerhout states, that the forests are of easy access, but that there is a great want of hands to bring the timber to the wharf, as the Malays refuse every thing like steady work.

The "Marbouw" is represented as resisting the attacks of white ants for one hundred years and upwards, and as it is very well calculated for beams and all housework, I would hold it to be a good speculation to send down a small gang of Hill coolies (who are skilled in felling trees) for this purpose; but when the specimens arrive, a Committee can be appointed to examine them, and report to the Society.

I am, &c.

C. K. ROBISON.

Calcutta, 24*th April*, 1845.

List of the Timber trees of the Province of Malacca, by J. W. WESTERHOUT, ESQ., *Assistant Resident, Malacca.*

Tampinees,
Blean,
Marbouw,—very strong & hard,
Tambosoo,
Tampang,
Madang Katanahan,
Kalat Meerah,
Galam Tekoos.
Madang Boagah,
Madang Konjeet,
Madang Lawang,
Madang Paranas,
Madang Langodee,
Madang Samenjaak,
Madang Kawan,

Lanioosoo,
Rangas,
Rassaak,
Natoo,
Saraya,
Marantee,
Lida Karabouw,
Pisang Pisang,
Mangaranan,
Pataleng,
Salomar,
Dalle Dallee,
Baloon Ejook,
Madang Taloor,
Bintangoor,

Bonoot,
Kampaas,
Jalotoong,
Giham,
Paning Paning,
Pannah,
Kalat Potee,
Kalat Lapies,
Chengal,
Pinang bahie,
Tolang Daheeng,
Chechaar,
Gombang,
Madang Kaladee,
Madang Tandook,
Sagah,
Panagah,
Kledang,
Marsanah,
Tarantang,
Brombong,
Mankadoo Otan,
Golam Zekoos,
Kalaat Menah,
Maraboun Lahoot.

Notice of Horticultural operations in the Garden of the Branch Agri-Horticultural Society at Lucknow. Communicated by CAPTAIN G. E. HOLLINGS, *Secretary of the Society.*

To J. HUME, ESQ., *Secretary, Agri-Horticultural Society of India.*

MY DEAR SIR,—I have to thank you for your favor of the 29th ultimo, and the Dahlia seeds which you so kindly sent. As many of the seeds that I got from England, and bulbs which were given to me by different friends who had received them from the hills, or obliged me with some roots of their own growing, are thriving in perfection, and in addition to the seed forwarded by you, I have great reason to expect a good supply of bulbs from Mussoorie; I anticipate having a grand show next season.

I really have not time to give you an account of our proceedings since I last wrote. I have succeeded in raising cucumbers from English seed by forcing the seeds in a hot bed, and afterwards planting them out. I have received the two cucumbers first produced from seed; they are finer than any I have seen in India. I will send some of the seed when dry to Major Napleton and the Society. I purpose sending in a few days, in a large box, to be forwarded by steamer from Allahabad, specimens of all the different products of the garden that will bear being transported, and seeds of all kinds of flowers, and shall feel obliged by your undertaking the office of distributor to those persons, members of the Society, who are desirous of getting seeds from Lucknow. I always do all I can to meet the requisitions of applicants; but the fact is, we have not a sufficient establishment to enable us to work out a system to ensure regularity and certainty, and therefore I think it best to send all that we can spare, or nearly so, to you and Major Napleton, and to indent on your kindness to distribute them.

I think I mentioned in a private letter to you, that I had raised a very peculiar melon, answering to the description of the Queen Anne's melon, of which you formerly sent one seed to me; the scent and flavour of the fruit was delicious; the size that of a large orange of the kind called by the natives "Rungturah." I have preserved a few seeds, and will share all those that appear good with you and Major Napleton.

One of the plants from English strawberry seed bore fruit this year; the flavour was excellent, and I hope to be able to preserve the variety. We have had two splendid crops of strawberries this year; the first during the period of Prince Waldemar's visit, from the 20th to the end of March; and the second has lasted for more than a fortnight, and we are getting between three and four seers daily: the fruit is large in size, and has a very good flavour. I am rather conceited about the strawberries, because when I first took charge of the garden, the mallees said it was of no use trying to cultivate them, the soil would not admit of it: as it may be useful to others, I will tell you what was done.

After the *Rubbee* crops were gathered, the ground allotted to the cultivation of strawberries was allowed to remain fallow; at the commencement of the rains a large quantity of old "*guleez*," street scrapings, that had been kept for more than a year, was strewed over it, and, after a shower or two of rain, worked into the soil which was ploughed and turned with "*fouras*," spades: all the rain water that fell was kept in the field by banking up the sides; after the rains had subsided the soil was turned once more, and the young suckers from the last year's roots planted at a distance of a foot or eighteen inches from each other. As an experiment, previous to planting out, circular holes, about six inches in diameter and from ten inches to a foot deep were dug, about four inches were filled up with manure, and the remainder with a rich compost, and the plants were set in the middle: (I got this hint from Colonel Wilcox,) before planting, a sprinkling of manure from the sheep-fold was spread over the field, and a reservoir was formed, in which the same rich manure was deposited, and all the water that irrigated the field passed through the reservoir; as soon as the plants began to blossom, they were watered with pure water every third or fourth day; the plants which were put into the circular holes have given the best fruit. I forgot to mention, that in the compost used there was a proportion of about one-fourth of river sand.

Having mentioned how the strawberries were cultivated, I will add our receipt for growing celery.

At the commencement of the rains, trenches three feet deep were dug, and filled with olds weepings from the cattle sheds, *i. e.* the manure called "*goba,*" which is not cow-dung, such as is used for fuel, but a compound of refuse straw saturated with dung and urine, left in the open air, and occasionally turned for at least one year, which was allowed to remain until, from heat and rain, it was completely decayed, which absorbed two-thirds of its bulk. The plants that were so much admired at the exhibition in December were obtained from the Lucknow Cantonments and grown from *slips,* not seed, which were taken from the original plants just before the blossom appeared, and placed in small nurseries under the shade of thick leafy trees, such as the Loquat. In making the celery beds one-half of old manure obtained from scraping the streets and other deposits, called by the natives "*guleez,*" was added to an equal quantity of ordinary garden soil, and well mixed with it; this compost was put over the decayed manure above alluded to, the plants were transplanted from the nurseries towards the end of October, and placed at a distance of two feet between each—the soil which had originally been excavated forming a protecting bank; as the plants increased in size, they were regularly earthed up in the same way as cauliflowers are, and were ready for use in two months.

It is necessary to be careful about the quantity of water in the absence of rain, and when the weather is dry it is advisable to water the plants every three or four days, but not to such an extent as to let the moisture get *under the roots.*

It is probable, that in Bengal there is more chance of too much than too little moisture, and I would in that case recommend a mixture of sand with the compost, and also the adoption of some arrangement for drainage, as too much moisture at the roots would make the plants weedy and tasteless, even if there was not quite sufficient to rot them.

I am indebted for these two receipts to Nund Lall Misr, an inhabitant of Mynpoorie, who is the darogah of our garden, and to whom is to be attributed all the success that has attended the experiments that have been made under my auspices; and if they are considered of any value, it would be gratifying to me to be the medium of communicating to him the expression of the sentiments of the Agri-Horticultural Society regarding them; and although I have done all in my power, by an increase of salary, to show the opinion I entertain of his skill, industry and honesty, I am fully convinced that nothing could tend more to gratify his honorable pride, or stimulate him to future exertions in the good cause of Agri-Horticulture, than the knowledge that his exertions were appreciated by the Parent Society.

Believe me, &c.

Lucknow, 6th May, 1845. G. E. Hollings.

P.S. I had almost forgotten to mention the full success that attended the Darogah's experiment of slipping potatoes; it was tried on a comparatively small scale, but the fruit was very nearly as fine as any grown in the garden. The Darogah obtained his information from Major Sturt, who commanded the 2nd Regt. O. L. Infantry at Seetapore, who saw an account of the method in a newspaper and tried it: the Darogah was then the Bazar Chowdry of the Regiment, and having the opportunity, repeated the experiment in the Char Bagh, which is the designation of our garden, and, as I have said, succeeded. There is one great advantage in the arrangement, which is, that you got fresh potatoes about a month or six weeks later than from the ordinary methods of growing them. Some care is required in the preparation of the soil, and in protecting the slips when first planted.

I have just received a handsome supply of bulbs of the Orchis mascula from my friend Lt. Brooke of the 63rd: it seems to me that they are not so clear and transparent as those I got from the Oude Teraee, but they are infinitely superior in size and appearance.

Although the mangoes have failed throughout the Upper Provinces,—there were eleven thousand blown off the few trees that bore fruit this year in the garden, and three hundred from the graft trees,—those that are left promise to be very fine, and we have a very handsome display of grapes and peaches. I have determined, not without a pardonable reluctance, to send two plants each to the Society and Major Napleton of the Vines grown from seeds brought up by Sir W. Nott from Cabool, in the boat that I am to despatch from Lucknow.

G. E. H.

REMARKS ON THE APPLICABILITY OF THE NERIUM (WRIGHTEA) TINCTORIUM FOR THE MANUFACTURE OF INDIGO.

(*Extract of a letter from* C. B. TAYLOR, ESQ., *of Rajharra Factory, Palamow, dated* 21*st November*, 1844.)

In lately reading over a volume of the "Library of Entertaining Knowledge," treating of vegetable substances, I found an account of a tree discovered by Dr. Roxburgh, and called by him 'Nerium tinctorium,' which produced a very superior quality of indigo, and as I do not believe that the existence of such a tree is generally known, I take this opportunity of bringing the subject to your notice. It is possible that some of your Members may know of the existence of the tree; but as many may be as ignorant of it as I was, until I saw the account alluded to, I shall transcribe all that relates to the subject from the volume in question, for general information.

It appears most remarkable, that a tree producing such a valuable substance as indigo, and that of a superior quality, and 'attended with much less labour and cost' than the indigo produced from the common 'Indigofera tinctoria' of the country, should be totally unknown; this appears to me to throw some slight suspicion upon the correctness of the statement which I have transcribed, but I should strongly recommend your writing to one of the Civil Officers stationed at Chicacole, or to some other station in the Northern Circars, for information respecting the tree, also for a supply of seed when it ripens in January; and if it be really a true account, and the indigo can be made from the tree 'with much less labour and cost' than indigo from the well known plant, I suspect it will not long be said, 'but it has not yet taken its place among the imported Eastern productions'.*

Extract.

"In the year 1792, Dr. Roxburgh transmitted home a sample of indigo prepared from the leaves of a species of rose bay, which he distinguishes by the name of *Nerium tinctorium.* From the excellent quality of this indigo, and other advantages attending its cultivation and preparation, it might have been supposed that the *Nerium* indigo would quickly have become an article of commerce, and have been in much request among our dye houses; but it has not yet taken its place among the imported eastern productions, though it should seem that the extensive cultivation of this tree would be attended with much less labour and cost, and offer a greater certainty of profit than the common indigo plant.

"The *Nerium* grows plentifully throughout the Carnatic, and in every part of the Circars where there are hills and mountains, being an extent of about a thousand miles in length; near inhabited places it is so often cut down for fire-wood, that in such situations it is always found in the state of a very small tree or a large bush; but when suffered to reach its full growth, it attains to the height of from eleven to fifteen feet up to the branches. Its trunk, which is of an irregular shape, is about a foot and a half, to two feet in diameter. Its bark when old is scabrous; but when young, smooth and ash-coloured. The

* With the view of carrying out this suggestion of Mr. Taylor, the Secretary addressed Dr. Wight at Coimbatore, in a letter under date the 18th of December, of which the following is an extract:—

"I have the pleasure, on behalf of the Agri-Horticultural Society, to enclose extract of a letter from a member on the subject of the Nerium tinctorium, and to solicit the favor of any additional information you may be able to afford respecting the useful properties of this tree. If it is much used by the natives on your side of India for the dye it affords, if that dye is equal in color to that given by the Indigofera tinctoria, &c. &c. Dr. Wallich, in reply to a note I addressed him on the subject, observes, 'I suspect there must be some weighty ground, for neither the Marsdenia or Nerium (Wrightea) being extensively cultivated for their produce; nevertheless they appear to me quite worthy of further enquiry.' Dr. Wallich adds, that he has neither seeds nor plants of the Nerium to give from the Botanic Garden, but hopes to multiply from the only tree he has left. Could you favor us in the meanwhile, with a small packet of seeds?"

A reply to the above communication has not yet been received, but Dr. Wight has kindly forwarded a supply of seed, which is available to any members, Indigo planters and others, desirous of introducing this tree into their respective districts.

wood of this tree is remarkably white and close grained, in appearance resembling ivory. The leaves are oval, pointed, tolerably smooth, and of a pale green colour; they are very numerous, and when full grown, from six to ten inches long, and from three to four inches broad. To cause a greater production of leaves, it should be cut low as the mulberry trees are for feeding silk-worms, and like them the oftener it is cut down the greater is its disposition to increase. Many shoots issue from the old stumps, and in the space of one year these shoots grow to various heights—from one to ten feet, according to the nature of the soil and season. The leaves fall at the commencement, or during the colder part of the year. In March, or the beginning of April, the young leaves together with the flowers first make their appearance towards the end of April; those which were earliest in unfolding attain to their full size. This period was found by Dr. Roxburgh to be the most favourable for gathering the leaves; about this time also it ceases flowering, and many of the seed-vessels become perfectly formed, though the seeds do not ripen until January or February. The leaves remain in a fit state for gathering until about the end of August, when they begin to acquire a yellow rusty tinge, and are gradually cast. The colouring matter resides in the leaves alone; all trials to extract any from the twigs proved unsuccessful. Indigo is prepared from these leaves, in the same manner as from the indigo plant by the scalding process. The leaves of the Nerium, unlike those of the common Indigofera, will not yield their colour to cold water, but by hot water it is readily extracted. Hard spring water is found preferable in increasing the quantity, and improving the quality, of the indigo. After being exposed to the action of the fire for about three hours, the leaves begin to assume a yellow hue, then the scalding has been sufficiently pursued; and as the agitation and precipitation do not consume a longer time, the whole process is very speedily completed. From two to three hundred pounds of green leaves, yield one pound of indigo."

Since writing the above, I have referred to the article Indigo, in the American Encyclopædia and in Ure's Dictionary, the former merely mentions the Nerium as a known species of Indigo; but the latter, in enumerating the various species, says 'The Nerium tinctorium affords some indigo.' The tame expression 'some indigo,' does not go far to corroborate the very favourable account of the tree, which I have extracted from the Library of Entertaining Knowledge.

An account of the successful propagation by seed of a superior variety of Mangoe. Communicated by P. HOMFRAY, ESQ.

To JAMES HUME, ESQ., *Honorary Secretary to the Agri-Horticultural Society.*

DEAR SIR,—As it is probably not generally known, that the stone of the mango fruit produces a tree which, without being grafted, will bear fruit precisely alike in appearance, flavor and quality, to that produced from the parent tree, I beg to state, in proof of my assertion, the following facts, which have come under my notice, that you may, if you think proper, recommend at this the proper season, an extensive propagation of good mangoes by planting the stones of choice fruit. The late Mr. Overbeck, formerly Governor of Chinsurah, had in his garden a mango tree imported from Java; he sent a basket of the fruit of it to the late Mr. Hampton of Howrah, who planted some of the fruit stones in his garden, and a tree from one of them having been found to bear fruit exactly alike in every respect to the fruit from the parent tree, Mr. Hampton was induced to plant some of the stones of the fruit from off his own tree. The trees raised from them, (viz. three or four in his garden, one in mine, and two in Mr. J. Homfray's garden) have all, without exception, borne precisely the same kind of fruit in appearance, flavor and quality, as the fruit which came about fifteen years ago from Mr. Overbeck's tree, and which I tasted. Mr. J. Homfray has likewise in his garden a grafted tree, received from the Botanic Garden, of the Mazagon mango, stones from the fruit of which he planted, and one or two of the trees raised therefrom have commenced bearing, and produce fruit exactly alike, and fully equal in every respect to the fruit of the parent tree. These nine or ten instances, without a single exception, convince me that, in planting mango fruit stones, perfect reliance may be placed on their producing trees which, without being grafted, will bear fruit precisely alike in appearance, flavor and quality, to the fruit from the stones of which the trees were raised. What facility have we not then to stock our gardens, and the country with mango trees, of every choice kind, by importing mango stones from Bombay and other places, and planting them, in addition to the good sorts we have at hand. The trees commence bearing at six or seven years old, and grow kinder than grafted trees usually do. I send per bearer for your own tasting a few (there are not many on the tree, which is young,) of the mangoes from off the tree in my garden which, as I have stated, was raised from a fruit stone from off a tree of the late Mr. Hampton's, which was again raised from fruit off the late Mr. Overbeck's tree imported from Java.

Yours faithfully,

Howrah, 21st *May*, 1845. P. HOMFRAY.

A MODE OF CONVEYING CUTTINGS OF PLANTS FROM ONE PART OF THE COUNTRY TO ANOTHER.

(*Extract of a letter from Lieutenant-Colonel* L. R. STACY, *C. B. Futteeghur, dated 29th March*, 1845.)

"In 1823, I sent to a friend in Calcutta some cuttings of a very fine Bokhara plum, from which to take buds. The plan succeeded so well, that I make it known to you, that in case it should not have been noticed, it may be adopted.

"I cut off the branches into slips of from 8 to 10 inches, and introduced them carefully into a circular *box* made of the body of the plantain tree, taking out as many layers of the heart as allowed the plum branches to lie comfortably inside. The ends I left untouched. I sent them dâk, wrapped of course in a cover of wax cloth, from Dinapore. I have no doubt but that they might be sent any distance by this arrangement.

"Will you suggest to any amateur gardeners some experiment with *Neem* tree leaves as a manure, and a decoction of them as a specific for driving away insects?"

AN ACCOUNT OF THE FIRST, THIRD, AND FOURTH EXHIBITIONS OF VEGETABLES, FRUITS, &C. HELD DURING THE SEASON 1844-1845, BY THE BRANCH AGRI-HORTI. AND FLORICULTURAL SOCIETY OF BHAUGLEPORE.

J. HUME, ESQ., *Honorary Secretary of the Agri-Horticultural Society of India.*

MY DEAR SIR,—In forwarding the accompanying account of our Horticultural exhibition, which took place on the 19th instant, I have the honor, by request of our Branch Society, to solicit the favour of your submitting them to the Parent Society at the next Meeting. There is not at present a yard of ground in the Public Garden (which is now 15 beeghas) uncultivated. The fruit and other trees are in a most healthy condition, and rapid progress is making in the Floricultural Department, and my letter of yesterday's date to your address will have shown you, that our experiments in Agriculture, although limited (for want of a larger field to work in,) are likely to turn out well. We have a Nursery of very promising coffee plants, and also of Bombay Mango Seedlings, Orange, Loquot, Leechee, Sitsal, Toon, &c. &c.

I remain, &c.

T. E. A. NAPLETON,

Secretary, Bhaugulpore Branch Agri-Horti-and Flor. Society.

Cleveland House, Bhaugulpore,
November 24th, 1844.

FIRST SHOW OF 1844-1845.*

An exhibition of flowers, vegetables, and fruits took place in the public garden on Tuesday afternoon, the 19th November 1844, at 3 o'clock. The attendance of resident Members of the Society, both European and Native, was unusually great. It was very gratifying also to observe, that several subscribers to the institution belonging to other districts, together with many ladies, honored the show with their presence, and expressed themselves highly pleased with the various specimens brought forward to compete for prizes. Very little rain having fallen in this quarter since the 1st September last, constant irrigation has of course been resorted to, and owing to such an unusual drought, caterpillars and insects (as might have been expected) committed great ravages on the early sowings. The Society's garden produce consisted of new potatoes, cauliflower, asparagus, turnips, carrots, beet root, salad, cucumbers, arrow-root from imported West India roots, Cabul capsicums, and various other vegetables. Amongst the beauties of flora, were a remarkably fine display of dahlias, mignionette, passion flowers, pereskia bleo, plumbago, geraniums, roses, euphorbias, wall-flower, zinnias, dwarf balsams from English seed, together with many other rare flowers were exhibited, amongst which heliotrope in the greatest profusion describable may be justly included.

Umpires having been elected; every sort of vegetable specimens were brought before them for inspection in separate *dallees*, by which

* By an unfortunate oversight, this account was omitted to be inserted in the third volume of the Journal. An account of the second show will be found at page 38. of this volume.—EDS.

arrangement they were at once enabled to decide on the respective merits of each kind, and their opinion was as follows:

1st. That the public garden produce, although not allowed to compete for prizes, was most excellent and satisfactory.

2nd. From Dr. Stuart's garden—peas, cauliflower, asparagus, lettuce, beet root, turnips, scarlet radish, Jerusalem artichokes, love apples and plantains carried off prizes; and amongst the dallees from private gardens, brought forward for competition, his were on the whole pronounced to be the best.

Prizes were also awarded to the mallees of the following gentlemen on account of various fine specimens:—

To Mr. J. Pontet's garden, prizes were awarded on account of peas, beet root, carrots, turnips, leeks, herbs, chillies, arrow-root, and country beans.

To Mr. G. F. Brown's, for onions, ginger, country beans, and cucumbers.

To Mr. J. Glass' for onions, lettuces, and yams.

To Mr. J. Piron's for carrots, turnips, and radishes.

To Mr. Quadros's for turmerick.

To Baboo Gooroochurn Mitter, for leeks, indigenous vegetables, and tobacco.

To Serjeant Dowling, for Cabul capsicums.

To Mahomed Rafiq, Sudder Alla of Patna, Muddun Tackoor, and Muhasha Omanath Ghose, large Zumeendars in this district, for indigenous and other vegetables.

To Cleveland House, for early potatoes, French beans, asparagus, cauliflower, and endive.

The Floricultural specimens from private gardens justly called forth much admiration, and prizes were given as follows:

To Captain Don's mallee for roses, honeysuckle, geraniums, russelias, and euphorbias, pinks, exotics, zinnias, and heliotrope.

To Mr. G. F. Brown's for roses, mignionette, zinnias, and heliotrope.

To Cleveland House for roses, honeysuckle, geraniums, myrtle, sweet briar, mignionette, russelias, euphorbiae, and passion flowers.

The prizes for indigenous fruits were awarded to Mr. J. Glass, Dr. Stuart, and Cleveland House mallees.

A present of twenty rupees, on being proposed by one of the Umpires, was immediately subscribed, and given to the mallees of the Society's Garden, as a reward for the satisfactory state of every thing under their charge.

A vote of thanks was given unanimously to the Umpires for the able discharge of their duties, and thus ended the first show of 1844-1845.

The following are the names of the New Subscribers since the 1st August last.

G. D. Turnbull, Esq., Civil Service, Azimghur.

Mr. W. Claxton, Kussowlee.

W. Dampier, Esq., Superintendent of Police, Lower Provinces.

Captain G. Scott, 6th Regiment, Light Cavalry.

J. H. Bridgman, Esq. Lehra, Gorruckpore.

C. K. Robison, Esq. of Calcutta.

Captain Elwall, Thuggee Department, Chupprah.

Lieut. W. J. H. Charteris, 2nd Oude Local Infantry.

A. W. MacLeod, Esq. Nauthpore, Purneah.

W. Gray, Esq. Nauthpore, Purneah.

A Arrouch, Esq. Planter, Rajmahl.

W. R. Jones, Esq. Butteral, Purneah.

E. J. C. Richardson, Esq. Civil service, Bhaugulpore.

Hajee Mirza Mahdee Spahannee, Calcutta.

D. MacLeod, Esq. Deputy Magistrate, Tirhoot.

Mufukhurool Moolk, Museer ooldowlah Nawab Syud Sufdur Ully Khan Bahadoor, Sufdur Jung of Killah Nizamut, Moorshedabad.

A. B. Fenwick, Esq. and Captain W. Kennedy 5th Regiment Native Infantry.

Baboo Ram Udheen Sing Zumeendar, Tuppah Bhoorsah, Pergunnah Furkah, Monghyr.

F. Gouldsbury, Esq. Sessions Judge, Bhaugulpore.

Baboo Grischunder Mokerjee.

Raja Byjnauth Narrain, Zumeendar of Talooka Soneburau.

Shew Sahoy Sing, Zumeendar Talooka Nugurparah.

Donations since last Report.

1st. The sum of ten Rupees has been most kindly presented to the Society by Mrs. Ellerton.

2nd. From Dr. Wallich, Superintendent Hon'ble Company's Botanical Gardens, several packets of cuttings of rare plants, many of which arrived in excellent order, and a large assortment of plants delivered to the Secretary in Calcutta, which would have been a real acquisition to our garden, had not a storm near the mouth of the Bhaugeruttee upset the boat in which they were being conveyed towards Bhaugulpore. Dr. Wallich is however most kindly replacing the lost plants.

From Sir Lawrence Peel, some very rare and beautiful plants, likewise many other contributions from Messieurs C. K. Robison, A. Parker, J. and G. Wood, which with few exceptions were also lost in the wrecked boat.

From the Parent Society an assortment of cotton, munjeet, Nerbudda wheats, white linseed, pandanus vacoa, and some vegetable and other seeds. The Nerbudda wheat of three sorts, although a good deal perforated by the weevil, has germinated in part. It has excited considerable attention from the Zumeendars to whom it has been distributed, from its celan and large grain, in so much that from its apparent superiority over the wheats of this part of the country, it has been considered a boon even to receive a small packet by way of experiment on their lands. The white Nerbudda linseed promises much. and could it be introduced generally would likewise be of great benefit, from the pureness of its oil in comparison with that extracted from the red or common linseed of the country.

From Dr. Campbell, Superintendent of Darjeeling, some seed barley and five maunds of Darjeeling potatoes.

From Dr. Christie of Katmandoo, two sorts of wheat and some cuttings of the Cereus triangularis.

For the continued support afforded us by the great increase of new Subscribers, and for all the above handsome donations, the best thanks and acknowledgments of this our Branch Society are now accorded.

T. E. A. Napleton, *Secretary.*

P.S. The Society has also been presented with plants and seeds by Mr. G. F. Brown, Mr. J. Pontet, Mr. Finch, Mr. A. J. Lambe, Mr. Staniforth, Colonel Persse, and Captain Don, to whom the Society is much indebted for their liberal contributions.

Third Show of 1844-45.

On Saturday the 12th April 1845, an exhibition of vegetables, flowers, and agricultural produce took place in the Society's new show room in the public garden at 5 o'clock P. M. and was most numerously attended. The Lord Bishop of Calcutta and suite, together with several visitors from his Lordship's Steamer, honored the assembly with their presence.

In the agricultural department the samples of grain were in some instances very fine, but owing to little oi no rain having fallen in this and the neighbouring districts since the middle of September last, the *tout ensemble* was inferior to last year's.

Amongst the public garden samples two were remarkably fine of their respective kinds, viz. white linseed and white gram; twenty-five seers of the former were grown upon about two cottahs of ground, and the superiority of this fine white linseed over the old red sort, has been acknowledged far and near, and the whole of the above seed will be distributed in this and the neighbouring districts for next season's sowings.

There were some fine samples of wheat, barley, gram, oats, safflower, &c. from the farms of several Zumeendars. A silver medal was awarded to George Barnes, Esq. of Bedaire, Colgong, for wheat, gram, &c. the produce of the Bedaire and Ekdarrah farms conjointly. The wheat sent from the latter farm by Mr. Turner, was pronounced first rate.

The competition for the second medal and several money prizes was deferred until the 30th May proximo, when there will be another Agricultural exhibition as well as a Fruit and Flower show, by which arrangements several Zumeendars and others who were prevented by sickness and other causes from attending the last show, will have an opportunity of being present.

In the vegetable department there was an unusually fine display for the season of the year. The following specimens, the produce of the Public Garden, attracted much attention, and the umpires expressed their highest approbation at the improved state of Horticulture in the Society's Garden.

Potatoes, asparagus, artichokes, mangul wurzul, beet root, red, Savoy, and drumhead cabbages, carrots, knole kole, leeks, love apples, and turnip cabbage comprised the chief specimens.

A severe hail storm which took place a few days before the exhibition, destroyed the celery crop.

Prizes were awarded to the mallees of the following gardens, they being the successful competitors.

Mr. G. F. Brown,	Cleveland House,
Mr. J. Pontet,	Molvee Mahomed Rafiq,
Mr. C. Stuart,	The Suddur Alla,
Mr. John Glass,	Shah Mayut Hoossain,
Mr. George Barnes,	Amanauth Ghose,
Baboo Gooroochurn Mitter,	Ubdullah Khan,

For the Floricultural Department there were some beautiful bouquets, but in consequence of the lateness of the evening, but few prizes were competed for.

The following specimens of the beauties of Flora were greatly admired.

The honeysuckle, woodbine, wax plant, geraniums of sorts, verbena, the amaryllis and passiflora families, heliotrope, myrtle, sweet-briar, carnations, pinks, roses of several sorts, cum multis aliis.

The Society has great pleasure in publishing the following list of new subscribers since the last report dated the 16th January 1845:—

Lieut. A. L. MacMullin, 23rd Regt. N. I. Dinapore.

Captain G. M. Sherer, H. C. Stud. Buxar.

Captain F. M. H. Burlton, Assistant H. C. Stud, Buxar.

William Moran, Esq. Mooteharree, Chumparun.

Dr. A. Grant, Civil Surgeon, Bhaugulpore.

John Gale, Esq. Pundoal Durbungah, Tirhoot.

Colonel E. Garstin, Superintending Engineer Lower Provinces.

Chowdry Fugeerbux, a large Zumeendar of Furkeah.

Rajah Roodrah Nund Sing, a large Zumeendar of Furkeah.

Captain Wright, 1st Regt. N. I. Dinapore.

James H. Young, Esq. Magistrate of Bhaugulpore.

R. C. Raikes, Esq. C. S. Bhaugulpore.

George C. Barnes, Esq. Bedaire, Colgong.

Henry Page, Esq. Mooskypore, Monghyr.

T. Wilson, Esq. Ghazeepore.

Mecan Khan, Bhaugulpore.

Lootf Ullee, Bhaugulpore.

The following money and other donations have been received since our last Report:—

From Dr. A. Davidson, 10th Regiment Light Cavalry, a donation of sixteen Rupees.

From Rajah Bafah Gobind Sing Bahadoor, Hawlie Pergunnah, Purneah, a donation of one hundred Rupees.

From Rajah Roodrah Nund Sing of Bundelie, Purneah, a donation of one hundred Rupees.

A donation from G. C. Cheap, Esq. C. S. of a large assortment of grass seeds.

A donation of about a hundred geranium cuttings from Captain Don.

A present of some Hoya carnosa and Rose Plants from J. Piron, Esq.

A present of several packets of seeds from the Himalaya mountains, from A. Bell, Esq. M. D. and Captain Phillpotts 66th Regiment N. I.

A donation of twenty-five vines of esteemed sorts collected and presented by Captain Hockley, commander of the "Jellinghee" accommodation boat.

From Captain R. D. Kay, 2nd Grenadiers, Asst. Adjt. General, Dinapore division, a large and much prized assortment of Cape bulbous and tuberous roots.

From the Parent Society.

1. Seed of the American Sumach, Cæsalpinia coriaria.

2. Seed of the far-famed and beautiful Cordia sebestena, from Barbadoes.

3. Seed of the Granadilla from Barbadoes.

4. Seed of the water lemon from ditto.

5. Seed of the Soursop (Anona muricata,) from Barbadoes.

6. Seed of another species of Anona from Captain Burnett's garden at Dum-Dum.

7. Seed of the Solandra oppositifolia, from Ceylon (a beautiful shrub.)

8. A few vegetable seeds from the Cape, which are very acceptable for early sowings.

Several plants of heart's-ease, from C. J. Richards, Esq., Garden Reach, Calcutta.

A present of tulip, narcissus, jonquills, crocus, and other rare bulbs from Messrs. Veitch and Son, the Society's Seedsmen and Florists, the whole of which arrived in most excellent order per overland route.

From the Honorary Secretary, about five hundred rare cuttings and plants.

The Society has great pleasure in announcing that the following gentlemen have most kindly consented to become Honorary Joint-Secretaries at the stations specified opposite their respective names :—

R. F. Hodgson, Esq. C. S. for the Monghyr district.

W. St. Quintin, Esq, C. S. for the Gyah district, and during his absence on leave, E. Jenkins, Esq. Civil Service.

Captain H. Milne for the Ghazeepore district.

The Honorable F. Drummond, C. S. for the Purneah district.

Walter Landall, Esq. of Lattypore, for the district due North of Bhaugulpore.

My dear Sir,—In forwarding an account of our last Agri-Horti. and Floricultural exhibition, I have the honor to request you will submit it at your next general meeting for the information and approval of the Parent Society.

I remain, &c.
T. E. A. Napleton,
Hon. Sec. B. B. A. H. and F. S.

Bauglepore, 3d June, 1845.

Fourth Show of 1844-45.

An exhibition of Agri-Horti. and Floricultural produce took place on Friday evening, the 30th May 1845, in the Society's Show rooms, at 5 o'clock P. M. and was remarkably well attended, there being about seventy members of the Society, the ladies of the station, and a number of visitors present.

Mr. G. F. Brown, the Rev. J. MacCallum, Dr. Grant, and the Aga Sahib, having been elected umpires, proceeded to inspect the samples of grain, &c. in the Agricultural department, amongst which were some particularly fine specimens of wheat, barley, white gram, field peas, tobacco, oats, white linseed, cotton, and safflower, some of which were sent from Mozuffurpore in Tirhoot to compete for the prizes. After a careful examination of the whole, the umpires awarded a silver medal to George Barnes, Esq. for the superior produce of the Colgong estate, which however, that gentleman most properly declined receiving, having only at the show on the 12th ultimo won a similar prize. Next in the list came Rajah Oodit Narrain Sing, a large Zumeendar to the North of Bhaugulpore, to whom the medal was presented. Money prizes from Sir Lawrence Peel's annual and handsome donation to our Branch Society were also awarded to the following native gentlemen,—

Muddun Tackoor, Mahomed Majid, and Baboo Gooroochurn Mitter for the 2d and 3rd best samples of Agricultural produce.

Before proceeding further, it is but proper to notice the produce of the public garden which was laid out on the three tables, and consisted of

Three dallees of very fine grapes, white, light red, and black, quite ripe and of excellent flavour.

A small dallee of peaches.

A basket of asparagus of unusually large growth, one of the heads having weighed fourteen Rupees, which was reared from seed received last October from our seedsmen, Messrs. Veitch and Son.

There was a large basket of Darjeeling potatoes (acclimated) which for fineness of skin, size, and healthy appearance, could not perhaps be surpassed in any part of the world, two baskets of carrots, two of red cabbage, onions, leeks, cucumbers, &c. the produce of Messrs. Veitch and Co's seed, were pronounced first rate. There was also a very fine show of flowers from the Society's garden, likewise some fine specimens of white linseed, white gram, wheat, acclimated American cotton and English oats.

In the Fruit department there were some baskets of remarkably fine peaches, Bombay mangoes, leechees, plantains, lemons, corounders, whampees, figs, bails or wood apples, alloo bokharas, &c. from the gardens

of Mr. J. Pontet,	The Suddur Alla,
Mr. J. Glass,	Oomanauth Ghose,
Mr. George Barnes,	Babo Gooroo Churn Mitter,
Mr. T. Grant, of Narrainpore,	Gobind Suhaee,
Mr. Gouldsbury,	Waris Ullee,
Mr. P. Quadros,	Muddun Tackoor,
Cleveland House,	Shah Enayut Hoossan,

and several prizes were awarded to the Mallees of those gentlemen.

In the Floricultural department there was an excellent display of bouquets. Five sorts of roses in fine flower, heart's-ease, geraniums of nine sorts, honeysuckle, sweet briar, belladonna and amaryllis, lillies, myrtle, duranta plumieri, euphorbia, passion flowers, ixoras, double pinks, zinnias, abutilon striatum, cardamom, tecoma jasminoides, verbena, bauhinias, coral plant, and we were happy to observe a far larger number than usual of bouquets of indigenous flowers, which were arranged with much taste, and interspersed with some very pretty roses and jasamine. This being the first occasion of heart's-ease having been brought to the show room, we must not omit to state that we are indebted to Mr. James Pontet for having introduced two of them in fine blossom, which were much admired.

Several prizes were awarded in this department to the Mallees of Captain Don, Mr. John Glass, Baboo Gooroo Churn Mitter, Baboo Oomanauth Ghose, Moulvee Mahomed Rafiq, and Cleveland House.

Vegetable Department.

Although it was not intended to have had an exhibition of vegetables on this occasion, a great number of dallees were sent, but the evening having closed in before they could be inspected the show therefore was adjourned till 6 o'clock the next morning, when a few members of the Society most kindly attended as umpires, and gave great satisfaction in the performance of their duty; a few prizes were awarded, and thus ended the last show of 1844-45.

The following is a list of donations to our Branch Society since the 12th April ultimo.

From Captain G. Scott, 6th Regiment Light Cavalry, Loodiana, a money donation of thirty-two rupees.

From W. Claxton, Esq. merchant, Loodiana, a fresh and most acceptable assortment of dhalia seed and dhalia tubers, together with some Scotch fir seed.

From Captain Tombs, A. D. C. to General Tombs, Saugor, a packet of English double dhalia seed, together with some acclimated dhalia seed from Mussoorie.

From Captain Don, a fine supply of geranium cuttings of sorts.

From Colonel Ouseley, Governor General's Agent, Chota Nagpore, eight plants of a most superior description of edible Date, indigenous to the province of Surgunja.

From W. St. Quintin, Esq. (a most zealous supporter of our branch Society) an assortment of seeds collected at Darjeeling. Mr. Quintin has intimated that he has been fortunate enough to meet with some rhododendron seedlings, lilly of the valley, bulbs, &c. and that he is making a collection of plants for our public garden.

From William Storm, Esq. a number of vines from his splendid garden near Calcutta.

From Dr. Wallich, Superintendent Honorable Company's Botanical Garden, a most acceptable batch of seeds.

From J. Gouldhawke, Esq. of Kant Nuggur, 2 plants of the wild strawberry.

We have the pleasure to publish the names of the following new subscribers since the 12th April ultimo:—

Charles Cave, Esq. Korah near Purneah.
Mirzah Mahomed Hoossan of Purneah.
J. Grant, Esq. Civil Service, Dinagepore.
C. Steer, Esq. Civil Service, Dinagepore.
A. G. MacDonald, Esq. Civil Service, Rungpore.
Goordial Sing of Bhaugulpore.
Ram Suhaee Zumeendar of Chumpanugur, Bhaugulpore.
Shew Ram Austee of Bhaugulpore.
Rajah Beja Gobind Sing of Havalee, Pergunnah Purneah.
Kazee Ullee Bux of Monghyr.
Goollam Ullee of Lokmanpore.
Auzum Khan of Lukur Dewanee.
Kaulleepershaud of Puckee Surae.
Koodrut Ullee of Toopoul.
Doorgapershaud of Bhaugulpore.
Baboo Kunhyah Loll, Zumeendar of Bhaugulpore.
Moulvee Urfan Ullee of Bhaugulpore.

Since last report six bighas of ground have been added to the public garden solely for Agricultural purposes; the ground has been divided into eight small fields, and they are intended for the reception of French and English oats, Nerbudda white linseed, Darjeeling and Madras potatoes, Nerbudda and other wheats, clover and trefoil, foreign tobacco and cotton, white gram, West India arrow root, mangul wurzul, Tenasserim yams, &c. &c.

The produce will be distributed amongst the supporters of our Branch Society, and through them to the Zumeendars and ryots of their respective districts.

With a view of introducing a better mode of ploughing in this district, several gentlemen have joined in the following sweepstakes :—

Bhaugulpore ploughing Match (Gentlemen Ploughers) to come off about the middle of November next, in a piece of ground attached to the Public Garden.

A sweepstakes of one Gold Mohur each for a ploughing Match, under the following rules.

The quantity of ground to be ploughed, to be decided on by the umpires; competitors are at liberty to use English, Chinese, Indian, or ploughs of any foreign construction: the number of Bullocks or Horses to be used in each plough not to exceed a pair. The tests or merits of the ploughing to consist of the following essentials :

Depth, closeness, and straightness of furrow.

The winner entitled to two-thirds of the prize, the 2nd plough to the remainder. Six gentlemen have already entered themselves as subscribers to the above project.

The public tank on the left flank of the Society's garden has lately been lengthened eighty feet to the Eastward, and a ghaut of fifty feet in width is about to be built, and when these additions are completed, the best judges have given it as their opinion that this will be one of the most extensively useful and prettiest tanks in India. The perpendicular depth is twenty feet, the banks are prettily sloped and turfed, and two ghauts which are situated on the high road, will be available to the public; and as there are some beautiful trees close to them, the traveller will here have the advantage of reposing under their shade and satisfying his thirst. The tank has a promenade about twenty feet broad on two sides of it, (the other two being entirely thrown open to the community at large) and weeping willows, with many other ornamental shrubs, have already been planted thereon; and whilst on this subject it may not be amiss to mention that Beebee Choohun, the proprietress of the lands adjacent to the Society's garden, most liberally came forward with a rent-free grant for the ground occupied by the tank and promenade; and it is but justice to add, that the best thanks of the community of Bhaugulpore are due to her for this act of generosity and disinterestedness.

Memorandum.

Since writing the above, it has been decided to have a ploughing match for Native as well as Gentlemen ploughers, and that both matches shall take place on the same day in November next.

A sweepstakes of two rupees each for all natives who like to enter a native plough with a pair of bullocks.

Native umpires to be appointed, who shall decide on the quantity of ground to be ploughed, the merits of the ploughing, and awarding the prizes.

Appointments of, or alterations in, the Honorary Joint-Secretaries since the 12th April last and up to the 30th May 1845.

The following gentlemen have most kindly undertaken the duties of the above office.

G. L. Martin, Esq. of the Civil Service for the Purneah division.

The Honorable F. Drummond for the Beerbhoom division.

THE AGRICULTURE OF DIFFERENT AGES AND COUNTRIES.

By Cuthbert W. Johnson, *Esq. F. R. S.*

(*From the Journal of Agriculture for March and October* 1844.)

The state of mankind, in the earliest periods of their social existence, is commonly one of idleness. A scantily populated, fertile country, is ever distinguished for the rudeness of its cultivation and the comparative inferiority of its produce. In the first ages of mankind, and, in fact, in that of newly-peopled countries, the wants of the first settlers are usually too readily supplied to render much exertion necessary. The rich alluvial soils, fertile without manure, productive of the finest grass without labour, are the first spots on which the new comers locate themselves. These supply food for their live-stock, and corn and vegetables for the owner's family, with the least labour; and if the settler is not tempted, by the high price it bears, to grow more corn than is sufficient for his own wants, he devotes himself to the delights of the chase—his gun, his fisheries, his dogs, supply him with abundance of game, with his food, and with skins for his clothing.

Thus employed, thus readily supported, it need hardly surprise us that, in the rudest state, these occupations are ever regarded as the only occupations worthy of man, and that to the weaker sex is committed the care of the garden and the cultivation of the field. The foresight exercised in these matters, by such primitive cultivators, is ever in keeping with the rest of their proceedings. Thus the islanders of the Southern Ocean, being devoid of tools, were accustomed to destroy by fire the noblest trees, to produce a wretched unwieldy canoe. To acquire the fruit of the bread-tree, the natives had no better expedient than to burn the tree down; and when the Orientalists found out the advantages of growing corn, it was long before they discovered a mode of thrashing it. To tread it out by the feet of oxen was regarded as the most reasonable way of separating it from the straw—a plan still followed even in Portugal. The progress of agricultural implements betrays the same indolence and carelessness. The plough, for instance, in some rude form or other, is an agricultural implement of remote antiquity; but it was long used of such a form as produced bad work, and very unnecessary labour to the poor beasts who were fated to draw it along. Plough-harness was another difficult question, which long puzzled the primitive cultivators of the soil. Thus the poor Irish boors for ages fastened their horses to the plough by their tails, and when, at last, an act of the Irish Parliament prohibited the barbarism, it was regarded by the then tillers of the soil as an interference of the legislature totally uncalled for. It was said to be an act which violated that freedom of action, and was an interference with that great march of experimental improvement, for which our gallant neighbours have ever been so desirous. It will be, perhaps, an interesting, and, at the same time, a research affording us some instruction, if, previously to entering upon an examination of the different systems of agriculture, produced by the effects of soil and climate, I repeat and enlarge upon what I have, in another place, had occasion to observe upon the farming operations of distant ages.

We have but little information to guide us as to the country in which man first cultivated the soil; nor of that in which he first settled after the Deluge. Thus much, however, is certain, that we have the earliest authentic account of the state of agriculture as it existed among the Egyptians and their bondservants, the Israelites. From the former the Greeks were probably descended. The Romans, at a later period, were a colony from Greece; and from the Romans the other countries of Europe derived their earliest marked improvement in the arts. My brief history of the progress of agriculture, then, will be divided into, 1st, The Agriculture of the Egyptians and other Eastern Nations; 2nd, The Agriculture of the Greeks; 3rd, The Agriculture of the Romans.

I.—*The Agriculture of the Early Eastern Nations.*

Every family of these primitive nations had its appointed district for pasturage, if it pursued a pastoral life; or its allotted inclosure, if it was occupied by tilling the earth. There was no distinction in this respect between the monarch and his people; each had a certain space of land from which he and his family were to derive their subsistence. The Egyptians, as well as the Israelites, were flock-masters. The latter were particularly so; and, as Joseph's brethren said to Pharaoh, "their trade was about cattle from their youth." (*Gen.* xlvi. 34.) When, therefore, they came into Egypt, they desired the low-lying land of Goshen, as producing the most perennial of pasture. (*Gen.* xlvii. 4.) It is true that the same authority says "every shepherd is an abomination unto the Egyptians;" but this was because, about a century before the arrival of Joseph among them, a tribe of Cushite shepherds from Arabia had conquered their nation, and held them in slavery; till, after a sanguinary contest of thirty years, they regained their liberty about twenty-seven years before Joseph was promoted by Pharaoh. That the Egyptians were flock-masters is certain from many parts of the Scriptures. Thus, when Pharaoh gave permission to the Israelites to dwell in Goshen, he added, as he spoke to Joseph, "And if thou knowest any men of activity among them, then make them rulers over my cattle," (*Gen.* xlvii. 6;) and when the murrain came into Egypt, it was upon their "horses, asses, camels, oxen, and sheep." (*Exod.* ix. 3.) The attention and care necessary to be paid to their domestic animals were evidently well known and attended to; for when they proposed to settle in a land, their first thought was to build "sheep-folds for their cattle." (*Numb.* xxxii. 16.) They had stalls for their oxen (*Hab.* iii. 17,) and for all their beasts. Thus, King Hezekiah is said to have made "stalls for all manner of Beasts, and cotes for flocks; moreover, he provided him possessions of flocks and herds in abundance," (2 *Chron.* xxxii. 28;) and that this abundance exceeded the possessions of the greatest of our modern flock-masters, we may readily acknowledge, when we read that "Mesha, King of Moab, was a sheep-master, and rendered unto the King of Israel 100,000 lambs and 100,000 rams, with the wool." (2 *Kings* iii. 4.)

They prepared the provender for their horses and asses of chaff, or cut straw and barley. (*Judges* xix. 21; 1 *Kings* iv. 28.) Our translation does not explicitly state this, but it is clear in the Hebrew original.

(*Dr. Kennicott's Codex*, xxiv; *Harmer's Observations*, i. 423.) It is also certain, from the Hebrew original, that they tied up calves and bullocks for the purpose of fattening them, (*Jerem.* xlvi. 21; *Amos* vi. 4, &c.; *Parkhurst's Hebrew Lexicon*, 673;) and that they were acquainted with the arts of the dairy. "Surely the churning of milk," says Solomon, "bringeth forth butter," (*Prov.* xxx. 31;) and Samuel speaks of the "cheese of kine." (2 *Sam.* xxvii. 29.) The chief vegetable products cultivated by these eastern nations, were wheat, barley, beans, lentils, rye, the olive, and the vine. (*Exod.* ix. 31; *Levit.* xix. 10; 2 *Sam.* xvii. 28, &c.)

The scanty notices which we have of their tillage, gives us no reason to doubt that they were skilful husbandmen. Their name for tillage (*Obed*) emphatically expresses their idea of it; for it literally means *to serve the ground.* (*Parkhurst*, 508.) And that the cares and attention necessary were well sustained, is evidenced by the fact that David, for his extensive estate, had an overseer for the storehouses in the fields; another over the tillage of the ground; a third over the vineyards; a fourth over the olive trees; two to superintend his herds; a seventh over his camels; an eighth to superintend his flocks; and a ninth to attend similarly to the asses. (1 *Chron.* xxvii. 25—31.) Of their ploughing, we know that they turned up the soil in ridges, similarly to our own practice; for the Hebrew name of a husbandman signifies a man who does so. (*Parkhurst*, 93.) That they ploughed with two beasts of the same species attached abreast to the plough, (*Deut.* xxii. 10.) That the yoke, or collar, was fastened to the neck of the animal; and that the plough, in its mode of drawing the furrows, resembled our own; for we read of their sharpening the coulter and the ploughshare. (1 *Sam.* xiii. 20, &c.) Ploughing was an operation that they were aware might be beneficially performed at all seasons; for Solomon mentions it as a symptom of a sluggard, that he will not plough in the winter, (*Prov.* xx. 4;) and that too much care could not be devoted to it, they expressed by deriving their name for ploughing from a Hebrew root, which signifies *silent thought and attention.* (*Parkhurst*, 244.)

Their sowing was broadcast, from a basket, (*Amos* xi. 13; *Psalm* cxxvi. 6;) and they gave the land a second superficial ploughing to cover the seed. It is true that harrowing is mentioned in our translation, (*Job* xxxix. 10;) but Schultens and other Hebraists agree that harrowing was not practised by them. Russell, in remarking upon the mode of cultivation now practised near Aleppo, says, "No harrow is used, but the ground is ploughed a second time after it is sown, to cover the grain." (*Parkhurst*, 720.) The after cultivation apparently was not neglected: they had hoes or mattocks which they employed for extirpating injurious plants. "On all hills," says the prophet, "that shall be digged with the mattock, there shall not come thither the fear of briars and thorns." (*Isa.* vii. 25.) In those hot climates a plentiful supply of moisture was necessary for a healthful vegetation; and the simile of desolation, employed by the same prophet, is "a garden that hath no water." (*Isa.* i. 30.) In Eygpt they irrigated their lands; and the water thus supplied to them was raised by a hydraulic machine, worked by men in the same manner as the modern tread-wheel. To this practice Moses alludes, when he reminds the Israelites of their sowing their seed in Egypt, and watering it with their feet, a practice still pursued in Arabia. (*Deut.* xi. 10; *Niebuhr, Voyage en Arabie,* i. 121.)

When the corn was ripe, it was cut with either a sickle or a scythe, (*Jer.* l. 16; *Joel* iii. 13,) was bound into sheaves, (*Psalm* cxxix. 7; *Deut.* xxiv. 19, &c.,) and was conveyed in carts, (*Amos* ii. 13,) either immediately to the thrashing-floor or to the barn. They never formed it into stacks as we do. These passages in the Scriptures, (*Exod.* xxii. 6; *Jud.* xv. 5; *Job* v. 26) refer exclusively to the thraves or shocks in which the sheaves are reared as they are cut. (*Harmer's Observ.* iv. 145, &c.) The thrashing-floors, as they are at the present day, were evidently level plats of ground in the open air. (*Jud.* vi. 37; 2 *Sam.* xxiv. 18—25, &c.) They were so placed that the wind might, at the time of the operation, remove the chief part of the chaff. They perhaps had thrashing-floors under cover, to be used in inclement seasons; for Hosea, (ii. 35,) speaking of "the *summer* thrashing-floors," justifies such a surmise. The instruments and modes of thrashing were various. They are all mentioned in these two verses of the prophet: "Fitches are not thrashed with a thrashing instrument, neither is a cart-wheel turned upon the cummin; but the fitches are beaten out with a staff, and the cummin with a rod. Bread-corn is bruised because he will not ever be thrashing it, nor break it with the wheel of his cart, nor bruise it with his horsemen." (*Isaiah* xxviii. 27, 28.) When the seed was thrashed by horses they were ridden by men; and when by cattle, although forbidden to be muzzled, (*Deut.* xxv. 4,) yet they were evidently taught to perform the labour. (*Hosea,* x. 11.) The "instrument" was a kind of sledge, made of thick boards, and furnished underneath with teeth of iron. (*Isaiah* xli. 15; *Parkhurst,* 242, 412.) The revolving wheels of a cart, and the various sized poles employed for the same purpose,* need no further comment. To complete the dressing of the corn, it was passed through a sieve, (*Amos* ix. 9,) and thrown up against the wind by means of a shovel. The fan was, and is still, unknown to the Eastern husbandmen; and where that word is employed in our translation of the Scriptures, the original seems to intend either the wind or the shovel." (*Isaiah* xxx. 24; *Jer.* xv. 7; *Parkhurst*, 183, 680.)

Of their knowledge of manures we know little. Wood was so scarce that they consumed the dung of their animals for fuel. (*Parkhurst*, 764.) Perhaps it was this deficiency of carbonaceous matters for their lands that makes an attention to fallowing so strictly enjoined. (*Levit.* xix. 23, xxv. 3; *Hosea*, x. 12, &c.)

The landed estates were large, both of the kings and of some of their subjects; for we read that Uzziah, King of Judah, "had much both in the low country and in the plains; husbandmen, also, and vine-dressers in the mountains and in Carmel, for he loved husbandry," (2 *Chron.* xxvi. 10;) that Elijah found Elisha with twelve yoke of oxen at plough, himself being with the twelfth yoke, (1 *Kings* xix. 19;) and that Job, the greatest man of the East had 14,000 sheep, 6,000 camels, 1,000 yoke of oxen, and 1,000 she asses. (*Job* i. 3; xliii. 12.) Even in the time of Isaiah, the accumulation of landed property, in the hands of a few proprietors, was so much on the increase, that a curse was uttered against this engrossment. "Wo unto them," says the prophet, "that join house to house, that lay field to field, till there be no place, that they may be placed alone in the midst of the earth." (*Isaiah* v. 8.)

II—*The Agriculture of the Greeks.*

Agriculture was too important and too beneficial an art not to demand, and the Greeks and Romans were nations too polished and discerning not to afford to it, a very plentiful series of presiding deities. They attributed to Ceres, as their progenitors, the Egyptians, did to Isis, the invention of the arts of tilling the soil. Ceres is said to have imparted these to Triptolemus of Eleusis, and to have sent him as her missionary round the world to teach mankind the best modes of ploughing, sowing, and reaping. In gratitude for this, the Greeks, about 1356 years before the Christian era, established, in honour of Ceres, the Eleusinian mysteries, by far the most celebrated and enduring of all their religious ceremonies; for they were not abolished at Rome until the close of the fourth century. Superstition is a prolific weakness, and consequently, by degrees, every operation of agriculture, and every period of the growth of plants, obtained its presiding and tutelary deity. The goddess *Terra* was the guardian of the soil; *Stercutius* presided over manure; *Volutia* guarded the crops whilst evolving their leaves; *Flora* received the still more watchful duty of sheltering their blossom; they passed to the guardianship of *Lactantia* when swelling with milky juices; *Rubigo* protected them from blight; and they successively became the care of *Hostilina* as they shot into ears; of *Matura* as they ripened; and of *Tutelina* when they were reaped. Such creations of Polytheism are fables it is true, yet they most please by their elegance, and much more when we reflect that it is the concurrent testimony of anterior nations, through thousands of years, that they detected and acknowledged a Great First Cause.

Unlike the arts of luxury, agriculture has rarely, if ever, been subject to any retrograde revolutions. Being an occupation necessary for the existence of mankind in any degree of comfort, it has always continued to receive their first attention; and no succeeding age has been more imperfect, but in general more expert, in the art than that which has preceded it. The Greeks are not an exception to this rule; for their agriculture appears to have been much the same in the earliest brief notices we have of them, as the husbandry of the nation of which they were an offset. The early Grecians, like most new nations, were divided into but two classes—landed proprietors, and helots or slaves; and the estates of the former were little larger than were sufficient to supply their respective households with necessaries. There was, probably, not even a prince or leader of the Greeks who did not, like the father of Ulysses, assist with his own hands in the operations of the farm. (*Odyss.* i. xxiv.) Hesiod is the earliest writer who gives us any detail of the Grecian agriculture. He appears to have been the contemporary of Homer, and, in that case, to have flourished about nine centuries before the Christian era. His practical statements, however, are very meagre. Xenophon died at the age of ninety, 359 years before the birth of Christ. The following narrative, if not otherwise specified, is taken from his *Œconomics*. In his times, the landed proprietor no longer lived upon his farm, but had a steward, as a general superintendent, and numerous labourers, yet he always advises the master to attend to his own affairs. "My servant," he says, "leads my horse into the fields, and I walk thither for the sake of exercise in a purer air; and when arrived where my workmen are planting trees, tilling the ground, and the like, I observe how everything is performed, and study whether any of these operations may be improved." After his ride, his servant took his horse and led him home, "taking with him," he adds, "to my house, such things as are wanted; and I walk home, wash my hands, and dine, of whatever is prepared for me, moderately." "No man," he continues, "can be a farmer till he is taught by experience; observation and instruction may do much, but practice teaches many particulars which no master would ever have thought to remark upon." "Before we commence the cultivation of the soil," he very truly remarks, "we should notice what crops flourish best upon it, and we may even learn from the weeds it produces what it will best support. Fallowing or frequent ploughing in spring or summer is of great advantage." And Hesiod advises the farmer (*Works and Days*, 50) always to be provided with a spare plough, that no accident may interrupt the operation. The same author directs the ploughman to be very careful in his work. "Let him," he says, "attend to his employment, and trace the furrows carefully in straight lines, not looking around him, but having his mind intent upon what he is doing." (*Ibid*, 441-443.)

Theophrastus evidently thought that the soil could not be ploughed and stirred about too much, or unseasonably; for the object is to let the earth feel the cold of winter and the sun of summer, to invert the soil, and render it free, light and clear of all weeds, so that it can most easily afford nourishment. (*De Causie Plant, lib.* iii., c. 2, 6.) Xenophon recommends green plants to be ploughed in, and even crops to be raised for the purpose; "for such," he says, "enrich the soil as much as dung." He also describes the properties which render dung beneficial to vegetation, and he also dwells upon composts. (*Hist. of Plants*, ii., c. 8.) Xenophon recommends the stubble at reaping time to be left long, if the straw is abundant, "and this, if burned, will enrich the soil very much, or it may be cut and mixed with the dung." "The time of sowing," he adds, "must be regulated by the season, and it is best to allow seed enough."

Weeds were, even then, carefully eradicated from amongst their crops; "for, besides the hindrance they are to the corn, or other profitable plants, they keep the ground from receiving the benefit of a free exposure to the sun and air." Homer describes Laertes as *hoeing* when found by his son Ulysses. (*Odyss.* xxiv., 226.) Water courses were made to drain away "the wet, which is apt to do great damage to corn."

Homer describes the mode of *thrashing* corn by the trampling of oxen, (*Iliad* xx., 495, &c.;) and, to get the grain clear from the straw, Xenophon observes, "The men who have the care of the work, take care to shake up the straw as they see occasion, flinging into the way of the cattle's feet such corn as they observe to remain in the straw." From this author, and from Theophrastus, we can also make out that the Greeks separated the grain from the chaff by throwing it with a shovel against the wind.

III.—*The Agriculture of the Romans.*

It is certain that, at a very early age, Italy received colonies from the Pelasgi and Arcadians, and that, consequently, with them the arts of Greece were introduced; and we may conclude that there was then a similarity in the practice of agriculture in the two countries. About 753 years before the nativity of Christ, Romulus founded the city of Rome, whose inhabitants were destined to be the conquerors and the improvers of Europe. The Roman Eagle was triumphant in Egypt, Persia, Greece, Carthage, and Macedon; and the warriors who bore it on to victory, in these and other countries, being all possessors of land of a larger or smaller extent, naturally introduced, upon their return, any superior vegetable or improved mode of culture which they observed in the more civilized seats of their victories. Thus the arts of Rome arrived at a degree of superiority that was the result of the accumulated improvements of other nations; and, finally, when Rome became, in turn, the conquered, the victors became acquainted with this store of knowledge, and diffused it over the other parts of Europe. Of the agriculture of the early Romans we know but little; but of its state, during the period of their greatest prosperity and improvement, we have fortunately very full information. Cato in the second, and Varro in the first century before the Christian era, Virgil at the period of that event, Columella and Pliny but few years subsequently, and Palladius in the second and fourth century each wrote a work upon agriculture, which, with the exception of that by Columella, has come down to us entire.

1. *Size of the Roman Farms.*—When Romulus first partitioned the lands of the infant state among his followers, he assigned to no one more than he could cultivate. This was a space of only two acres. (*Varro*, i. 10; *Pliny*, xvii. 11.) After the kings were expelled, seven acres were allotted to each citizen. (*Pliny*, xviii. 3.) Cincinatus, Curius Dentatus, Fabricius, Regulus, and others distinguished as the most deserving of the Romans, had no larger estates than this. Cincinatus, according to some authorities, possessed only four acres. (*Ibid.; Columella*, i. 3, &c.) On these limited spaces they dwelt, and cultivated them with their own hands. It was from the plough that Cincinatus was summoned to be dictator, (*Livy*, iii. 26;) and the Samnian ambassadors found Curius Dentatus cooking his own repast of vegetables in an earthen vessel. (*Plutarch in vita Cato. Cens.*)

Some of the noblest families in Rome derived their patronymic names from ancestors designated after some vegetable, in the cultivation of which they excelled, as in the examples of the Fabii, Pisones, Lentuli, Cicerones, and the like. (*Pliny*, xviii. 1.) In those days, "when they praised a good man, they called him an agriculturist and a good husbandman; he was thought to be very greatly honoured who was thus praised." (*Cato in Præf.*) As the limits of the empire extended and its wealth increased, the estates of the Roman proprietors became very greatly enlarged; and, as we shall see more particularly mentioned in our historical notices of gardening, attained to a value of £80,000. (*Plutarch in vit. Marius et Lucullus.*) Such extensive proprietors let portions of their estates to other citizens, who, if they paid for them a certain rent, like our modern tenants, were called *Coloni* (*Columella*, i. 7; *Pliny Epist.* x. 24) and *Politores*, or *Partiarii*, if they shared the produce in stated proportions with the proprietor. (*Pliny Epist.* vii. 30, and ix. 37, &c.) Leases were occasionally granted, which appear to have been of longer duration than five years. (*Ibid.* ix. 37.)

2. *Distinction of Soils.*—Soils were characterized by six different qualities, and were described as rich or poor, free or stiff, wet or dry. (*Colum.* ii. 2.) The best soil they thought had a blackish colour, was glutinous when wet, and friable when dry; exhaled an agreeable smell when ploughed, imbibed water readily, retaining a sufficiency, and discharging what was superfluous; not injurious to the plough irons, by causing a salt rust; frequented by crows and rooks at the time of ploughing; and, when at rest, speedily covered with a rich turf. (*Virgil, Geor.* ii. 203, 217, 238, 248; *Pliny*, xvii. 5.) *Vines* required a light soil, *corn* a heavy, deep, and rich one. (*Virg. Georg.* ii. 29; *Cato*, vi.)

3. *Manures.*—The dung of animals was particularly esteemed by the Romans for enriching their soil. "Study," says Cato, "to have a large dunghill." (*Cato*, v.) They assiduously collected it and stored it in covered pits, so as to check the escape of the drainage. (*Colum.* i. 6; *Pliny*, xvii. 9, and xxiv. 19.) They sowed pulverized pigeon's dung, and the like, over their crops, and mixed it with the surface soil by means of the sarcle or hoe. (*Colum.* i. 16; *Cato*, xxxvi.) They were aware of the benefit of mixing together earth of opposite qualities, (*Ibid.*,) and of sowing lupines and ploughing them in while green. (*Varro*, i. 23.) They burnt the stubble upon the ground, and even collected shrubs and the like for the similar purpose of enriching the soil with their ashes. (*Virgil Geor.* i. 84; *Pliny*, xvii. 6, 25.) Pliny also mentions that lime was employed as a fertilizer in Gaul, and marl in the same country and

Britain; but we can only surmise thence that they were also probably employed by the Romans. (*Pliny*, xvii. 8. and xvii. 5.)

4. *Draining.*—The superfluous water of soils was carried off by means both of open and covered drains. (*Colum.* ii. 2, 8; *Pliny*, xvii. c.; *Virg. G.* i. 109.) Cato is very particular in his directions for making them. (*Cato*, xliii. clx.)

5. *Crops.*—They cultivated wheat, spelt, barley, oats, flax, beans, pease, lupines, kidney beans, lentils, tares, sesame, turnips, vines, olives, willows, and the like. To cite the authorities who mention each of these would be needless, for they are noticed in all the Roman writers upon agriculture. Of the relative importance or proportion in which the crops were profitable to the Romans, we have this judgment of Cato: "If you can buy 100 acres of land in a very good situation, the vineyard is the first object if it yields much wine; in the second place a well watered garden; in the third a willow plantation; in the fourth an olive ground; in the fifth a meadow: in the sixth corn ground; in the seventh an underwood; a plantation yielding stout poles for training the vine; and in the ninth a wood where mast grows." (*Cato*, i.) They made hay, and the process appears to have been the same as in modern times. After being cut, it was turned with forks, piled into conical heaps, and finally into stacks or under cover. But the mowing was imperfectly performed; for, as soon as the hay was removed from the field, the mowers had to go over it again. (*Varro; Colum.* ii. 22.)

6. *Implements.*—The plough consisted of several parts: the beam to which the yoke of the oxen was fastened; the tail or handle terminated in a cross bar, with which the ploughman guided the instrument; it had a ploughshare, the share-beam to which it was fixed, and two mould-boards, a coulter, and a ploughstaff for cleaning the ploughshare. (*Ovid. Pont.* i. 8, 57; *Virg. G.* i. 170; *Pliny*, xvii. 18, 19.) Some of their ploughs had wheels, and some were without coulters and earth-boards. Besides this, they had spades, rakes, hoes, with plain and with forked blades, harrows, mattocks, and similar implements.

7. *Operations.*—*Ploughing* was usually performed by two oxen, though three were sometimes employed. They were yoked abreast, and trained when young to the employment. *Cicero in Verr.* iii. 21; *Col.* vi. 2, 10; *Pliny*, xviii. 18; *Virg. G.* iii. 163, &c.) They were usually yoked by the neck, but sometimes by the horns. *Pliny*, viii. 45; *Colum.* ii. 2.) There was but one man to a plough, which he guided, and managed the oxen with a goad.. (*Pliny*, *Epist.* viii. 17.) They sometimes ploughed in ridges, and sometimes not. They did not take a circuit

when they came to the end of the field, as is our practice, but returned close to the furrow. They were very particular in drawing straight and equal sized furrows. (*Pliny*, xviii. 19, s. 49.) They seem to have ploughed three times always before they sowed, (*Varro*, i. 29;) and to stiff soils, even as many as nine ploughings were given. (*Virg. G.* i. 47; *Pliny*, xviii. 20; *Pliny, Epist.* v. 6.) The furrows in the first ploughing were usually nine inches deep. When the soil was only stirred about three inches, it was called *scarification*. (*Pliny*, xviii. 17—19.) They usually fallowed their land every other year. (*Virg. G.* i. 71.)

Sowing was performed by hand, from a basket; and that it might be performed regularly, the hand moved with the steps. (*Colum.* ii. 9; *Pliny*, xviii. 24.) The seed was either scattered upon the land and covered by means of rakes and harrows, or more commonly by sowing it upon a plain surface, and covering by a shallow ploughing, which caused it to come up in rows, and facilitated the operation of hoeing. (*Pliny*, xviii. 20.) They were particular as to the time of sowing, the choice of seeds, and the quantity sown. (*Varro*, i. 44; *Pliny*, xviii. 24, s. 55; *Virg. G.* i. 193, &c.)

Weeding was performed by hoes, hooks, and by hand. In dry seasons the crops were watered. (*Virg. G.* i. 106.) If they appeared too luxuriant they were fed off. (*Ibid.* 193.)

Reaping and Mowing were the usual modes of cutting down the corn crops, but the ears were sometimes taken off by a toothed machine, called *batilium*, which seems to have been a wheeled cart, pushed by oxen through the corn, and catching the ears of corn between a row of teeth fixed to it, upon the principle of the modern daisy rake. In Gaul, the corn was cut down by a machine drawn by two horses. (*Varro*, i. 50; *Virg. G.* i. 317; *Colum.* ii. 21; *Pliny*, xviii 30.) They do not seem to have ever bound their corn into sheaves. (*Colum.* ii. 21.)

Thrashing was performed by the trampling of oxen and horses, by flails, and by means of sledges drawn over the corn. (*Pliny*, xvii. 30; *Colum.* ii. 21; *Virg. G.* iii. 132; *Tibullus*, i. 5, 22; *Varro*, i. 52.) The thrashing floor was circular, placed near the house, on high ground, and exposed on all sides to the winds. It was highest in the centre, and paved with stones, or more usually with clay, mixed with the lees of the oil, and very carefully consolidated. (*Colum.* i. 6; *Varro*, i. 2; *Virg. G.* i. 178; *Cato*, xci. and cxxix.)

Dressing was performed by means of a sieve or van, and by a shovel, with which it was thrown up and exposed to the wind. (*Varro*, i. 52; *Colum.* ii. 21.) It was finally stored in granaries or in pits, where it would keep fifty years. (*Pliny*, xviii. 30; *Varro*, i. 57.)

8. *Animals.*—Oxen, horses, asses, mules, sheep, goats, swine, hens, pigeons, pea-fowls, pheasants, geese, ducks, swans, guinea-fowls, and bees, are mentioned by various authors as products of the Roman farms. Directions for breeding many of these are given in the third and fourth books of the Georgics.

Such is an outline of the Roman agriculture; and in it our readers will doubtless find sufficient evidence to warrant them in agreeing with us, that it was but little different from that pursued by the present farmers of England. We are superior to them in our implements, and consequently in the facility of performing the operations of tillage; we perhaps have superior varieties of corn, but we most excel them in our rotation of crops, and in the management of stock. We differ from them, also, in not practising the superstitious rites and sacrifices which accompanied almost all their operations, (see *Cato*, cxxxiv. c.;) but of the fundamental practices of agriculture they were as fully aware as ourselves. No modern writer could lay down more correct and comprehensive axioms than Cato did in the following words; and whoever strictly obeys them will never be ranked among the ignorant of the art. "What is good tillage?" says this oldest of the Roman teachers of agriculture. "To plough. What is the second? To plough. The third is to manure. The other part of tillage, is to sow plentifully, to choose your seed cautiously, and to remove as many weeds as possible in the season." (*Cato*, 61.)

Such is a rapid sketch of their agricultural knowledge—a knowledge which has since increased, and will be certainly added to by attending to the advice of another of their writers. "Nature," he observes, "has shewn to us two paths which lead to a knowledge of agriculture—experience and imitation. Preceding husbandmen, by making experiments, have established many maxims, their posterity generally imitate them; but we ought not only to imitate others, but make experiments, not directed by chance, but by reason." (*Varro*, i., 18.)

In a preceding page of this Journal I have endeavoured to trace a few of the earliest agricultural improvements made by the nations of antiquity. These, we have seen, were at first exceedingly rude; for then, the population being but limited, only the richest natural soils were required to be cultivated, and nature was too bountiful in her gifts, and man, resident in an oriental atmosphere, far too indolent, to be either an active or an enterprising cultivator of the land: hence we find that, as the population of the earth increased, slaves were on most occasions made to do the work of the farm; and, moreover, all kinds of expedients were adopted to avoid manual labour—the patient bullock trod out the corn which more northerly nations, in a later age, separated with the flail. Every thing else seemed in keeping with this Asiatic indolence. They rarely manured their soils—the irrigation system was a substitute for other modes of fertilizing the land—since, when once the reservoirs and channels, necessary for this valuable agricultural operation were made, the water glided on to the land, without the assistance of the owner.

Irrigation, also, supplied in a great measure the incessant loss of moisture occasioned by the heat of the climate—a temperature, too, which rendered it most to the farmer's interest to cultivate only particular plants; and this effect of temperature upon his crops, as poorer soils were gradually forced into cultivation, the farmer soon perceived was very materially influenced by various circumstances occurring even in the same climate, such as by the nature of the soil, its declination, and by its elevation above the level of the sea. In tracing a few of these causes of varying modes of cultivation, I shall have occasion, in a portion of this paper, to repeat and enlarge upon what I have in another valuable periodical work, (*British Farmer's Magazine,*) some time since, had occasion to observe. The effects produced by these circumstances are chiefly to be attributed to the difference of temperature produced by change of latitude, or elevation, or declination, upon the crop which is attempted to be cultivated—an effect of whose importance indeed a very casual glance at the plants natural to the soils dispersed over the surface of the globe will serve to convince the intelligent farmer. Such a brief review was long since made, nearly in the following language, by M. Mirbel:—There are, however, many very considerable local advantages besides those I have mentioned, such as the proximity of mountains, of forests, of the sea, &c., &c., which are all causes of variation of temperature, and must each be attended to in accounting for the natural vegetation and the *cultivated* crops of any particular district. For instance, the winter is less severe on the northern coasts of France than in the interior on the same level, an effect produced by the vicinity of the ocean; for the sea preserves a far more even temperature than the atmosphere, and is constantly at work to maintain some degree of equilibrium in the warmth of the air. In the summer it carries off a portion of the caloric from it; in the winter it gives back a part of that which it contains. It is thus that the mass of water held in the vast basin of the ocean tempers on its coasts the heat of summer and the cold of winter. For this reason, in Devonshire, and on the opposite coast of France, the myrtle, fuschia, magnolia, pomegranate, Indian rose, and a swarm of other exotic plants, grow in the open air; but in the interior of England and France require shelter. The same cause permits the cultivation of many species in the open grounds about London, that near Paris will not do without a greenhouse.

In proportion as the natural temperature of a country decreases, as we advance towards the pole for instance, we are sensible of the change in the appearance of the vegetation. The species which require a mild and temperate climate are supplanted by others which delight in cold. The forests fill with pines, fir, and birches, the natural decoration of a northern land. The birch, of all trees, is the one that bears the severity of the climate the longest; but the nearer it approaches the pole the smaller it grows: its trunk dwindles and becomes stunted, and the branches knotty, till at last it ceases to grow at all towards the 70th degree of latitude, the point where man gives up the cultivation of corn. Further on, shrubs, bushes, and herbaceous plants only are to be met with. Wild thyme, daphnes, creeping willows, and brambles, cover the face of the rocks. It is in these cold regions that the berries of the *Rubus arcticus* acquire their delicious flavour and perfume. Shrubs disappear in their turn. They are succeeded by low herbs, furnished with leaves at the root, from the midst of which rises a short stalk surmounted by small flowers. Such are the saxifrages, the primroses, the *androsaces*, *aretias*, &c. These pretty plants take up their quarters in the clefts of rocks, while the grasses, with their numerous slender leaves, spread themselves over the soil, which they cover as with a rich verdant carpet. The lichen, which feeds the rein-deer, sometimes mixes in the turf, sometimes of itself covers vast tracts of country, its white tufts standing in clumps of various forms, looking like hillocks of snow, which the sun has not yet dissolved. If we go farther, a naked land, sterile soil, rocks, and eternal snows, are all we find. The last vestiges of vegetation are some *byssi* and some lichens which cover the rocks in motley patches.

The principal causes which induce this progression of changes are three:—1. The excess of duration in the winter, a consequence of the obliquity and disappearance of the solar rays. 2. The dryness of the air, a consequence of the decrease of heat. 3. The prolonged action of the light, which illumines the horizon through the whole period of vegetation.

It is well known that too great a degree of cold, by congealing the sap, occasions the rupture of the vascular system in plants, and thereby destroys them; but the deleterious action of cold is not confined to purely mechanical results, it has been proved that heat is a stimulus that cannot be dispensed with in vegetation. Many species secrete juices in warmer regions which are unknown in their economy in colder climates. The ash yields manna in Calabria, but loses that faculty as it approaches towards the north. The grape in the south of Europe abounds in matter of a sweet quality; in the north it contains an excess of acid. So long as the organic functions which depend upon the degree or duration of heat can be carried on, the ash and the vine continue to grow—they grow even when those functions are performed incompletely, but their growth is stinted. They finally disappear at that point where the portion of warmth in the atmosphere, though still equal to prevent the freezing of the sap, is no longer able to stimulate their organs or their frame into action.

All other vegetables, whose dimension and duration subject them to the full severity of the frost, share the same destiny, at a greater or less distance from the torrid zone, and in proportion as their constitutions require a greater or less degree of heat; so that nothing is found near the pole but such dwarf shrubs as are sheltered under the snow in winter, or annuals and herbaceous species endowed with so quick a principle of life as to rise, flower, and fruit, within the space of three months, or some agamous and cryptogamous species, which adapt themselves to all degrees of temperature, and are consequently the last organic forms under which vegetable life is to be descried. Heat and moisture united, the farmer well knows, are highly favourable to the growth of plants. No countries are more abundant in herbaceous vegetables, or better wooded, than Senegal, Guinea, and Cayenne, where both these props to vegetation are in the plenitude of their force. Experiments made with the hygrometer prove that the moisture of the atmosphere increases as we approach the equator*. In hot climates, when the sun sinks below the horizon, the watery exhalations condensed are returned to the earth in the form of a copious dew, that moistens the surface of the foliage, and feeds those vegetables in which the absorbing power of the parts above ground suffice for their support; of this number are the succulent plants, the *aloes*, the *cacti*, *&c.*—in these the fibrous root only serves to hold them in their places, and the moisture of the atmosphere is inhaled and retained by the spongy parts above. Thus, in the vast plains that receive the waters from the eastern declivity of the Andes, when the scorching heat of summer has consumed the grasses and other herbaceous plants, which the rainy season has brought forth, we still find some lingering *cacti* which, under their dry thorny coats, conceal a cellular system, by which an abundant sap

* The annual average depth of rain in England is about two feet. In 1840, for instance, the depth at Aberdeen was 24.627 inches; at Empingham, 18.58; Epping, 20.767; Falmouth, 31.511; Gosport, 25.525; Greenwich, 18.24; York, 24.72 inches. That is perhaps not much below the average of the continent of Europe. Some portions of western Europe, however, are exceedingly wet; 123 inches have been noted to fall at Coimbra in Portugal in a year. The fall of rain is still greater in the West Indies. At St. Domingo, 120 inches; at Cayenne, 116 inches; at Maranham, 277 inches.

has been imbibed and preserved. But in countries where the atmosphere holds but little moisture in solution, either because the soil is wholly destitute of water, or by reason of the coldness of the temperature, we find no plants at all, or such only as are of a dry hard texture. The sands of Africa, unwatered by rivers, are found to be utterly barren—Spitzbergen, Nova Zembla, &c., where the influence of the sun is felt only for two months of the year at most, and where, consequently, the air is habitually dry, furnish a very scanty portion of herbaceous plants only, or some dwarf shrubs, with a narrow heathery foliage.

Vegetation, in ascending above the level of the sea, undergoes modifications analogous to those which attend its progress from the line to either pole, with this distinction, that in the last case the phenomena succeed by almost imperceptible gradations, while they crowd upon and follow each other in rapid succession on the ascent of mountains. The height of 4,000 or 5,000 yards in the hottest parts of the globe produces changes as distinct as the 2,000 leagues or more which lie between the equator and the polar regions. The three causes of these rapid changes all re-appear within this space, viz., a diminution of heat, dryness of the air, and protracted duration of light. The higher we ascend, the shallower the upper stratum of air becomes—thence the excessive cold at great heights. The weight of the atmosphere which, at the level of the sea, supports a column of mercury equal to twenty-eight inches, diminishes as we ascend, so that, at considerable elevations, it will only support a column of a considerable less height—a power which gradually diminishes as we ascend. A consequence of this fact is, that the vaporization of fluids takes place on high mountains at a very low degree of heat. Notwithstanding this, however, the decrease of temperature is so great that, the ambient air is very slightly impregnated with moisture. It is true that heights have not the long days of the polar regions; but they receive the rays of the sun earlier than the plains, and are quitted later by them, so that their nights are shorter than on levels.

This progressive varying course of vegetation on mountains had not escaped the attention of Tournefort. At the foot of Mount Ararat he had observed the plants which grow in Armenia, a little higher, those of Italy and France, above, those of Sweden, and upon the summits, those of Lapland. Observations of the same kind have been subsequently made on Mount Caucasus, the Alps, Pyrenees, and other mountains of the old continent, and in Britain, whose hills, however, can rarely be dignified with the name of mountains. Linnæus, in his own way, had summed up these observations in an axiom. "The different kinds of plants," he said, "shew, by their stations, the perpendicular height of the earth." Yet it was not till lately that any exact survey had been taken of this interesting department of botanical geography.

The common heath, (*Erica vulgaris,*) says M. De Candolle, which covers the sandy plains that lie along the coast of western France, grows in the Pyrenees to the very summit of Mount Cenis, and to the very summit of Mount Calm, at nearly 3,000 yards of elevation. The cross-leaved heath (*Erica tretralix*) is another instance; it grows from the level of the sea to 2,400 yards of elevation. The sea-gillyflower (*Statice armeria*) is found in Holland in spots which lie below the level of the sea, and on the Alps at an elevation of 2,500 yards. *Statice plantaginea* grows on the beach of Olonne, and at 2,000 yards of elevation on Mount Viso. The coltsfoot and the birdsfoot trefoil both grow at the level of the sea all over England and France, and are met with again above Mount Jovet at the height of about 2,400 yards. The scurvy-grass, which is generally found at the skirts of the sea, flourishes, also at the edge of the stream at Neuville in the Pyrenees, at the height of about 2,000 yards. Mother-of-thyme, (*Thymus serpyllum,*) which grows in every lowland spot in France, mounts also to the tops of a great many of the Alpine heights. Even thyme (*Thymus vulgaris*) ascends the Pie d'Ereslids to above 2,000 yards. Foxglove, which is met with in all the lowlands of the west and midland part of France, grows on the Lozere at 1,500 yards, and nearly at the same elevation on Mount Calm.

Mat-grass (*Nardus stricta*) grows at the level of the sea, and it also forms the highest situated swards that are found in the Cevennes, the Alps, and the Pyrenees. It grows indifferently in marshy places and in those which are liable to dry up, so that it is found both on the tops of mountains where the snow disappears in the summer, and on the sides of those from whence it is never entirely absent. The sweet-scented vernal grass (*Anthoxanthum odoratum*) and the Timothy grass, (*Phleum pratense,*) which grow everywhere in England and France at the level of the sea, ascend to the elevation of 2,000 yards. The common juniper, (*J. communis*) attains an elevation of 3,000 yards. The marsh lousewort does the same; the scorpion grass 3,500 yards; and the daisy, (*Bellis perennis,*) the ox-eye daisy, (*Chrysanthemum leucanthemum,*) and the bladder campion, (*Silene inflata,*) ascend to 2,000 yards, and the kidney vetch (*Anthyllis vulgaris*) to 3,000 yards. When plants, in fact, not suited by their nature to support an excess of either heat or cold, are found to grow in different latitudes, it is always at such heights as that the effect of elevation compensates that of the latitude. Thus many of the plants of the Alps and the Pyrenees grow in the plains of the north of France, especially in the Ardennes and neighbouring provinces. Of these I have already cited some instances. Again we know that many plants which belong to Lapland, or other countries of the north of Europe, when they are met with in France, grow there at considerable elevations. *Saxifraga Greenlandica* grows in the Pyrenees very near to the summit of the Maladette, which is 3,278 yards high, and comes down to below 2,400 yards. *Linnæa borealis* is not found in the Alps below an elevation of 1,800 or 2,000 yards. *Menziesia dabaecia,* which covers the low lands in Ireland is found in Western Pyrenees as high up as 1,000 yards. The chestnut grows in the low lands of the north of France, upon the hills of the south of France, and at a great elevation on the Appenines, and at a still greater on Mount Etna.

Plants which are the objects of husbandry are controlled by laws corresponding completely with the preceding. Such as grow in all latitudes, grow likewise at all elevations. Those that are found only in determinate latitudes, are found only in corresponding elevations. Thus we learn from Humboldt, that the potato, which succeeds so well in the north of our old continent, is cultivated in Chili as high as 3,600 yards. We know that the cabbage thrives down at the edge of the sea as well as on the Alps, at every elevation at which man can take up his abode. Corn is also cultivated at very extraordinary elevations. Rye is grown in France, in the departments of the Higher and Lower Alps, at 2,200 yards, particularly above Allos, in Provence. Wheat does not grow so far to the north as rye, neither will it do so well as that grown at great elevations—yet it is grown at 1,800 yards. At such elevations, sowing is generally done before harvest time, that the plants may get strength before the snow falls, which has been known to lie upon the rye the year through. When this has happened, the rye remained *in statu quo* while the snow laid, and resumed its growth at the end of eighteen months, when that had melted away. Barley will grow well only in temperate climates. It is true it may be raised under the tropics, but not at a lower elevation than from 3,000 to 4,000 feet, and then it is a profitless crop.

Cultivated plants, which do not bear cold, are under a like influence as to elevation. They can only be grown at such heights as correspond in temperature with that of the distance from the equator to which they belong. In general, it is considered that in our temperate climate a degree of latitude affects the mean temperature nearly in the proportion of 180 or 200 yards of elevation. This rule, it is true, is liable to numberless modifications from local circumstances; yet I have had the curiosity to apply it (observes M. De Candolle) to the different plants of husbandry, and have obtained some results that may be worth recording. The most elevated point at which I found maize was grown as a crop is in the department of the Lower Pyrenees above the village of Lescans, at about the elevation of 1,000 yards. Now, if we take our departure from that point, which is the 43rd degree of latitude, and proceed five degrees upon the same meridian line, we come to the neighbourhood of Mans, and to the south of the departments of Ille and Vilaine, which are precisely the northernmost points where maize is used for a crop.

The vines of Velai are perhaps the highest vineyards. The elevation of the town of Puy is computed at 632 yards, and the vineyards that belong to it go up to about 800. Now, if setting out from that point, which is a little beyond 45 degrees of latitude, you take four degrees to the north upon the same meridian, you come to between Rheims and Epernai—that is to say, very close upon the northernmost limit at which the vine forms a branch of husbandry. With regard to the olive tree, the local peculiarities of the countries where it grows are such as to make investigations of this kind very intricate. It is generally cultivated in parts protected on the north by some vast range of mountains, where the mean temperature is consequently higher than it would otherwise be. When it is not sheltered by any range of mountains, the northernmost point in Europe at which we find the olive is Ancona, in 43° 37′ of latitude. In respect to the other point of view, its positions have been measured in several parts of Roussillon, Languedoc, Provence, and Italy, and these have been always nearly at an elevation of 400 yards above the level of the sea, which ought to indicate that the olive might grow two degrees more to the north of Ancona. Now, if we take two degrees towards the north from that point on the same meridian, we come to about Lake d'Itarde, and the neighbourhood of Como, which are just the northernmost points at which the olive is cultivated. The fig-tree, which goes farther to the north than the olive, and not so far as the vine, preserves a corresponding gradation in regard to the elevations at which it will grow; but we can hardly determine any precise limit for a tree over which aspect has more power than the degree of positive heat. The same may be observed in regard to the walnut tree, which reaches a little higher both in latitude and elevation above the sea than the vine.

The common oak (*Quercus robur*) grows in the plains on a level with the sea, reaches the slopes of the mountains, and ascends to the height of 1,600 yards. It degenerates in proportion as it approaches the point where it ceases to vegetate. The beech (*Fagus sylvatica*) makes its first appearance at the height of 600 yards above the sea, and its last at 200 yards above the oak. The silver fir (*Pinus picea*) and the yew (*Taxus communis*) shew themselves at 1,400 yards, and extend to about 2,000. The Scots fir (*Pinus silvestris*) and the *Pinus pumilio* take their stations between 2,000 and 2,400 yards. There the trees stop, and shrubs with a juiceless foliage, and low or creeping stems, present themselves : these lie hid beneath the snow in winter. Amongst them are some of the *Rhododendrums*, *Daphnes*, *Salix*, herbacea, and *Reticulata*, &c. Soon after we meet only small herbs with perennial roots—a foliage disposed in a rosette and a naked stalk. These, with the lichens and *Byssi*, arrive at the height of 3,000 and even 3,400 yards. The first that occur are the *Gentiana campestris*, *Saxifraga*, &c.; then *Ranunculus alpestris*, *Aretia alpina*, &c.; and, finally, *Ranunculus glacialis*, *Saxifraga cespitosa*, *oppositifolia*, *Androsacea*, and *Greenlandica*. The last brings us to the borders of eternal snow. These are European observations; but Humboldt and Bomplaud have demonstrated a similar succession of plants in the New World, and in one of the hottest and most fertile regions of our globe.

In the equinoctial countries of America, vegetation displays itself to the view of the observer as on the gradually rising steps of an immense amphitheatre, the base of which sinks below the waters of the ocean, whilst its summit reaches to the foot of the glaciers which crown the Andes, 5,000 yards above the level of the sea—shewing that in America there are vegetables which grow at the height of 1,600 or 1,800 yards beyond the point where vegetation ceases in the Pyrenees and Alps, a difference that does not depend solely upon latitude, but also, according to Mr. Ramond, upon the breadth of the chain of mountains. In chains but of little breadth, such as those of Europe, the air and temperature of the plains have an influence which is constantly tending to confound the limits of the different kinds of vegetables; but this is not the case in the chain of the Andes, which is from forty-eight to sixty leagues in breadth. (*Journ. Science*, vol. iv., p. 176.—*Brit. Farm. Mag.*) The plants which belong to dark and humid abodes, such as *Boletus ceratophorus*, *Byssus speciosa*, &c., are found on the vaults of caverns and the wood-work of mines, as well in Mexico as in Germany, England, and Italy, concealed within the bowels of the earth; these less perfect species constitute the last zone of vegetation. Next come the plants which belong to fresh water and to salt water; of these a great portion grow, without preference, in every degree of latitude, the medium in which they exist preserving a more equable temperature than the atmosphere. Dockweed (*Lemna minor*) and the greater reed-mace, or cat's-tail, (*Typha catifolia*,) grow in the marshes both of Asia, Europe and America—the latter being common to Jamaica, China, and Bengal. Probably there is no region on the globe where the grey bog-moss (*Sphagnum palustre*) is not to be found. This indifference to climate is still more remarkable in the sea-plants, such as the *Fuci lavers* and *Ceramia;* the gulf-weed (*Fucus natans,*) detaching itself from the rocks on which it grew, and forming shoals of an immense extent on the surface of the water, obstructs the ship's way as well towards the poles as under the line. On a level with the sea, and to a height of 1,000 yards, we find the palms, the liliaceous plants, the plantain trees, and the balsam of solu, with crowds of other species which grow only in a very hot temperature. This is the zone of the palms—a tribe conspicuous for the elegance and grandeur of part of its species, and forming one of the chief ornaments of the scorching plains that lie between the tropics; some of them, however, thrive in more temperate regions. The *Ceroxylon andicola,* a fine palm rising sixty yards in height, grows in the Andes, at Tolima and Quindiu, in the 4° 25′ of northern latitude, setting off at 1,860 yards above the sea, and continuing to the height of 2,870, an elevation where the atmosphere is at a moderate degree of warmth. Another species has been discovered at the Straits of Magellan towards the 53rd degree of southern latitude. Two sorts—the fan-palm and date-tree—are even seen to grow on the southern shores of Europe, upon the coasts of the Mediterranean, and not far from the foot of the Pyrenees, thus advancing their tribe to beneath the 43rd degree of northern latitude; but these are exceptions, the palms in general confining themselves to the hottest parts of the globe, and none being met with towards the polar regions.

Some of the effects produced on different soils and in various climates by a difference in the annual amount of rain, have been sketched by Mr. John Morton, in his excellent work on soils, a volume which I have often had occasion to recommend to the careful perusal of the farmers of our islands. When treating of the effects of varying degrees of moisture on vegetation, he alludes (p. 214) to a calculation of M. Humboldt, who states the proportional quantity of rain in different latitudes to be—

Latitude.	Mean annual depth of rain.
0	96 in.
19	80
45	29
60	17

But local causes, as continues Mr. Morton, have the effect of greatly altering their quality. Thus, much more rain falls on mountains, and in their immediate neighbourhood, than on low level land; and again, the proportion is larger on the sea coast than on inland plains; so that it may be taken as a pretty general axiom by the farmer, that the humidity of the atmosphere decreases according to its distance from the sea. At Keswick and Kendal, in Cumberland, the annual quantity of rain is about 60 to 67 inches per annum, while at places in the interior the average is only about twenty-four inches, and on the borders of Essex and Hertfordshire only about nineteen inches. The greatest proportion of rain in England generally falls in September, October, and November. But even climate is very materially altered by the improvements effected by the skilful agriculturist, such as by the drainage of lakes, bogs, and morasses, the clearing away of forests, the more perfect drainage of cultivated soils, and the conversion of pasture into arable land. In those localities where such improvements have been extensively effected, the evaporation from the surface of the earth is very considerably diminished, and in consequence, the surrounding atmosphere is drier and warmer. This has been partially exemplified in some parts of Scotland, and in the fens of Lincolnshire, since they have been drained.

It is not only, however, the mean average depth of rain which falls upon a district, but the nature of the soil, and especially of the subsoil which hastens or retards the arrival at maturity of its crops—for instance, the harvest is much earlier on siliceous, sandy, or gravelly soil, and considerably later on aluminous or clay soils, than we might be reasonably led to expect from the climate, and their elevation above the level of the sea—thus the crops are never so good or so early on cold tenaceous clay soils on the gritstone formation, or on the moorlands in Yorkshire, at an elevation of 500 feet, as they are on the chalk wolds in the same county, at an elevation of 800 feet. It is this difference which gives to dry calcareous and siliceous soils so very considerable an advantage. Land situated at still greater elevations than this, is in this country of still less value, and at an elevation of 1,000 feet above the level of the ocean it ceases to be profitable for arable purposes, since it is only in very particular seasons that the crops ripen, and hence at such an altitude the land is generally devoted to pasturage.

The effects, then, which I have thus rapidly traced of varying moisture and of heat upon the indigenous plants of the earth, and upon the cultivated crops of agriculture, are circumstances which must be carefully regarded by the farmer who is desirous of varying the ordinary modes of cultivation. They are facts, however, like all those where the influence of the seasons is concerned, which must be ever subjected to very material variations; but still they are sufficiently uniform in their general results to enable the cultivator to draw highly important conclusions, which will not only tend to improve his knowledge of the most scientific modes of productive farming, but enable him to continue his healthful and gratifying researches with all that noble confidence which a better understanding of the works of God, as so beautifully displayed in the laws which regulate the vegetable world, is certain to increase.

ELECTRICITY OF PLANTS, AND INFLUENCE OF ELECTRICITY ON VEGETATION.

Royal Institution.

Friday, May 16.—The Rev. E. Sidney on the Electricity of Plants, and influence of Electricity on vegetation. In introducing the subject of his lecture, Mr. Sidney took occasion to draw attention to the important nature of the inquiry, its high interest as a branch of natural science, and the valuable practical results which might possibly be brought to light in its investigation. The attention of electricians, he stated, had been drawn to the subject so long back as 1746, when a Mr. Maimbray, at Edinburgh, announced that electrified plants grew more rapidly and vigorously than those that were not so treated; about the same time the Abbé Nollet discovered that electrified seeds germinated with increased facility; and these observations were confirmed and extended by the experiments of Bertholon and Jalabert, the former of whom attributed very marked effects to the use of electrified water. The truth of these experiments was supported by some electricians, but denied by others, who, upon repeating them could not perceive any effect produced on the electrified plants; amongst the latter class stands the name of Sennebier; but on reading the account of how his experiments were performed, it is no longer surprising that he failed to perceive any effect from electricity as he placed the seeds which were to be electrified inside an electrified vessel, a situation in which it is evident they would not be exposed to the electric influence. After briefly adverting to the more recent observations of Davy, Pouillet, and others, Mr. Sidney drew attention to the recent progress of the subject, and the high interest it was at present exciting. The first point which the lecturer insisted on, was, that electricity appears to exercise a powerful influence on growing plants; in support of which he quoted a number of experiments and observations, all tending to show that plants, under the influence of electricity, grow with increased vigour, and more especially when negatively electrified. The manner in which drooping plants have been observed to revive, on the artificial application of electricity, was also noticed; and, lastly, the effects which are found to be produced by thunder-storms were described. The rapid growth of plants during thunder-storms might, no doubt, in part be attributed to other causes; but, at the same time, it was a very fair inference that the electric condition of the air had something to do with the phenomena, as such a conclusion was borne out by numerous experiments, on a small scale, made with artificial electricity. Electricity of low, like that of high tension, has been found to affect germinating seeds and growing plants in a remarkable manner; it was noticed by Davy, that seeds germinated more freely at the negative pole of the voltaic battery than at the positive, and since his time numerous experiments have been made, all tending to prove that voltaic electricity powerfully affects plants. Mr. Sidney next drew attention to the facility with which fresh vegetable matters conduct electricity, in consequence of the good conducting power of the fluids which they contain; this was illustrated by placing a small blade of grass in contact with the conductor of a powerful electrical machine, when it was proved, that the whole of the electricity generated by the machine was quietly carried away by the blade of grass. It was also shown that the pointed forms of the leaves and other parts of plants, combined with their good conducting power, fitted them most admirably to receive or disperse electricity; and hence electricians sometimes employed vegetable points in place of metallic ones for those purposes. To show this, a large Leyden jar was quickly and silently discharged by bringing the pointed blades of grass near its outer surface, and the brass knob at the top. In consequence of the high electric powers of plants, as might be supposed, they exerted a marked effect on the electric condition of the atmosphere, so that when an electroscope indicated abundance of electricity in the free open air, it indicated none in the vicinity of a tree with pointed leaves. In illustration of the good conducting power of vegetable matter, Mr. Sidney stated that it was impossible to give an electric shock to a circle of people standing on a lawn, as the electricity invariably took the shorter and better conducting course through the grass; whilst there was no difficulty in giving a shock to any number of persons standing in a circle on gravel. 3rdly. The apparent adaptation of the various parts of plants to different electrical uses, was pointed out. Thus, the first leaves of many plants are pointed and acute; others rounded or globose. The buds of most plants are pointed, or covered with a strong pubescence. Some plants, more especially those which grow rapidly, have an immense number of sharp points, or pointed hairs; whilst those which grow less rapidly, or are intended to meet the variations of the seasons, are less pointed, but often provided with dry thorns or prickles. As plants come into flower, they generally tend more to a globose form; the flower-buds are generally rounded, and the fruit, or seed-vessels, are seldom provided with acute points. It may, therefore, possibly be the case, that though electricity is favourable to plants at one stage of their growth, it is hurtful to them at others, just as is well-known to be the case with light, which is essential to them when full-grown, but is hurtful to them in the embryo state. The general phenomena of vegetation were then considered in relation to electrical agency.

It would prove an interesting subject of inquiry, to examine in how far the rise of the sap in spring is influenced by electricity; it is certain that in spring, and before the leaf-buds are opened, whilst they still retain their pointed form, the air is dry, and in the most fitting state for electrical effects. Mr. Sidney, then adverted to the singular powers which plants have of precipitating moisture from the atmosphere, an effect which he suggested might possibly be of electric origin, and endeavoured to strengthen this view by a number of ingenious arguments; amongst others, the remarkable cases described by Mr. Weekes and other electricians, in which showers of rain were brought down by the use of uninsulated kites. The lecturer next endeavoured to show that the forms and geographical distribution of certain species of plants indicate a relation to their electrical properties. Thus, for example, the numerous Pine and Fir trees which abound in high latitudes, present most admirable extensive discharging apparatus for receiving or dissipating electricity; and, supposing the preceding observations correct, such trees would exert most important and beneficial influence in equalising the electric condition of the atmosphere, and tending to produce a greater uniformity of temperature. Lastly, the subject was considered as a purely practical one, and the prospect which there exists of electricity being advantageously applied to stimulate or assist vegetation inquired into. Mr. Sidney seemed to think it very questionable whether electricity could ever be usefully applied to the improvement of agriculture, but, in horticulture (in forcing flowers and fruits,) he thought there were prospects of decided benefit; and, therefore, that this branch of the subject was well deserving a careful experimental investigation.

Electricity, both common and voltaic, might probably be advantageously employed in assisting the germination of old and dry seeds; and likewise, applied with caution, in the culture of exotics and other hot-house plants, its use might be productive of good results. The lecturer exhibited several plants which he had caused to grow in earth under the influence of a feeble current of voltaic electricity, generated by a plate of zinc and another of copper, connected together, buried in the soil beside the roots of the plants; and in the case of plants of Potato, Cineraria, and Mustard, which he exhibited, a very marked effect appeared to have been produced, as the galvanised plants were larger and much more vigorous than those without the plates. He stated that he had also produced a very good effect on Pines, Cress, and Fuschias, but had found plants of Pelargoniums killed by the application of the zinc and copper plates. The well-known experiment of Dr. Forster, on Barley, was then described, and shown to be a decidedly unphilosophical arrangement, so that it appeared very doubtful whether electricity had anything to do with the large increase of crop said to have been obtained by that gentleman. At the same time, the experiment was highly deserving of attention; and Mr. Sidney suggested that it would be well worth while to try experiments on electro cultivation, describing several which have been commenced in Norfolk and elsewhere, on more accurate principles; he also gave a brief sketch of some of the experiments on this subject, at present being made by Mr. Edward Solly, in the gardens of the Horticultural Society. The lecture was, throughout, worded in the most guarded and cautious language, the whole subject being new, and but very little understood; it was, therefore, brought forward rather with a view to excite attention, and induce further research, than to propound theories, or make startling assertions. Mr. Sidney very justly observed, that putting all theories aside, there appeared to be sufficiently numerous well-authenticated facts to warrant further inquiry and experiment.—*From the Gardeners' Chronicle, May* 24, 1845.

ELECTRIC AGENCY APPLIED TO HORTICULTURE.

I have been making several experiments, the results of which have been of the most satisfactory character. My application of the subtle agent has been through the medium of galvanism, and as it is generated it is totally under control, which is not the case if it is collected (as is generally the case) from the atmosphere, which is always subject to the uncertain fluctuations known to exist in telluric and atmospheric electricity. My experiments are, of course, far from matured, but yet they may not be void of interest to yourself.—*First Experiment:* I took an old 50-pair galvanic trough, and lined one-half the length of one side with zinc, and the opposite side in a similar manner with copper; they being about 12 inches long and 2 deep, leaving a distance between the plates of 4 inches, and connected by a zinc band. The trough was filled with moist soil and Turnip-seed sown thickly upon the surface and pressed into it, but not covered, one-half being under the galvanic influence, the other in a natural state. Results: The seeds under galvanic influence swelled and sprouted many hours before the others, and twice as many vegetated; and by the time they were all well up the galvanic ones had the advantage of 24 hours. I should tell you that they were placed in a temperature of more than 60°, and were all well up in three days; therefore 24 hours is a most extraordinary advance.

Second Experiment: I lined a common flower-pot, 6 inches wide at the top and 4 at the bottom, with zinc and copper, as in the last experiment, the plates being, of course, deeper; I then sowed three Cucumber-seeds in it, and three in another pot, without galvanism, and placed both in the same temperature, as the last experiment. Results: In the course of two days, the galvanic seeds appeared 11 hours before the others; in three days both were well up, the galvanised having greatly the advantage in strength and colour, and going a-head rapidly. After a lapse of a fortnight, the galvanised seeds seemed to have the advantage of four days' growth, were much darker in colour, and about twice as strong, healthy, and vigorous. I also tried an experiment with some Peas, which had been sown some time previously, and were just cutting the ground. A zinc plate, 1 foot square, was placed at the end of one of the double rows, and buried to an inch below its upper edge, and a similar plate of copper was buried at the other end to the same depth, and connected by a copper wire. The weather was showery, and the growth of all was rapid. In the course of 30 hours, the galvanised ones had assumed a darker appearance, and were more regularly up, than the others, and decidedly in advance; and in the course of a fortnight they were so much forwarder than the others, as to be easily seen at a considerable distance, and were altogether much higher and stronger. I am also trying an experiment with some Potatoes, but they are not up yet. These results have been so satisfactory to me, that I intend to try the principle upon an acre of Barley, and am preparing the wires for that purpose; and, when finished, will send you the results.—*A. Ibid.*

INDIA-RUBBER FOR GRAFTING.

It is often, in grafting upon slender stocks and branches, very inconvenient to attach and support a great lump of clay, which, in spite of the greatest care and attention, will, either in very wet or very dry weather, crack and fall away. Last spring I made trial of sheet India-rubber, cut into narrow strips or bandages, from ¼ to ¾ of an inch broad, which I applied to the graft—having first fixed the graft with bast—and with success. The India-rubber presents all the requisites sought for in clay; it is air-tight and water-tight, and moreover, it will not fall away; and it is elastic, which admits of the swelling of the scion in its growth, and it is applied with perfect ease and quickness. After wrapping the bandage round the graft and stock, as you would a linen bandage on a cut finger, the last turn only requires securing by tying with a bit of thread or thin bass; and it has a very light and neat appearance, when the operation is completed.—*G. L. Ibid.*

Correspondence and Selections.

FURTHER PARTICULARS REGARDING THE NERIUM INDIGO.

Extract of a letter from G. J. FISCHER, ESQ., *dated Salem, 8th January* 1845, *to* DR. ROBERT WIGHT, *at Coimbatore.*

I have just received your packet of the 4th, and shall be most happy to contribute what information I can in removing Mr. Taylor's sceptical impressions in regard to the " Nerium Tinctorium."* The Statement in the " Library of Entertaining Knowledge," is perfectly correct, every part of it. It is to the hilly and woody Carnatic and Northern Circars he must look for a confirmation of it, and not in the open champaign country of Bengal.

The " Nerium Tinctorium," commonly known as " the Palah tree," grows wild, and in the greatest abundance, in all the hilly tracts throughout Southern India; and the natives have made Indigo from it for country consumption from time immemorial. Their process is a very rude one, and consequently their produce of a quality not at all suitable for export, full of sand and dirt of every kind; yet there is the dye; and though of impaired strength from bad treatment, yet it answers all their purposes from being so cheap and so soluble,—it is generally used in the state of paste. Dr. Roxburgh's treatise on the subject (the Indigo was no discovery of his, but only an improved mode of manufacture that he adopted,) induced Mr. Heath to turn his attention to it in 1823, and to set up factories after the Doctor's plan, with the exception of the beating apparatus which was greatly improved by one of his superintendents, and with the exception that we bought the leaves by weight, instead of employing coolies on monthly pay to bring it. These factories Mr. Heath worked till 1830, when he gave them up, partly from failure of funds, partly on account of the

* Mr. Taylor's remarks will be found at page 86.—*Eds.*

great fall of Indigo, and partly in favor of certain Chrome* works which he was setting up at Porto Novo, and for which the boilers were required, and taken away. In the beginning of 1833, I took over the factories, dismantled as they were, in settlement of accounts between us; and in 1834 the famine having broken out, and the Indigo trade revived, I applied to Government, and got some boilers from their Gunpowder Manufactory, the only place where they were obtainable, and set two of the factories agoing. I could not afford to do more, because the price charged by Government was so enormous, 50 per cent., in addition to what they themselves had paid for them, which was high enough: and these two factories I have worked ever since with tolerable remuneration. The Indigo sells better than even the Cuddapah indigo. In 1842, it fetched from 4*s.* to 5*s.* 6*d.* per lb. Later Account Sales I have not got.

The only reasons I can assign for the non-extension of works for this kind of Indigo are the great expense of the boilers, and the limited quantity of Indigo that you can make at any one place. I meet the last drawback by making both kinds of Indigo at the same works, the Nerium and the Avery: they interfere very little with each other, and the same works and same establishment answer for both; and, by the two together giving the works constant employment during the season, reduce prices materially.

It will never do to sow the tree; it is of exceeding slow growth†, and hundreds of thousands are required to feed one work, nor will a work succeed except where natural advantages are combined, such as plenty of jungle for firewood, and plenty of land, paying no rent to

* This was in consequence of the high prices of the Chrome dye at the time, and the discovery of a rich deposit of the Chromate of Iron in this neighbourhood.

† "How far Mr. Fischer is correct in his remarks regarding the slowness of the growth of the tree, I am, at present, unable to say. In the arid sterile soils where only it is permitted to grow wild in any abundance, I dare say he is right; but I suspect if treated like mulberries, and grown in a richer soil, it will not be found so slow. The question will then be, whether the cultivated plant will yield as good Indigo as the wild one? This can only be ascertained by experiment. As it is never cultivated in this part of the country, I am sorry I can give you no information on that point. The tree itself is certainly a very handsome one, and well worth the trouble of introduction simply on that account, even should it disappoint the expectation of speculators."—*Extract of Dr. Wight's letter of* 19*th June*, 1845, *to the Secretary of the Agricultural Society.*

Government, yielding the tree, and that free of cost and charge of planting; but of such situations there are thousands in Southern India, and all that is wanting to turn them to account is capital and enterprise.

SUCCESSFUL CULTIVATION OF THE CHINA SUGAR-CANE AT BUXAR AND DHOBA.

Extract of a letter from P. P. CARTER, ESQ., *dated Bhojepour, near Buxar, 5th June* 1845.

"Of the five descriptions of Sugar-cane I obtained from the Society in March last, the "China" has succeeded so wonderfully in spite of white ants, heat, and every evil, from which the others (and even the country cane of the district) have suffered so severely, that I am very anxious to have some correct information of its qualities; and shall feel very much obliged to you for obtaining the opinion of any person who may have given it an extensive trial in this country. Should this "China" prove to be a good yielding cane, producing sugar of good quality, I would cultivate it in preference to Otaheite and every other description I know of. I am rather curious to know what height and thickness it attains at full growth, as from its present vigorous appearance it promises even to surpass the Otaheite, while the seeds were scarcely thicker than my little finger. In March last I found a species of sugar-cane growing on the "Deearrah" or alluvial lands of the Ganges so much larger than the common (the specimens brought me being at the least eight cubits long and two quarters of an inch in circumference,) that I got some and planted out in the same field with some of the country, and from its vigorous appearance and broad, dark-colored leaves and hardiness, it very closely resembles the "China" above spoken of. The natives pronounce it an inferior cane, the goor obtained from it being not easily convertible into sugar; but this, I am inclined to believe, is rather attributable to the soil and mode of cultivation, and to its generally being for upwards of two months in the rainy season, inundated by the Ganges."

MY DEAR SIR,—In reply to yours of 16th instant, I regret I am unable to furnish your correspondent at Buxar with any satisfactory account of the actual yield in sugar from the China cane, my cultivation of it hitherto having been on too small a scale to allow of my working it up separately with our machinery. It may be however some satisfaction for him to learn, that so far as the experiments I made with it extended, they proved quite as promising here as he has found his to be in Buxar, and it was only your inability to supply me with plants that prevented my extending the cultivation this season. Of all the varieties of cane I have tried, the China has proved by far the hardiest in surmounting the attacks of white ants, heat, and drought, and it has yielded me a good crop at the rate of two hundred and two B. Mds. of cleaned cane per beegah from the same situation in which Otaheite, and two varieties of blue cane, were all but destroyed by the white ants; and in which common country cane yielded its usual average of 150 Mds. per beegah.

At the mill the China yielded fifty-five per cent. by weight of juice to forty-five per cent. trash, the juice being of the gravity indicated by eleven per cent. of Baumé's Saccharometer, which is equal to the average of the best cane juice I have seen produced in these parts: so that there is nothing in these premises to discourage the hope of its produce in sugar proving inferior to the results it gives in the field.

Its aspect when growing also seems to confirm its adaptability to this climate, for though the canes are only from three-quarters of an inch to one inch in diameter, it grows to the height of ten and twelve feet with very ordinary cultivation, and I have counted as many as eighteen and twenty canes spring up from one stole. It has a bountiful supply of long slender leaves, which keep their fresh green appearance far better than the other varieties.

I had an October cross last year, half with China and half with country cane plants: the latter barely survived through January, and were all cut off by the hot winds before March was over; while the China are now fine-looking plants, and I hope will be ready to cut by November next.

I hope the above may be not quite without interest to your correspondent, and I should be very glad to learn in due time the result of his own experiments.

I remain, &c.,

Dhoba, 20th June, 1845. S. H. Robinson.

ACCOUNT OF AN EXHIBITION OF VEGETABLES, FRUITS, &C. HELD AT LUCKNOW IN JUNE, 1845.

Extract of a letter from Capt. G. E. Hollings, *Secretary Branch Agri-Horticultural Society at Lucknow, dated* 18*th June,* 1845.

" I have the pleasure to forward a list of the prizes awarded at our Exhibition of the 9th instant; the show far exceeded our anticipations, and there cannot be a doubt that a periodical repetition will ensure the attainment of the object we have in view, namely, an improvement in the culture of fruits, vegetables, and flowers.

" Specimens of cereal grains grown in our garden were exhibited for the satisfaction of those who took an interest in their cultivation. You will be able to form an opinion of their quality when you get the parcels I have forwarded by steamer."

List of Prizes given to the different Mallees belonging to the Gardens in the Cantonment and the City at Lucknow, on the 9th June 1845.

Names of Articles.	*Amount of award.*			*To whom awarded..*
Fruits.				
Bombay Mangoes,				
1st Sort,...				Nidhan, Colonel Wilcox's Mallee.
2d Ditto, ...	1	8	0	Munshaw, Charbaugh ditto.
3d Ditto, ...	2	0	0	Ditto —— ditto —— ditto
Country, 4th Ditto,..	1	0	0	Ellahee Bukhsh, Gardener of Hosseina- [bad do.
Peaches.				
1st Sort,....	2	0	0	Issuree, Lieut. Chamberlain's do.
2d Ditto, ...	1	0	0	Nanhoo, Charbaugh do.
China Ditto, ...				
1st Sort,....	2	0	0	Issuree, Lieut. Chamberlain's do.
2d Ditto, ...	1	0	0	Keerah, Residency do.
White Grapes, ...	2	0	0	Bhola, Captain Bird's do.
Purple Ditto, ...	2	0	0	Thakoor, Charbaugh do.
Bedänäh ditto, ...	2	0	0	Keerah, Residency do.
Strawberries, ...	3	0	0	Nanhoo, Charbaugh do.
Plantains,				
Large, ...	1	0	0	Golaub, Mirza Dara Setoat Bahadoor's [do.
Small, ...	1	0	0	Dhurrum Doss, Residency Mallee.
Musk Melon, ...	1	0	0	Golaub, Mirza Dara Setoat Bahadoor's [do.
Water Melon, ...	0	8	0	Ditto —— ditto —— ditto.
Figs,				
White, ...	1	0	0	Keerah, Residency Mallee.
Black, ...	1	0	0	Budloo, Major Scott's do.
Alloobokharah, ...	1	0	0	Bisram, Captain Bird's do.
Phalsa, ...	0	4	0	Ellahee Bukhsh, Hossainabad do.
Shaddock,..	0	8	0	Ditto —— ditto —— ditto.
Orange, ...	0	8	0	Hoolass, Charbaugh do.

Names of Articles.	*Amount of award.*			*To whom awarded.*
Cocoanut, ...	1	0	0	Bisram, Captain Bird's Mallee.
Pomegranate, ...	1	0	0	Keerah, Residency do.
Guavas, ...	0	4	0	Goorbuxsh, Rev. Dr. Carshore's do.
Sugar-cane,				
1st Sort, ...	2	0	0	Keerah, Residency do.
2d Ditto, ...	1	0	0	Gungah, Captain Bird's do.
				* N. B. The prize Mango weighed forty-four rupees.
Vegetables.				
Asparagus, ...	2	0	0	Nanhoo, Charbaugh Mallee.
Cabbages, ...	1	0	0	Goorbukhsh, Rev. Dr. Carshore's do.
Carrots, English,				
Orange, ...	1	0	0	Nihaul, Colonel Wilcox's do.
White, ...	1	0	0	Thakoor, Charbaugh do.
Carrots, Horn, ...	1	0	0	Goorbukhsh, Rev. Dr. Carshore's do.
Turnips,				
Red, ...	1	0	0	Ditto —— ditto —— ditto.
White, ...	1	0	0	Nihaul, Colonel Wilcox's do.
Potatoes,				
Bangor, ...	1	0	0	Ditto —— ditto —— ditto.
Apple, ...	1	0	0	Dabee, Charbaugh do.
Beet Root,				
Red, ...	1	0	0	Oussaree, ditto ditto.
White, ...	1	0	0	Thakoor, ditto ditto.
Salsify, ...	1	0	0	Oussaree, ditto ditto.
American Parsley.	0	8	0	Ditto —— ditto —— ditto.
Celery, ...	2	0	0	Goorbukhsh, Rev. Dr. Carshore's do.
Onions,				
Bombay, ...	1	0	0	Keerah Residency Mallee.
Sereenuggur, ...	1	0	0	Munshaw, Charbaugh do.
White, ...	0	8	0	Teizee, Dr. Login's do.
Leek, ...	0	8	0	Nanhoo, Charbaugh do.
Yams, ...	0	8	0	Bukhtawur, Captain Fraser's do.
Maize,				
American,....	1	0	0	Oussaree, Charbaugh do.
Country, ...	0	8	0	Gouree, Residency do.
Kurrella, ...	0	8	0	Keerah, Residency do.
Bangun, ...				
English, ...	0	8	0	Sukkut, Lieut. Fenwick's do.
Country, ...	0	8	0	Teizee, Dr. Login's do.
Tomato,				
Large, ...	0	8	0	Sukkut, Lieut. Fenwick's do.
Cherry, ...	0	8	0	Goorbuxsh, Rev. Dr. Carshore's do.
Capsicums, ...	0	8	0	Nanhoo, Charbaugh do.
Pulwul,....	0	8	0	Dyal, Residency do.
Sheetaphul or Cucurbita Pepo,				
Cabool, ...	0	8	0	Ditto —— ditto —— ditto.
Country, ...	0	8	0	Chutree Poor House's do.
Beans, ...	0	8	0	Bheekharee, Captain Hollings' do.
Turmeric, ...	0	4	0	Bissram, Captain Bird's do.
Arrow-Root, ...	1	0	0	Nanhoo, Charbaugh do.
Flowers.				
1st Sort,....	3	0	0	Bhola 2nd, Colonel Hervey's Mallee.
2d Ditto, ...	1	0	0	Bheekaree, Captain Hollings' do.
3d Ditto, ...	1	0	0	Sobha, Colonel Wilcox's do.
Total, Rupees,....	67	4	0	

G. E. Hollings, *Secretary.*

Experiments on the growth of Indigo, under various modes of treatment. Communicated by W. HAWORTH, ESQ.

To JAMES HUME, ESQ., *Secretary Agricultural Society.*

MY DEAR SIR,—I have the pleasure to hand you the following particulars of an interesting experiment I have lately had tried on a small scale, on the growth of *Indigo* under various methods of treatment; the general result of which, I have no doubt, will prove interesting to many members of the Agricultural Society.

On the 22nd March last, six rows, of about eight feet long each, were sown with the same description of Indigo seed, as follows:

Row No. 1.—Was sown in the usual way in poor ground, without manure.

Result, 31st July.—A fair healthy plant, about 4 feet to 4-6 high, well covered with leaves and small branches.

Do. No. 2.—Seed mixed with a small quantity of pulverized sal-ammoniac, and sown together.

Result, 31st July.—No signs of vegetation had ever been seen from the time the seed was put in.

Do. No. 3.—The seed was sown in plain ground as in No. 1, and at once placed under the influence of galvanism.

Result, 31st July.—A very healthy plant, of about 5 feet in height; but unfortunately this row was partly shaded from the sun by a tree during the greater part of the day, and evidently suffered from this cause, as did also a part of row No. 1; and on this account I consider this part of the experiment unsatisfactory.

Do. No. 4.—The seed in this row was sown mixed with bone-dust.

Result, 31st July.—No signs whatever of vegetation.

Do. No. 5.—The seed was steeped in a weak solution of sulphate of ammonia for 24 hours, and then sown.

Result, 31st July.—A very fine plant from the first, about 6 feet high to 6½, and well covered with leaves and small branches.

Row No. 6.—The ground in this experiment was prepared by watering it with a solution of 1 oz. of sulphate of ammonia, and two quarts of water, which was sufficient to saturate the ground to a moderate depth.

Result, 31st July.—Was the most satisfactory of all, the plant reached the height of 6 to 6-6, and was most luxuriantly filled out with branches covered with healthy leaves, and in every respect appeared to be all that could be wished.

I have but a few observations to make on these experiments, and my object in now bringing the subject before the Society, is to call the attention of parties more deeply interested than myself in the growth of Indigo, as well as other parties generally interested in Agricultural pursuits, to the importance of further investigating the influence of electricity on vegetation, as well as to the use of various well known and inexpensive salts as manures, and also to test the value of various manures, such as bone-dust, guano, &c. I believe most planters have sufficient time, and can also easily attain the necessary knowledge for carrying into effect such simple trials; a moderate degree of patience and perseverance is required to ensure success. In the above experiments it will be seen that Nos. 2 and 4 were entire failures in this instance; still, I have no doubt, further trials of the same processes, somewhat modified, would be successful: for instance, had the sal-ammoniac in experiment No. 2 been mixed with a quantity of earth some days previous to the seed being sown, or had it been applied to the ground in the form of a solution as in experiment No. 6, it is probable it would have succeeded; again, had the bone-dust in experiment No. 4 been first mixed with earth and allowed to remain for some days to expend a portion of its strength on the surrounding soil, it would have answered better.

I may add, that in consequence of observing the very rapid vegetation of the plant under the influence of "galvanism and ammonia," compared with the plant growing in common earth, I had *three* pots prepared, into each of which four stems of the Indigo plant, from rows Nos. 1, 3 and 6, (say the plant from each number into separate pots) were transplanted. These I intended for the inspection of the members of the Society at their last Meeting; but from various causes I overlooked the appointed day, or else these specimens were very satisfactory.

The plants under the influence of galvanism, were twice the height of those growing in the common way; but the plants from *seed only*, steeped in a solution of ammonia for 24 hours, were more than three times the height and size of the common plant; it also came to maturity, and seeded nearly a month before the latter, or plant growing in common ground, and the plants under galvanism kept about midway between the two both as to bulk and time of seeding: they are still in existence, but the backward plant has now nearly overtaken the forward ones, except that the seed of the latter is now almost all ripe, while the rest is in green pod. I am sorry my immediate departure from Calcutta will prevent my continuing these experiments; but I trust to hear, that other parties have been induced to follow up such trials on a more extended scale than I had either time or convenience to put in practice.

I remain, &c.

W. Haworth.

Calcutta, August 4, 1845.

Progress of Silk culture at Bangalore, with a few remarks on the vegetable products of that station. Communicated by Dr. F. J. Mouat.

To J. Hume, Esq., *Honorary Secretary, Agricultural Society.*

Sir,—I beg leave to send you a few shawls to show to the Agricultural Society as specimens of Mysore manufacture. The silk was obtained from worms reared in the neighbourhood of Bangalore, where there is a splendid mulberry garden and stone worm-house, containing an immense number of the insect in every stage, from the egg to its perfect and mature condition. Captain Haines, the Superintendent of the Garden, has promised to send me an account of it with specimens of the cocoon and raw silk when reeled. The manufactured condition is well exhibited in the specimens now submitted, of which the dyes, patterns and every thing connected with them are the unaided labours of the Bangalore manufacturers, with the single exception perhaps of the reels, some of which were constructed by Capt. Green of the Madras engineers, and are very simple and efficient. The shuttles used are all native, and of the rudest and most primitive form. It was my intention when I visited the garden and manufactures carried on within the pettah or native town of Bangalore, to have drawn up a short account of them for the Society; but as the officer in charge of them, who is not only well acquainted with the subject, but takes great interest in it, has kindly promised to do so, the Society will be no losers by my silence. The silk manufactures of every part of India are so important, and capable of being carried to so great a pitch of perfection, as to be worthy the attentive consideration of all, who take an interest in developing and improving its resources. To no one can any part of the country be more deeply indebted than is Mysore to the present Commissioner, General Cubbon of the Madras Army, an officer uniting the highest and rarest mental endowments, with the best qualities of the heart, who has not only succeeded in raising considerably the revenues of the province entrusted to his care, but has accomplished the more difficult task of conciliating the turbulent refractory spirits under his rule, and gaining the good will of every class, native as well as European. My recent visit to Bangalore was so brief, and at so bad a season of the year, as to prevent my investigating its mineral and botanical resources, nor could I obtain any of the great works which have already been published, and afford valuable information regarding the Mysore territories generally.

The Botanical Garden* which was so flourishing under the zealous care of Captain Munro, of H. M. 39th, and Dr. Smith, has been abandoned, and made over I believe to the Rajah, from want of encouragement and support from the residents of Bangalore. Its distance from the cantonment appeared to be the chief objection to it. The natural advantages of Bangalore as regards climate and soil are very great, and might with a little public spirit and enthusiasm in agricultural pursuits, be rendered productive of much benefit to the surrounding country, yet there is probably no station in India of the same size, and possessing a similar amount of wealth and intelligence, where so little use is made of them in these matters.

* A very interesting report regarding this garden, drawn up by Capt. Munro in 1839, is published in Vol. VI, of the Society's Transactions.—*Eds.*

The vegetables of the Calcutta market with all our natural disadvantages to contend against, are, thanks to the exertions of the Agricultural Society, superior to those of Bangalore, where they might be easily rendered as fine as are to be found in any quarter of the world, by teaching the native gardener improved methods of cultivating them.

The whole surface of the part of the country through which I passed was covered with masses of granite, and gneiss is stated to be the universal subjacent rock; mica, felspar, and quartz also occur in great abundance.

Flowers are numerous and varied in the private gardens of Bangalore, and many fruits attain great perfection; among the former may be enumerated several varieties of the rose, geranium, dahlia, violet, honeysuckle, sweet briar, jessamine, pinks, stock, larkspur, with several other kinds which appear to thrive without much care or cultivation; among the latter are seen strawberries, melons, grapes, mangoes, apples, oranges, the pumplenose; and some others, which do not thrive so well.

Bangalore in fact needs only the presence of a Major Napleton, to render it a perfect paradise for the production of fruits, flowers, and vegetables.

Calcutta, Medical College, I have, &c.
August 2nd, 1845. F. J. Mouat.

Report on the Silk Fabrics alluded to in Dr. Mouat's *communication.*

(*Extract of a letter from* J. W. Laidlay, Esq., *dated Calcutta, 12th August,* 1845.)

"I have taken some pains to ascertain the value of the silk shawls from Bangalore, which are highly interesting from the rapidity with which so beautiful a manufacture has sprung up where a few years ago silk was scarcely known. I am not sure however if much dependence is to be placed in the valuations I have obtained, for such manufactures are quite unknown in this part of India, where the weavers attempt little beyond the plain Korah, unless it be a few checked goods and imitation of tartans at Cossimbazar, and some poor attempts at raised or flower-work at Radanaghore. The former of these, under due encouragement, might be much improved; I send a specimen of checked work I happen to have by me. These shawls were pronounced by all the dealers to whom they were shown to have come from China; and valued, at 20 for the largest, 8 for the next, and 4 Rs. each for the rest. I do not think them *over*-valued by any means: for the texture seems good, the colours are very fine, and in every respect they are a creditable specimen of Mysore skill. The warp seems to have been prepared somewhat differently from what is customary in Bengal; having been *trammed* or *orgauzined*, whereas in silk goods made here it is used plain. I think the Society is much indebted to Dr. Mouat for the opportunity he has afforded us of seeing these interesting productions."

EXPERIMENTS WITH GUANO ON GARDEN PRODUCE.

Extract of a letter from F. W. Russell, Esq., *C. S.*, *dated Hooghly, 2nd August,* 1845.

"The following are the results of some of my experiments with the guano which you were so kind as to send me, and they are much at the service of the Society.

I weighed three seers of guano and sprinkled it on a piece of ground, about 30 yards long by about 20 wide, during a shower of rain. A few days after I sowed on part of it two seers of marrow-fat peas, and I planted out some cauliflowers and nole-kole and cabbages. All came on most astonishingly, and the peas looked strong and healthy; but when they reached the height of a foot or so, they ran rapidly up in a few days, then shrunk and died as if over-exhausted. In another spot I planted marrow-fat peas, and when they were about eight inches high, prior to putting the rods to them I drew two lines with a quill on either side of the plants, about eight inches from them, and put a small quantity of guano in the drill and covered it up and watered it. I suspect I dosed them too strongly; they seemed to receive unusual vigor, but died very soon. I then tried a third experiment; I soiled the ground, which was previously rich, with a lesser dose of guano than the first. I put one seer where I had before used three; the result was astonishing: the plants ran up to the height of ten feet and more, with stems thicker than I ever saw or could have believed possible, and I feared it would be "all cry and no wool;" but they threw out magnificent flowers and then podded, and the length of the pod and size of the peas astonished every one who eat them,—their flavor was delicious. The pea experiments were all on the same seed, marrow-fats from Patna. The nole-kole were finer than any I ever saw. I cannot say much for the cabbages; some persons thought them very delicious, but I own I did not myself observe much difference; perhaps they would have stood a stronger dose. The cauliflowers on this ground flourished magnificently. I never beheld finer or more splendid plants; but when they flowered, they threw up the flower at once like seed, and there was no fine, firm, flat head; they were like cauliflowers running to seed, but they did not bear any. I tried an experiment on other plants. I put a circle round the root, and put a less quantity than I had done, at least so I thought. They were certainly fine plants, but did not come up like those manured with bone-dust; but not having any bone-dust this year, I could not compare them together. I had not sufficient leisure to make so strict an investigation as I could have wished, but I am sure that an attentive gardener will benefit his peas and nole-kole with guano; but he may kill them by an overdose: hence, it must be done with skill and care. I killed a whole bed of fine parsley and onions, with only sprinkling a very little on the ground."

ACCOUNT OF A THREE-YEARS-BEARING MANGO TREE OF ARRACAN.

Extract of a letter from Major D. WILLIAMS, *to* DR. WALLICH, *dated Kyouk Phyoo, 7th July,* 1845.

"I may as well mention how I became acquainted with this three-years-bearing mango-tree. Some years ago when in charge of the Ramree district, an old and respectable inhabitant of the town brought me some mangoes which, from their shape, smoothness of skin, and superior flavor, were very different from those I got elsewhere; on enquiry I found the fruit grew in his garden, whither I immediately went, and was astonished to find trees not above four feet high covered with beautiful-looking ripe fruit, the branches being supported to prevent their breaking under their heavy burden.

I had all trees that would bear it removed to the cutchery grounds, some even with their fruit on, and they are alive and bear to this day; afterwards, yearly, I purchased from the old man his mangoes, and raised from their seed, plants which I distributed all over the district of Ramree, and am now doing so in this district, and planting them in gardens of my own. They are never raised from grafting, of which the Mugs know nothing. The seed will vegetate by being thrown any where in shade (the sun will destroy it) exposed to the rain or moisture; our common mango trees fail in bearing occasionally, every third year I believe: these trees have never failed, nor have I seen any of them attacked by worms. The stone or seed is flat, the skin smooth, not much thicker than paper, and the flavor delicious. It is my intention to send some plants for the Horticultural Society to Mr. Hume, and shall feel obliged by your mentioning this to him."*

RESULT OF AN EXPERIMENT TO INTRODUCE AMERICAN COTTON INTO THE DISTRICT OF SHAHABAD.

Extract of a letter from GEO. FIELD, ESQ., *Deputy Opium Agent, to* E. C. RAVENSHAW, ESQ., *Commissioner of Patna, dated Arrah, 5th July* 1845.

"I did not submit the promised report in continuation of my letter of the 18th July 1843,† on the result of the experiment made to introduce the American cotton seeds into this district, as it proved quite a failure as far as the native cultivators were concerned. With my letter above-mentioned, I sent samples of the produce of the few fields that escaped destruction by the heavy rains of 1842, and the gale of October of that year; and during my tour of the district in the cold season of 1843-44. I went to these villages and made enquiries

* Since this letter was written, Major Williams has kindly forwarded five seedlings, which have been planted out in the Society's Nursery garden.—*Eds.*

† This communication of Mr. Field will be found in Vol. II, page 200, of the Journal.—*Eds.*

about the crop, but found it had been ploughed up and the ground sown with other crops, and that there was no disposition to renew the experiment; in fact, the cultivators thought it a hardship that their best lands should thus be occupied in experiments.

As regards my own attempt, the result was otherwise. The 12¾ cottas of ground sown in my garden yielded 36 seers of seed cotton the first year, three maunds the second year, and one maund the third year, without any labour or expense beyond weeding and earthing up; the quality of the cotton is excellent, far superior to the produce from the native seed. The return of the second year is about 600 lbs. per acre, about the average produce of the native seed, but the proportions of seed and cotton are considerably in favor of the American seed. The American yields ⅓ cotton, ⅔ seed; the country ¼ cotton, to ¾ seed in this part of the country."

Result of trials given to various Seeds in the District of Champarun. Communicated by J. W. Yule, Esq.

James Hume, Esq. *Secretary to the Agricultural and Horticultural Society, Calcutta.*

Sir,—Having lately obtained from Government the lease of a large estate in this district, bordering on the Nipalese country, and extending to the lower range of Hills, in which rice is the staple product, I am anxious to introduce a description of grain, superior to what is now in general use; and learning that the Carolina Paddy is much prized, I would feel greatly obliged by your sending me a small quantity on trial, by the first Steamer for the Upper Provinces, addressed to the care of Messrs. A. Charrier and Co. Steam Agents, Dinapore. By the same opportunity I will likewise thank you to forward some 'Sumach,' seed, which is very likely to succeed here.

The soil is rich, and well adapted for almost every sort of grain, and the facilities of irrigation are, owing to the vicinity of the hills, great, and attainable at a trifling cost. I am convinced therefore that were a better description of seed corn introduced, and more care taken of the cultivation (which I am doing all in my power to impress on the minds of the Ryotts,) it might be made to yield double what it does at present.

Should you then have any fine sorts of Wheat, Oats, Barley, Gram, and White Linseed to spare, I would esteem it a very great favour your sending me a small quantity of each.

The country is moreover quite free from white ants, and is perhaps on that account well suited for the cultivation of Sugar-cane. As I am anxious to give it also a trial, may I trouble you to register my application for 200 canes of each sort in the Society's garden, should any be distributed this year.

Flower and vegetable seeds will also be very acceptable when the season for distribution arrives.

I am, &c.
J. W. YULE,
Member of the Agricultural and Horticultural Society.

Memorandum of Seeds, &c.

Carolina Paddy,
Sumach, } for immediate use.

Wheat,
Oats,
Barley,
White Linseed, } for October Sowings.

200 of each sort of Sugar-cane.

Flower and vegetable Seeds.

Ramnuggur, vid Betteah, District of Champarun, May 9, 1845.

JAMES HUME, ESQ. *Secretary to the Agricultural and Horticultural Society, Calcutta.*

DEAR SIR,—I have delayed to acknowledge the receipt of your letter of 28th May, until I could inform you of the arrival of the box containing seeds, the despatch of which you there advised, and at the same time be able to send you a report of what I have done, and the result.

I now beg to do so, and at the same time to tender you my best thanks for your kind attention, in so promptly meeting my wishes.

On the 21st ultimo the box containing the seeds reached me in safety, and as the ground had been prepared some days previously, I put the following in next day, viz., the Chota Nagpore Paddy and American Maize Seeds.

On the 23rd, I sowed part of the Sumach, Madder, Guinea grass, Acacia lophanta and Nerium tinctorium.

On the 26th the Paddy came above ground, and on the 11th instant was transplanted from the bed in which it was sown, measuring 24 square yards, to a field measuring 780 square yards; and there it is growing most luxuriantly.

On the 26th the "Flint corn" appeared above the surface, and is growing well, but of the other two sorts sent only a plant of each has vegetated.

On the 27th, the Sumach came up partially, and continued to vegetate daily until the 30th, when in consequence of the heavy rain which fell on that day, I transplanted all that I thought could bear it into small flower pots, and I was fortunate in having done so, for from the 1st to the 7th instant about 17 inches of rain fell, which destroyed all that had been left on the ground. I have now therefore only 19 trees remaining, but as they are thriving well, I hope to form from them a nursery sufficiently large to give the plant a fair trial on this soil.

Of the Acacia lophanta I have succeeded in saving three plants, but of the Madder not one seed has come above ground; however I have plenty of it remaining, so shall continue to sow a small portion every month, in the hope of at last hitting on the proper period. Of the Nerium tinctorium, on the other hand, scarcely a seed has failed, and as I find from the description of the plant in part 2, of the 4th Vol. of the Journal, just received, that it becomes a large tree, I must transplant them to a greater distance from each other than I had intended.

The Guinea grass is thriving well, also the dahlias, but of the latter I have only saved eleven plants, the rest having been destroyed by the heavy rain.

Of the Tobacco seeds only one sort, the Latakia, has come above ground, the other three never having vegetated at all.

I am sorry to say that the weevil or goon has got into the wheat and gram seeds,* or rather both of these insects have attacked them, and I begin to fear that there will be none left to sow when the season arrives. The white linseed seems in very good condition, however, and will I trust escape.

Some of the Sumach plants are already upwards of six inches high, and I am inclined to conclude from this rapid growth in so short a time, that the soil hereabouts is suited to its culture.

I remain, &c.

J. W. YULE.

Ramnuggur, 30*th July*, 1845.

Award of Prizes by the Agricultural Society of Madras, for Samples of Raw Silk. Communicated by Captain F. S. GABB, (52*nd Madras N. I.*) *Secretary of the Society*.†

Extract from the Proceedings of a special General Meeting of the Madras Agri-Horticultural Society, held at the Society's Garden on Monday the 3rd February 1845, at 5 o'clock P. M. to determine the prize articles sent in for competition.

Samples of the prize articles are laid before the Meeting, also the specimens of silk received from the Agricultural Society at Calcutta, as a criterion to be guided by.

Twenty-two lbs. of Raw Silk, equal quantities of white and yellow, of the Fusculum estate at the Neilgherry Hills, from Major F. Minchin.

The following from N. A. Groves, Esq.

Twenty lbs. of yellow silk reeled at the Neilgherry Hills, the produce of Indian worms of Signor Mutti.

Five lbs. of the same as the above, reeled at Chittore by the School children.

* These are the Taganrog and Egyptian wheats and white gram forwarded by Dr. Royle by the overland mail, and received in May.—*Eds.*

† "I have the pleasure, as requested, to transmit the enclosed extracts from the Proceedings of our Committee, relative to the competition for Silk Prizes in February last."—*Extract of letter from Capt. Gabb, dated* 20*th August* 1845.

Five lbs. of white, also originally obtained from Signor Mutti, and reeled by the children.

Ten lbs. of silk of the indigenous worm of this country, also reeled by the children.

Twenty-two lbs. of silk of the Mysore worms, and reeled in Madras by Mahomed Cassim.

Eight lbs. of silk the produce of Signor Mutti's "Cross breed," the Italian with the Egyptian worm, reeled by Padsha Saib in Royapettah, Madras.

The Secretary explains that the cause of the small quantity of silk brought by Padsha Saib, was the heavy loss of worms he lately experienced at the time of the late rains, upwards of two lacs having perished. Padsha Saib was the first person who attempted the culture of silk-worms in Madras; after the late Secretary, Major Reid, C. B. had procured from Bombay a better description of worm he made over to Mahomed Cassim the indigenous country worms in his possession, and thus armed him with weapons to turn against himself.

Read the following Letters.

From Monsieur Perrottet of Pondicherry, enquiring if Silk produced there will be allowed to compete for the prizes.

From the Secretary to the Mysore Commissioner, stating that he had forwarded to Messrs Ashton, Richardson and Co. specimens of Silk cloths, &c. the manufacture of Mysore, and requesting that they may be exhibited at the Society's show, with a view to the encouragement of the Mysore manufactures.

Resolved 1*st*—That the raw silk offered for competition for the 1st Government Prize by Messrs. Minchin and Groves, being both of such superior quality, especially considering that it is the result in both cases of the first year's attempt to cultivate that article, and the merits of both being so nearly equal as to render it next to impossible for unpractised eyes to determine which is the best, that a respectful recommendation be forwarded to Government, advising that, with a view to encourage further efforts to bring this valuable article of commerce to perfection, a prize of 300 rupees be awarded to each.

The Government was of opinion that the more successful competitor, Mr. Groves, should alone receive the higher reward of 300 rupees.

Resolved 2nd—That Government be recommended to award the 2nd prize, rupees 150, to Mahomed Cassim, the only native competitor who has brought the amount (22 lbs.) of silk necessary to compete for the 2nd prize, under the terms of the Government proclamation of 10th May 1844.

This recommendation was acceded to by Government.

Resolved 3rd—That Government be respectfully requested to award a donation of 75 rupees to Padsha Saib, the only other native who has produced any silk for competition for the 2nd prize, in consideration of his losses, and of his having been the first person who attempted the culture of silk-worms in the town of Madras.

This recommendation was acceded to by Government.

Resolved 5th—That Monsieur Perrottet be informed that the Committee are of opinion, that silk the product of Foreign territories, cannot be admitted to compete for the prizes offered by Government, under date the 10th May 1844.

Resolved 6th—That the Silk Fabrics of the Mysore territories forwarded by the Secretary to the Mysore Commissioner, be exhibited at the Society's show, in compliance with his request.

(True extracts,) F. S. GABB, *Captain*,
Secretary.

SUGGESTION FOR IMPORTING MELON AND ONION SEED FROM EGYPT.

Extract of a letter from G. C. CHEAP, ESQ., *dated Bauleah, 4th July*, 1845.

"As a reader regularly of your Agricultural and Horticultural Journal, let me suggest your printing among the extracts what is in Wilkinson's new work* on Egypt and Thebes, Vol. I, from page 457 down to "always in arrears," at page 468. So many things in Egypt reminded me of India when I was there for three months, that I am sure that with a little trouble we should have their melons and other esculent vegetables which are very fine; and the *Lupins* which the poor people are so fond of, and from being so cheap much used as

* The work is too dear to get into the hands of every one.

food, would be a great deal better than *gram*, which the Bengalees are so fond of. All my onion and melon seed failed, or I should have sent the Society some, and I strongly advise their importing some of the Egyptian melon and onion seed, which would, I am confident, thrive about Patna and Baugulpore; Bengal is too damp for them."

THE PRODUCTIONS OF EGYPT.

The inundation of the Nile, which commences about the beginning of June,* is generally admitted into the canals of the interior about the first fortnight in August; and the water, gradually extending over the country, soon forms a large lake on the inner or desert side of the cultivated land. It begins to subside in September, or early in October, and as it quits the soil they sow clover and several leguminous plants.

Barley and wheat, which are carried, the former in the fourth, the latter in the fifth month, are sown about the middle of November;† and at the same time that a crop is raised on the land the water of the Nile has just left, another is procured by artificial irrigation. The land at a distance from the Nile is considerably lower than that of the banks, as may be seen from the above circumstance, and from the height of the dykes, which, near the river, are frequently on a level with the soil. Tillage is known to elevate land, and this difference has been here attributed to constant cultivation; but the continued current which at that time runs along the inner side of the lands, tends also considerably to lower their level. Some parts of Egypt are much lower than others; as, for instance, from Girgeh to near Minieh; but, during a low inundation, even these are not all overflowed.

* About Cairo. At Asouan, about the end of May, or the very commencement of June. Seneca says, very simply, "Primum incrementum Nili juxta insulas. . . . Philas noscitur."

† The time, of course, depends greatly on the duration of the inundation.

The principal plants of the winter season, grown after the inundation, are:—

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Wheat	Kumh	Triticum sativum, L. 6 varieties.*	Five varieties bearded; reaped beginning of April. U L.E.†
Barley	Shayeér	Hordeum vulgare, L. 2 varieties.‡	Reaped, some after 90 days, some the 4th month; sown also at other times. U. L.E.
Beans	Fool	Vicia faba, L.	Sown in Oct. or Nov.; cut in about 4 months. § U. L E.
Peas	Bisilleh	Pisum arvense, L.	Sown middle of Nov.; ripen in from 90 to 100 days. U. L. E.
Lentils	Ads	Ervum lens, L.	Sown middle or end Nov.; cut in 100 or 110 days. U. L.E.
Vetches	Hommos	Cicer arietinum, L.	Ditto. U.L.E.
Lupins‖	Termes	Lupinus Termis, Fors.	Ditto. U.L.E.
A sort of clover, Trefoil	Bersim	Trifolium Alexandrinum, L.	Sown beg. of Oct.; first crop after 60 days; 2d other 50 days; 3d left for seed; continued by irrigation for a 4th crop, but then no seed. U.L.E.
A sort of clover	Hélbeh	Trigonella Fœnum græcum, L.	Young stalks eaten; also used for clover; sown mid. Nov.; one crop only in about 2 months; ripens in 110 days.‖ U.L.E.
	Gilbán	Lathyrus sativus, L.	Eaten by ruminating animals, instead of clover, after 60 days: seed ripens in 110; when young they eat its stalks; and the seeds are ground with corn for bread. U.E.
A sort of French bean	Lóobieh	Dolichos lubia, Fors.	Sown at the same time as wheat; ripens in 4 months; and by the *shadoóf* in Aug., and ripens in about 3 months; for cooking, the beans are gathered in 60 days. U L.E.
	Gishrungayga	Phaseolus Mungo, L.	Ripens in 6 or 7 months; to S. of E' Sooán.

* 1. Towálee, long-eared wheat.—2. Dthukr Yoosefee, with large ear, of which the beard alone is black.—3. Naygeh, small ear, the husk of the grains black as well as the beard.—4. Zerra e' Nebbee, not bearded, of a reddish colour; very small quantities met with in the midst of the other wheat.—5. Moghyuz, short broad ear: mostly in Lower Egypt.—6. E' Tubbánee, white; the common Egyptian wheat.

† *i. e.* cultivated in Upper and Lower Egypt.

‡ 1. E' Tubbánee, white.—2. E' Gennáree, red; high growth. Grown in equal quantities.

§ Much depends, in all these crops, on the time of sowing, the state of the land, and other circumstances. Sometimes they are sown without the use of the plough, in the mud, immediately after the water has left the surface.

‖ The stalks yield the charcoal for gunpowder. Mohammed Ali has introduced the Kordo[illegible] lóobieh for this purpose.

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Safflower	Kórtum	Carthamus tinctorius, L.	The flowers used for dyeing are called O'sfor; the seeds give an oil (Zayt hélwh;) sown mid. Nov.; seeds ripen in 5 months. U.L.E.
Lettuce	Khus	Lactuca sativa, L.	Lettuce oil is extracted in Upper Egypt; seeds ripen in 5 months; sown middle November.
Flax	Kettán	Linum usitatissimum, L.	Its oil called Zayt har; sown mid. Nov.; plucked in 110 days. U.L.E.
Cole-seed	Sélgam	Brassica oleifera, L.	Yields an oil; sown middle Nov.; cut in 110 days. U.E.
Tobacco	Dokhán béledee, or akhder	Nicotiana tabacum, L.	Sown beg. Nov.; first crop in 100 days; 2d in other 60; 3d in 20 more: this last is called ribbeh.* One variety has the leaves long and lanceolated, with a pink flower: this is the best and mildest, called béledee, or
		Nicotiana rustica, 2 var. (?)	native. The other, with yellow flower, called Lângee, or Bút-hágee, has the leaves round, thick, and of a darker colour, strong, and only mixed with the former or used as snuff.† U.L.E.
Hemp	Bust, hashísh, the dagha of the Hottentots ‡	Cannabis sativa, L.	Employed only for its intoxicating qualities, and then called Hashish; sown mid. Dec.; ripens in 4 months. U.L E.
Cummin	Kamóon	Cuminum Cyminum, L.	Sown mid. Dec.; cut in 4 months. U.L.E.
Coriander	Koósbera	Coriandrum sativum, L.	Ditto. U.L E.
Poppy	Aboono'm or Aboonóme	Papaver somniferum, L.	Sown end Nov.; the opium taken in the mid. March; seeds ripen in April, the best bought from the peasants, at 45 piastres the rotl; grown for the China market. U.L E.
Water-melon	Bateékh	Cucurbita citrullus, L.	And about 10 other cucurbitæ; cut in 90 days; sown mid. Dec. U.L.E.
Cucumber	Kheéar	Cucumis sativus, L.	And about 7 other cucumis; cut in 60 days. U.L.E.
	Doóra sáyfee or baalee §	Holcus sorghum, L.	Besides the crop raised by the *Shadoóf*, and that during the inundation; sown mid. Nov.; ripens in *five* months and a half. U.L.E.
	Doora Hámra	A variety.	With the Baalee. U.L.E.

* Ribbeh, gain, interest, or usury.

† In Egypt and Nubia, snuff is often used in the mouth instead of the leaf. Its strength is increased by adding natron.

‡ In India, bang or gunga.

§ So called from ripening in the summer. It is a variety of H. Sorghum. If the seed of the

The plants of the summer season, which succeed either immediately or after a short interval, are produced solely by artificial irrigation. The water is raised from the river by rude Persian wheels, or by the *shadoof;* which last is frequently employed in the inland canals, the Bahr Yoosef, and the wells near the edge of the desert. Nor is its use confined to the productions of the summer; it is always requisite for some of them in the spring, and frequently throughout the whole winter, and even autumn, if the inundation is deficient.

The chief productions of the summer, sown the half year before, and during the inundation,* are—

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Rice	Roox or Aroóz	Oryza sativa, L.	In the Delta and Oasis. The best is from about Menzaleh; that of the Oasis an inferior variety; carried in 7 months.
Indian corn	Doóra shámee	Zea mays, L.	Called Syrian Doora; mostly in Lower Egypt; cut in 70 or 75 days; sown one month after the D. Saffra. U.L.E.
A red grained variety		Var.	Ditto.
Doóra of the heat	Doóra Kaydee	Holcus sorghum, L.	Mostly in Upper Egypt; sown beg. or end of April; cut at rise of Nile, 100 days; its ear larger than the D. Saffra; its seed is sown as Byoód. U L.E.
D. of the autumn	D. Byoód or D. Dimeéree	Id.	Sown mid. Aug.; cut in 4 months, but its seed being no longer prolific is all used for bread.
Bending D.	D. Owaygeh	Holcus compactus, L.	Grows with the D. Kaydee.
Yellow D.	D. Saffra	Included with the H. Sorghum, L.	Cut in winter; sown when the Nile is at its height, in mid. of Aug., and banked up; ripens in 120 days. U.E.
Red D.	D. Hámra	A var. of H. sorgh.	Cut also in 120 days; mostly in southern provinces; sown mid. Aug.; mixed with the Byoód; seed red.

D. Kaydee is sown as baalee (*i. e.* in Nov.) it produces seed; but if that of the baalee is sown as kaydee (*i. e.* in April), it springs up, but is barren. The baalee seed is sown as byoód, and *vice versâ.*

* At the commencement of the inundation, the children of Thebes light torches made of reeds or palm-trees, and run about the villages, striking each other with these burning brands. It is said to be an old custom handed down from the ancient Egyptians. Formerly children of a larger growth joined in this amusement.

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Falling D.	Furayt* or Khorayt	H. bicolor, L.	Grows with D. Saffra, but ripens in about 90 days. U. L. E.
Millet	Dokhn	Holcus saccharatus, L	Only about Asouan, in Nubia, and the Oasis; sown same time as the Doóra.
Sugar-cane	Kassob	Saccharumofficinarum, L.	It is planted twice in the year; that in May is gathered in Nov. and Dec., at first it is constantly irrigated. If cut, or broken at the root, and then watered for the ensuing year, it produces several shoots, which, though not arriving at the height of the first year's cane, yield better (but less quantity of) sugar: this crop is called Khilfeh; planted horizontally, in slips. U. E.
Cotton	Kotn	Gossypium herbaceum, L.	Planted in March,† and summer; gathered in Nov., Dec., Jan.; renewed every third year from seeds; in good soil, some is gathered in the fifth month. U.L.E.
	Símsim	Sesamum orientale, L.	Gives the oil called séerig; ripens in about 100 days, at the time when wheat is sown; 10 days after the D. Byoód. U. L. E.
Coffee	Bon or bunn	Coffea Arabica, L.	Grown about Benóot, near Kéneh; does not answer.‡
Indigo	Neéleh §	Indigofera argentea, L.	Sown in April; cut first time after 70 days; 2d after 40; 3d after 30; 4th in 25, in first year; they then leave it without water all the winter, and water it again in March; in 40 days cut first crop; 2d in 30; 3d in 30: third year the same. After three years renewed from seed; first year's crop the best. 1 kantar (of 500 rotl) is sold for 5 and 7 real; 1 feddan gives from 2 to 2¼ kantar. U. L. E.

* So called from the seed falling, on being struck, or under heavy wind. They do not use its grain.

† About the 28th of March they sow the cotton seeds, at two paces apart, three or four seeds being put in together.

‡ The Nubians use the seeds of the Karikadán, *sida mutica*, for coffee; but they generally mix them with a little coffee, of which they have the effect of increasing the bulk, and spoiling the flavour.

§ This signifies blue, but not in the Arabic of Egypt. El Neel, a general appellation for large deep rivers, seems to have been borrowed from their blue colour.

Eng. Name.	Arabic Name.	Botanical Name.	Observations.
Gerow			Sown at the high Nile, 1st week in Sept., cut green for fodder after 30 days.
Madder	Foóah, or doódeh	Rubia tinctorum, L.	Its long roots give a dye. U. E.
	Hénneh*	Lawsonia spinosa et inermis, L.	Mostly in Lower Egypt; also in Upper Ethiopia.
Water-melon	Bateékh	Cucurbita citrullus, L.	And the other cucurbitæ; during rise of the Nile, and in March in the sand-banks of the river. Those from Brulos considered the best.
Onion	Bus'sal	Allium cepa, L.	Sown in August; when young gathered for use, or transplanted about end of Feb.
	Bam'ia towée-leh	Hibiscus esculentus, L.	Mostly in gardens; gathered in 50 or 60 days; in Sept. and Oct. It suffers from cold, and will not thrive in winter. U.L.E.
	Bamia béle-dee or wáyka	Hibiscus præcox, Fors.	Ditto.

Besides a number of vegetables, which are raised at different times by means of artificial irrigation.

Fruits†, which are for the most part grown in the gardens about the principal towns, or in the Fyoóm, succeed each other in the following order:—

Eng. Name.	Arabic Name.	Ripen in
Mulberries	Toot béledee, shámee	January.
Seville oranges	Naríng, 3 var.	January.
Rhamnus nabeca, Fors.	Nebk, or Sidr	March, April.
Cucifera Thebaica	Dôm, or Dome	April.
Apricots	Míshmish	End of May.
Peaches	Khokh	Middle of June.
Apples	Tefáh, or Teffáh	End of June; mostly from gardens of Mount Sinai.
Pears	Koomittree	End of June; mostly from gardens of Mount Sinai.
Ceratonia siliqua, L.	Kharóob	End of June.
Plums	Berkoók	June.

* The use of this as a dye for the feet and hands is very general. Some have derived the rhododactylos Eos from this eastern custom. The leaves are pounded, and, being made into a paste with cold or warm water, are applied to the hands and feet on going to bed, in the same manner as a poultice. When taken off, a red dye is left on the nails and other parts of the hands and feet; and another application of a mixture of soot and lime is sometimes applied to change it to a dark olive or blackish hue. New hénneh is preferred, and that quality which gives a deep colour.

† Cherries are unknown in Egypt, but it is a curious fact that the ancient Egyptians sometimes covered their bows and walking sticks with cherry bark; like the modern Turkish pipes.

Eng. Name.	Arabic Name.	Ripen in
Grapes	E'néb béledee	End of June and beginning of July; black and white.
	Fyoómee	—— White.
	Sherkáwee	—— Black, bad.
	Hegázee	—— Mostly brought dry from Arabia.
	Roomee	—— Large, black and white; origin Greek.
Figs	Tin Bershoómee	July.
Sycamore figs	Tin gimmáyz	From April to September.
Prickly pear	Tin Seraféndee	End of July.
Cactus opuntia, L.	Tin shōk, or shoke	
Pomegranates	Roomán	August.
Lemons	Lemóon malh, 4 var.	August, and other seasons.
Dates	Bellah, about 20 var.	End of August.*
Citrus medica, var. 8. and 9., L.	Troong, 2 var.	September.
Oranges	Portogán báledee Rashédee	20th November, but still rather sour.
Sweet lemons	Lemoón helwh	
Banana, Musa paradisiaca	Móz, or Moze	November.

The dates sold in Egypt are of several kinds, some natives, and some imported from other countries. The most common are,—

Bellah Séwee, which consist of—	
Soltánee	
Sāidee	
Fráhee	
Káibee	From Seéwah.
Ghazálee	
Roghm Ghazálee	
Bellah Aamree	From El. Koráyn.
Amhát	Rosetta, and about Cairo; red.
Menawútee	Menawút, and about Cairo; yellow.
Benáysh	Salhéëh; red. Used for agweh (preserve).
Hyánee	Birket el Hag.
Sofr é denéëh	Rosetta.
Semánee	Ibid.
Bróolosee	Broolos, or Boorlos.
Sobúe e'sít	Originally from the Hegaz.
Kobáshee	Ditto.
Ibréemee	From Ibreem, Nubia.
Sélgee	Imported from the Hegaz.
Suffee	Ditto; stone very small.
Keroón el Ghazál	Hegaz (Arabia).
Sakoótee	Ditto, and Oasis.
Yemenee	from the Yem'en, &c.

Though the time of sowing the winter and summer plants is in some degree fixed, much of course depends on the continuance of

* About the 28th of March, they tie some of the blossom of the male to that of the female palm trees.

the inundation; and many of them, by means of irrigation, are raised at other seasons.

Besides, the productions of the valley of the Nile vary in different provinces; and some belong almost exclusively to certain districts. Clover, so abundant in the Delta and Lower Egypt, is rarely cultivated in the Thebaïd, where its place is supplied by gilbân. Rice exclusively belongs to the Delta and Oases; and cole-seed, gortum, poppies, and lettuce are nearly confined to Upper Egypt, where also the greatest quantity of holcus is cultivated. Date-trees are more abundant in the north; and vines, figs, roses, and olives, are limited to the Fyoom and the gardens of large towns.

The advantages which some species of crops have over others are a matter of little interest to the peasant, whose preference is not consulted; but this evidently leads to many unfair and oppressive measures on the part of the shekhs, whose office it is to select as well for *themselves* as for those under their authority. The expense and outfit of water-wheels and their oxen is undertaken by the Government, and afterwards repaid by the peasant, either in money or produce; and the quantity of land each wheel irrigates depends on the nature of the crop.

To give an idea of the value and the returns of different produce, the profit or *loss* of the peasant, and his real condition, I shall introduce a brief statement of the particulars of each, collected in 1827.

1	Water wheel,	with 8 oxen	irrigates	3 feddân	of cotton.
1	...... wheel,	....	......	7 feddân	of wheat.
1	...... wheel,	....	......	2 feddân	Doora kaydee (gaydee).
1	...... wheel,	....	......	8 feddân	Indian corn.

The produce of the *best* land is as follows:—

			Val. in Piast.		P.
1 fed.	gives 2½ qant.	cotton, best	120 the kantár*	in 12 months	total 300
1 fed.	.. 8 ard.	wheat	38 the ardeb†	in 4 m. 20 d.	.. 304
1 fed.	.. 12 ard.‡	Doora kaydee	16	in 3 m. 10 d.	.. 192
1 fed.	.. 5 ard.	Indian corn	16	in 2 m. 15 d.	.. 80

			Val. in Piast.		
8 ard. of wheat	give 10 camel lds.	of straw	2 the load	in 4m. 20 d.	total 20
12 ard. doora	.. 15	fodder	2	3m. 10 d.	.. 30
5 ard. Ind. corn	.. 5	do.	2	2m. 15 d.	.. 10

Calculation by the water-wheel. Cotton.

3 feddân | with 1 wheel | give 7 kan. | of cotton | value 900 pias. in 12 months.

* Valued nominally at 180 piastres by the government, but 120 are alone paid. Inferior cotton is at 75, and even at 50.

† This is the best land, and only in a few parts of Egypt. The price of corn varies in different years, from 25 to 50 piastres.

‡ In some low land near Abydus, capable of constant irrigation, it has been known to produce 18 ardebs.

		Corn.		Val. in Piast.	
The 7 feddán	with 1 wheel	gives 56 ardebs	of wheat	2128	in 4m. 20d.
2 of those 7 fed.	with 1 and the same wheel ..	.. 24 ard...	Doora kayd ..	384	.. 3m. 10d.
8 feddán. ..	with the same	.. 40 ard...	Ind. corn ..	640	.. 2m. 15d.
The wheat ..	in addition..	gives 70 loads -	of straw	140	
D. kaydee..	.. .. ..	.. 30	fodder	60	
Ind. corn ..	.. .. ..	.. 10	.. .. ..	20	
			Total,	3372 in 10m. 15d.	

or allowing for clearing, loading, and ploughing, with about one month and a half of inundation, twelve months. From this it is evident that the culture of the cotton is very disadvantageous to the peasant, whether calculated by the feddán or the wheel; even if we add the value of a crop of corn raised at the same time as the cotton, which will be mentioned presently.

The land tax (taking as above, the best land) is as follows:—Tax 40 real, or 90 piastres, for 1 feddán, producing 2½ quant. cotton, value 300 piastres per annum, leaving an apparent balance for 1 feddán, 210 piastres, without deducting for the expenses of the wheel and the other taxes.

Takawee * ½ ardeb	19	for 1 feddán	producing 8 ardebs wheat	304	per an
Tax 40 r. or ..	90		12 ard. doora ..	192	
1 load straw ..	2		5 ard. Ind. corn	80	
	111		10 loads straw ..	20	
			15 fodder	30	
			5 ditto	10	
				636	

leaving the apparent balance for 1 feddán of corn, 525 piastres.

To calculate by the wheel:

	P.
3 feddán, 1 wheel, 7½ quantars cotton, 900 p. minus tax 270 p.	630
By the same wheel may also be cultivated 7 feddáns of wheat, 218 p. or, deducting the tax of 777 p...	1351
	1981

Leaving the balance 1981 piastres in the hands of the peasant, to meet the expenses of the water-wheel and the additional taxes.

But let us take the most favourable crop:—

Cost.			*Produce.*	
Takawee (seed) for 7 fed.	133	1 wheel gives annually	56 ard. wheat, on 7 fed. ..	2128
Land-tax (best land).. ..	630		24 ard. doora, on 2 fed. ..	384
Seven loads of straw	14		40 ard. Ind. corn, on 8 f...	640
Takawee for 2 fed. doora ..	16		straw	140
for 8 fed. Ind. corn.	32		fodder	60
	825		fodder	20
				2372

* Seed borrowed from Government.

Balance 2547 piastres for one wheel in favour of the peasant; from which we have to deduct the expenses of the water-wheel and the other taxes, which are as follows:—

I.—*Outfit of Wheel.*

	P.
1 water-wheel, wood, &c.	200
Digging the well	50
Building the same	350
8 oxen	600
For the first year .. Total,	1200

II.—*Annual Expenses.*	P.
12 ardebs, beans for the oxen ..	192
Fodder	160
4 feddán gilbán	288
Pots, annually	15
Man, 3 ardebs grain ann.	70
Carpenter, 3 ardebs	70
Grease, 6 rotl.	6
Wood	15
7 ropes	56
Large ropes	6
2 sets of harness	6
6 men's pay (1 at 40 fodtha a day, 5 at 20 f.) annually ..	1278
	2162

III.—*Additional Taxes.*	P.
For 7 feddán he is to supply 21 rotl of butter, bought by the Government at a loss to him of	5
House-tax of owner of the wheel	150
Wool, 20 f. a month	6
Charge when recruits are levied	8
	169
Annual expenses	2162
	2331
Outfit of wheel, first year ..	1200
	3531
Net produce	2547
Loss to the peasant, first year ..	948

*Second Year.**

Annual expenses	2169
Additional taxes	169
	2331

Second Year.

Net produce	2547
Expenses, &c.	2331
Balance in favour of peasant the second and ensuing years, ..	216

From which he has to make up his first year's loss. Hence it appears that four years must elapse ere he can pay the arrears for the original expense; and still during this time he and his family are to be provided for from the same funds. Those who plant cotton are of course much greater losers;† and besides the above taxes, palms and other trees, which do not repay the peasant, should be taken into account.

I shall now calculate the produce of a piece of land I measured at El Byrát, near Thebes, of the mean quality, and paying 40½ piastres annually. This land produces the autumn crop of wheat, like all that which the Nile has sufficiently irrigated, without a water-wheel; and, on making an exact measurement, I found that one feddán gave two

* A water-wheel lasts about eight years; by which time another set of oxen is generally required.

† In the proportion of about eleven to seven.

ardebs and seven mids ($2\frac{7}{8}$ ardebs), which, at the market price, was valued at $22\frac{1}{3}$ piastres the ardeb, making nearly $64\frac{1}{2}$ piastres.

Produce.

	P.	F.
Wheat $2\frac{7}{8}$ ardebs	64	20
3 loads straw	6	
	70	20
Deduct expenses..	64	
Balance in favour of peasant for 1 feddán	6	20

Tax and Expenses.

	P.	F.
Kharag (land-tax)	40	20
Tagawee ½ ardeb	11	10
Ploughing, hire, &c.	4	20
Reaping.. ..	3	0
Carrying..	1	20
Threshing (3 roftows, hire)	2	8
Winnowing (1½ roftow)	1	4
	64	0

But my measurement, being taken with a line, gives the real contents of the feddán; whereas, their mode of measuring with the pole, greatly increases it; so that one feddán will be reckoned at least $1\frac{1}{6}$ f. or about 6½ piastres over the just tax, being equivalent to the surplus of the produce.

The consequence of this is, that the peasant *steals** as much as he possibly can from his *own* grain, which indeed necessity obliges him to do; and the only resource left besides stealth, to enable him to support himself and family, is to raise a crop of wheat and barley (called shitwee, "of the winter") which he sows and waters by the shadoof, during the time that the wheat of the lowlands is growing up without any artificial irrigation. Nine men join in raising this crop, and four feddán, half wheat and half barley, are watered by the shadoof.

Produce.

			P.
2 feddán	give 16 ardebs †	wheat at 22½ piastres	360
2 feddán	20 ardebs	barley at 16	320
	20 loads	straw at 1	20
	20 loads	straw at 1	20
			720

Expenses.

		P.
Tagáwee (seed)	1 ardeb wheat	22½
	1 ardeb barley	16
Shadoóf ("pole and bucket") wood, &c.		3
buckets, 2 sets		9
Implements		10
Kharág (tax) for 4 feddán, at Koorneh, 40½		162
Government land-surveyors, to *prevent* imposition		5
Loss on butter		5
		232

* When the whole crop is taken by the government; in which case the ardeb rises speedily from 2?½ to 30 and 40 piastres or upwards.

† I have calculated the taxes, as at Koorneh, and yet allowed the best land; and in no part of these calculations have I reckoned the items which increase the loss of the peasant; as claims of the shekh, Copt scribe, &c.

which, deducted from the produce, leaves 487½ piastres; and this, divided between the nine men, gives to each about 54 p. 7 f.

After this, a second crop is also raised by the shadoof, called káydee (or gàydee "of the heat"), and nine men sow two feddán of doora káydee.

Produce.	P.	*Expenses.*	P.
2 feddán give 24 ardebs, at 16 ..	384	Takáwee ..	14
(no fodder taken from it)		Shadoóf buckets	9
		Tax	81
		Surveyor's fee	2
		Grease for the bucket	2
			108

leaving 276 piastres, or about 30 p. 27 f. to each man.

A third crop is afterwards raised of doora shâmee (Indian corn) called dimeeree "of the autumn," by five men, who sow three feddán with the shadoof.

Produce.	P.	*Expenses.*	P.
3 feddán give 15 ardebs Indian corn, at 16	240	Tagáwee	5
fodder	10	Bucket	3
Sown also (with the Ind. corn) gerów, worth	25	Tax	121½
	275	Surveyor's fee	4
			133½

which leaves 141½ piastres to be divided between the five men, being 28 p. 12 f. to each. The sum of the net receipt for these three crops is then as follows to each man:—

P.	F.		*Additional Taxes.*	P.
54	7	from the first crop	House, for one of the poor class	40
30	27	second	Wool	4
28	12	third	Recruits, expenses for	2
			Butter, loss on	4
113	6	annually		50

leaving for his annual expenses 63 p. 6 f., about 18 shillings English, not 7 fodda, or $2\frac{2}{5}$ farthings a day.

This is making the utmost allowance; for it is rarely the case that three crops are raised in one year, independent of that upon the inundated land; and the numerous exactions of the provincial governors have the invariable effect of leaving the peasant *always in arrears.*

ON THE PRODUCTION OF SOILS AND MANURES BY THE LOWER ORDERS OF PLANTS.

By Robert D. Thomson, M.D., Lecturer on Practical Chemistry in the University of Glasgow.*

The intimate connexion subsisting between the soil and plants might have led, one would have supposed, to an early appreciation of the fact that vegetables extract nourishment from the earth. Jethro Tull, however, informs us that, antecedent to himself, (in 1732,) no one having alluded to the subject, he was under the necessity of inventing a term to express what he meant by the method in which inorganic nourishment was taken up by plants. He termed it the *pasture* of vegetables; for he was quite convinced that, as cattle feed on vegetables that grow upon the external surface of the earth, the plants themselves must first receive from within the earth the nourishment they give to animals. By pasture Tull did not understand the pabulum itself, but the superficies from whence the food was received. By this term he meant the spaces between the particles of soil, and upon the surface of these particles he believed the roots of plants to pasture, or to imbibe, by their appropriate apparatus fine portions of the soil. He argued that much nourishment cannot be derived from rocks or soils without interstices; and that, in proportion to the porous nature of the earth, or, in other words, to its fine state of division, is its fertility enhanced. The earth, he affirmed, is not deprived of its fertility by any other means than by fire and the roots of plants; for when vegetables are not allowed to grow on a soil, the latter will always grow richer. The operations of ploughing and harrowing, the circumstances of exposure to the sun, to the frost, to the action of water, and to mechanical pulverization, will only contribute to render the earth more fertile, provided fire and plants are withheld from acting upon it. By his sagacity in detecting this source of the nourishment of plants, Tull abolished the Virgilian agriculture in England, and produced a new era in the science, from which may be dated the commencement of all modern improvements in farming.

It is not a little remarkable that so acute a man as Lord Kames should have endeavoured to supplant the great doctrine of Tull by the old idea that the only use of the soil was to give support to the plant mechanically, and to hold water for its nourishment. Mr. Kirwan was

* Forming a Lecture delivered in the University of Glasgow.

one of the first chemists who subjected the ashes of plants to examination, and he was succeeded by Saussure and Davy, who clearly demonstrated that the inorganic materials of vegetables were essential to their constitution. Saussure did not seem, however, to consider the vegetable matter of the soil as of any further utility than as supplying ashes or inorganic materials in a fluid form to the roots of vegetables; for he observes that the oxygen of the air removes carbon from the humus. The humus, in losing this element, gives off, at the same time, under the form of water, its oxygen and hydrogen, and an extract soluble in water. Hence the mould or humus appeared to him to be capable of entire decomposition at the usual temperature of the atmosphere, while the soluble extract, the residue of the decomposed humus, contributed in a certain proportion to its fertility, in consequence of the ashes of the extract containing all the principles of the ashes of vegetables.

It is quite obvious, therefore, from these views, that Saussure entertained no ideas similar to those of the *humus* theory, which, originating in Sweden, and passing into Germany, attracted a number of supporters, but never made its way into this country. Liebig, it is sufficiently well known, has in a great measure destroyed the basis upon which this highly improbable theory was raised, and has contributed essentially to supply us with more precise notions of the nature of manures, by demonstrating that it is upon the inorganic constituents rather than upon their organic ingredients that the value of manures depends.

Argument in favour of the inorganic nature of manures.—The humus theory, which consists in supposing that decayed vegetable mould dissolved in water is capable of being taken up by plants, and supplying them with most of their solid nourishment, seemed still, however, to receive some support from the class of plants termed lichens, so common upon our rocks, trees, and walls. It was believed by botanists that this lowly order of plants was destitute of roots, and that the seeming roots which retain them so closely in contact with the surface of rocks and trees, were designed for the purpose of fixing the plants in their place, and not for the sake of supplying them with nutriment, which was afforded solely by the air. If this view were correct, then it would follow that these plants could contain none of the ingredients of rocks, or, in other words, that lichens must be destitute of inorganic constituents, and that, if the humus theory be inaccurate, the mould produced by the decay of lichens cannot act as a source of nourishment to future vegetables. Now it is generally admitted that lichens are active producers of soil, and that they afford a mould for other plants to flourish in; hence they appeared to supply a strong argument for the humus theory. The experiments which we have made, however, in the Glasgow laboratory last year, have clearly demonstrated that the lichens afford the most powerful of all arguments against the humus theory, and present a beautiful illustration of the great work performed in nature by the lowest members of the vegetable kingdom. Our experiments also shew that lichens, contrary to the opinion of botanists, must be supplied with roots possessed of greater power than those of trees or herbs, and that, of all orders of plants, their capacity to take up inorganic matter, and deposit it as part of their constitution, is alone surpassed by the sea-weeds which, however, are surrounded on all sides by a nutritious inorganic atmosphere.

It was known that some lichens contained one or two inorganic constituents; but these were considered to be partial facts, and it does not appear to have occurred to chemists that inorganic matter is an essential ingredient in this class of plants. On heating 50 grains of a carefully picked specimen of *Parmelia parietina*, the yellow wall lichen, a common yellow incrustation on trees, rocks, and walls, I found that, after exposure to the highest temperature, a considerable quantity of matter remained which could not be expelled. The ash weighed 3.4 grains; in another experiment, 40 grains of the same plant left 2.7 grains of ash; and in a third experiment, 7 grains of the fresh leaf, or frond, most distant from the point of attachment to the rock, yielded a skeleton, preserving the shape of the lichen, weighing 0.47 grains, and consisting of silica, iron, and phosphates, &c. These three experiments afford the following per centage:—

1st.	2nd.	3rd.
6.8	6.75	6.71

A considerable portion of the plant was burned; the ashes were preserved and analyzed. The following is the result of two analyses, in which I was assisted by my pupils, Messrs. David and James Murdoch of Stirling:—

	1st.	2nd.
Silica,	68.46	64.62
Sulphate, Phosphate, and Common Salt,	0.75	——
Peroxide of Iron, and Phosphate of Iron and Lime,	22.04	34 55
Carbonate of Lime,	8.75	——

The presence of the phosphoric acid was determined by digesting the precipitate produced on the addition of caustic ammonia in acetic acid, when the perphosphate of iron remained undissolved. These, and the subsequent experiments, were made from the autumn to the commencement of the winter of 1843,* and it is interesting to know that the

* Proceedings of the Philosophical Society of Glasgow, vol. i., p. 184.

results in reference to the presence of phosphoric acid, have been confirmed by analyses made at Giessen, and published in June of this year, (Annalen der Chemie, Juni 1844, p. 393.) It is also curious to observe, in comparing analysis made of the same lichens growing on different localities, how much larger the proportion of silica is in those plants which have vegetated on rocks than in those which have lived on the trunks of trees. At Giessen, the lichen under consideration, mixed with some others which were growing side by side on an apple tree, yielded about 50 per cent. of silica, while in the preceding results the amount of this ingredient approached 70 per cent. The specimens subjected to analysis were, however, derived from the surface of the mica slate rocks of Dunoon, in the Firth of Clyde, where a plentiful supply of silica was exhibited to their roots. This result is in accordance with the observation of Saussure, that plants which vegetate upon a mould derived from a siliceous rock furnish—other circumstances being alike—ashes that contain less lime and more silica than those growing upon a calcareous soil. The facts thus developed in reference to one species of lichen, so different from what was to be expected from previous experiments, led immediately to the examination of various other species. A specimen of *Parmelia saxatilis*, a common grey lichen, abundant on rocks and dykes, which had been collected on the banks of Loch Venachar, where it is extensively used by the inhabitants to impart, by means of an alum mordant, a purple colour to woollen cloths, was subjected to analysis—200 grains, when burned, left an ash which weighed 7.8 grains, consisting of substances exactly similar to those which have been described when treating of the yellow wall lichen.

A number of other species, for which I am indebted to the kindness of Dr. Balfour, professor of botany, were also analyzed, and found to afford similar results. The following table contains a few determinations in which I was assisted by my pupil, Mr. George Aitken of Glasgow:—

	Soluble Salts per cent.	Insoluble Salts per cent.	Total Ash per cent.
Cladonia rangiferina,	9.75	2.71	12.47
Scyphophorus pyxidatus,			6.09
.. bellidiflorus,	0.59	0.59	1.18
Ramalina scopulorum,	0.33	3.84	4.18
Parmelia omiphalodes,	0.33	7.79	8.12
.. saxatilis,			6.91
.. parietina,			6.75
Cetraria islandica,			1.84

The ashes of those various species, being tested in the usual way, were found to be similar to the inorganic constituents which have been already described, viz., silica, peroxide of iron, phosphate of iron, phosphate of lime, and carbonate of lime.

Importance of the lowest order of plants in nature.—The examples are perhaps sufficient to enable us to draw the inference that this class of plants constitutes no exception to the rule which seems to pervade the vegetable kingdom, that inorganic matter is important to the life of the species into which it enters as a constituent, just as with animals whose skeletons cannot dispense with the presence of earthy and soluble salts. This view of the composition of lichens enables us clearly to distinguish the position which this lowly order of plants occupies in the economy of nature. In moist climates they are the never-failing tenants of the arid rocks; nor are the tropical stony masses destitute of their presence. On the contrary, they seem to thrive in all seasons and climates—withstanding, with equal facility, the scorching equinoxial heats and the frigidity of the most elevated mountain zones. It is interesting, then, to deduce from chemical details the importance of this extensive distribution throughout the domain of nature. When land first appears above the level of the ocean, one of the first organic beings which makes its habitation on the newly-discovered rock is some one of the species of plants to which we have been directing our attention. The barren island, stony and hard, is unfit for the purposes of supporting living beings until it has been covered with a soil; this is effected by the disintegration of the rocky masses of which the island is composed, by the agency of moisture and heat, aided by other atmospheric causes. But a most important auxiliary is the lower orders of plants, which not only act by the mechanical separation of the particles of the rock, but also by imbibing the most influential of its nutritive ingredients, and bringing to the surface, as it were, a layer of living matter calculated for the support of vegetable beings. These plants, like other vegetables, wither and decay to give place to a rising generation, which continues to extract similar materials from the rock. By continuation of this process, a layer of mould is deposited on the surface of the formerly barren mass, which is now calculated to serve as a place of growth for seeds, wafted by the waters of the ocean, or deposited by wandering wild fowl. There is no reason for inferring, however, that this mould acts upon the plants that grow in it by supplying humus, according to the old view, as a source of soluble nourishment. On the contrary, it may be inferred, from the experiments previously detailed, that the mould produced by the action of lichens, and the decay of the latter on the surface of rocks, influence a higher order of plants, by presenting to them a focus of the richest food, that has been carefully selected and deposited for their use by this too often despised order of vegetables; for when we compare the amount of inorganic matter existing in different tribes of plants, we find the lichens to be exceedingly rich in this commodity. This is particularly exhibited in the following table, constructed from my examination of lima wood, sapan wood, and sea-weeds, where the composition of 1000 grains of each of the plants is given :—

	Lima.	Sapan.	Lichens.	Algæ.
Organic Matter, ...	971.25	987.08	932.5	875.3762
Inorganic Matter, ...	28.75	12.92	67.5	124.7238

The species of lichens whose composition has been here selected are the yellow wall lichen and the rein-deer lichen, so abundant on our moors, while the specimen of sea-weed was brought from Cape Horn by Dr. Joseph Hooker, in the expedition under Sir James Ross, and was of enormous magnitude. That sea-weeds should contain so much saline matter does not afford subject for much surprize, since the waters of the ocean supply an inexhaustible source of nourishment, in which, constantly imbedded and soaked, they can suck in food by every pore. It is different, however, with lichens, which have only one side in contact with the focus from which their inorganic constituents can be derived. It must, therefore, now be an interesting point for botanists to determine the nature of the roots or connecting links between the lichens and the source of their nourishment, which appear to be of such an efficient nature when brought in comparison with other orders of plants.

Mode of discovering the presence of manures in rocks.—But not only has the examination of lichens confirmed the most rational views of the true nature of manures, but it has also supplied us with important information respecting the nature of rocks, and of the useful purposes to which even our giant mountains may be applied for the service of the farmer. An analysis of lichens derived from rocks will enable us to detect from whence supplies of the phosphates and other manures may be procured in the largest quantities, for the presence of these bodies in lichens is a direct demonstration of the existence of the same materials in the rocks upon which they grow. Our supplies of concentrated manures in the form of guano, bone earth, &c., cannot last long; but it is consolatory to think that, in our rocky mountains, there are deposits of food for plants from which these concentrated manures must primarily have been derived, and to which we may again have recourse directly for stores of manure. It does not seem necessary that the phosphates should be extracted from the rocks in which they are contained by any expensive chemical process; but those masses which may be found by chemical analysis to contain any considerable amount of these salts, might be applied in a pulverized state to the soil directly. The same method of application might also be adopted in reference to the supply of alkalis for agricultural purposes. Many of our rocks, such as trap and granite, which contain abundance of the alkalis, and are susceptible, under atmospherical influences, of rapid decay, might be applied in a pulverulent form to the soil. Immense masses of trap, broken for the purposes of mending the roads at Glasgow, have decomposed in a few months into fine gravel; while every one is familiar with the Cornish clay, used for the manufacture of porcelain, a product of the rapid decomposition of the felspathic constituent of the granite of Cornwall, and whose extrication must have been accompanied with the separation of a large amount of alkalis. All these facts indicate that farmers need not despair of possessing, by the agency of chemistry, inexhaustible sources of manure; for, since all soils must have been originally derived from the adjacent strata, it is sufficiently obvious that new soils may be formed by simple methods.

The experiments which have been detailed in this paper, will, it is hoped, tend to elucidate the important function which the lower orders of plants fulfil in the domain of nature, and they likewise, it is conceived, remove satisfactorily the last argument which remained for the existence of the humus theory.

Air plants require inorganic food.—There still, however, is presented to our notice, a class of plants which might be quoted as proofs of this theory, and, of consequence, as evidence against the inorganic nature of manures. This class is usually denominated air plants; and, from their designation, would appear to feed on air alone. Analysis, however, has shewn that these plants resemble, in every respect, other vegetables; that they contain inorganic matter; and, so far as inference is legitimate, seem incapable of existing without inorganic food. Several species have been analyzed in the Glasgow laboratory; one of these was the *Corallina Skinneria.*. The analysis was conducted by my pupil, Mr. John Thomson. Its composition was as follows:—

Water, ...	79.64
Ashes, ...	2.02
Organic Matter,	18.34

The ashes, being analyzed, were found to consist of the following constituents:—

Silica, ...	8.43
Peroxide of Iron and Phosphates, ...	3.08
Alumina, ...	6.16
Carbonate of Lime, ...	40.62
Soluble Salts, consisting of Common Salt, Chloride of Potassium, Sulphate of Soda, containing 12.84 Sulphuric Acid, 3.36 Potash, 13.17 Soda, ...	42.72

We have thus presented to our notice another illustration of the apparently universal fact, that plants require inorganic matter as an essential element of their existence, and the inference becomes almost inevitable that, if its presence has been overlooked hitherto in any species of vegetable, careful examination will tend to carry out still further the important generalization.

Water incapable of dissolving much vegetable matter.—In connexion with the observations which have been previously made in opposition to the humus theory, I cannot omit to notice the inferences which appear to me deducible from a series of experiments in which I have for some time been engaged on the composition of various waters of Scotland, as they possess such a direct bearing in respect to the influence of dissolved vegetable matter in the nutrition of plants. Liebig, it is well known, in shewing the fallacy of the opinion respecting the influence of humus in the nutrition of plants, proves his point by a *reductio ad absurdum.* He admits, for the sake of argument, that humic acid is absorbed by plants in the form in which it could gain access in largest proportion, and then, from known data, demonstrates that the quantity absorbed in this way could only amount to the most minute fractional part of the weight of the plant. His reasoning is carried on principally by hypothetical instances; but the facts which I have obtained bear out, in a still stronger light, the position which he assumed. I have found that the waters of rivers which are perfectly clear, without being mixed with any perceptible colouring matter, and which have been drained from mosses, and have passed over deposits of vegetable matter in a state of decay, contain one part of vegetable matter dissolved in about 50,000 of water; while, on the other hand, when the waters were very dark coloured, and apparently contained as much vegetable matter in solution as they were capable of taking up, the mean amount in solution was nearly one part in 35,000, while the largest quantity was one part in about 15,000 of water. In the latter cases it was evident that the water was saturated with the vegetable matter, because, after being subjected to evaporation for a very limited space of time, a deposit of vegetable flocks occurred; and this deposit was also apparent even after filtration, when the water was allowed to evaporate spontaneously. It is evident, therefore, in summer, when waters are clear, that, to communicate 1 lb. of solid vegetable matter, in a state of solution, to a plant, 50,000 times that weight of water would be required—a mode of supply of so slow and inefficient a nature, that but a small fraction of the organic elements of vegetables could be thus imparted. Liebig has supposed the case which he employs as an illustration of a much more favourable nature to the humus theorists. He admits humic acid to be soluble in 2,500 parts of water, on the authority of Sprengel, and humate of lime to be soluble in 2,000 parts of water, and shews that, in a particular case, to produce 2,650 lbs. of wood, 165 lbs. could only have obtained admission in the form of humic acid. This is the most favourable condition. It is scarcely necessary to advance that the results obtained by my experiments are still less in favour of the nutrition of plants by the admission of decomposing vegetable matter in solution to their vessels. Experiments have been made to ascertain how much organic matter could be taken up by water when allowed to digest in the latter. Mould has been treated with cold water, and it has been found that the water remained clear, and dissolved less than 100,000th part of organic matter. This amounts to about one-half the quantity of organic matter obtained as the result of the experiments previously alluded to.

Nature of the effect produced by steeping seeds.—When we are satisfied of the prominent position which inorganic matter assumes in the nourishment of plants, we are in some measure prepared to examine the effect resulting from steeping seeds in saline solutions. Virgil states that he had "seen many persons sowing seeds which had been previously sprinkled with carbonate of soda (nitrum) and black lees of oil, that the seminal produce might be enlarged."—(Georgic I., 193.)

> "Semina vidi equidem multos medicare serentes,
> Et nitro prius et nigra perfundere amurca;
> Grandior ut fetus siliquis fallacibus esset,"

which has been thus incorrectly translated by Dryden—

> "Some steep their seed, and some in caldrons boil,
> With vigorous nitre and with lees of oil,
> To swell the flattering husks with fruitful grain."

The ancients applied the term nitrum to carbonate of soda, and hence the term as employed by Virgil must be so understood. Such processes have long been employed by farmers, and are familiarly known by the terms brining and pickling. Jethro Tull tells us that brining, as an antidote to smuttiness, was discovered in the following manner, about the year 1660:—"A shipload of wheat was sunk near Bristol in autumn, and afterwards, at ebb, all taken up, after it had been soaked in sea water; but it being unfit for making of bread, a farmer sowed some of it in a field, and when it was found to grow very well, the whole cargo was bought at a low price by many farmers, and all of it sown in different places. At the following harvest, all the wheat in England happened to be smutty except the produce of this brined seed, and that was all clean from smuttiness. This accident has been sufficient to justify the practice of brining ever since in all the adjacent parts, and in most places in England." The same author gives the following process for brining wheat:—"The first thing is to make a very strong brine, (of pure salt,) and, when the wheat is laid on a heap, sprinkle it or lave it therewith; then turn it with a shovel, and lave on more brine; turn it again with a shovel, until, by many repetitions of this, the wheat be all equally wet. Next sift on quicklime through a sieve; turn the wheat with a shovel, and sift on more lime; repeat this sifting and turning many times, which will make it dry enough to be drilled immediately." He farther informs us that when lime has been long slaked—that is, when it has become carbonated—and is, therefore, incapable of extracting, from the surface of the seeds, the water which has been brought in contact with them in the form of brine, it is unfit for the purpose of preparing the brined seeds. Tull was, however, sceptical as to the influence of brining, for he says that smutty seed-wheat, though brined, will produce a smutty crop, unless the year prove favourable; and he conjectures that the Bristol wheat might have been foreign wheat, and from a locality where smut did not prevail.

A common idea entertained by farmers is, that smuttiness is principally confined to wet seasons; and this seems confirmed by the circumstance that we find no allusion to smut in the writings of Virgil, although, by a mistranslation, Dryden has made it appear that such a disease was known to the ancients. The original states, (Georgic I., 150):—

> "Mox et frumentis labor additus, ut mala culmos
> Esset robigo,"

which the poet translates—

> "Soon was his labour doubled to the swain,
> And blasting mildews blackened all his grain."

The term in the original obviously relates to rust or blight, and not to smut; hence Dryden would have been nearer the mark if he had used reddened for blackened in the preceding translation.

If, therefore, as would appear from the absence of any notice of smuttiness by Virgil, this disease was unknown in an Italian climate, a powerful argument is supplied in favour of the idea held by farmers that smut is only produced in wet seasons, and the question whether brining is of any service in warding off this disease would still remain open for determination. The same remarks would apply to pickling wheat, so generally employed in the best agricultural districts. It is unnecessary to describe this familiar process, more especially as it has been so well detailed by Professor Low in his excellent work on agriculture. It is only proper to observe that the operation is of the same superficial nature as that of the brining previously noticed; and that the urine with which the seed is sprinkled must not gain access to the interior of the seed, otherwise deleterious effects will undoubtedly ensue. Tull seems to have been acquainted with the process of pickling—(he wrote about 1732)—and to have been quite aware that the injudicious employment of such operations is fraught with danger, for he says, " If seed-wheat be soaked in urine it will not grow, or if only sprinkled with it, it will most of it die, unless planted presently." Now all who have read the works cf Tull with attention will agree that he was too accurate an observer to have made this objection to the common process of pickling if it had not been founded on fact. If we could suppose that the process of steeping were capable of conveying any nourishment to plants in their nascent state, it would be scarcely possible to employ a more efficient fluid than urine. But the operation of brining, which is popularly held to be efficient for preserving plants from the influence of smut and insects, would lead to the inference that the steeping of seeds has no connexion with the early nourishment of the plant, as we know that potash, and not soda, is the main constituent alkali in white wheat; and, indeed, according to the most recent analysis of this grain, soda appears to be entirely absent. As an answer to the argument that in steeping, the seed may absorb some salts which may afterwards serve as nourishment, we have only to imagine a turnip seed to be subjected to this operation, and then to endeavour to form a notion of the minuteness of the solid matter capable of being taken up by it from the solution in which it might have been immersed. From the evidence before us, it cannot be asserted that brining and pickling are of no practical value. The popular opinion in their favour rather supplies presumption in support of their employment. At the same time it must be confessed that their use is empirical, and that the recommendation of similar processes, which are in reality merely rude imitations, without affording any explanation of their mode of action, is to practise agriculture in a manner scarcely advisable in the present stage of its progress. We have learned from Tull, as we may from experience, that even the long established operations may prove prejudicial, and mar the object of the farmer, unless they are performed with caution and experience; and we may gather from his advice, that we should have the very best evidence presented to us, before tampering with the safety of our crops, to the detriment of the farmer and injury of the prosperity of the country.

There is a wide difference between the application of chemical principles and that of chemical substances in agriculture. True chemical principles, when rationally applied, must lead to correct results; but chemical substances may be used independently of such considerations, and the results to chemistry and to agriculture must be prejudicial. Agriculture and chemistry are experimental sciences. It is, therefore, necessary, if we expect to make progress in them, that experiments should be made. But, as in the laboratory, agricultural experiments should first be made on a limited scale, and their results carefully tested, before being submitted as facts to the agricultural world.—*Quarterly Journal of Agriculture, January* 1845.

THEORY OF BONE MANURE.

By Mr. J. TOWERS, *Member of the Royal Agricultural Society of England.*

It is astonishing in how short a time an entire change of opinion may be brought about by circumstances which were not at all foreseen, nor even suspected. Referring to an encyclopædia, in a volume printed in 1836, under the head *Bones*, we meet with the following remarks and conjectures:—

"Bones have been of late years very extensively used as manure especially on *poor lands* and *gravels*." "By their means large tracts of barren heaths have been converted into fertile fields. Most of the bones procured from London and the manufacturing towns have undergone the process of boiling, by which the *oil* and a great part of the gelatine" (or animal jelly) "which they contain have been extracted." "All those who have used bones extensively, report that little difference can be observed. Some give the preference to those from which the *oil and glue* have been extracted; but oil and glue form excellent manure. How is this to be explained?" "The fat and gelatine being intimately blended with the bony matter, and contained in cavities or cells, may remain a long time in the earth without decomposition. As a proof of this, it has been found that bones which had lain in the earth for many centuries, on spots where ancient battles were fought, afforded on analysis nearly as much gelatinous matter as fresh bones would have done."

This remark, my own experience has partially confirmed; for, upon opening a vine-bed wherein a quantity of cracked ox and sheep bones had been placed in 1836, I found that eight years had produced no apparent change, other than that of discoloration, owing to the deposition of some oxide of iron, which conferred a brown and yellow tint.

I had heard and read much about the ramification of myriads of fine fibrous vine-roots among the tissue and in all the apertures; but am constrained to confess that, while I traced this ramification from some other vegetable roots, I discovered very few from those of the vine. It is stated that the great effect of bones most likely depends on the phosphate of lime—

"But a closer examination of the fields manured with bones has led us to surmise that much of their importance depends on the mechanical texture of the bone, and on its power of absorbing and retaining moisture; for if a plant which vegetates with peculiar vigour in a field manured with bones be pulled up, it will almost invariably be found that small pieces of bone are attached to the roots; and when these are minutely examined, the smaller fibres of the roots will be found to have grasped them, and to pervade their cavities, which will always be found more or less moist."

"The *moisture*, then, and a small portion of the remaining *gelatine* dissolved in it, *form the food* on which the plant has thriven. The more the bones have undergone fermentation, the more soluble the gelatine will be. This accounts for the seeming anomaly of boiled bones—they have undergone a fermentation. The residue, although not deprived of all its animal matter, is much more porous, and will imbibe and retain *moisture in its pores*. The food of the plants is here ready prepared and dissolved, and kept in store, without being in danger of being washed through a porous soil, or evaporated by the heat. The solid substance, which is chiefly *phosphate of lime*, has a stimulating effect"—(how *stimulating* and what does the expression imply?)—"and assists that of the more soluble parts. But phosphate of lime is not soluble in water, and does not decompose readily in the earth; its effect, therefore, is not so great as to account for the general result. In *stiff* clays the pieces of bone are bedded in a tough substance, which prevents their decomposition; and in very wet soils the advantage of these small but numerous reservoirs of moisture is lost. Hence it is easily seen why bones are of less use in such soils."

The above extract, which appears to comprise all that was known or rather conjectured, of the availability of bones as a manure chiefly for turnips, clovers, and pasture grass; and I give it, not with any view to enlighten the agriculturist, but to demonstrate the contracted limits of our information at a very recent period. Four yours only from that time had elapsed, when Liebig's Organic Chemistry announced and proved the very great, nay paramount, utility of "*trustworthy investigations of the ashes of plants*"—the products of combustion, scientifically conducted, with a view to detect the true *inorganic* constituents of each individual.

In attempting to present a tolerably clear and accurate view of the chemical agency of *bones*, I may claim some authority, as perhaps I am now the only chemist alive in whose laboratory the *phosphate of soda* was manufactured, in the large way, for the medical practitioners, soon after its discovery and announcement by the late Dr. Pearson. Before I refer more particularly to a process which will elucidate the entire theory of bone-manuring, it will be right to adduce some facts which have been recorded in the Journal of the Royal Agricultural Society of England. These I find, in the following short letter from the Duke of Richmond, and in a note appended by Mr. Pusey:—

On the solution of bones in sulphuric acid for the purposes of manure.

"My dear Pusey,—I have not yet received the details of the experiments tried by the Morayshire Farmers' Club with sulphuric acid and bones; but I know that the result has been most satisfactory. On my own farm, which is a light sandy soil, I tried one acre with it, another with guano, and a third with stable-yard dung. Early in November I had a quarter of an acre of each drawn and weighed. The heaviest crop was from the land manured with the sulphuric acid, though it did not cost me above 11s. or 11s. 6d. an acre. I understand also that the turnips came into rough leaf sooner on that acre than on any of the others.—Believe me yours sincerely,

"*London, December* 9, 1843. Richmond."

Note.—The experiments contained in this letter bears out those of the Morayshire Farmers' Club, the details of which appeared in the last Journal, and affords good hope that this, the most important saving which was ever held in the use of manure, will be found generally useful. For those details I must refer to that paper, merely mentioning now that in one trial a bushel of bones, to which sulphuric acid had been applied, exceeded in its effects six bushels used in the common way.

Mr. Pusey then alludes to the chemical composition of bones, and takes a view of them corresponding in many particulars with that I have already given in the extract from the encyclopædia. Space will not admit of farther quotations; therefore I will at once come to the practical evidence afforded by the processes of the laboratory.

Premising, then, that ox and sheep bones consist (on the authority of Fourcroy and Vauquelin) of—

	Parts.
Solid Cartilages, Gelatine, and Oil, ...	51.
Phosphate of Lime, ...	37.7
Carbonate of Lime, ...	10.
Phosphate of Magnesia, ...	1.3
	100.

We have 51 parts which can be *partly* extracted in the forms of oil and size by simple digestion and boiling in water, and wholly decomposed by the agency of combustion. The elements of these 51 parts yielded by combustion, prove them to be oxygen, hydrogen, carbon, and some azote or nitrogen. Now, in our process to obtain Dr. Pearson's tasteless purging salt, chemically termed (then *natron phosphoratum*, but now) "phosphate of soda," the bones were placed in iron cylindrical retorts, terminating at the farther extremity in a nozzle, to which were adapted pipes to receive and convey the gaseous and fluid products. The machinery and furnaces, in a word, closely resembled those now employed in the coal-gas works, and the bones were ignited to redness much in the same way as the coals. The liquids obtained were impure ammonia (hartshorn) contaminated by abundance of fœtid animal oil. Here we perceive the union of the elements of water and of ammonia; the former being hydrogen and oxygen, the latter hydrogen and azote. A volume of carbon vapour must also have been extricated, and recombined with hydrogen and oxygen in the animal oil.

When these fluids had passed off, the bones or animal charcoal, then heated to redness, retained their figure, and, if suffered to cool in the retort, would have remained quite black, in the condition of *ivory black*. But the doors of the retort were immediately unluted, and the contents withdrawn as quickly as possible, when, by the attraction of oxygen from the open air, they burst into flame, and the carbon remaining in them was consumed, passing off in the state of carbonic acid gas.

Thus, then, the 51 parts per cent. were disposed of, leaving the 49 parts to be accounted for; but these represented the *inorganic* constituents of the bone.

It is now plain that by boiling and burning we get rid of the elements of humus and of ammonia; and, in so doing, relieve the bone from those substances which coat and entangle it, while they also prevent the operation of the soil and plant-roots upon those other elements which are required for specific purposes.

The *theory of humus* has, from the first, been problematical; and while it was received as the sole interpreter of vegetable nutrition, philosophers and practical men floundered about amidst difficulties and contradictory perplexities. Carbonic acid was referred to as the *sine qua non*, and so long as any substance could be deposited in the land which might be made to yield that gas it was believed that enough was done. The more recent discoveries have, however, proved that, while farm-yard manure contains an ample store of that decomposing animal and vegetable matter which is finally resolvable into black humus or vegetable mould applicable to *every soil* and plant, there are other constituents of each individual plant which require specific manures for their especial nutriment. And now, to come to the point at once, if it can be clearly shewn by analysis that a sound well-grown turnip *does* contain bone-ash—that *trefoil* exhibits vestiges of gypsum—and that *lucerne* yields a very considerable portion of *phosphates*—then we can distinctly assert that, be the quantity of humus in the soil what it may, it is utterly incapable of furnishing one particle of those inorganic salts which, nevertheless, must be derived from the soil and not from the atmosphere.

Bones deprived of their decomposible organic elements contain 49 parts per cent. of salts of lime. Now, in order to produce phosphoric acid from these salts, the bones, rendered white by their final combustion, were placed in deep leaden vessels; and so much water was added as completely to cover them with an inch stratum in excess. Concentrated sulphuric acid was then poured with great caution over this water in a small stream, till, in the end, whatever was the weight of the bones, just one-half of that quantity of acid was superadded, while a man with a wooden oar stirred the contents of the vessel. The first operation of the acid was to seize the *lime* existing in the form of a *carbonate*—thus liberating, with strong effervescence, a volume of carbonic aërial acid.

In this process, 10 parts of the 49 were, by combining with their equivalent of sulphuric acid, converted into about 11 of sulphate of lime, in round numbers; that is, supposing in every 100 parts of carbonate of lime there are 44 or 45 parts of carbonic acid. Artificial gypsum, therefore, was the first product of treating calcined bones with sulphuric acid.

The effervescence having ceased, the remainder of the sulphuric acid was employed in liberating the super-phosphate of lime, by combining with the basal lime of the bone-phosphate, and thus producing a proportionate additional quantity of artificial gypsum or sulphate of lime.

Let any one burn a few bones in a common furnace till they become white, and to one pound placed in a stone ware jar add one quart of rain water, and then about half-a-pound of the strongest sulphuric acid. By slow degrees, and in a few days, if the mixture be occasionally stirred with a stick, the decomposition will be completed, and a thick mass, called, by some writers, "gruel of bones," will be the result. If this mass be put into a jelly bag of coarse linen, a clear pale-yellow fluid will draw off, after which, water should be poured upon the filter till the fluid no longer has an acid taste. The filtrated liquid is the phosphoric acid of the bone, holding in solution a considerable portion of phosphate of lime, while the residuum in the bag is gypsum.

The agriculturist may thus learn what he effects by treating bones with sulphuric acid; for he will discover that he not only obtains a *super-phosphate* of great importance to any crop which contains, and therefore requires, this chemical agent as its peculiar element, but that, in addition, he has acquired a great bulk of that valuable salt called gypsum, (sulphate of lime.)

That the clear liquid is not pure phosphoric acid is readily shewn by heating it in an earthen vessel, and adding, till the hissing ceases, a quantity of carbonate of soda. A copious white sediment will be separated, and the clear liquid will be a weak solution of phosphate of soda, the salt originally announced as a purgative by Dr. Pearson. This liquid, evaporated by simmering, will form rhomboidal crystals of phosphate of soda.

I have thus endeavoured to shew in plain terms, without entering into any *atomic minutiæ*, the precise composition of bones. As to the fact alluded to in the first quotation, that "the food of plants is *ready* prepared in bones that have been boiled, and that the roots will be found to have grasped the bones, and to pervade their cavities," it just amounts to, and proves nothing more than, the adhesive pertinacity with which the roots of any plant cleave to the bottom and sides of a porous garden pot. Here they find no prepared gelatine, nothing, in a word, but *diffused* water—moisture so distributed as neither to glut nor swamp the most delicate fibre; and, indeed, so long as the *porous medium* of baked clay can thus be retained in that state of saturation, most plants will thrive with superior luxuriance. As to manures soluble in soils, we know nothing of them; every direct experiment evinces that the rootlets, while uninjured, cannot inhale the smallest particle of even colouring matter, although it is equally proved that, by amputation, a woody twig will imbibe ink and red solutions; and convey them even to the leaves and blossoms; water, therefore, alone, or holding salts in solution, (as soda, potassa, and the phosphates with a saline base, or gases developed by vital agency,) appears, upon the above-cited evidence, to be the only *terrene* aliment of vegetable bodies, since, moreover, it is certain that *humus* accumulates in all cultivated soils.

But recurring to undecomposed bones, whether crushed, ground to small pieces, or to the finest dust, they are so guarded by the animal matters as to resist the energy of either soil or plant, and, for a considerable period, that even of strong sulphuric acid. Yet they can be acted upon by that acid; for I have obtained phosphate of soda from crude bones. The speedy and determinate effect produced upon a crop of turnips, recorded by the Duke of Richmond and Mr. Pusey, depends upon the free condition of the *super-phosphate.* Admitting that it is not traceable in the turnip, while in that condition, it is not the less certain that, if chalk exists in the soil, the salt, which will be formed by its combination with the acid, will still be phosphate of lime, which, being a fresh product, and in an extremely divided state, can be attracted and taken up by the roots of the vegetables at the precise moment when it is immediately required.

Our colleges and seminaries, forming now or contemplated, for the instruction of rising agriculturists, ought to enter deeply into such researches, and make apparent those facts which, at present, are received as speculative theories.—*Quar. Jour. of Agriculture for March,* 1845.

HORTI-FLORICULTURAL NOTES.

(From the Horticultural Magazine for Oct. 1844 *and Jan.* 1845.*)*

The effects of Hybridizing on Flowers and Vegetables.—The application of this art to any really useful purpose is one of the most gratifying of all garden operations, and we have many instances of beneficial results. To this art do we owe some of the most splendid varieties of broccoli; varieties which, with a good deal of hardy character, possess all the beauty, and generally nearly all the flavour of a cauliflower; and there may yet be considerable improvement in the same race of plants. To accomplish these improvements, the hardiest species of the cabbage tribe should be inoculated or impregnated with the farina of the handsomest cauliflower, when nine-tenths of the produce may be thoroughly worthless, but there may be an approximation to the cauliflower head with all the hardiness of the parent plant. Season after season we may fail to do any good, but perseverance alone can succeed; for, if we gave up the point with one or two failures, there would end the matter; and because we had not, we should be assuming that we could not. For instance, suppose we actually fertilized the bloom of the hardy Savoy, which no frost can kill, with the farina of the cauliflower; the result might be an infinity of bastard-looking, rank, ugly-growing, and perhaps ugly-tasting, plants; yet there may be one or more, or some, varying a good deal, but having more or less a button of bloom close like the cauliflower itself, or sprouting like the Cape broccoli, or partaking of both; and this may prove hardy in constitution, tender to eat, and of free growth; it may be hardy enough to come in perfection early in the spring, or late in the winter, and easy to cultivate at any season, like the Savoy, or some of the earliest and hardiest cabbages. But whatever advance were made, with a very hardy plant for its parent, the chances are that something still better might be produced by again seeding it after fertilizing it again with the cauliflower. This is only a suppositious case; but all experiments are founded in some notion of their probable utility; and the subject which suggests this is the knowledge that, by saving seed from a thoroughly hardy plant, and fertilizing it with a tender one of peculiar qualities, there is every probability of the produce being hardy, and a chance that some may partake of the better qualities of the tender one.

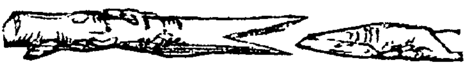
To go from the useful to the ornamental, let us look at the American Rhododendrons, and those of Nepaul and the eastern countries. Rododendron Arboreum is of a bright scarlet crimson colour, very tender constitution, and very handsome. R. Ponticum, R. Maximum, R. Cataubiense, and others, are perfectly hardy, but not so handsome; in short, not one of them have any approach in their colour to a scarlet. Now, by fertilizing these hardy ones with the brilliant scarlet Arborea, abundance of varieties have been produced, quite hardy, with the magnificent colours of the tender ones. Thus have our varieties of hardy shrubs been added to most wonderfully, until there are almost as many shades of the Rhododendron as of any other flower. Another wonderful effect of this hybridizing may be seen in the grand addition made by Mr. Smith, of Norbiton, who succeeded in producing, by fertilizing a Rhododendron with the farina of the Azalia Sinensis, a beautiful yellow variety, a colour which all the Rhododendrons in the world never possessed before. This may be said to be the triumph of hybridization, because the Azalia is almost like another family, and there was hardly a hope of producing bright yellow flowers on the foliage of a Rhododendron entertained by any but the indefatigable man who accomplished it; in fact, it is the flower of a deciduous plant upon an evergreen. That the flower made quite a sensation when it first appeared is quite natural; and it has prepared us for a hundred other novelties that we might otherwise have never thought of. With these proofs of the efficacy of hybridizing before our eyes, it does seem the height of folly to condemn it; yet professed botanists are said to have actually fought hardly against it on the ground of its destroying the distinctions of genera and species as laid down in botanical works. The art has not yet done much in the way of fruit. The raising of new varieties is not hybridizing: it is simply from sowing the seeds, which naturally produces various qualities and distinctions, for the most part wild, but with some improvements on the kind from which it is sown, and which have been found to be desirable; but we do not see why there should not be the flavour of the golden-pippin on the size of the Alexander, or the beauty of the Ferns-pippin with the flavour of a nonpareil. But whatever be the union proposed, there seems no obstacle to its accomplishment, by the ordinary means of hybridizing. As to its effect in flowers, nobody can even imagine a limit; and we are rapidly putting aside all the distinctions of species, and confounding many genera. Seedling varieties, the result of the art of hybridizing, are more numerous, and present many wider distinctions than were to be found between the species themselves, while the silly notions that these cross-bred subjects would not seed, has been universally exploded. Hybrids are found as perfect in all their organs, as free to seed, and the seeds as free to grow, as the most distinct genera in its native purity; and the plants produced from such seeds have proved as varied and as striking as the parent plant. It is not worth while to inquire here, whether, by crossing particular varieties of fruit, anything could be produced partaking of both, it is sufficient for us to notice generally what has been done. How much our gardens are indebted to the art of hybridizing for the larger portions of the floral beauties which now embellish them, and how much more is yet to be expected from the continuance of the practice, judiciously applied with a distinct object, and that object well chosen! In vegetables the great objects to achieve are hardiness and earliness, alterations of colour, size, habit, shape; and in all cases the bad one, which is in some characteristic of what you want, should be fertilized by the good one, of whose qualities you wish the bad one to partake. Marshall was said to produce his beautiful prolific early bean by fertilizing the common horse-bean with one of the broad beans, and the result is an excellent variety with many good qualities. Now, if there happened to be a very hardy pea, however coarse and bad, and ugly, it would be desirable to fertilize it with some of the best of the tender ones, and the result might be the quality of the good one on a plant with the hardy nature of the bad one, and so it would run through all vegetation. We seem mercifully permitted to use the fruits of the earth for our benefit; and the very means pointed out to us for perpetuating any new variety of plant, seems especially to direct us in the grateful task of improving all things intended for our use until they shall be all we require them to be.

Hybridizing.—In bringing before the notice of our readers the practice of hybridizing, we have to remind them that nothing should be done without a meaning as clear as the sun at noon-day; nothing should be attempted without an object, that object being the improvement of one or other of the flowers on which we are at work. Now, the only points to be gained by hybridizing, are first to obtain the properties or qualities of a tender plant upon a hardy one, or the flowers or colours of an ill-habited plant upon one of good habit. Generally speaking, these two points comprise all that can be gained; but there may be another object, which is only comprised in those mentioned by implication—the mixture of colour between plants of equal, or nearly equal claims. The first of these objects is important, and has been accomplished to a great extent in the Rhododendron. The difficulties attending this operation with many flowers are, first, the species flowering at different seasons; secondly, their flowering in different places; for there are certain rules to be observed, without which failure is certain. The pistil of the female plant, or rather the plant which is to bear the seed, has to be impregnated with the pollen or farina of the male plant, or the one which is required to impart the desired property; and this requires some nicety. First, the seed-bearing plant must be watched, and as soon as the flowers open, the stamens, which hold the powder called pollen, must be taken out by small tweezers before they burst, indeed, as soon as they can be got hold off: this secures the pistil from being impregnated by the flower itself. The next is to observe from hour to hour, or from day to day, and as soon as the top of the pistil is glutinous, it is ready for the operation, and at that time the pollen must be applied: consequently provision must be made for it, by forcing or retarding the other plant, so that the pollen shall be ready at the time. One thing is certain, if the pollen be not ready, there is no hope; but if it be ready beforehand, it is possible to keep it. We have carried it a hundred miles, and kept it some days, yet it has answered; but how long it could be kept has not been yet proved. It has been said that it could be carried a long voyage, and even then be efficacious. In the case of a Rhododendron Maximum, while being impregnated with a R. Arboreum, the latter was in bloom three weeks before the former; yet every stage of the process proved, as well as the result did, that the operation had perfectly succeeded. The plan we adopted was, to cut out the point or end of the pistil directly the flower opened, and as the pollen vessels burst we gathered the single flowers from the bunch, and placed the stalk in water in one of the holes of a pansy-stand, covering it with a wine glass, which completely excluded the air as we flooded the surface, that the edge might stand in water. This we did with each bloom as soon as the pollen appeared, so that, before one plant was ready to receive impregnation, we had all the flowers of the Arborea off the bunch some days. The flowers had almost perished, the farina had fallen to the bottoms of the cups, and we took it out with a camel's-hair pencil, and applied it to the pistils of the hardy plant, which had been accelerated all we could by protecting with glass. This merely proves that the pollen might be brought from great distances if done with care, and some persons speculate on its keeping as well as seed. This may be tried: our business is to tell what we know, and not to speculate on what may be done; but as opportunities of procuring flowers offer frequently, they need not be lost; and our opinion is, that flowers, picked in the usual way, and shut in a book, might be preserved some days in sufficient order to perform the operation. We have once in our lives seen rather a curious affair, in which a florist, something behind his neighbours in a flower which shall be nameless, sent to one who had made considerable advances, for a few flowers to inspect, and with these actually impregnated some of the best of his own, and made a rapid start in a season, much more so than he had made in half-a-dozen years previously. From this it may be gleaned, that when people send out choice flowers for inspection, they will have to deprive them of their pollen, or they stand a chance of making rivals almost before they are ready to send out their own plants. The mode of performing the operation having been described in part, we have merely to add, that some flowers are much more difficult to hybridize than others, and that unless they are caught at the moment the pistil is glutinous they will be crossed by some other flower, or by themselves. The instances of hybridization in various flowers will be recognised in many families, but in none more than the family we have mentioned; for in that the operation has been successfully performed by the bright yellow Azalia Sinensis, which is deciduous, upon the

Rhododendron, which is evergreen; and here there is something worth trying for. The term has generally been applied to the crossing of species; but the cross-breeding of flowers for the improvement of their properties is carried on to a great extent, as is evident from the Pansy, the Rose, the Mimilus, Phlox, Verbena, Pink, Carnation, Tulip, Auricula, Fuchsia, and many other subjects; and those who will perform it, instead of leaving it to dame Nature, may, generally speaking, calculate upon a result with more certainty. The first object with a plant is to save seed from the best habit. With a flower, we should select the best form and texture; and it is only when two flowers are distinguished for equal, though different, good qualities, that we can recommend both to be crossed; for here the chances are that both will yield improvements; but where the form of a flower, or the habit of a plant, is bad, and the mere colour or size is the object to obtain seed, only the plant of good habit, or the flower of good form and texture. In hybridizing or breeding the Pansy, seed from a round, thick, smooth flower. In Tulips, seed from a pure yellow, or pure white ground, with a thick, smooth, flat-ended petal, that forms the most even-edged cup, and the rounder the better. In a Rose, take the thick, well-imbricated petal, that opens freely. In a Verbena, take the roundest flower, the freest from notch or serrature, and the most stiff petal. In Petunias, seek for the thick round flower with the flattest lip. In Auriculas, look for the flattest, roundest flower, with the smoothest paste, the smallest tube, and the evenest divided colours; for the widths of the white colour and edge ought to be alike. In the Ranunculus, which has been produced all but, if not quite, perfect, the semi-double varieties that are nearest to double, with bright, broad, thick, smooth petals, and let the pollen you apply come from flowers which are desirable on account of colour; nor does it matter what flower it is, all that has to be done is to select that which is most desirable for form and texture as the seed-bearer, and that which is most conspicuous for colour or size. The Fuchsia Fulgens was the means of deteriorating the whole race of Fuchsias, and the benefit of crossing was hardly felt for years. The coarseness of all the novelties was proverbial, not because pains were taken to hybridize, but because Fulgens happened to be a free seeder, while the more elegant species were very shy seed-bearers, and florists merely sowed the seed from the former because it grew to their hands. Since this, people have been more careful, and the Fuchsia is rapidly improving. It is curious that the very seed-pods of flowers frequently change character; those in the habit of coming small often come large; and seeing these, we have a curious field for speculation in the adaptation of the principle to fruit. For instance, by impregnating fruit, for the purpose of observing whether there is any distinct alteration in the form or flavour of the produce the same year; not that it would indicate exactly the kind of fruit that the seed therein would produce, but that it might make a difference in the fruit, as it often does in the seed-pod. We know there is a difference produced in the seedling fruit that comes afterwards from the seed of the fruit impregnated; but of hybridizing in the case of fruit we shall speak hereafter, as well as of some flowers which present, from their nature, some obstacles to the operation.

Transplanting.—The whole art of transplanting consists in the removal of plants from one place to another and unless this be done without any material damage to the roots, the plant must suffer in health, and sometimes die altogether. Generally speaking, there is no difficulty in removing plants when young, and if they were removed every season they would hardly be the worse for it; when, however, we attempt to remove trees, plants, or shrubs, that have been many years undisturbed, the greatest care must be used to prevent injury from the loss of fibres, which, with all our attention, will be broken, and the plant must suffer in proportion to the damage done to the root. Two facts may be relied upon in the consideration of this subject; first, the growth of a tree is always in proportion to the under growth of its roots, and the head maintained grows as large as the roots will allow it; secondly, that any damage the roots sustain checks the growth of the tree or plant. From these two facts all the art of removing trees and plants should be learned, and upon these two facts all the art is founded. In transplanting seedlings of almost any kind, there is no difficulty, because the roots being easily removed whole, the plants suffer nothing. In seedlings of all kinds there is a strong disposition to make new roots, and, if the fibres are damaged, but little mischief accrues. It is when plants have stood some time, and their roots have made considerable progress, that the difficulty of removal begins to arise. Here, then, we have particular duties to perform; the first is, by carefully removing the earth to the very end of the root to get the plant up with as little damage as possible; and, secondly, to curtail the head sufficiently to allow for the damaged powers of the root. In taking up nursery plants, where despatch governs every thing, the roots lose considerably, and the ends of all the main spreading portions are invariably chopped off with the spade. This forces on us another operation: we have first to cut smooth all the bruised end, and, secondly, to prune off a considerable portion of the branches, to diminish the evaporation and consumption of moisture; some trees, indeed, are so much inclined to grow and strike root, that they would live almost if the roots were chopped off; but there are others which are extremely impatient of damage at the roots, and, if not very carefully removed, will fail. Again, there are many trees that cannot be pruned; for instance, Cedars, Firs, Arborvitæ, and trees of that description, must not lose a branch, or they lose their beauty; hence the necessity of removing every fibre of the root with it, if the tree is to live; while the trees are small there is but little difficulty. But the more valuable kinds are generally kept in pots a few years, that they may suffer nothing by removal. As they advance in growth, the pots are changed; but at length they are turned out into the ground, and for one year, or even two, they might be moved well and easily, because their roots have not had time to spread; but, after that, the difficulty increases every year, and it is a tedious as well as troublesome job to follow out the direction of the roots, and extricate them from the ground, without damage. But certain it is that the only conditions required on removing a tree, of any age or kind, are these: First, to release all the root from the ground, without bruising; secondly, to remove the tree whole, as it is, and undamaged, from where it was to where it is to be; thirdly, to preserve all the fibres thoroughly moist, from the time it is released from the ground until it is replaced; fourthly, to support it in such way, on replanting, as that the earth may be all among the fibres and roots, solid and proper, as it was when it was moved; and, lastly, that in treading and pressing the earth about it, the fibres shall not be pressed together, nor the roots bent out of their places. These conditions attended to, and the largest tree in the world would remove well, and without suffering materially. Still, it is next to impossible to comply with all these conditions with very large trees, and therefore large trees are seldom removed, and rarely live after removal. Many contrivances have been resorted to; but there ought to be two years preparation before it is attempted. This preparation consists of digging a circle round the tree, and cutting off the roots that extend beyond this; and as even this may be too much check, if all done at once, it is necessary to do it at two different periods, by opening four opposite places, and at each place cutting away an eighth of the circle, building a wall within a foot of the remaining roots, and filling up that foot with the soil again, as well as the hole outside the bricks; new fibres and roots will spring out, and almost fill the space to the bricks. The next season the other four spaces may be opened, and the roots cut off at the same distance. At this time there must be some undermining, to examine whether there be any roots running very deep or downwards, like a tap-root; and if there be any, they must be severed before you build walling to complete the circle of bricks. If these operations be well conducted, there will, by the next moving time, be a mass of roots within the brick wall capable of sustaining the tree; and the removal, without damage, will be accomplished with little risk. The only thing then required is power; for by clearing all round the outer part of the brick wall first, and then pulling it down, the roots will be undamaged, and the ball of earth entire. But too much importance is attached to the ball of earth in all cases: thousands of trees have been moved with balls of earth to them five times the weight of the trees themselves, while the roots have been dreadfully shortened all round, and the principal nourishing portions removed. In removing very large specimens, some nicety is required in reducing the head enough to make allowance for the decreased power of the roots, without injuring the general figure and appearance. Even in adopting the plan we have suggested, which is too troublesome for anything but a really valuable and large specimen, the head of the tree should lose something, and it will require some ingenuity to remove those portions whose removal will not injure the appearance of the specimen. But the same principles that govern us in the case of a large tree should be observed in transplanting all things. One certain fact is, that whatever the root suffers checks the tree, and unless the subject be the better for checking, the plant must be reduced, and therefore care must be taken to prevent the root from suffering. But many subjects are the better for the check; that is to say, they would be too luxuriant without such check; hence the practice of root-pruning, to check fruit-trees, a practice that hastens maturity and brings on fruit-bearing. This was the inducement to disroot pines, which some people have complained of as unnatural culture; but our fore-fathers were not such dolts as the present generation would have us think them to be. The old lesson read to us in our boyish days would apply to many theorists who undermine old practices, a truism not to be despised by any means, though not always right as applied to modern changes,—"Young folks *think* old folks are fools, but old folks *know* young folks to be fools." The pruning of roots checks the flow of raw sap, which induces rank growth, and allows that already in the tree to elaborate and adapt itself to the fruiting process; and if roots are not pruned, or a check given artificially, the tree must push on with vigour, forming leaves and branches, but no fruit, until the tree attains its mature size, and the roots have settled down the supply by lessening it sufficiently, when that sap which is supplied will properly elaborate, and fruit is the consequence. Confine the roots of a tree in a pot, and stunted growth is a certain consequence. Cut away the parts of a root which wander farthest, and a more sudden check takes place; yet it so lessens the quantity of nourishment taken up, that, presuming it be not too violent, it hastens the blooming and fruiting; carry this operation too far, and the check is too great; yet a little further, and the tree dies, because the leaves give off more moisture than can be taken up. The only chance, therefore, of saving trees of which the roots have been too much damaged, is to lessen the work which the roots have to perform, when the life will be saved. We have, in the clearing of a piece of ground, met with accidents, and destroyed more root than we ought, chiefly in consequence of some vigorous growths taking place out of the usual situation of roots; more than half has been destroyed perhaps. It has been on such occasions that we have tried experiments: plant such trees or shrubs as they come up, and they die; lessen the head a good deal, and they live, but are sickly; cut a very large portion down, and the remainder will not lose a leaf. Hence it is that plants of all kinds that are inclined to grow too vigorously receive a wholesome check when they are young. Hence it is that fruit-trees are root-pruned, and bear the earlier for it. Hence it is that pine-apples are disrooted to hasten their fruiting; and many plants that are apt to run away and grow too fast are frequently removed, and each time with the loss of some of their roots. But, on the subject of transplanting, it will be desirable to particularize many differently habited trees, shrubs, and vegetables, in papers devoted to themselves. It is enough to lay down, at present, as an unerring fact, that the loss of roots checks growth; that the only way to counteract this, when the check is not desirable, is to take extra pains to preserve them, to remember that every fibre that is broken is the loss of a means of support, and that, to maintain the plant healthy, it must be reduced in exactly the proportion that the root suffers; so that plants like firs, which cannot be cut down without the destruction of their symmetry, must not lose any portion of their roots, because there are no means of lessening the consumption, and therefore we must not lessen the supply.

Grafting.—This operation is of high importance in practical gardening, for although hundreds of subjects can be raised from cuttings they cannot be rendered useful for years; while the same cutting grafted on a vigorous stock might form a tree the second year. The whole strength of the stock may be thrown into the small piece grafted on it, whereas if grown as a cutting it could not grow at all until it struck root, and even then but slowly for a considerable time. The advantages of grafting are not limited to this nor any other, but are many. First, it enables us to multiply any new or distinct variety to a much greater extent than by any other means, because a piece with a single bud on it is sufficient for a graft. Secondly, it enables us, if desirable, to throw greater or lesser nourishment or vigour into the graft according to the stock we place it on. Thirdly, it enables us to change the variety of any tree, or shrub, or plant already established, instead of removing the old tree or shrub and placing a new one in its stead. The manner in which the operation is performed is adapted to the circumstances under which it is undertaken: for instance, if grafting is performed for the purpose of multiplying a variety, stocks of the proper kind are selected, for the purpose of conveniently removing when the graft has taken; generally a year established in the ground if for fruit-trees, or a year old in pots. The first is because fruit-trees and shrubs in the open ground ought not to be more than three years in a place undisturbed; and therefore as one year after planting a stock is strong enough to be grafted, it allows of one year to let the graft grow, and a second to form a sort of head, or to grow into stuff, as the gardeners call it. These stocks may be grafted two or three ways: rapidly growing subjects, intended for standards, are grafted as near the ground as possible; some subjects are, however, grafted where they are to form the head: in either case the union of the graft or scion may be secured the same way, nor does it matter in what way the join is made. The most simple perhaps is, to cut the stock into the form of a wedge, and to split the scion, and cut the inside wood out so as to fit across it like a saddle; this must be done with a sharp knife, so that the bark may not be damaged by bruising. In placing the graft on the stock, if the wood be both of a size, or nearly so, the fit may be perfect; but if the graft, which is mostly the case, be smaller than the stock, it must be placed on one side, so that the bark of the graft or scion on that side shall exactly fit the bark of the stock, for if the scion does not reach half-way across the wedge of the stock, it will, nevertheless, soon cover it all, and even hide the join by its growth; whereas, if the scion were put on in the middle of the stock, so that the barks would not touch, no union could take place. When the stock and scion are made to fit properly, they should be tied firmly together, and covered with proper grafting clay, thickly enough to keep out the air and prevent the wind from drying up the juices before they have time to unite. Another mode of joining these together, is to cut the top of the stock square, take a slice off the side, and then cut the scion or graft with a shoulder, and slope the inside so as to fit on the stock on the side where the slice was taken off. Here, too, the bark must be made to meet on one side, for it will unquestionably fail, unless the barks are made to meet all along one edge. Here the tying and covering with clay must be observed, the same as in the other case, and the diagrams show the way in which the cuts are made. Besides these modes of joining there are many others: one mode is to cut the end of the stock into a long slope, and the graft or scion into a similar sloping form; these two slopes being made to fit, it only remains to cut a slit in each slope in such position that the tongues formed by the cuts will tuck into one another, and bring the slopes together with a good splice: this tied and clayed as before mentioned, will secure a good union. To sum up the various modes of grafting, it matters not how the join is formed so that it be neatly fitted, the two firmly tied, and the air well kept out by the clay. Supposing this to be joined near the ground, the graft must be watched, and only the strongest bud be allowed to grow up: this should be encouraged to grow straight until it is tall enough for the trunk of a standard. All this time, the side or lateral shoots must be removed, except the top four or five, and as new ones come at the top the bottom



ones are to be removed, so that there shall not be more than the half-dozen branches when the trunk shall have attained the height it is intended to be; these half-dozen shoots are then allowed to form the head; of which, however, we shall speak at a future time, when, after mentioning the various modes of grafting, we give lists of the best stocks on which to graft all the leading subjects.

The raising of Plants from Seed.—Nothing so completely kills the germ in a seed as alternations of wet and dry. It matters very little about the cause why these alternations kill them, but having proved it many times, I hesitate not to say such is the effect. Next to this in point of mischief, is cold and wet; and next to that, heat and dry. From repeated trials, I have proved that heat and moisture will cause seed of all kinds to germinate; but there are many that will grow with so little of either, as to require no care or attention. Among our popular plants, Eriostemon buxifolium, which gives a hard seed, and Andromeda floribunda, the seed of which is very small, are as difficult as any; but if there is a fair degree of moisture kept up, and the heat of an ordinary stove preserved, these seeds will germinate freely. The easiest mode of securing this, is to sow in a seed-pan of peat and loam, with a little sand; water with a very small-rosed syringe, throwing the wet like a moist dew, and as lightly, and covering with moss. In a fortnight, or rather more in some cases, and in others a month, the seed will germinate, when they must be shaded with white thin cloth or paper over a hand-glass or bell-glass, which should be placed on to protect it from draughts and alternations of atmosphere. As soon as they are large enough to conveniently get hold of, plant them out in similar pans, or large pots, an inch apart, water them gently from time to time, and cover again with hand-glass, and have it lightly shaded until the roots get established. In this pan they may grow until they have not room enough, giving them warmth no longer than establishes the roots, and then moving them into the green-house; keeping them, however, protected with the glass and shade, as before. When they require repotting, it is still better to get other pans or large pots, and increase the distance apart, for the larger the body of mould they are in, the better. In the case of Americans and hardy things, they may be bedded out in a place composed of peat and loam, such as Rhododendrons and Azalias are grown in the first June, after they are large enough, and there shaded from the heat of the sun daily; while the Eriostemon, or any other green-house plants, may be potted into those of forty-eight to the cast. The after management, however, is not so much the object of this paper, as the germination of the seed. We have known sowing after sowing to fail, in the hands of some of our best cultivators, but on trying the moss and heat, they have succeeded completely. When once the seeds have fairly begun to grow, it does not matter how soon the heat is reduced a little; for both the plants we have mentioned, and all Botany Bay plants, Ericas, Epacris, and Americans, are impatient of warmth; and an hour or two neglected, would perhaps kill them all; still moisture prevents generally any rapid dissolution. It must also be remembered that an hour or two's hot sun would clear off and dry up the whole batch, in its young state. On this account, as soon after the pricking out as they are fairly established, and begin to grow, you may begin to lessen the heat; first by putting them in the coolest part of the stove, and next by removing them to the warmest part of the green-house, after which to the coolest.

Steeping Seeds.—It appears almost incredible that the merely steeping of seeds should have any prolonged effect on the plant itself, yet the evidence is so strong, if credence can be given to the proceedings of public institutions, that it were idle to dispute the fact; nevertheless, evidence of experiments should be received with caution. That a good deal more has been attributed to steeping than ought to have been is certain, and that many whimsical nostrums have been put in requisition is also obvious. The best authenticated is perhaps the effect caused by steeping in muriate of ammonia, and we think that as the fertilizing effects of so small a quantity as half an ounce in a gallon of water, and that used only once in six waterings, are proved, it is not too much to suppose that the steeping of a seed which would imbibe a considerable portion, may assist the future vegetation.

Seeds of Dahlias and other double syngenecious Flowers.—In saving seeds for sowing, never take them in the centre; take none but petal seeds, for they will give the largest proportion of double flowers. China Asters and Dahlias have generally some disk seeds, if they are even very double; therefore on taking the pod to get out the grains, begin from the outside, and when you have got a few of the rows of seed from them, throw the rest into a common sort, which you may give away or sell; but building upon the chances of good flowers, you will be much better paid for your labour by the few outside seeds, than ever you can by sowing the whole. This is worth attention.

Advice to Dahlia Growers.—When crops have been grown time after time from the same seed, each crop gets weaker; experience teaches that Dahlias are not different in this respect from potatoes. Whoever dreams of planting his own seed potatoes, as men do their own Dahlias, twenty seasons running? Nobody. Then Dahlia growers, take the hint, change a root of all your collections that do not do well with you, because they require a change as much as a potato. The great blunder that you have all made, is that of throwing away sorts which you call worn out, only because they are tired of your stuff, and your treatment. Dahlias no more get worn out than any other plant, but you treat them worse than you treat any other plant. Hundreds of old Dahlias have been thrown away, that if now produced would win seedling prizes. Let us have no more such neglect, for it deserves bad flowers.

The Verbena.—This plant is rapidly coming into notice, not less for its use in the garden clumps than its appearance in vases and pots. The colours are more than ever diversified, and each season adds brilliance and beauty to collections. Some persons are checking the advance, by selecting bad instead of good ones from seedlings. We have seen some of the new varieties approaching the standard pretty well, though there is much to do yet; but the colour of a new sort captivates many growers sufficiently to prevent raisers from doing as they would. Those, however, who wish to advance the flower should never select narrow petals nor notched ones, for neither can be good, and the presence of them in a collection would spoil the seed. In choosing any for the garden, fix upon such as are very broad in the petals, in preference to any other quality, and when you have done this in each colour you will have laid the foundation of a collection; but if they are for the flower-garden alone, you have a second point to look for—you must have them dwarf, for a tall straggling Verbena is good for nothing.—*T.*

Cabbages.—Nothing is more common than making about two sowings do all that is required of this universally approved and useful vegetable, and they are kept stunted in the seed-bed (or perhaps run to seed there) for the purpose of taking plants out whenever there is a place to fill up. Now I opine that no vegetable is better worth the trouble of growing well than a cabbage; and for this purpose I recommend, as I practise, the sowing frequently, that the plants may be taken at their proper stages of growth for planting out to cabbage. By frequent sowing, that is to say, once a month during the growing season, and by pricking out into nursery beds as soon as the plant is large enough to handle, you can always contrive to keep plants that will answer the purpose of a short or prolonged growth. The advantage may be felt another way: there is no complete failure, no quarter of the ground need be idle six weeks, because you are always ready to fill it with this excellent vegetable. As to the sorts I am almost indifferent; I have planted for years only two sorts—the true early York and the Imperial—both are excellent, and if taken in season I do not know which is the better of the two.

ON THE ROTATION OF CROPS, AND ON THE QUANTITY OF INORGANIC MATTERS ABSTRACTED FROM THE SOIL BY VARIOUS PLANTS UNDER DIFFERENT CIRCUMSTANCES.

Royal Society.

May 22nd, 1845. "Memoir on the Rotation of Crops, and on the Quantity of Inorganic Matters abstracted from the Soil by various plants under different circumstances." By Professor Daubeny, M.D., F.R.S.

The author was first led to undertake the researches of which an account is given in the present memoir, by the expectation of verifying the theory of DeCandolle, in which the deterioration experienced by most crops on their repetition was attributed to the deleterious influence of their root-excretions. For this purpose he set apart, ten years ago, a number of plots of ground in the Botanic Garden at Oxford, uniform as to quality and richness, one-half of which was planted each year, up to the present time, with the same species of crop, and the other half with the same kinds, succeeding each other in such a manner that no one plot should receive the same crop twice during the time of the continuance of the experiments, or at least not within a short period of one another. The difference in the produce obtained in the two crops, under these circumstances, would, the author conceived, represent the degree of influence ascribable to the root-excretions.

The results obtained during the first few years from these experiments, as well as from the researches which had, in the mean time, been communicated to the world by M. Braconnot and others on the same subject, led him in a great measure to abandon this theory, and to seek for some other mode of explaining the falling-off of crops on repetition. In order to clear up the matter, he determined to ascertain, for a series of years, not only the amount of crop which would be obtained from each of the plants tried under these two systems, but also the quantity of inorganic matters extracted in each case from the soil, and the chemical constitution of the latter, which had furnished these ingredients. The chemical examination of the crops, however, on account of the labour it involved, was confined to six out of the number of the plants cultivated; and of these three samples were analysed, the first being the permanent one, viz. that cultivated for nine or ten successive years in the same plot of ground; the second, the shifting one, obtained from a plot which had borne different crops in the preceding years; the third, the standard, derived from a sample of average quality, grown under natural circumstances, either in the Botanic Garden itself, or in the neighbourhood of Oxford. These analyses were performed by Mr. Way.

The examination of the soils was carried on in two ways; the first, with the view of estimating the entire amount of their available ingredients; and the second, with that of ascertaining the quantity in a state to be taken up at once by plants, the available ingredients being those which are soluble in muriatic acid; the active ones, those which are taken up by water impregnated with carbonic acid gas. This portion of the investigation was conducted in part by the author, and in part by Mr. Way, and has reference to three subjects; first, to the amount of produce obtained from the deficient crops; secondly, to their chemical constitution; and thirdly, to the nature of the soil in which the crops were severally grown.

The plants experimented upon were spurge, potatoes, barley, turnips, hemp, flax, beans, tobacco, poppies, buckwheat, clover, oats, beet, mint, endive, and parsley. The only crop which seemed to show the influence of root-excretions was *Euphorbia Lathyris*, which would not grow in the same ground three years successively, although the soil was found afterwards fitted for rearing several other species of plants. In the remaining cases, there was in general a marked difference between the permanent and the shifting crop, to the disadvantage of the former; and where exceptions occurred to this rule, they seemed capable of being accounted for by accidental causes. The amount of each year's crop is given in a tabular form, and their differences illustrated by diagrams showing the relation between the two crops of each vegetable.

The second part of the memoir commences with an account of the method of analysis, pursued by the author for determining the nature and proportions of the ingredients, present in the ashes of the crops submitted to examination. This method was, in general, similar to that recommended by Will and Fresenius in their paper published in the 'Philosophical Magazine,' No. 169; but in determining the amount of phosphoric acid, the following mode was adopted in preference to the one therein given.

As the phosphoric acid would seize upon the iron in preference to any other base, the amount of peroxide of iron present in the ash was first determined by precipitating it from a muriatic solution by means of acetate of ammonia. The weight of the precipitate gives that of phosphate of iron, from which that of the peroxide of iron may be readily calculated. This being ascertained, he proceeds to determine the phosphoric acid by operating on a fresh portion of the solution of the ash, into which a certain known weight of iron dissolved in muriatic acid is introduced, in quantity more than sufficient to unite with the whole of the phosphoric acid present. This done, acetate of ammonia is added and the mixture boiled, when all the peroxide of iron, whether combined with phosphoric acid or not, is thrown down. From the weight of the precipitate, that of the phosphoric acid present may be calculated, as both the amount of peroxide of iron present in the ash, and that which was added subsequently, are known.

A report is then given of the analysis of the ashes of barley, of the tubers of potatoes, of the bulbs of turnips, of hemp, of flax, and of beans, all cultivated in the Botanic Garden; and from the data thus obtained, the quantity of inorganic matters abstracted from the soil in ten years by the above crops is deduced; and a table is given showing the relation between the permanent and shifting crops, with respect to their produce, the amount of inorganic matters, that of alkali, and that of phosphates, contained in them.

In the third part of his paper, the author considers the chemical composition of the soil in which the above-mentioned crops were grown. He states, in the first place, the method he adopted for determining the amount of phosphoric acid present in the soil.

An analysis is then given of the soil taken from a portion of the garden contiguous to that in which the experiments were carried on, and from one of the plots of the garden itself, and from these data a calculation is made, that the ground at present contains enough phosphoric acid for nineteen crops of barley of the same amount as the average of those of the permanent crops, and of the same quality as that obtained in 1844. It was also found, that there was a supply of potass sufficient for fifteen crops of barley; of soda, for forty-five; and of magnesia, for thirty-four. When, however, we examine how much of these ingredients is taken up by water containing carbonic acid, the proportion of each is found to be much smaller; and a striking difference exists, in this respect, between the soil which had been recently manured and that which had been drawn upon by a succession of crops. In the first case, the quantity of alkaline sulphate obtained in the pound was 3.4 grs.; in the latter it varied from 0.7 to 0.07; and of phosphate, the quantity in the former was about 0.3, whilst in the latter it varied from 0.18 to 0.05.

From these facts the author concludes, first, that the falling-off of a crop after repetition depends, in some degree, on the less ready supply of certain of the inorganic ingredients which it requires for its constitution; but that two crops equally well supplied by the soil with these ingredients may take up different quantities of them, according as their own development is more or less favoured by the presence of organic matter in the soil in a state of decomposition.

Secondly, that it is very possible that a field may be unproductive, although possessing abundance of all the ingredients required by the crop, owing to their not being in a sufficiently soluble form, and therefore not directly available for the purposes of vegetation; so that, in such a case, the agriculturist has his choice of three methods; the first, that of imparting to the soil, by the aid of manure, a sufficient quantity of these ingredients in a state to be immediately taken up; the second, that of waiting until the action of decomposing agents disengages a fresh portion of those ingredients from the soil (as by letting the land remain fallow); and the third, that of accelerating this decomposing by mechanical and chemical means.

Thirdly, that it is probable that in most districts a sufficient supply of phosphoric acid and of alkali for the purposes of agriculture lies locked up within the bowels of the earth, which might be set at liberty and rendered available by the application of the artificial means above alluded to.

Fourthly, that the aim of nature seems to be to bring into this soluble, and therefore available condition, these inorganic substances by animal and vegetable decomposition, and therefore that we are counteracting her beneficial efforts when we waste the products of this decomposition by a want of due care in the preservation of the various excrementitious matters at our disposal.

Fifthly, that although we cannot deny that plants possess the power of substituting certain mineral ingredients for others, yet that the limits of this faculty are still imperfectly known, and the degree in which their healthy condition is affected by the change is still a matter for further investigation.

Lastly, that the composition of various plants as given in this paper, differs so widely from that reported by Sprengel and others, that we are supplied with an additional argument in favour of the importance of having the subject of ash-analysis taken up by a public body, such as the Royal Agricultural Society of England, possessed of competent means and facilities for deciding between the conflicting authorities, and supplying us with a more secure basis for future calculations. (*Chemical Gazette, July*, 1845.)

TRANSMISSION OF CUTTINGS TO INDIA.

It will be recollected that when suggesting a particular mode of preparing and packing cuttings of fruit-trees for India* (see p. 539, 1843), I said, in a fit of enthusiasm, that they might be so prepared and packed as to enable them to survive a sailing voyage to India round the Cape of Good Hope; but the experiment appeared so impracticable, that after preparing a quantity of cuttings in the way recommended, I could meet with only one gentleman who would incur the trouble and expense of transmission. The cuttings were gathered nearly three months before the vessel sailed, and after a voyage of nearly four months to Calcutta, it will be seen by the following report that 36 out of 82 cuttings had retained some traces of vitality. Now, if these cuttings had been sent by the Overland Mail in November, packed in the same manner, they would have arrived at Bombay in a fresh state, fit for grafting; and even had they been shipped from thence to Calcutta, the whole passage would not have exceeded half the time that they occupied round the Cape of Good Hope, to say nothing of the disadvantage of being cut three months before they were despatched. In future there need be no such delays, as the Peninsular and Oriental Steam-ship Company have concluded arrangements for running their vessels direct to Calcutta by the Red Sea route, and, by a rough calculation, I imagine that young fruit-trees may be sent by this conveyance from London to Calcutta, at a rate not exceeding 2*s.* each. In order to go so cheap, they must, however, be prepared in the nursery, after the following manner:—Graft strong shoots quite close to the ground, on stocks about the same size as that of the scions, and allow only one shoot to grow from the graft; about the end of August cut back this shoot to half its length, in order to strengthen the eyes below, and by the end of October the grafted tree will be fit for the journey; but a plant two years old would, however, be preferable. Before they are packed, all the small roots, that would be likely to perish on the way, may be cut off, and the grafted part reduced to 10 or 12 inches. Young trees, thus prepared, would occupy little space—not much more than what double the quantity of grafts would require. Dry sawdust seems the best article in which to pack them, and as stone fruit is more liable to injuries than Apples and Pears, they might be first packed in tin cases, and then put into strong wooden boxes, suffi-

* For this particular mode of packing, See Vol. 2, page 387, of the Journal.—*Eds.*

ciently large to receive 3 inches of sawdust all round the tin cases. I have known collections of seeds, packed in this way, to come safely from Australia, dry earth being used in place of the sawdust.

The following is a list of cuttings sent to Calcutta early in 1844, and the result :—

	Dead.	Alive.	
12 Currants, ...	8	4	with a little sap.
APPLES.			
7 Hawthornden, ...	5	2	
6 Alfriston Pippin, ...	4	2	
2 King of the Pippins, ...	0	2	
3 Reinette du Canada, ...	1	2	
2 Wormsley Pippin, ...	1	1	
3 Downton Pippin, } 3 Dutch Mignonne, }	2	4	
2 Brabant Bellefleur, ...	0	2	
2 Pennington's Seedling, ..	2	0	
PEARS.			
2 Aston town, ...	2	0	
8 Ne Plus Ultra, ...	2	6	
3 Althorp Crassane, ...	1	2	
3 Easter Beurré, ...	0	3	
3 Beurré Bosc, ...	0	3	
2 Beurré Bance, ...	0	2	
3 Hacon's Incomparable, ..	2	1	
PLUMS.			
10 Greengage, ...	10	0	
82 Cuttings, ...	46	36	

These cuttings were carefully coated in bees'-wax, and packed in sawdust in a strong box, which was screwed down very tight, in order to exclude air. They were shipped from London in the month of January, 1844, and arrived in June following at Calcutta.

Other cuttings had their ends inserted in Potatoes, without any bees'-wax, but they all perished.—*D. Beaton, Gardener's Chronicle, August* 1845.

NOTE ON THE KANG PUNNEAH NAGA TRIBE.

By J. M'Clelland, Esq.

At page 6, of the sketch of the late Mr. Griffith, published in the Journal of the Agri-Horticultural Society, (Part I., Vol. IV.) it is remarked, in allusion to the privations to which he exposed himself, that he had frequently to construct his own shelter for the night, &c.; and in a note, in which an instance of this is given, page 36, it is said, he was then twenty miles beyond the British boundary, and amongst a tribe only known by their depredations on the outposts of the Assam Light Infantry, occasionally decapitating whole guards as they lay asleep.

At the moment of writing the above note, the discipline or respective merits of particular troops or corps did not occur to me, and I mentioned the Assam Light Infantry quite inadvertently.

I find on reference to a Journal kept on the occasion, that instead of the Assam Light Infantry, I ought to have said the Rajah's troops, as I find the district along the Naga frontier was at the period in question in possession of a native chief, Rajah Parunder Singh. With regard to the distance beyond the boundary at which the incident alluded to occurred, the Naga boundary was formed by a bund, two miles on the Assam side of Gabru Porbut at the time of our visit, and the point to which Mr. Griffith advanced on the occasion, was one day's journey beyond Gabru; so that I set down twenty miles beyond the British boundary as a mere guess. Capt. Hannay, who appears to have taken umbrage at the allusion made inadvertently to the Assam Light Infantry, asks where the Tea Deputation, to which Mr. Griffith was attached, could have crossed the British boundary to such a distance. I may remark, however, that the Deputation may be said to have broken up on the 8th of March, the day before we set out on the excursion in question.

We returned to Gabru from the Naga hills on the 12th of March, and reached Joorhath on the 15th, when we find the following entry in our Journal, which bears out our remark on the character of the Nagas. "15th (March 1836). After a second interview with Mr. R. Bruce, in the Rajah's service, the only person on the spot we had to consult, we have abandoned our intention of visiting the Dhunsiri at this advanced season, particularly as it would take several days to get there, and several more to get boats. The Nagas, it would seem from Mr. Bruce's account, are a people with whom the intercourse of individuals should be carefully extended, and they are not now in a settled state, so as to render it prudent to enter the hills unless with a guard. There are three or four distinct tribes of Nagas on the Rajah's frontier, which the official situation of Mr. Bruce, as Captain in command of the Rajah's Military force, consisting of 600 men, renders him well acquainted with.

"They are, he informs us, warlike tribes of the most uncivilized nature. The houses of their men of rank, and indeed of all classes in proportion to the means and opportunities they may have had, are but museums of human skulls, procured during their wars amongst themselves, as well as with their neighbours. It is the highest honor a warrior can boast, to have in his possession the skulls of the greatest number of victims to his spear. The head of a female, is however, so highly prized, that the Naga who procures one from an enemy is *tatoed*, and henceforth worshipped as a deity during life, and has a stone raised to his memory when he dies.

"Their practice is to fling the spear, which they do with great precision, and when struck they rush upon their victim, and by means of the Dhau they carry behind in their girdle, strike off the head with incredible dexterity. Mr. Bruce further informed us, that about a year or fifteen months before, twelve of the Rajah's sepoys on outpost duty, were decapitated in this way before they had time to turn out. The Nagas, Mr. Bruce says, are remarkable for their successes in night attacks. They conceal themselves for days as close as possible to the place they intend to carry, requiring nothing for their support but a little raw grain; and on a suitable occasion, they rush from their concealment, piercing every object before them with their spears." The above details are given precisely as they were related by Mr. R. Bruce, although we saw nothing in our intercourse with the Nagas to indicate the character given of them. Yet there was nothing in the statement materially different from what appeared to be the general impression at the time in Assam; and had Captain Hannay written to me, instead of appealing, as he did to the Agricultural Society, relative to an obvious inadvertence in the sketch of his late friend, all I can say is, that he would have saved himself and the Society some trouble. It is true the Secretary was considerate enough to refer the substance of his first letter to me, but coming before me in that way, the nature of the inadvertence did not occur to me.

Having had the subject thus recalled to my recollection, I at first intended to draw up a short notice of what we saw of the Naga tribe on the occasion adverted to, and had a drawing lithographed from our sketch book for the purpose. But recollecting that they have since been visited by numerous officers from Assam, our own observations would be of comparatively little interest.

I may remark however, that it is probable there are at least two distinct races occupying the extensive mountain tract between Cachar valley and Assam, known under the common name of Nagas. Mr. Griffith in his subsequent travels, now under publication, describes the Nagas met with 150 miles to the N.N.E. of those we first saw, as of Tartar origin, having like the Singphos and Burmese the Chinese cast of features; while the *Kang Punneah* tribe, or those inhabiting the hills near Gabru Purbut, were regular Bengalese both in complexion and physiognomy, retaining the stature and figure of the original stock, under a very different climate and mode of existence. It has often occurred to me, that the history of the various tribes inhabiting the mountain ranges between Bengal and Assam, would, if properly investigated, supply some curious information, being the boundary at which two great families of mankind meet. Without blending with each other as might be expected, they exist rather in little isolated colonies, preserving all the peculiarities of their respective stocks. Thus the Kassias and the Garrows are of Tartar origin, occupying the extreme limit of the range, though surrounded by Georgian nations. The Nagas who occupy the central districts of the same chain, are (if we may judge from the few we saw) Georgian races, though bounded on the east and west by Tartar nations, such as Kassias, Singphos and Burmese and eastern Nagas. With regard to the drawing of one of the Naga tribe we visited in 1836, the copyist has not preserved the lines of the features, which are too soft, so as to give the individual a boyish appearance, instead of which he was a man of 28 or 30 years of age. Notwithstanding all the civilities we offered, he was the only individual who ventured to hold any direct intercourse with us. His visits were rather capricious and uncertain; they were however quite disinterested, for with the exception of tobacco for immediate use, and a few glass beads, he seemed quite indifferent to any thing we had to offer. The only covering of the men consists of a small square piece of thick cloth fixed in front to a narrow girdle, and ornamented with courie shells in the manner represented in the drawing. Their arms consist of a light spear, and a peculiar straight heavy knife, intermediate between the Singpho *Dhau* and Goorka *Coukrie*, which they carry behind in the girdle. We saw no women.

J. M'Clelland.

29th November, 1845.

Result of Experiments with Guano on Flowers. By R. Smith, Esq.

To the Secretary to the Agricultural Society of India.

Sir,—In the early part of the present year, I obtained from the Agricultural Society a small packet of Guano, weighing about two pounds.*

The Guano appeared to be mixed with earthy deposit, and presented the appearance of a reddish brown, or ferruginous powder, of a coarse consistence, and possessed that peculiar "Sea bird" smell, for which no corresponding term seems hitherto to have been invented.

From what I had heard and read of Guano as an article of commerce, the sample which I had received appeared to me to differ, in color at least, from that which is known in Europe; most probably from some peculiarity in the soil of the place whence it was obtained.

* This Guano (Peruvian) was portion of a supply presented by W. P. Grant, Esq.—*Eds.*

Be that as it may, I proceeded to give it such trial as the means which I possessed, afforded; and perhaps my experience in this way may be of some service; since I concluded, that the majority of the experiments would be made on vegetables. I therefore chose flower seeds, flowers and shrubs, for the purpose; and the results of my experiments were as follows.

I purchased from an Auction firm in this place, a packet of French flower seeds, consisting of most of the ordinary and some superior sorts of annuals. As the experiments were intended to determine the fertilizing property of the Guano, I selected an ordinary but good soil for the purpose, but to which no other preparation was given than by sifting to separate extraneous matters. In this soil the seeds were sown, in small gumlahs; on the surface of each, about a tea-spoonful of the Guano was strewn, and lightly mixed in, in order that, if the Guano possessed a stimulating power on the germination of seeds, such effect might be shewn by this method of making the experiment.

The seeds to all appearance were in excellent condition when sown in gumlahs, and no water was given to them, and then sparingly, merely by means of sprinkling, until the third day after they had been sown. At the same time, care was taken to shade the gumlahs for a few hours during the heat of the day, and precautions were used, at the same time, against insects.

I am thus particular in mentioning these apparently trivial circumstances, because, I am convinced that, in instituting experiments of this nature, one cannot take too much pains, considering the importance of the results involved.

I waited very patiently the usual time for the germination of the seeds; but to no purpose. Not one came up: still, I was loath to suppose that, an experiment so carefully undertaken, had failed so evidently, and I continued for some time longer to entertain the hope that the seeds would vegetate; but, after the lapse of nearly a month, I felt that the case was hopeless, and returned the contents of the gumlahs to the spot whence they had been derived.

And now comes the consideration—was the fault in the Guano, or in the seeds? As in many more weighty cases, much might be said on both sides; but, as the dose which I had given to each gumlah was exceedingly small, I must give a verdict against the seeds, which, despite of their excellent appearance, most probably had lost their germinating powers, the blame of which may rest with the party who offered them for sale.

I had calculated so certainly on the seeds vegetating, that the whole had been sown at once without any reservation, which I regret; as, had a portion been reserved, it is probable that the question whether they or the Guano was in fault, would not have been left with a shade of doubt attached to it.

Disappointed in the result of the experiment in seeds, I next applied myself to the task of endeavouring to ascertain the effect of the Guano on flower plants; and in this, I may venture to say, that I experienced some degree of success. The Guano, generally in very small proportions, not in fact exceeding that of a tea-spoonful on an average, was strewed around the stems of flower plants in all stages of growth, both in the open ground and in pots, and carefully stirred in with the soil to the depth of an inch or two, and in some cases, quite superficially. The effects, after careful observation for some time, seemed to be that succulent plants grew more vigorously from the application of the Guano, and their leaves assumed a more healthy appearance where they had previously been in a state approaching to disease. On shrubby plants I do not think that any decided effect was produced; while on the species of Junceæ, the Russelia being a marked instance, the application of the Guano was evidently injurious.

From the effect of the Guano on succulent plants, I have reason to think that it will be found a valuable stimulant and nourisher for vegetable productions, and the cereal grains, which form the bulk of the products of the soil in practical agriculture. I am at present arranging for a series of experiments on the effects of artificial electricity on plants; and I hope in due course to present to the Society the results of the experiments. Small as these matters may appear in principle, they are the same as those by means of which Nature works out her stupendous effects; and should not be underrated either for their simplicity or for the inconclusiveness of their present result, for—as is well observed—it is the units of individual experience which go to compose the sum total of human knowledge.

Mily. Board Office, I remain, &c.
8th Sept. 1845. R. Smith.

RECIPE FOR THE PREPARATION OF THE SALEP MISREE ROOT.

Extract of a Letter from Captain J. C. Brooke, *dated Kotrah viâ Neemuch, August* 12, 1845.

"I do not know whether you ever received the box of Salep Misree Roots I sent;* kindly inform me, as I never had an acknowledgment of their receipt. The way to prepare them is not, as stated by Royle. The Caubul plan, as told me by a native gentleman, (and who having learnt it from an Affghan merchant, prepared some of the roots I sent him as fine as the finest Caubul,) is as follows—'Cut the outer skin off with a knife, and all the dirty rotten parts very carefully. Throw the roots into milk and heat, taking care not to boil them, or to allow them to get very soft. Dry them in the shade a few days, and afterwards in the sun, till they become perfectly hard.' Take care to throw the milk away, as it is intensely acrid and poisonous. The reason for using milk, I conceive, is the fact of its not dissolving the glutinous part, while it extracts all the acrid vegetable juice. Water will do the latter, but it carries the gluten along with it. I sent some of the roots to Captain Hollings at Lucknow, and they have flourished. They require the richest rotten loam moisture, but good drainage: they may be kept out of the ground from January till May."

FURTHER EXPERIMENTS WITH THE SHAN BLACK VEGETABLE DYE, ETC.

Communicated by the Society of Arts.

To the Secretary Agri-Horticultural Society, Calcutta.

Dear Sir,—At length I am enabled to inform you as to the proceedings taken by the Society of Arts in reference to the Vegetable Black Dye from the Shan country; the sample of the Cloth manufactured from the fibre of the Pine-apple and Moorva or Moorghie; and the Clay Bust of the late Dr. Carey, by Nubboo Coomar Paul.

The Committee of Chemistry, to whom the Black Dye was referred, considered the subject at their meetings of November 30th 1843,

* The box failed to reach the Society.—*Eds.*

February 29th 1844, January 23rd, April 8th, and May 12th 1845, respectively. The Black Dye has been subjected to experiment by Mr. A. Aikin, Mr. J. T. Cooper, and Mr. E. Solly, all chemists of considerable experience. By transmitting (as under) a copy of Mr. Cooper's statement made at the last meeting of the Chemical Committee of our Society, you will be enabled to judge to a certain extent of its value in a commercial point of view. Both Mr. Aikin and Mr. Solly have also furnished reports of the Dye, and the matter was adjourned till next session to enable Mr. Cooper (Messrs. Aikin and Cooper being at present chairmen of the Committee of Chemistry) and Mr. Warington the chemist, to subject the Dye to further experiments.

[Copy of Mr. Cooper's statement with regard to the Vegetable Black Dye.]

"Mr. Cooper produced four bottles, each containing a solution of the Dye, and gave the following evidence as to the results of the experiments made by him. Two of the bottles contain a solution of the Dye in lime water and green sulphate of iron, the other two are solutions in lime water and potash; they both make a perfectly colourless solution, both absorb oxygen; on exposure to the air they become clouded, but the potash has the greater power of holding the colour; there are 12 grains of colouring matter to 72 of lime, in each of the bottles. Like indigo it does not require any mordant to render it fixed; it seems to be a dye of itself: the two specimens of Dye are identical; both the solutions absorb oxygen rapidly, potash seems to be the proper solvent for it. I do not imagine that it is of any great value, as a dyeing Drug it wants power. With 12 grains of indigo you might make a very strong Dye, sufficient to dye half a dozen pocket handkerchiefs. The addition of a little acid would precipitate all the colouring matter; by dipping a piece of cotton into the solution two or three times, and then exposing it to the air it became a sort of slate colour. As an article of commerce, I do not imagine that it is of any value; there are so many substances already in use for dyeing Silk, black: as a curiosity it might be worth having."

2nd. With regard to the manufacture of Cloth from the fibre of the Pine-apple and Moorva, the whole of your communication, dated

14th May 1844, was read, and entered on the minutes; and I am desired to return to you, as the representative of the Agri-Horticultural Society of India, the best thanks of the Society of Arts for introducing the subject to their notice, and at the same time to inform you, that the samples are not considered by our Committee of Colonies and Trade sufficiently large to be tested either as Cloth or Rope. They will be glad to receive larger samples, if they can conveniently be sent.

3rd. In respect to the Clay Bust of the late Dr. Carey, my task is easy and very agreeable. I had the honor on the 2nd June last to receive from the hands of our illustrious President, Prince Albert, the Society's Silver Isis Medal, to be transmitted to Nubboo Coomar Paul for his performance. I shall be obliged to you to inform me how I may send it in the safest way to your "self-taught Native Sculptor."

I beg to return you the thanks of the Society for Nos. 1, 2, 3 and 4 of vol. III. of the Journal of the Agricultural and Horticultural Society of India.

Society of Arts, &c. Adelphi, I am, &c.
London, July 1st, 1845. FRANCIS WHISHAW.

CORRESPONDENCE REGARDING THE CULTIVATION OF MADDER IN THE DECCAN, WITH HINTS ON A MODE OF CURING SENNA.

To JAMES HUME, ESQ., *Honorary Secretary Agricultural Society of India.*

MY DEAR SIR,—A short time ago I was favoured with a despatch of Madder seeds from you. Of these I have carefully sown a part, and distributed the rest in quarters where they are likely to be duly appreciated. I beg to offer, for the inspection of the Committee of the Society, a specimen of Madder raised by me, from seed received years ago from Mr. Little in Bombay, the former very active and useful Secretary of the Society. I have since then propagated the plant pretty extensively from cuttings, which root readily, or from separation of roots. It appears very hardy, and requires no care, but rather a good soil. It keeps down weeds by its inherent strength of growth, and I should think that in the rich alluvial of Bengal it would answer well. I had repeatedly thrown aside, as comparatively useless the roots, which appeared to me to contain too little of the red co lour, and the yellow seemed to predominate. I now however observ from the contents of the number of the Society's Transactions, whic you have been kind enough to forward to me, that the yellow part c the Dye is chosen in England. We have in our higher hills here pretty common, the Rubia cordifolia,* a very hardy and useful spe cies, but the roots appear to be turned to no account by the people.

I remain, &c.

ALEXANDER GIBSON,

Sooneri, 8*th July*, 1845. *Superintendent Botanical Garden*

P. S.—I am happy to say, that I have many plants of Dr. Wallich' Sumach now flourishing here. I mean the Divi-divi, or America Sumach. I am just about to advertise a number as fit for distributio The young plants appear very hardy, having shewed not the least sig of being affected by the very hot winds we had in April and May.

Report on the foregoing specimen of Madder.

I have carefully examined the Madder roots forwarded to me b you, but find that they have undergone no preparation whateve as to drying in the sun or a stove which naturally renders its appea ance bad and dead, instead of being bright and lively.

The powder prepared from the root by you is a tolerably goo "Mull" in appearance; but it would, I think, have borne more th resemblance of "Ombro," had the roots been properly dried.

Notwithstanding this unfavourable report, I think there is son ground for hoping that, with proper care, a very good article migl be produced, quite sufficiently so, at any rate, to warrant yo Society in asking Dr. Gibson to make further experiments.

I shall be most happy to draw up a paper of the method which the article is commonly prepared in Holland, should tl Society think it worth while giving it their attention.

Yours faithfully,

Calcutta, 10*th Sept.* 1845. RICH. DODD.

* The Munjeet of commerce.

My dear Sir,—I have now the pleasure to send you a small specimen of the Madder, dried more carefully than the last was. This may enable you to judge better as to its qualities.* It is at present not in seed, but I will take the first opportunity of its being so to send you a parcel.

Meantime I have planted out a good many roots; but this not being the season in which roots shoot with vigour, they have only been partially successful; however, in April or May, I hope to extend the cultivation considerably by this means. I feel much obliged by the interesting communication with which you favoured me. I was very sorry to learn that the consignment of seeds for Dr. Thompson at Sydney, never reached you. I will make up another parcel in the chance of getting an opportunity of sending it direct. I think that the rather dry climate of New South Wales, is likely to suit the Senna plant well. By the way, I ought to mention that increased experience has now taught me a better mode of curing the leaves. It is this—I now cut down the plant to about four inches, and have the leaflets *immediately* stripped off and dried. This quite does away the necessity for after stalk-picking, and gives a fine, entire, and well coloured leaf. I am free to confess, that for this improved process, I am indebted to some of the surrounding native cultivators, who have willingly taken up the culture, and bring their produce regularly to me to be purchased for the medical stores.

Believe me, &c.

Sooneri, 1st Nov. 1845. Alexander Gibson.

* "Having carefully examined the root of the Madder forwarded to the Society, I find it in every way far superior to the first specimen sent by Dr. Gibson, and on which I offered an opinion in September last. It is more brilliant in color and better dried. The preparation from it, owing to its having been made in the light, has the appearance of French Madder; but even in this state it is far superior to the preparation from the other specimen." *Extract from a Report, dated 13th December*, 1845.

Capabilities of the climate, and natural features of the Palamow District for the rearing of Sheep. Communicated by C. B. Taylor, Esq.

My dear Sir,—I have been for some time past endeavouring to rear a flock of Sheep, of a cross-breed between the Merino Ram and the white-fleeced Ewes of this country, and having got sixty lambs, a few of which are upwards of a year old, have unfortunately lost my Ram; I regret this much, because there is every probability that better wool would, from a succession of crosses with the Ram and its offspring, be produced up here, than in the low sultry climate of Bengal. This is a hilly uncultivated country, and there is consequently abundance of pasturage. The climate being temperate for at least eight months in the year, and tolerably cold for four months, is better adapted for the production of fine wool; generally, the thermometer at sunrise during the months of November and February, the commencement and end of what is called in India the cold season, stands at 40° Fahrenheit, and in December and January, it usually stands at from 34 to 40°, and I have observed that it frequently stands at 34°, I mean at sunrise, and it remains pleasantly cold from October to the middle of April, even at the latter period when the heat is so great in Bengal, I am obliged to cover myself with blankets at night. In looking over a memorandum book for 1843, I find that the thermometer stood at 53°, a little after sunrise on the 30th March, on the 30th of April at 78°, also a little after sunrise, and on the 10th and 11th of May, a little after sunrise, at 70°. This temperature, differing so much from Bengal, makes it probable that much finer wool would be produced up here; but if I cannot get another Merino Ram or two, my experiments must be at an end, and therefore take the liberty of asking you, if you are acquainted with any gentlemen that would be likely to sell me one. Many of the members have been trying the experiment in Calcutta, I believe, but with what success I have not heard; but were it in my power to procure the Rams from England, I would not confine my attempts to improve the fleece only, but would also endeavour to increase the weight and size of the carcass also, which I think could be more certainly accomplished than any permanent improvement in the fleece, for I suspect were the fineness of the fleece not kept up by crosses with imported Merino Rams, it would soon degenerate. But I think success would be more certain in attempting to increase the size of our undersized Sheep, as well as the improvement in the breed rendered more permanent; for instance, a cross between the Tees Water Ram, the largest breed in England, and the offspring of a Merino Ram, or their offspring after a succession of crosses with the Merino Ram, would combine in itself not only a finer fleece, but a good weight of carcass, which would have the double advantage of yielding a greater weight of fleece;—but the obstacle in the way of all such experiments is the difficulty in procuring the required Rams. I know no one in Calcutta, who would undertake such a commission, but should be glad if any respectable party would undertake it for me, and pay the probable cost in advance.

Yours, &c.

Rajharra Colliery, Palamow, C. B. TAYLOR.
14th Sept. 1845.

Remarks on a few kinds of Edible Oils, and on the Butea Kino of the Palamow Jungles. By C. B. TAYLOR, ESQ.

MY DEAR SIR,—I have the pleasure to inform you, that I have despatched to your address a box containing the following mentioned Oils, and which I promised you some time since.

*Hingun,** *Mowah,* (Bassia latifolia,) *Cossum* tree,* *Cossum fol* or Safflower, Sun-flower, Poppy seed oil, Cotton seed oil, and oil of the Radish seed.

I think you will find the *Hingun* to be the purest of all these oils, and nearly equal, if not completely so, to Olive oil.

The *Mowah* oil I also consider a very valuable oil, and which possesses the property, like cocoanut oil, of "congealing at the ordinary temperature of the atmosphere" in the cold season, and could

* Since the despatch of these oils Mr. Taylor has forwarded a few of the leaves, fruit, &c., of the *Hingun* and *Cossum* trees, and they have been recognized by Dr. Wallich to be respectively Ximenia Ægyptiaca and Schleichera trijuga.—*Eds.*

therefore I suppose be converted to the purpose of making Stearine, which is used in England for making soap and candles, for it was this quality of congealing I suppose, that suggested the idea of putting the oil "in the state of lard" into hair bags, and then subjecting them to a heavy pressure, the substance forcing itself through the bags being called Elaine, and what remained in them, Stearine. It was the latter substance, after being purified, was found to make candles of a very superior quality, and I can see no reason why the *Mowah* oil, being subjected to the same process, should not answer the same purpose; the latter oil would have the advantage of being much cheaper, for I think it could be sold in Calcutta for five or six rupees per bazar maund, It is applied up here by fraudulent people to the purpose of adulterating Ghee, and must be very difficult of detection, as the colour and odour are nearly the same; the oil has a bitter taste, but is eaten by the inhabitants of this district, who assert that the bitter taste goes off when cooked with their food, and also when it is five or six months old. The sample I send is newly made.

There are two other trees of this species in India; and as they appear to merit some attention, I beg to extract a short account of them from the *Penny Cyclopædia*. See article Bassia.

"Bassia butyracea, the Indian Butter tree, also the Fulwa, or Fulwara tree, is found wild on the Almora hills in India; where it grows to a considerable size, its trunk sometimes measuring fifty feet in height, and five or six feet in circumference. It has broad oval long-stalked leaves, from six to twelve inches long, smooth on their upper surface, hairy on their under. The flowers which are large and pale-yellow, hang down near the tips of the branches, from the axils of the leaves, and generally grow there together. They are succeeded by smooth pulpy fruits, about as large as a pigeon's egg, usually containing two or three roundish light-brown seeds. From these is produced a fat-like substance, which is a kind of vegetable butter, concerning which we find the following information in the *Asiatic Researches*, by Dr. Roxburgh. 'On opening the shell of the seed or nut, which is of a fine cheanut colour, smooth and brittle, the kernel appears of the size and shape of a blanched almond. The kernels are bruised on a smooth stone to the consistency of cream, or of a fine pulpy matter, which is then put into a cloth bag, with a moderate weight laid on, and left to stand until the oil or fat is expressed, which becomes immediately of the consistency of hog's lard, and is of a delicate white colour; its uses are in medicine, being highly esteemed in rheumatism and contraction of the limbs. It is also much valued, and used by natives of rank with an *Utr* (aromatic oil) of some kind, except the fruit which is not much esteemed: no other part of the tree is used. After the oil has been expressed the dregs are employed by the poor as food. This Fulwara butter will keep many months in India without acquiring any bad colour, taste or smell, and might no doubt be substituted advantageously for animal butter. The timber is of no value, being nearly as light as that of Semul or cotton-tree (Bombax heptaphyllum.)'

"Bassia longifolia, the Indian oil tree, is a large tree, a good deal like the last; but its leaves are narrower, and its flowers much more fleshy. It is a native of the Peninsula of India, and is found in plantations along the Southern Coast of Coromandel, where it is called the Illupie tree; its fruit is yellowish, and yields by pressure a valuable oil, which is used by the poorer natives of India for their lamps, for soap, and instead of better oil for cookery. The flowers are also roasted, and eaten by the Indian peasants, or bruised and boiled to a jelly, and made into small balls, which are sold or exchanged for fish, rice, and various sorts of small grain; the wood is as hard and durable as teak, so that this is one of the most generally useful trees found on the Continent of India."

There are two oils which I now send, which I did not mention in my former letter on this subject; Radish and Sun-flower; these are enumerated among the edible oils in Loudon's Encyclopædia of Agriculture, although the former has got such a disagreeable smell that I suspect few would be found willing to eat it.

It must have been remarked by those who have been long in the country how rarely you see a plantation of useful trees, I mean those planted by the hand of man; I suppose, with the exception of some of the Palm species and fruit trees, a tree was never planted in India with a view to obtain a profit from it, although it is certain that there are many valuable trees indigenous to the country that might be formed into plantations, with a certainty of their yielding a handsome return for the capital expended on them. I also believe great benefit would be derived from introducing some of the useful trees belonging to other tropical countries into this. At present, writing on the subject of oil, I shall mention oil trees or plants: the Arachis nut of the West Indies would undoubtedly prosper with us, and which I read somewhere lately, had been propagated in some part of the Madras Presidency. Another useful oil plant, a native of China, would also make a valuable addition to our stock of oil plants, and respecting which I beg to annex an extract from the Library of Entertaining Knowledge: Vegetable substances, vol. iii. page 229.

The Oil Plant, or Camellia oleifera.

"This beautiful shrub is a native of China, where it is cultivated in large plantations, and produces much of the oil consumed by the Chinese. Its product being oil, and its appearance closely resembling the Tea plant, the Chinese give it the expressive and appropriate name of the 'Oil-bearing Tea plant.' It frequently attains the height of a moderate sized Cherry tree, and bears a profusion of large, single white blossoms. 'This circumstance,' says one of our best travellers in China, 'gave an interesting and novel character to the places which it covered. They often looked in the distance as if lightly clothed with snow, but on a nearer view, exhibited one immense garden.'

"A red sandy soil on which few other plants will grow, seems to be the best adapted to the Camellia oleifera."

I shall mention two other tropical trees: the Cocos butyracea, and the Elæis guineensis. They both bear fruit abounding in oil. According to Dr. MacCulloch, the quantity of this Oil (Palm oil) imported into Great Britain in 1829, amounted to cwt. 2963 : 17, valued at £ Stg. 179,921-17. Dr. MacCulloch also says, in his account of the trade of Sierra Leone, that, "The great article of import from the Coast of Africa, is Palm oil, and of this more than fifty times as much is imported from the Coast to the South of the Rio Volta, several hundred miles from Sierra Leone, as from the latter." I believe the trees are found in the greatest abundance in Senegal to the North of Sierra Leone; there is little doubt, but what they would succeed in India, the climates being pretty nearly alike.

It had nearly escaped me to mention, that I have also forwarded to you about one quart of Butea kino, in a bottle.*

I remain, &c.

Rajharra, 27*th Aug*. 1845. C. B. Taylor.

PROGRESS OF THE BRANCH AGRI-HORTICULTURAL SOCIETY OF BHAUGULPORE.

To James Hume, Esq., *Honorary Secretary Agri-Horticultural Society of India.*

My dear Sir,—I have the pleasure to enclose an account of an Agri-Horticultural meeting, which took place here on the 14th instant, and shall feel obliged by your submitting it for the information of the Parent Society at your next meeting.

I remain, &c.

Bhaugulpore, 22*nd Nov*. 1845. T. E. A. Napleton,
Honorary Secretary.

At a meeting of the Bhaugulpore Agri-Horti. and Floricultural Society, held on the 14th of November 1845, numerously attended by the European and Native Residents,—

* "I have at length procured for you a sample of about one seer of Polase Gum, or Dak Gônd, a substance which it appears by a paper in the Society's Journal, Part IV. of vol. III. by Mr. E. Solly, Junior, has already attracted some attention in England. The gentleman just named, proposes to call it Butea Kino, and anticipates that it will become a valuable article of commerce, and moreover says, 'And from *its probable cheapness*, it promises to be of considerable value in the arts, and especially in that of tanning leather.' I am afraid that Mr. Solly's anticipations will not be realized on this side of India, and that from causes directly opposite to those which he states as making it probable that it will become of 'considerable value in the arts,' which, according to his expectations, is its *probable cheapness*. What will prevent it from becoming a valuable substitute for other tanning substances now in use is its *probable* dearness; I say *probable* dearness, because there is a chance that in other localities where the tree may be found in great abundance, it may yield a larger quantity of the gum than those in my neighbourhood, which have *all* been once cut down by the cultivators of the soil for the purpose of converting the wood into ashes to manure their lands with; this may account for the small quantity of gum which each tree has been ascertained to yield, which is only a few drachms. I shall reserve the sample to send along with the samples of oil, unless you desire to have it immediately: all the oils will not be ready for the next month or two."—*Extract of a Letter from Mr.* Taylor, *dated* 27*th April*, 1845.

Mr. G. F. Brown, in the chair.

The Honorary Secretary read,

1st. A statement of donations in money during the past year, amounting to Rs. 293.

2ndly. Of other donations, as follows:

From the Parent Society—Two silver medals, a money donation of 50 rupees, several consignments of agricultural and horticultural seeds; and it is but proper to add, that unceasing attention to our wants, and every kind wish for the well-doing of our Branch Society, have ever been evinced by the Parent one.

From Dr. Wallich, Superintendent Honorable Company's Botanical Gardens—Seeds, plants, and every assistance that could be desired.

From Colonel Ouseley, Governor-General's Agent at Chota Nagpore—Some plants of edible date, 60 bottles of Nerbudda white linseed, and 30 bottles of Nerbudda wheat; all having arrived in splendid order, although sent in the rainy season.

From the Honorable Sir L. Peel—A packet of flower seeds, which vegetated freely, and the plants were highly ornamental and much admired; also a number of rare plants.

From Captain Hollings—A large collection of grafted fruit and other trees, together with an assortment of fresh and good seeds; and it is most gratifying to see the Honorary Secretary of the Lucknow Branch Society, although so far away, taking the lively and zealous interest he does in the welfare of our Branch one.

From John Hamilton, Esq. of Calcutta—Some rare and beautiful plants.

From G. W. Bartlett, Esq. of Calcutta—A number of beautiful plants, amongst which the "Cordia Sebastena," was highly appreciated.

From J. C. Richards, Esq. of Calcutta—A number of Heart's-ease plants, and a box of Dahlia bulbs.

From David Gibson, Esq. of Malda—30 Malda Mango grafts of the rarest kinds.

From Edward Haworth, Esq.—A donation of 12 volumes of Loudon's Gardeners' Magazine.

From E. Dussumier, Esq.—A donation of some French Radish seed, and a number of fine Pine-apple plants.

From T. Mullens, Esq.—A donation of vegetable and flower seeds.

From Major J. H. Simonds—A fine supply of double stock and Lucerne seed.

From E. F. Lautour, Esq.—A great number of Sylhet Orange grafts of the best kind.

From George Barnes, Esq.—A donation of one very fine Sapotah tree, and five Bombay Mango grafts.

3rdly. List of 38 new subscribers since the 30th of May, 1845.

4thly. It appeared that the sum of Co.'s Rs. 2,592 : 12 : 0 was realized in subscriptions, and that Rs. 483 on the same account were under collection. That the money donations amounted to Rs. 443, including the Hon. Sir L. Peel's annual handsome subscription of 100 Rs., and 50 Rs. from the Parent Society. That Rs. 113 : 6 : 0 was collected from the subscribers, who take a vegetable *dali* from the Public Garden, and the balance from last year's account of Rs. 279 : 10 : 6½, caused a total on the credit side of Rs. 3,912 : 0 : 6½. On the other hand, it appeared that the expenditure during the year, after paying off all demands, was Rs. 3,496 : 0 : 2, leaving a balance in favour of the Society of Rs. 416 : 0 : 4½. This was pronounced very satisfactory.

5thly. Proposed by the Honorary Secretary, and seconded by Mr. J. H. Young,—That a Committee of three members be appointed for the general superintendence of the affairs of the Society. *Carried nem con.*

6thly. Proposed by Mr. J. H. Young, and seconded by Mr. Hodgson,—That the Committee consist of Messrs. C. D. Russell, F. Gouldsbury, and G. F. Brown. *Carried nem con.*

Memorandum.

At the particular request of Mr. G. F. Brown, Mr. J. H. Young consented to supply his place as a member of the Committee.

7thly. The Honorary Secretary having reported that the seeds received this year from Messrs. Veitch and Co. had not turned out well, in consequence of having been stowed by our London Agents in a bad part of the hold of the ship, it was resolved that in future Messrs. Veitch and Co. should be held responsible for sending out their own seeds in good order, and that the London Agents be dispensed with. Resolved also,—That in future this Society procure seeds from the Cape, America, France, and other quarters.

8thly. Proposed by Mr. Hodgson, and seconded by Mr. J. H. Young,—That the Society establish a small garden at Darjeeling, for the purpose of acclimating seeds which they receive from England and other parts of the world, a similar plan having been found to answer extremely well in the Upper Provinces.

Carried *nem con*, and resolved,—That as Mr. R. F. Hodgson is about to proceed on leave to Darjeeling, he be requested to make arrangements for carrying out the above object in conjunction with Dr. Campbell, whose assistance is solicited in the undertaking.

9thly. Proposed by Mr. R. F. Hodgson, and seconded by Mr. Wallace,—That where there are eight or more subscribers to this Society in any district, a twelfth of the annual subscriptions be set apart to be distributed by themselves as prizes at one or two public meetings (where the produce of the gardens can be exhibited) during the year, as an inducement to the natives to cultivate better vegetables, &c., provided that the subscribers in such districts apply for the amount, and that a report of such distribution be sent to this Society.

10thly. Proposed by Mr. J. H. Young, and carried by acclamation,—That the thanks of the Meeting be voted to the Honorary Secretary for the great care and attention which he has devoted to the affairs of the Society since its institution, and for the very satisfactory result of his management of the funds during the year. And,

Lastly,—The best thanks of all present having been voted to the Chairman, the meeting broke up.

T. E. A. Napleton,
Honorary Secretary.

G. F. Brown,
Chairman.

Memorandum.

R. C. Raikes, Esq. of the civil service, has kindly consented to become an Honorary Joint Secretary for the district of Mymensing.

Memorandum of the result of an Experiment in crossing the Indigenous Cottons of India. By DR. A. BURN, *Superintendent Government Cotton Experiments at Broach.*

To the Secretary to the Agri-Horticultural Society of Calcutta.

SIR,—At the request of Dr. A. Burn, Superintendent of the Government Cotton Experiments at Broach, I have the honor to transmit to you the accompanying memorandum and plates.

I have, &c.

Bombay, 11*th Nov.* 1845. L. R. REID.

The plant, from which this is a specimen, was sown at the beginning of the monsoon in July 1844, along with other plants of the G. Arboreum; it grew up and ripened its produce, but it differed from them in habit considerably. They grow and blossom all the season from November, until checked by the heat in April. It blossomed and yielded all its produce in the space of two months, like as the G. H. does, and it was free from the chief fault of the G. A., viz. that of yielding too small a quantity of produce. In short, it had all, or nearly all, the good qualities of the parent plants. The plant grew to the height of six feet, and the lower lateral branches, four in number, were two feet long each, the remaining ones being shorter gradually up to the top of the plant. The number of blossoms was sixty, but only about fifty remained to yield produce, the others falling off. The color of the stem and other parts was greener like the G. H., and not so black or dark-colored as the G. A.; the whole plant was also more hairy than the G. A. and resembled in this respect G. H., the most hirsute of all the varieties of the Genus Gm. The color of the blossoms was chiefly red, but at the roots of the petals the yellow color of the G. H. flowers was vivid, and more distinct than is shewn by the dried specimen.

The produce from the 50 bols weighed equal to 4 rupees and 3 quarters, or 855 troy grains, and for the sake of comparison in results, an equal weight of produce from G. A. was examined at the time along with that of the cross plant. The results were as follow:

Cross plant, wool grains, ...	239	=	28	per cent.
————, seed ———	607½	=	71	ditto.
————, loss and dust, ...	8½	=	1	ditto.
	855		100	
G. Arboreum, wool grains, ...	191¼	=	22¼	per cent.
————, seed ———	658	=	77	ditto.
————, loss and dirt,... ...	5¾	=	0¾	ditto.
	855		100	

This shows clearly that improvement as to *quantity* of wool has been one result of the crossing. 28 per cent. is, I believe, equal to the yield of the best New Orleans produce in America, and in this instance the *quality* of the wool, in my opinion, is quite equal to the best New Orleans to be found in the English markets. It is superior to the best Broach or "Surats." One fact, however, should be noticed; the yield of the G. H. here on *fallow* land is commonly 33 per cent.

The G. A. and G. H. are eminently suited to the climate here, which none of the foreign varieties are; a knowledge of the climate as to *distribution* of moisture is the grand desideratum in India for successful cotton culture. The average fall of rain at Broach for 1843 and 1844, was 38 inches 31¾ cents. The average of Bombay, as given, I believe, by Mr. Noton, is 76½ inches, showing an excess over Broach of 38-18½, or double in amount. Now the two last seasons at Broach are considered to be above the average fall, and too much for successful cotton crops. Cotton cannot be raised near Bombay, and if at Broach the fall of rain was any thing like that at Bombay, it is clear no cotton bushes could grow: they would be rotted by the excess of moisture, as they have been in all low places, during the past two seasons. These latter remarks apply chiefly to G. H. and G. A., for each variety of G. plant varies much in habit. Crossing appears to me to be a very likely mode of obtaining a better and more productive kind of plant than is at present cultivated in India. Witness the varieties of the Potato thus acquired, of the Hopeton oat now so universally esteemed in the Lothians. Use the pollen of some of the fine foreign cottons to impregnate the blossoms of the hardy, and suited to climate, G. A., and is it too much to expect to permanently improve upon it? In the case now under notice, I am perfectly satisfied of the success so far, but will the produce from the seed of any plant retain the improvement? We must try and see the results next season.

If an acre of land were planted with 7,000 plants, (not too many) and they yielded at the rate above stated, or take it only at grains 720 each plant, then the wool would amount to lbs. 201, and at 4*d.* per lb., or lbs. 6 per rupee, its value would be Rs. 34, a sum one-third of which would be ample to cover the expenses of cultivation, if judiciously gone about.

The number of seeds from the 855 grains of produce was,

Cross plant	676 good.	G. A. 762 good.	Difference in number 62.
	27 bad.	3 bad.	
	703	765	

Broach, 25th January, 1845. (Signed) ALEXANDER BURN.

P. S.—It is clear the cause of the partial success attending the experiments in cultivation of the American Cotton plant both at Coimbatore and Dharwar, depends on the moisture of both monsoons affecting the atmosphere of those two places, on different sides of the Gâts, with a degree of moisture, the continuance of which is sufficient to admit of the growth and maturation of the produce. The pass in the Gâts at P. admits of this.

On "Gutta Percha," a peculiar variety of Caoutchouc. *By* Douglas Maclagan, M.D., F. R. S. E., *&c.* *Communicated by the Royal Scottish Society of Arts.*

[Dr. Douglas Maclagan's Paper is chiefly interesting, as confirming the general correctness of the analysis published in the 5th No. of the 2nd vol. of the Society's Journal, at page 104. The subsequent identification of the plant by Mr. Griffith, as belonging to the Nat. order "*Sapotaceæ*," from a small specimen forwarded to Dr. Mouat, by the late Rev. Ed. White, with a further analysis of it, will be found at page 146, of the 3rd vol. of the Journal. A complete botanical description of the plant was also furnished by Mr. White, and published in the 4th vol. of this Journal, at page 59. It is satisfactory to the Committee of Papers of the Agri-Horticultural Society of India, to find that the whole chain of investigation connected with this important and interesting vegetable substance, was completely and accurately followed out in this country,—made known in the pages of this Journal, and finally corroborated by the experiments and observations of distinguished practical men in Europe.]

Gutta Percha, is the Malayan name for a substance which is the concrete juice of a large forest tree, native of the shores of the Straits of Malacca, Borneo, and the adjacent countries. The tree yielding it is unknown botanically, all the information we possess regarding it being, that it is a large forest tree, and yields this product abundantly. We are indebted for our knowledge of it to Dr. W. Montgomerie, H. E. I. C. S. whose spirited exertions to improve the cultivation of various articles of colonial produce at Singapore, have obtained for him several distinguished marks of approbation from the Royal Society of Arts of London. For his communication regarding Gutta Percha, Dr. Montgomerie received a silver medal from the Society.

The substance in its crude state differs in many particulars from common caoutchouc; it is of a pale-yellowish or rather dirty white colour. It is nearly as hard as wood, though it readily receives the impression of the nail. It is very tenacious, and not at all elastic.

It seemed to me to be worth while to determine, whether or not this substance really was a variety of caoutchouc, and for this purpose I subjected it to the ordinary process of ultimate analysis, and obtained as its per centage composition, carbon 86.36; hydrogen 12.15; the remainder, 1.49, was most probably oxygen absorbed from the air during the process employed for purifying it, as the substance, whilst heating on the vapour-bath, acquired a brown colour. The only analysis of common caoutchouc with which I am acquainted is that of Faraday, who obtained, carbon 87.2; hydrogen 12.8. The results are sufficiently near to warrant the conclusion that the two matters in question are generally the same.

I found also that the Gutta Percha yields the same product of destructive distillation as the common caoutchouc. Without entering into details, I may briefly state, that both equally yield a clear, yellow, limpid oil, having no fixed boiling-point, and, therefore, being a mixture of different oleaginous principles. In both instances the distillation proceeds most freely at temperatures between 360° and 390° Fahr., and seems almost stationary at 385°. Comparative analysis of similar portions of the two oils were made, and as is already known of common caoutchouc, the products exhibit a constitution represented by the formula C. 10. H. 8. The Gutta Percha thus appears really to be a modification of caoutchouc.

In its general properties it likewise shews a similarity to common caoutchouc. It is soluble in coal, naphtha, in caoutchouc oil, and in ether. It is insoluble in alcohol and in water, and floats on the latter.

Its most remarkable and distinctive peculiarity is the effect of heat upon it. When placed in water at 110°, no effect is produced upon it, except that it receives the impression of the nail more readily; but when the temperature is raised to 145°, or upwards, it gradually becomes so soft and pliant as to be capable of being moulded into any form, or of being rolled out into pieces or flat plates. When in the soft state it possesses all the elasticity of common India-rubber, but it does not retain those properties long. It soon begins again to grow hard, and in a short time, varying according to the temperature and the size of the piece operated on, regains all its original hardness and rigidity. A ball one inch in diameter was completely softened by boiling water in ten minutes, and regained its hardness completely in less than half an hour. It appears to be capable of undergoing this alternate softening and hardening any number of times without change of property.

It is also to a certain extent ductile. When soft it is easily torn across, but when hard it is very tenacious. A piece not an eighth of an inch in thickness, when cold, easily raised a weight of forty-two pounds, and only broke when half a hundred weight was attached to it.

From these properties it seems capable of many applications in the arts, its solution appears to be as well adapted as that of common caoutchouc for making water-proof cloth, and whilst softened it can be made into solid articles, such as knife-handles, door-handles, &c. The Malays employ it for the former of these, and prefer it to wood. A surgeon furnished with a small piece could easily, with the aid of a little hot water, supply himself with bougies or pessaries of any size or form.

[Dr. M. exhibited a knife-handle, a walking cane head, a riding whip, and other articles made of Gutta Percha.]

[*From the Edinburgh New Philosophical Journal, for October* 1845.]

Brief Observations on some of the Pines and other Coniferous Trees of the Northern Himalaya. By CAPTAIN EDWARD MADDEN, *Bengal Artillery.*

The Pines and allied trees of the Himalaya, both in size and number of species, probably surpass those of any portion of the globe, excepting perhaps California and the adjacent Coasts of N. West America, where the late traveller Douglas discovered two or three species which have been named after him, some of which exceed in dimensions even those of the Himalaya, so far as I am acquainted with them.

The following observations are chiefly founded on remarks made during journeys into the interior of the mountains, several years ago, and having only my memory to trust to, in some cases, and no very intimate knowledge of the subject in any, they will necessarily be of a very desultory and imperfect nature, and as such are intended for non-botanical readers, comprising the great majority of those who visit our N.-W. Hill stations, and who are, for the most part, so unacquainted with these matters that I am induced to believe my remarks will not be unacceptable. In drawing them up, I have borrowed freely from whatever sources of information were accessible, to supply, as far as I could, the deficiencies of personal examination. I have endeavoured to specify the quality of the timber afforded by each tree, and to note those, the introduction of which is desirable for their utility or beauty, and have indulged in certain Etymological and Antiquarian enquiries, perhaps more proper to Jonathan Oldbuck than to Linnæus, but which may serve in a small degree to relieve the dryness of the subject. Lastly, in arranging such of these trees as I am acquainted with, I have adopted the most recent classification, that of Richard, which appears to me more simple and perspicuous than that of Linnæus (in part, retained by Lindley) who grouped most of them under a single genus, PINUS, which, in the modern arrangement is divided into five genera, viz.; PINUS, ABIES, PICEA, LARIX and CEDRUS; these, with *Araucaria* and a few more, constitute the Section ABIETINÆ, as distinguished from CUPRESSINÆ, comprising the *Cypress, Juniper, &c.*, and TAXINÆ, the *Yew Tribe.*

I.—PINUS. In this genus the leaves are long, thin, and, generally, bound together with fascicles at the base by membranous sheaths, each bundle containing from two to five leaves. The cones are more or less pendulous with scales hard, thick, and often beaked and prickly at the ends; they are also persistent, i. e., they remain attached to the rachis or axis, after the seeds have fallen out.

The word PINUS is derived by some from the Greek, pion "fat," in allusion to its resin and tar, and the Sanscrit Peena, has exactly the same meaning, hence the "Uberrima pinus" of Virgil. By others, from the Celtic, Pen, a mountain, in reference to its usual localities, while others find its origin in our own 'fine,' or the Latin, 'finis,' as well as 'pin,' &c., in allusion to the slender leaves which are aptly designated "needle leaves" by the Germans, and "acerose" by botanists.

Two species of Pine are common in the Himalaya, viz., PINUS *longifolia,* and *excelsa:* a third, PINUS *Gerardiana* is also abundant, but of very limited distribution.

1.—PINUS *longifolia,* commonly called *cheer* or *cheel* in the mountains, and *sarul* in the plains, which latter is the name in Sanscrit. Captain Raper mentions *Kholan* as another name in Gurhwal, and Royle gives

Thansa and *Sulla* as others; the last perhaps a corruption of *Surul.* The *Cheer* grows from 40 to above 100 feet high, and abounds in all the lower and outer ranges of the Himalaya from Bootan up to the Sufed koh, where it is, I believe, called '*shouty*' by the Affghans. It is also a native of China. Dr. Griffith describes it as descending in Bootan, to the elevation of 1800 to 2000 feet above the sea; and on the Sewalick range between the Jumna and Sutluj, we find it in abundance at 2500 to 3000 feet, as at Nahun; also, at Kussowlee and Bunasur from 3000 to 6000 feet, in perfection, and finally, it becomes stunted and disappears at Simla, at 7000 feet above the sea; it will not, therefore stand the severity of an English winter, which even kills the RHODODENDRON, unless protected, a tree occupying in the Himalaya a still colder site than the *Cheer*.

The PINUS *longifolia* has rough bark, divided by deep seams into large oblong plates; the trunk of the largest tree is about 12 feet in girth, with exceedingly picturesque heads, very irregular in outline, formed by long spreading boughs: the leaves are always in fascicles of threes, with long persistent sheaths; they are stiff and glossy, of a bright grass green, and so far as I have observed erect, though both Roxburgh and Don (in Royle) describe them as pendulous, and Loudon figures them as completely so; they seem to be developing only where the branches are so; they are, especially, on young trees, above a foot in length; and according to Roxburgh, they sometimes exceed 18 inches, which fully warrants the specific name; though PINUS *filifolia* and *macrophylla* on the mountains of Guatemala and Mexico, 12,000 feet above the sea level, have leaves in fascicles of 5, from 12 to 15 inches long. The male flowers of the *Cheer* are produced in long close clusters of many catkins, at the end of the branches; round at first, but elongating as they open, and blossom about the beginning of the hot weather, in February and March; the seeds ripen in twelve months, and are eaten by the hill men and by birds. The cones are either solitary, or in clusters up to 5, in a regular whorl; they are ovate, very heavy, from 5 to 7 inches long, and about 13 in circumference near the base, and the scales, which are much thickened at the end, have there a large thick spring beak. Large quantities of tar and turpentine are extracted from the wood by the natives of the Sewalick range, the method of preparing which is explained in the Journal of the Asiatic Society of Bengal for May 1833. The natural turpentine is called *Gunda Biroza*, *Birj* and *Cheer ke gônd*, in Persian *Birozehtur;* but the term *Gunda Biroza*, is also used for the frankincense of the BOSWELLIA *thurifera (serrata*, Roxburgh.) *Biroza* is, perhaps, from the Hebrew, 'be rosh', the fir tree. In a catalogue of Indian woods, in the Journal of the Asiatic Society for April 1834, with remarks by Mr. Aikin, Secretary to the Society of Arts, the PINUS *longifolia* is stated to afford "excellent timber like Memel deal." Captain Cautley, however, states, that it is "held in no esteem" by the natives of Northern India, and by experiment it is found to be only half as strong as Saul. It has been extensively employed in the construction of the new barracks at Subathoo and Kussowlee, and when duly seasoned and protected from damp and wet, it seems to deserve Mr. Aikin's good character. It should also be felled of mature age, and at the proper season, and unless all these precautions are taken, it seems to be peculiarly liable to dry rot, and the attack of worms and insects. At best, however, it yields in durability to the kelou or cedar, over which it possesses only one advantage, that of bearing a great stress without flexure. It is also in general use at Ferozepore, &c.,

being the wood procurable there to which it is floated down the Sutledge. I am indebted to Mr. Conductor Mines for the following remarks on the *Cheer*:—"The quality of the wood differs more, perhaps, than that of any other pine consequent to its growing in high and low situations, that of the former of a good sized tree being superior, and in dry situations very durable, the fibres tough, more so than the keloo, it is therefore strong. The *Cheer* of the lower hills is not so durable as that of the higher; this I conceive to be from a rapid growth, and for this reason the trees of a forest differ much in quality; for the trees lower down the hill are of a much more rapid growth than those on its summit. Again, it would affect the quality of the timber if the trees grew very close together (this is applicable to all forests), and even the aspect affects the tree. A sapling of the lower hills will rot on the ground in six months; a piece of scantling from a larger tree of the higher hills in a dry situation (in a roof for instance) will scarcely exhibit decay during a century, while the same in contact with mineral damp would be quite decayed in about ten years. This tree grows to a large size, is branchless for 40 or 50 feet from the root, the boughs somewhat straggling, growing rather vertically than horizontally; the colour of the wood is light; it is full of turpentine, which follows the axe almost in a stream." Mr. Mines is of opinion, and I agree with him, that in the N. W. hills we have but one species, the differences in appearance being due to age, aspect, and other local circumstances, such as elevation, and being found in forests or solitary. The clumps and single tress on the Nahun range are very handsome with dense, bushy heads. In the volume "timber trees" of the Library of Entertaining Knowledge, I find the following confirmation of Mr. Mines's opinions:—"Generally speaking, the timber (of the pine) is more hard and durable. the colder the situation is, and the slower the tree grows, (as well as from the wood being more resinous,) and its peculiar positions; it is not unusual to find the Northern half of a common pine hard and red, while the Southern half, though considerably thicker from the pith to the bark, is white, soft, and spongy."

The natural history of the locust being now apparently an object of research, I may as well add, that on the 17th, 18th, and 19th of October 1844, when Simla and Kussowlee were visited by countless flights of these pests, they completely stripped many of the *Cheer* pines of their leaves growing at the base of each fascicle, so that the entire foliage was soon strewed on the ground about the roots of the tree.

Virgil celebrates the "Pinus *loquents*," and many of us listen with pleasure to the Æolian music executed during a breeze by the firs and cedars of Simla. When it occurs that the wood of the fir is also the material from which guitars, violins, and sounding boards are made, and that rosin, which is essential to the use of the bow, is also a product of this tree, one ought to be induced to give the Mantuan Bard the credit of being Vates in each sense of the word, and that he had in this case a vision of violincellos, and made a more lucky guess at futurity then in his Pollio. The use of the fir-wood for musical instruments is, however, at least as old as the time of David: 2 Sam. vi. 5.

Our European visiters at Simla and Mussoorie are accustomed to identify the *Cheer*, some with the Scotch or Norway fir (Pinus *sylvestris*,) and others with the pinaster or cluster pine, from each of which, however, it differs materially. The leaves of the Scotch fir are always in pairs, and are not above three or four inches long, and the tree flourishes best in a climate which would speedily destroy the *Cheer*, being found as far north in Europe as a degree or two within the arctic circle, and as high as 2000 feet above sea level on the mountains of the North of Scotland. The pinaster certainly resembles it in habit, but has also its leaves in pairs, not in threes, and only about half the length of the *Cheer*, while its cones, rarely solitary, are generally in clusters of from three to eight; in the *Cheer*, they are often solitary, and I never met above five in a whorl, arranged indeed so regularly round the branch as well to warrant the application of the name (pinaster, star-pine) had it not been previously and more correctly appropriated. Royle, however, mentions a pine in Nepaul which I have not seen, *P. Nepalensis*, which is classed as a sub-species or variety of the pinaster, and nearly allied to Pinus *sinensis* from China, both with leaves in pairs. The nearest Western approximation to the Cheer is *P. Canariensis*, a native of Teneriffe, &c.

Many of the European and American pines are well deserving the consideration of the Simla Horticultural Society for introduction to the Himalayas. Pinus *Sylvestris* (the keifer or foher of the Germans; hence, our word fir) affords the well known timber, red, yellow, and Memel, or Riga deal, from the rocky mountains of Scandinavia and the sandy plains of Poland, &c. *P. Mitis*, the "yellow Pine" of America, is excellent for timber, the sapwood excepted. *P. Laricio*, the Corsican Larch, common also in Spain, supplies an excellent red timber much used by the French in ship-building. *P. Australis* or *palustris*,, the swamp or long leaved Pine of Georgia and Virginia, grows 60 or 70 feet high, and yields the best spars for masts of all the American Pines. It is too tender for England, but would flourish with the *Cheer* of the east. American tar and turpentine is extracted from this tree. *P. resinosa* affords the Canadian Red Pine. *P. Lambertiana* grows 230 feet high; has cones from 14 to 18 inches long, with edible seeds, roasted or pounded into cakes. It grows in North California and New Albion, where Douglas measured one which had been blown down, 215 feet long, 57 feet 9 inches in girth, at 3 feet from the ground, and 17 feet 5 inches at 134. The timber is soft, spongy and white, like that of the spruces, and useless, except that when partly burned, the turpentine acquires a sweetish taste, and is used by the natives as sugar. *P. Sabiniana*, also from California, grows 140 feet high and 12 in diameter, clothed with branches to the ground, and with woody cones 6 inches in diameter. *P. Ponderosa* from the same regions has, singularly, heavy, close-grained and durable timber.

2.—Pinus *excelsa*. The "*Kail* or *Kaeel*" of the Simla Hills, the "*Leem*" of Kunawur, and I believe the *Yari* of Kashmeer, is pretty common at Simla on warm aspects, as below General Lumley's house, and various parts of Chota Simla about Glencoe and Torrentium. It is also found in abundance about Kotgurh, Theog and many sites of similar elevation all over the interior, from about 6,500 to 8,500 feet: from 5,500 to 9,500 in Bootan: above 11,800 feet in Kumaoon, and Colonel Hodgson mentions it as occurring above the cedars with birch towards Gungautree. (As. Res. xiv. 107).

Captain A. Gerard also mentions the Leem as occurring with birch, &c. on both sides of the Shatool Pass up to 12,000 feet. So far as I recollect the *kail*, it is not entitled to its specific name "*excelsa*," but it is said in Nepaul to attain an immense height; Loudon gives 100 feet, but it probably attains 120. As seen in the woods about Kotgurh,

&c., it is a large spreading tree with long horizontal boughs, for the most part coming off the trunk much closer to the ground than in the *Cheer*, diminishing upwards, so as to form a spreading cone rather than a large head or crown as in the *Cheer*. The bark is smooth, and the leaves are of a glaucous, or bluish green, very distinct from the bright tint of the *Cheer*, from which they also differ by their having from three to five, but generally five leaves to each fascicle, which, as in P. *Strobus*, a nearly allied species, is destitute of a sheath at the base: the leaves are from six to eight inches long, very slender and drooping, and Dr. Royle observes, that it is the "Weeping Fir" of Himalayan travellers, a designation which would more appropriately belong to the *Rai* or Abies *Smithiana*, and on reference to the As. Researches xi. 518, I find that Captain Raper describes his "Weeping Fir" by characters which only belong to the latter.* The cones of the Kail are solitary or in clusters, completely pendulous, very long and slender, and while young, of a pea-green colour; no others in these mountains approach them in length, being from 8 to 13 inches long, the scales obtuse, and thickened at the end, but without the incurved beak of the *Cheer:* the seeds ripen from the middle to the end of October. Both the tree and its cones afford a great abundance of highly fragrant turpentine, and the tar sold in the Simla bazar is, for the most part, supplied by this tree. The cones are so inflammable as to serve the same purpose in lighting fires as the bog or peat pine does in Ireland and Scotland. Captain P. Gerard who possesses volumes of inedited memoranda on almost every subject connected with these mountains, informs me that the wood is considered excellent for the manufacture of charcoal intended for the fusion of iron ore, and that its leaves and branches, as well as those of the *Kelou*, are much used for litter and manure: those of the *Kail* and *Cheer* are also advantageously substituted for hair to bind clay used for plaster. When they fall from the tree and cover the ground, it becomes as slippery as ice, as every one will recollect who has had occasion to traverse a wood composed of *Kail* or *Cheer*.

The *Kail* timber is said by Captain P. Gerard to be extensively used in the hills, and to be preferred to the *Cheer;* it is white, soft, has much alburnum or sapwood, and besides warping when exposed to the sun, in the form of planks, is said to rot rapidly if placed in contact with damp earth; but when protected from moisture, ranks next to the cedar *(Kelou)*. Mr. Aikin merely remarks "wood remarkably compact." Mr. Mines estimates it next after the *Cheer*, and says "the wood may be considered the red deal of these hills: it is knotty, and lasting in dry situations, but exposed to dampness of any sort will soon

* During a fine, dry winter, such as the present one of 1844-45, in the months of December and January, the leaves of the *Kaeel* pine were completely covered by a sweet, transparent, liquid substance which collected on the branches and leaves, and, as it dried, matted the latter as if with glue. This substance concreted into a pure, white manna, of the consistency of honey or sugar, hanging down from the branches in the form of long or rounded "tears." In this state, it is eaten by the hill men, and is extremely sweet and palatable, without any flavor of turpentine. Abundance of it also falls to the ground, where it covered the stones with a coating as hard and transparent as the finest varnish, and the leafless branches of willows, &c. were quite enveloped by it as with so much French polish. It was also produced on the cedar, oak and Andromena, but far less copiously than on the *Kaeel* pine. The mountaineers believe it falls from Heaven; to me it seemed to exude from the leaves, but Captain Hay informs me that it was, in fact, secreted by a species of *aphis*, of a dark, brown color, about one-tenth of an inch in length, which was to be seen in multitudes on the branches. We learn from Burkhardt, that the manna of Mount Sinai, still called Manni by the Arabs, drops from the tarfa, a species of tamarisk, probably our furas, "only in years when copious rains have fallen," as last season at Simla.—*Travels in Syria*, p. 599—604.

decay; hence it is never used by the natives," who, however, bring in to Simla for sale, split shingles of it called *dudgies*.

In experimenting on specimens of this and other Indian trees, there is considerable risk of being misled by reliance on native names, the tree should always be recognized previously by its proper characters: thus, about Kotgurh and Nagkunda, the *Kail* is universally known by the name *Cheel*, by which, at and below Simla, Pinus *longifolia* is always meant, and Col. Hodgson says (As. Res. liv. 85) the same mistake is made in Gurhwal towards Gungautree, where the "*Kail* is confounded with the *Cheer*." Colonel Hodgson describes the P. *excelsa* as being there a very tall and graceful tree, and calls it the "true deal pine," with wood light, and of a fine grain.

In most particulars, the *Kail* approaches very closely to "Pinus *Strobus*, which, though called the Weymouth Pine, is a native of Canada and the neighbouring United States, where it attains a height of 100 to 150 feet, and produces the clean, soft, white, but perishable, timber imported from America, under the name of 'Pine' or white Pine, much used for masts, but of little strength, and giving a feeble hold to nails. *Kail* timber has, probably, nearly the same properties; and in Nepaul, there is said to be a variety of the *Kail* still nearer the Weymouth Pine than the Simla one, which seems to have rather longer and stouter leaves than P. *Strobus*, with cones twice as long.

3. Pinus *Gerardiana*. The *Neoza Pine*, called *Rhee*, or *Ree* in Kunawur; *Shungtee* by the Thibetans of Hungrung; and *Kununche* and *Koneunche* by others of the same race. It is, I believe, the *Sonoubar Sukkar*(*) of the Persians and Arabs, and flourishes from 6,000 to 11,000 or 12,000 feet above the sea: it does not grow naturally on the Southern side of the Snowy range, but is found in great abundance, forming large forests, on its North side in Kunawur, beyond the influence of the periodical rains, where it grows in very dry, rocky ground, rejoicing in the clefts of the "Herbless Granite," and occasionally on the clay slate. I have heard, that it extends sparingly to Wangtoo Bridge and Nachar; and that it has been introduced at Seran; but that the fruit never ripens in any of these places, which are all deluged in the wet season. Its manner of growth differs, considerably, from that of the other Pines: the trunk is of large girth, but scarcely atttains the height of the *Cheer*: the boughs, which it commences to throw off 8 or 10 feet from the ground, are very crooked and straggling, and the bark, which is smooth, whitish and spotted, peels off in large flakes like that of the Birch, disclosing the smooth, green, inner layers. The upper branches form a large, compact, conical head. The leaves are stiff and glaucous, in fascicles of three, with deciduous sheaths, and to the best of my recollection, are about as long as those of the *Kail*. The *Neoza Pine* affords abundance of fine turpentine, and the cones exude a copious white resin: it flowers in June and July, and the pollen of the male catkins is even more plentiful than in the cedar, so that, on shaking a branch at that season, one is quite deluged with the golden shower. The cones are more cylindrical than in the *Cheer*, and are of a bluish color, from 8 to 10 inches long, and 14 or 15 in circumference near the base, being the most bulky of any in these mountains, as those of the *Kail* are the longest: the scales are thick and blunt, much recurved, and spinous at the apex. Each

* Or, "Sweet Pine Nut." Golius gives a Pine and its Nut as the meaning of Sunoubar. The phrase 'Sunoubar Sukkur' may denote the 'Pistacio Pine.'

cone contains about 100 seeds, which ripen in September and October, so that they take 14 months to come to maturity. In order to extract them the more easily, the inhabitants collect the cones into stacks, before the seeds are quite ripe, and disengage them by means of a gentle fire: they are about an inch long, nearly cylindrical, with little or no wing, and are very palatable, with a slight, and not unpleasant flavour of turpentine. They are sold in the Simla bazar under the name of *Neoza*, and are, with great probability, supposed to be identical with the *Chilghoza* of Affghanistan, the produce of a pine common on the Sufaid Koh near Jellalabad, and in Kafiristan, where the climate, probably, resembles that of Kunawur. Lieutenant Irwin tells us "*Chilghoza* bears a large cone, and that the seeds are idly supposed to possess many good qualities," amongst which, that of easy digestion is, certainly, not to be reckoned one. Either P. *Gerardiana* or P. *Cembra* affords, probably, the edible pine seeds which Sir Geo. Staunton says are much relished by the Chinese. Mr. Vigne found the *Neoza* to the North of Kashmeer and in Astor; whence it no doubt ranges up to Kafiristan, &c. I am ignorant of the quality of the timber, but its place of growth is so remote and inaccessible, and the trunk is so bent and contorted, that it can never be of any importance for building purposes, and the seeds are also too valuable as an article of food to admit of its being felled. Europe possesses two Pines, of which the seeds are edible, viz. Pinus *pinea*, the *Stone Pine* which has its leaves in pairs; and very large, smooth, shining cones, 4 to 6 inches long, and requiring, it is said, three years to ripen; the seeds, considerably larger than the *Neoza*, are called *Pignons* in the South of France, and *Pinon* in Spain. The tree is common about Villas at Naples and Rome, and forms "Ravenna's immemorial wood." It has been completely naturalized at the Cape of Good Hope, and with the following would perhaps thrive at Simla, where the rains destroy the *Neoza*, at least, as a fruit tree. Pinus *Cembra*, a native of Siberia, the Tyrol, the North of Italy and the Mountains of the Bernese Oberland, where it is called *Arth* and *Tannenboum*: it is the *Aralla* in Savoy, the leaves are in bundles of 5; the cone is oval, and here again the seed is without a wing, as if nature intended us to secure it the more easily. *Cembra* is said to attain a height of 120 feet in Siberia. I have already mentioned the edible seeds of P. *Lambertiana* in North America; and in South America, the Araucaria *imbricata* (or *Dombeyii*) now becoming a deserved favorite in English lawns and parks, yields a nut as large as an almond (about 200 to each cone) which is an important article of food to the Indians of Chili and Peru, the seeds of Araucaria *Brazilienses* are sold in the market at Rio Janerio. There is ample room in the Himalaya for one or all of these, and their seeds would furnish an excellent substitute for such wretched trash as the fruit of the Pyrus *variolosa* (the wild pear of Simla) which we may see the hungry Hillmen often devouring for want of something better. Either *P. pinea* or P. *pinaster* is the picturesque tree which Claude and several of the Painters of Italy loved to introduce into their landscape masterpieces. The former grows with a large stem topped by a vast canopy of branches.

II. Abies: the *Spruce*. In this Genus, the leaves are short, stiff, solitary, scattered round the branches instead of being collected into bundles. The cones are pendulous, with persistent scales, of which the outer edges are not thickened as in the Pinus, but end in a thin brittle membrane.

The regular spirals in which the scales of this and other fir cones are arranged to the right and left, are worthy of observation. Professor Henslow has some curious remarks on their geometrical properties applied to the distinction of species: a similar symmetry may be seen in the spines of many species of CACTUS and EUPHORBIA. The name ABIES comes from 'abeo,' to rise, to spring up, in reference to its lofty stature, or it may, perhaps, have been a corruption of *albus*, the ABIES of Virgil and Pliny being our *silver fir*, so called from its white leaves as seen from below.

1. ABIES *Smithiana*, the *Himalayan spruce*, called *Rai*, *Re*, *Ro* or *Row* in the Simla districts; *Realla*, or *Rher* in Gurhwal, where however, Colonel Hodgson also found it known as *Rhoh* and *Rhai*. It is the *Ryung* of Kunawur, and Captain A. Gerard frequently mentions it under the names *Ro'oo* and *Roo'ee*, which are also applied to the *Pindrow*, meaning apparently no more than we do by the general term pine or fir. The Chumba people occasionally call this tree 'Tos', which properly denotes the PICEA *Pindrow*. Royle names it in his plate PINUS *Khutrow*, but as far as I can learn, *Khutrow*, though little known about Simla, is equally applicable to the *Pindrow*; and as the meaning appears to be "wood pine'!—Kuthrow belongs more properly to the Pindrow, which affords the better timber of the two. Royle has identified his own P. *Khutrow* with the PINUS (ABIES) *Smithiana* of Wallich, which he tells us, is also occasionally called *Morinda*; and young trees in England are often labelled ABIES *Morinda*. A fatality seems to rest over the names and descriptions of this tree: the Penny Cyclopædia, apparently quoting Wallich, describes PINUS *Smithiana* as being the *Indian silver fir*, "a tree of enormous size," called Raga, and reaching in Kemaoon to the region of birch. The cones are stated to be erect, from four to six inches long, ovate-oblong, with a very even brown, obovate, rounded scale, covered with a glaucous bloom. Now this position of the cone, and the name *Ragha*, point either to PICEA *Webbiana* or PICEA *Pindrow*; but then the leaves of P. *Smithiana* are said to be slender, four-cornered, whitish beneath, dark green above, one to one and a half inch long, a little turned towards one side, and with small seeds: characters, except the whiteness below the leaf agreeing with those of the Rai, which is otherwise not described in the Penny Cyclopædia, in which, however, the account seems a confused jumble of ABIES *Smithiana* and PICEA *Webbiana*; the true "silver fir" of our mountains. The PINUS *Smithiana*, or Rai, is only to be seen at Simla, in the glen by Lord Combermere's Bridge, where a few specimens give an idea of its mode of growth, but little or none of the magnificent tree which it becomes on the lofty mountains of the interior, from Bootan up to Kafiristan, such as Muhasoo, Kumuloree, Huttoo, Choor, the main range; and generally those of Kumaoon, Gurhwal, Sirmoor and Busehur at elevations of from 7000 feet to 12,600 above the sea. Dr. Griffith found it to abound in Bootan from 9,500 to 11,600 feet; and at Olipore towards Chooghur Serai, at the head of the Koonur valley, he obtained from the neighbouring mountains of Kafiristan, "specimens of a beautiful ABIES or spruce, apparently allied to the *Morinda* or *Khutrow* of the Himalayas." The Rai is not only a very superb, but a very graceful tree; the boughs ascend a little in the young trees, but are horizontal in the old ones, and from these the branches and small twigs droop in vertical plane, in the most graceful manner, quite a contrast to the cedar, which has all its boughs and branches in horizontal planes. The leaves are

quadrilateral, somewhat curved, from one and a half to two and a half inches long, with excessively sharp points, and are scattered singly at nearly equal distances around the branches; this characteristic and the elegant pensile branchlets, mark the tree beyond the power of mistake. The cones are pendulous from the extremities of the branches, they are nearly cylindrical, six or seven inches long, and when old of a rich brown or purple. The seed ripens in October and November, and is by far the smallest of any of our pines. Loudon's supplement to his Encyclopædia of plants identifies Abies *Smithiana* with Abies *Morinda* and Pinus *Khutrow*, and states its height at fifty feet, but it may frequently be seen thrice that. When young, the *Rai* has considerable resemblance to the *Norway Spruce;* it is thickly clothed with bushy branches to the ground, declining, but not drooping as in the mature tree; and this difference has probably led some travellers to the conclusion that there was an undescribed species in the woods of Muhassoo and Huttoo.

The Abies *Smithiana,* in its preference of Northern aspects, is but one instance of many of a phenomenon which strikes every traveller in these mountains, that of the Northern and North-Western aspects being densely wooded, while the South and South-Eastern are wholly, or almost wholly, bare. Thus on Muhassoo, we may observe the *Rai,* the Maple, &c. to commence, where the Cedar forest terminates, not so much from the increased elevation, which only amounts to 9000 feet, as from the change of exposure; the Cedar, apparently flourishing on the more sunny declivities, while the former (with the *Pindrow,* next mentioned) delight in the rich and deep black vegetable mould of the still steeper Northern flanks, which supports also a multitude of shrubs and Herbaceous plants, and proves by its great depth, that this state of things has remained unchanged for many ages.* It has been also truly remarked, that these wooded aspects are almost invariably the most steep and rugged, no doubt, from the direction of the stratification, which brings the out-crop of the rocks into that quarter, affording at once a ready penetration to the roots between the layers, and preventing the removal of the soil by rains: thus at Kussowlee, may be noticed a steep Southerly slope, perfectly bare except in one spot, where the rocky strata cross out in a long thick band, which is covered with a brushwood of Hamiltonia, *Shrubby Senaios,* &c. The Northern slopes are also more exposed to the disintegrating effect of frost and ice, which break up the rocks and more rapidly convert them to soil; while the precipitous declivities not only tend to secure the trees from the ravages of cattle and wild animals, but also from the violence of the South and S. W. winds, the influence of which Dr. Griffith (who remarks on the phenomenon in Bootan) thinks quite a sufficient cause to keep down all luxuriant vegetation. Hence, upper Kunawur and Thibet, where the winds, even at midsummer, are extremely furious and searching, exhibit to us one monotonous tract of mountain or plain, altogether devoid of natural forest; the only trees being those planted near the villages for the sake of their fruit. Perhaps also the deluges of rain which assail the Southern aspects exercise an unfavourable influence on the growth of forest trees, by carrying down the soil to the rivers, rendering even cultivation im-

* Lieut. Irwin remarks, "Pines are not found in all situations, even of the cool countries, but prefer the steep sides of hills, never being found indigenous to plains or tame-featured hills.

practicable, except where the land is carefully terraced. Dr. Royle seems inclined to attribute much of the nakedness of the Southern exposure to the direct and powerful action of the sun's rays, which seems to be inimical to the growth of many of the Himalayan Trees: and as we are ourselves natives of the same clime, which cherished the spruce and silver firs, this may read us an additional, though scarcely a necessary lesson, of the propriety of living as much as we can in the shade. Looking at the mountains from the South, it is very curious to observe how, in many cases, their craggy summits are feathered with Pines, the uppermost members of a dense, but invisible forest, while scarcely a bush is to be seen on the South side; and hence, also in marching in the interior the abrupt antitheses of temperature which occur from "suns that dart intolerable day" to the chill and gloom of a thick forest. It is, I suppose, to this circumstance also that Major Wilcox alludes in his travels to the sources of the Burramputra (As. Res. xvii. 425) "on one side, there were no firs, though they abounded on the Northern mountains even at a much lower level." From his noticing their black appearance, the species is, probably, PICEA *Webbiana* or *Pindrow*. Vigne, also, notices, that the Southern aspects in Kashmeer are rocky and bare of trees; while the Northern and Eastern aspects of the Peer Punjal Range are covered with deep soil and dense forests; the barrenness of the former is attributed by the Kashmerians *to the hot winds from India*. Moorcroft notices the same phenomenon: "On the Northern side, the steep acclivities of the mountains were covered with fir-forests; those on the South were *less abrupt*, but more thinly wooded, the Pine evidently affecting a Northern aspect."—Travels, Vol. II. p. 96. Thus, whether it be the Northern exposure of an Alpine mountain or the frozen wastes of the North, nature provides her stores of most inflammable materials in the coldest situations. As a Timber tree, the *Rai* appears to be considered nearly worthless: the wood is white, and Colonel Hodgson says is not esteemed in Gurhwal for building, being heavy and knotty. (As. Res. xiv. 85.) When exposed to damp and wet, it is said to rot in a few months, and to split and warp from heat; it is extremely difficult to work with the saw, and when split into planks, exhibits a very rough surface: it appears, however, that split shingles are preferred to sawn ones, from the texture of the latter being cut across more or less, and thus admitting moisture, which is not the case when the fracture follows the direction of the fibre, and thin shingles are said to be more durable than thick ones from their more rapidly and completely drying after rain. With all its defects, the Rai Timber is strong, more so than the *Kail*, and I am told is pretty extensively employed for beams and other in-door purposes, where it is protected from moisture; and even in the form of shingles on native roofs, it is reported to have lasted 18 or 20 years. The remote and often almost inaccessible spots which the tree delights in may have tended to restrict its use as Timber. Mr. Conductor Mines observes of the *Rai*, that it attains a very great size, with a clean stem to a great height: "The wood is extremely soft, straight, and clean grained, of white color, and generally free from knots: it is considered to be of a very perishable nature; and is, therefore, never used but in the shape of split shingles for roofs, for which, I should say, it is admirably adapted, as from its straight grain, it would split well, and in such situations it is lasting." He also remarks, that, "a young *Rai* tree differs so much from an old one, that the inexperienced would pronounce them two distinct species." Mr. M. never fells this tree on account of Government, and careful experiments would be advisable before it is allowed to come into much use: native opinion is decidedly against it, formed, no doubt, on long experience. It does not occur in the catalogue of Indian woods examined by Mr. Aikin: he gives us, however, the character of PINUS (PICEA) *Brunoniana* from Nepal; "wood soft, and of no value." This is found in Kumaoon, Nepal and Bootan, and is called *Tangshing** and *Changatasi Dhoop*, growing 70 or 80 feet high, with a spreading branched head: the leaves are about an inch long, covered beneath with a milky white bloom, but bright green and glossy, above, serrulate towards the point, and so easily shaken off as to be almost deciduous. The cone is erect, not above an inch long, with lax, ovate, blunt, pale brown scales. The wood is bad, and liable to warp. (Penny Cyclopædia.) It approaches *P. Canadensis*, and will, probably, be discovered in Kunawur as between Meeroo and Rogee. Captain A. Gerard mentions the following varieties of Pines. *Krog*, *Geosun* and *Manderung*, of which *Geosun* is probably the *Cedar*, frequently called *Geum* in upper Kunawur; while *Krog* and *Merung* may denote the PICEA *Webbiana* and *Brunoniana*. Capt. Gerard, as well as Capt. Hutton, mention about the same place, as also on the Shatool Pass; "another variety of the Pine," called '*Spun*,' occurring with *maple*, *birch*, *mountain ash* and *black* currants, and which I suppose to be either the *Pindrow* or the *tree Juniper*, but no detail is given to tend to its classification.† *P. Brunoniana* is the *P. Dumosa* of Don.

The European tree which comes nearest the *Rai* is the *Norway spruce;* "the Fichtenbaum of the Germans, or ABIES *excelsa*, so ornamental to our English lawns and plantations, and which in its native soil sometimes grows 180 feet high. It is densely clothed to the ground with branches, and grows in a pyramidal form, and though the branches decline, they do not droop so completely as the *Rai*. The leaves also are thicker, and about an inch shorter and less glossy and bright in their colour.

The timber is the white deal of the Baltic, and is only durable under cover; it is white, soft and knotty. ABIES *alba*, *cærulea* and *nigra*, the American black and white spruce, are also occasionally met with in our shrubberies and gardens, and are exceedingly hardy, growing nearer to the pole than any other of the Pines. *A. nigra* has pendulous branches, and very dark, green foliage. *A. alba* (or *cærulea ?*) has stiff horizontal branches, with leaves under an inch long, of a pale bluish-green and exceedingly aromatic when crushed. ABIES *Canadensis* is the hemlock spruce, and from the young sprouts of this, of ABIES *nigra* and *excelsa*, is made *spruce* beer, so called from its being a decoction of the sprouts (German *Sprulitsen*) of these trees mixed with sugar. This product is not, perhaps, of sufficient value to recommend the introduction of the trees which supply it, but if the seeds could be produced, the stupendous ABIES *Douglasii* or *Taxifolia* is well deserving of notice. It forms immense forests in California, from 43 degrees to 52 degrees north latitude, is a quick grower, and thrives in England. A speci-

* Tangshing appears to be a generic term in Ludakh for Pine.

† In one of his Journals, Captain Hutton describes a tree called Jamoo at Nagkunda, which is Royle's *Cerasus Cornuta*. He also observes, that he could not find the *birch* between Nagkunda and Kotgurh; the *Bhojputtur** is certainly not to be seen there, but by the streams, *Betula Cylindrostachya* is common, with a clean trunk, and has been used in the new bridges, 1844.

men on the Columbia river measured 48 feet in girth, 3 feet from the ground: the bark is from six to nine inches thick, filled with receptacles of clear, yellow resin, and the height of the tree is from 100 to 230 feet. The cones are drooping, and are remarkable for their long 3-toothed bracteæ between the scales. The timber is very valuable, being heavy and firm, never warping, and nearly as deep in colour as yew. The introduction of the *Larch* to the Himalaya would be a real and an easier boon. Dr. Griffith, it is true, mentions his having found "a genuine larch," 10,000 feet above the sea, near Woollokha, in Bootan; but it would be a much simpler affair to import the seeds from England, where the tree has long been acclimated; its natural habitat is Siberia and the Alps which separate Switzerland and Germany from Italy, occurring in abundance and perfection on the Simplon and Splügen Passes, where the German name is *Lerkch*, origin of the Latin *Larix*. It is a very rapid grower, delights in steep rocky sites, and would, no doubt, flourish in juxta-position with the cedar. That our rainy season would not injure it, may be inferred from the success which has attended its introduction on a great scale in the Duke of Athol's Estates about Dunkeld, than which a wetter climate could scarcely be pitched on. It has the useful property of killing the heather, and thus preserving land for cultivation, while that plant flourishes in a wood of the Scotch fir. Besides that the bark is half as valuable for tanning as that of the oak, the timber of the larch is reckoned superior to all other European and American Pines. Some beams in the palaces, &c. of Venice, are 120 feet long, and the Lib. of Ent. Knowledge, Timber Trees, affirms that a fishing boat, built of larch only 40 years old, has been found to last three times as long as one of the best Norway Pine; it is not so buoyant, however, nor so elastic, and it does not dry so completely as Pine; boards of it are more apt to warp. It is, however, much more tough and compact; and what are very valuable properties, it approaches nearly to being proof, not only against water, but against fire,* for before a larch beam can be even completely charred on the surface, one of pine or of dry oak will be in a blaze, beyond the ordinary means of extinguishment." LARIX *pendula*, the American black larch, also supplies a very excellent timber.

But it is, perhaps, premature proposing this or any other introduction till we have learned how it behoves the authorities in the N. W. Provinces to take immediate measures for counteracting and replacing the enormous yearly increasing, and often wanton and most improvident devastation and denudation, caused by the great demand for timber, firewood and charcoal. Whole hills, immediately beyond the magic circle of the station boundaries, are already bared, and even the cedar forests of Muhasso are considerably thinned, not so much by the felling of large trees, as by the pernicious custom of cutting down young ones for small spars, whereby the purchaser who has contracted for sound timber, is grossly imposed on.† Even at Simla great numbers of trees annually disappear, notwithstanding the regulations to the contrary; so that besides the injury to its beautiful scenery, it is

* This fact is noticed by Julius Cæsar, who calls the larch "lignum igni impenetrabile." It is, however, tacitly contradicted in the Rev. W. Bingley's "Useful Knowledge," where we are told that the very combustible nature of this wood renders it unfit for building purposes.

† Major Boileau calculates that there are not less than 300 saws daily at work on Muhasso. Let the supply from this mountain be once exhausted, and the glen of the Girree will prove an insurmountable obstacle to the forests beyond it being made available.

not unwarranted by experience elsewhere, to predict that if matters progress at the same rate as hitherto, a scarcity of water as well as of wood will be the result, from the augmented rapidity of evaporation consequent on the removal of the natural screen supplied by the trees. Many are calling for further clearing on the score of health, but if Simla be really less salubrious than formerly, the fault should rather lie at the door of increased filthiness, for the woods are unquestionably far less dense than they were; and, at all events, the charge cannot be substantiated against the trees, chiefly cedars; for it has been remarked, I believe justly, that where ever the Pine, &c. naturally flourish, there the climate is naturally healthy. The narrow leaves can scarcely check the circulation of the air; and they are too resinous to injure it by the decomposition. It is quite possible, that the asserted increase of fever may originate in too devoted a cultivation of the vine, the hop, and "inspiring bold John Barleycorn." There is indeed during the wet season a rank undergrowth of herbaceous vegetation, especially of a species of *Balsam*, against which let war to the knife be proclaimed. But not a tree should be touched; on the contrary, every open spot beyond the boundaries, and especially the denuded tracts on Muhasso and the Kussowlee range, should be sedulously planted. Surely as the Hill chiefs are so well paid for their timber, and have thereby materially increased their incomes, it would be merely an act of justice and foresight to our successors, and of politic kindness to the lords of the soil themselves, were "the paramount power" to insist on every spot bared by the wood-cutter being at once carefully replanted under the sanction of a heavy fine, or even confiscation in case of non-compliance, with special instructions for the seizure of all cattle found trespassing, and strict prohibition of the ruinous practice of burning the grass annually, by which great tracts of young, flourishing forest are destroyed. The cedar may be had in any number and of all sizes, for, like the other Pines, it seems to thrive best when growing as thick as the young trees can possibly stand. There have been some attempts made to replant Muhasso, but this fact has been lost sight of; and instead of at least a dozen, one young tree only replaces the old one, omitting to allow for the numerous chances against its ever reaching maturity, which not one in ten does naturally. At Kussowlee and Subathoo, where the demand for fuel is great and unremitted, augmenting in the winter when there is no addition to the growth of Timber, the want will, in a few years become a serious evil, and tend considerably to enhance the cost of maintaining a European Regiment there. The same remarks hold good also with regard to Jutogh.

III.—Picea. The *Silver Fir.* Leaves flat and strap-shaped, marked below by two white streaks, one on each side of the midrib. They are arranged, nearly in two horizontal rows, one on each side of the branch as in the *Yew;* and the cones are erect, cylindrical with deciduous scales. The name comes from Pix, pitch, and is applied by Pliny to Abies excelsa, the Norway Spruce.

1.—Picea *Pindrow.* The Pinus *Pindrow* of Royle, called *Thunera* about Fagoo and Shallee; *Koodrom* at Muteeana, *Kulrai Sutrai* and *Choor* at Kot Khaee, &c. *Tos* in Chumba, Kooloo and the districts across the Sutlej; but about Nagkunda, and generally in these districts, where it is best known, it is called the *Pindrow* or *Pindrai.* Royle says, it is sometimes called *Morinda:* a Joobul man told me it was known as *Chitrow* in his country, and in the Choor, simply

Ruho or *Row*. It is, I believe, the *Ragha* of Kumaoon. Captain A. Gerard mentions the *Sungcha* Pine on the Shatool Pass, probably a misprint for "*Sungeha*," which I have heard used for this many-named tree.

The *Pindrow* is not found at Simla, and is rare near the road over Muhasso, though there are said to be woods of it in the deep glens to the North. It reaches a higher elevation above the sea, than even the *Smithiana* spruce, flourishing from 8500 to 12,800 feet on Kumuloree, Hutto, Choor, Kedarkanta, Changsheel, Puthurualla (the Urrukta of Royle and Fraser,) and in short, all ranges of similar height. It is, probably, the "*Black Pine*, a lofty tabularly branched tree," which Dr. Griffith found abundantly in Bootan, from 11,100 to 12,500 feet above the sea. The foliage is of the deepest green, almost black, the leaves 3 to 4 inches long, with acutely two-toothed ends; they are flat and originate all round the whitish stems, but dispose themselves into 2 horizontal rows, nearly as in the *Yew* (*Thona*) with which the natives of the lower mountains constantly confound it, and hence, perhaps, its name *Thunera*. In Loudon's Supplement, Taxus *Lambertiana* of Wallich is given as a synonym, from which it would appear, that Dr. Wallich also mistook it for a *Yew*, most likely from inspection of the branches merely, or Loudon may be mistaken, as he is decidedly, in stating the leaves to be of the "same color on both sides;" for they have two faint, white, silvery lines beneath, and in young plants on Huttoo mountain, I noticed them as well developed as in the *Silver Fir* of Europe; and Loudon is, perhaps, right in regarding the *Pindrow* as a variety only of Picea *Webbiana*. The word *Pindrow* alludes, I fancy, to its very peculiar mode of growth, tall and cylindrical, or slightly tapering, like the upright *Cypress*, or the Lombardy Poplar: the trunk attains a great girth and height; some on the Choor measure 20 feet round at 5 feet from the soil, and Loudon gives the height as 100 feet, which is certainly much under the extreme mark. The stem is densely clothed with short, thick, scrubby boughs, bearing little proportion in length to the height of the tree, and ending in a mass of flat, declining branches. The cones are deep purple and oval, according to Royle; to me they seemed rather elongated or cylindrical, but they only grow on the loftiest branches, are erect with deciduous scales, and therefore by no means easy to possess oneself of on a casual and hurried visit. The seeds ripen in September and October. The timber is reported to furnish good beams for walls and roofs, but like the Rai, rots and warps, if exposed to the rain and sun; and when split into planks, the section is extremely rough and uneven: in this form I saw it on the roofs of the out-houses at Nagkunda in tolerable condition, after 12 or 14 years' exposure; no objection was made on the score of difficulty in sawing. Dr. Royle says only that the timber is used in the construction of houses. Should experiment prove it worthy of notice, there are most extensive and splendid forests all over Huttoo, and its gigantic spurs, which would afford, for many years, a supply of the finest timber, with spars "fit to be the mast of some great admiral," when floated down by the Sutlej and Indus to the sea-coast.

2.—Picea *Webbiana*: *Silver Fir of the Himalaya*, the Pinus *Spectabilis* of Lambert, called *Chilrow* in the Northern Himalayas, according to Royle, also *Gobrea*, *Smallur*, and *Oonum*, or the *Purple Coned Fir*, from the rich purple tint of the cones, which are said to be strikingly beautiful, and to afford an indigo, or purple pigment, whence, probably, the name *Salur*, which is that of Boswelia *glabra* or *serrata* in

Rajpootana. Captain Webb, after whom this fir is named, calls it *Oumur*, and it is, I believe, the *Raisalla* or *King Pine* of Traill's report on Upper Kumaoon. Royle describes it as growing in the same situations as the Cedar and *Pindrow*, and also (Illustrations, p. 40) in Kunawur; but, so far as my observations extend, it does not form one of the trees on Nagkunda, Choor, &c., nor can I recollect on any occasion distinguishing it from the *Pindrow*, which Loudon seems to regard as a variety only of *P. Webbiana.* Fraser, in his tour in the Himalaya, frequently mentions the latter as perfectly resembling, in color and figure, the Silver Fir of Europe; specifying its slender, tapering form and short lateral boughs: but though he crossed Huttoo and many other mountains, where the *Pindrow* abounds, he never distinguishes it from the *P. Webbiana.* It appears, however, from Royle's Illustrations, that the leaves of the Picea *Webbiana*, are only half as long as those of the *Pindrow;* have the two well-defined silvery lines beneath, and are obtusely emarginate, instead of being bidentate at the end; the cones, also, are cylindrical, and longer than those of the *Pindrow*, which are oval: young trees of *P. Webbiana*, which I saw at home, exhibited the two white bands beneath the leaves, even more strongly marked than in the European Silver Fir. Captain Webb describes it as growing 80 or 90 feet high, with a diameter near the ground of 3 or 4 feet; and Captain Raper, who wrote the narrative of their journey (As. Researches, xi. 546), gives 70 or 80 feet as the stature, and 7 or 8 cubits as the girth. They met it, for the first time, near Rameni, and the Nundakinee river in Gurhwal, where it appears to be called "Deodar:" Captain R. notices its tapering habit, and says the "leaves are about 1½ or 2 inches in length, flat, sharply pointed, and produced horizontally on each side of the twig." In the volume, "Useful and Ornamental Planting," in the Library of Useful Knowledge, it is described as a most magnificent tree, resembling a silver fir upon a large scale; "nothing in the fir tribe can easily surpass in beauty this fine tree, whose silvery bark, bright green leaves, white beneath, and purple cones, studded with drops of transparent resin, render it an object of high attraction. Every exertion should be made to procure its cones." It appears to abound in Northern Kumaoon. Fraser says the Timber is used by the natives in building; and Captain Webb describes it as used by plane-makers: and Mr. Aikin reports, "Pinus *Webbiana* from Nepal: exterior layers soft, and of no value: interior ones harder and finer grained." I have been informed, that Captain Jones, Executive Engineer in Rohilkhund, recommends it as a very strong wood: but I am not certain whether this or the *Pindrow (Ragha)* be intended. Subsequent experiments made by Captain Jones exhibited the Timber of the *Rai Sulla* as about equal to the worst specimens of Kumaoon Cedar in direct strength; and very inferior to good *Cheel.* Vigne mentions, that in Kashmeer, the wood of "the longest species of fir," called '*Rayal*' and '*Budel*,' is used for window-frames and roofs.

The European fir which approaches nearest to the Picea *Webbiana*, is the Silver fir, Picea *pectinata*, so called from the comb-like or 2-ranked arrangement of the leaves, which, however, is a character common to the genus as now defined: it is the Abies *pectinata* of De Candolle, and is supposed to be the Abies *pulcherrima* of Virgil. When Cæsar asserts, that neither the Abies nor *Fagus* grow in Britain, he must be understood to speak of the *silver fir* and *sweet chesnut*, or perhaps the Quercus *ballota* or *edible Spanish acorn;* for the

Scotch fir and the *beech* are unquestionably indigenous, the latter being found in its greatest perfection in the very districts visited by Cæsar. The *silver fir* grows to a great size, and has its English name from the bark, which is white in the young tree; and from the leaves about an inch and a half long, which have two silvery lines beneath. They are, however, of the darkest green above, and it is the preponderance of this tree which has given name to the black forest in the South of Germany; it is also common on the Alps, on Mount Olympus and on the Pollino, and the forest of Rubia, in the kingdom of Naples grows from 130 to 150 feet high. It is, I believe, the *sapin* of the French, the *fichte* or *tanne* of the Germans; but Loudon applies these names to the *Norway spruce;* and in April, when the ends of the branches are covered by the yellow and orange male strobile, has a very rich and beautiful appearance. The timber is softer and less durable than that of fir or larch, but is said not to shrink. It affords a greater quantity of resinous matter than any of the other firs. "The property of reproducing a leaning stem or branch when divided, common to all other trees more or less, is wanting in this family of trees," *the coniferæ*; and when cut down below the branches, they are incapable of sending out fresh shoots, and are destroyed beyond remedy: this fact had been observed in very early times, for we read in Herodotus, (Erato. 37 of Beloe,) that Crœsus directed the citizens of Lampsacus to liberate Miltiades, "threatening on their refusal to destroy them *like Pines.*" The silver fir, however, when so treated, though it never recover its leafy honours, has the singular property of not only continuing to live, but even of increasing in bulk, and of covering with bark the scar of the feller: this circumstance is said to have been established by more than one example on Mount Jura, and if correct, is not easily to be reconciled with the usual theory of vegetable physiology, which assumes the leaves to perform an essential part in the elaboration of the sap, and the growth of the tree. Captain Young, Royal Engineers, says, "I have seen stumps of Hemlock (spruce) in the Nova Scotia woods that have survived their upper portions for forty years." (Profess. Papers, v. 116).

Strasburg turpentine is produced by the silver fir, *common* and *Burgundy pitch* from the *Scotch fir* and *Norway spruce; Bordeaux turpentine* from the *pinaster*, and *Venice turpentine* as well as oil of turpentine from the *larch:* and *Canadian balsam* from the Picea (old Abies) *balsamea*, or *balm of Gilead fir*. *Amber* is believed to be the fossilized resin of a pine; and the *surturbrand* of Ireland and Antrim, a jet black mineralized bituminous wood, found in layers in lava and basalt, is supposed to be Pine.

Douglas discovered two majestic species of this genus in North California or new Albion, one, Picea *grandis*, growing in the vallies to the height of 200 feet, with wood soft, white, and of inferior quality; the other, Picea *nobilis*, nearly as large, growing on the mountains with wood of excellent quality.

IV.—Cedrus. Leaves in tufts of from 40 to 50; evergreen, cones solitary, erect with deciduous scales: the larch (Larix) has also the leaves in tufts, but they are deciduous or fall in winter; while the cones, though erect, have persistent scales.

The word *cedar* in Greek, *kedros*, is probably derived from the Arabic *kadr*, worth, value, or its derivative, *kudrat*, strength, power, in allusion to the value of the wood: the Hebrew and Arabic names are *erez* and are from the Arabic root *araza*, he was firm and stable with roots deeply fixed in the soil (Golius.) There is not, I imagine, any affinity between the name *cedar*, and that of *kedarnah*, *kedar-kanta*, *kedar-patri*, (the latter is the Limonia *laureola*) found in the Himalaya, though in a paper by Lieutenant E. Conolly, in the Journal of the Asiatic Society for October, 1837, I see the title of *Siva Kedareswara* rendered, 'lord of cedars,' and again 'lord of the mountain stream,' which latter agrees with Traill's etymology of Kedarnath, 'lord of the abounding stream,' from the Sanscrit *ke* water, and *dar* abounding, a derivation true both in nature and fiction, since the Ganges is feigned to fall from the heaven of Vishnoo (the clouds) on Siva's head, whence it trickles on earth through his locks, which in this case denote the icicles, &c. of Gungautree.

1. Cedrus *deodara*. The Cedar tree of the Himalaya called *Kelou*, *Keloo* and *Keoulee*, about Simla: *Kelmung* in Kunawur, and *Geum* by the Thibetans: this is nearly the '*Kee*' of the Goorungs. *Dedoar* and *dewar* by the people of Gurhwal, Kemaon, Nepal, Kashmeer and Persia. Roxburgh, who named the tree, says *Devadaru or Deodar* is the name the tree is known by amongst the natives where it grows, i. e. the mountains North of Rohilkhund according to his information; that of the Penny Cyclopædia comprises a ludicrous amount of error, considering the origin of that generally admirable compilation under the auspices of the Society for the Diffusion of Useful Knowledge; for there we are told that this 'Sacred Indian fir' is "a native of the mountains of India, *near the town of Rohilkund*, on the Alps of Nepal and Thibet, at a height of 10,000 or 12,000 feet, and *also* in the woods of Almorah."

The Cedar was introduced into England by the Hon'ble Mr. Melville, in the year 1822, in which also was built the first house at Simla. Captain Gerard, however, informs me, that he had sent seeds home as early as 1819: the tree appears perfectly hardy in England, and is now to be seen flourishing in many Botanic Gardens, Parks, &c.: there is a fine young specimen, about 16 feet high, in the Chiswick Garden. In the Himalaya, it occupies a great vertical range, flourishing from about 5,500 to 12,000 feet above the sea, frequently mixed up for the first 1,500 feet with the Pinus *longifolia* and Quercus *lanata (Ban)*; while for the last 3000 or 4000 feet it accompanies Abies *Smithiana* and Picea *Pindrow* to their elevated sites, beyond which, we meet no trees but the *Bhoj puttur (Birch)* the *Kurroo* or *Kurshoo* oak (Q *Semecarpifolia*, much stunted;) Pyrus *lanata* resembling the *white beam* tree of England, and another like the mountain ash; the *shrubby Potentilla*: the *creeping Rhododendrons* and *Juniper*, and highest of all, a *Dwarf Willow*.

To see the Cedar in its perfection, one must visit the Snowy range and the lofty mountains of the interior, far from the influence of the plains, and where, for nearly half the year, it is enveloped in snow; there its dimensions become gigantic, and throw into the shade, even the fine specimens by the Annadale and Southern Cascade Temples below Simla. Between Nachar and Turanda, in lower Kemaon, there is an extensive forest of very fine trees (also with a temple), from 20 to 27 feet in girth, and near this last village, Captain Pepper and myself in 1830, measured one 36⅗ feet in circumference, fully 5 from the soil: and on a subsequent journey, I saw several on the Northern declivity of the Boorun and Roopin Passes, not under 30 feet in girth, and from 150 to 200 feet high. Captain A. Gerard notes some of these as being 33 feet round: and one at Soang of 30 feet. Captain P. Gerard measured one at Barung 34 feet in girth, at 4-6 feet from the ground;

Pilgrim (Mr. P. Barron) mentions the "Cedar firs" of Tongnath mountain, above Ookeemuth, as 25 feet in girth, and upwards of 200 in height: and on the Toogasee mountain, on the route to the Neetee Pass, Moorcroft measured one which had fallen, 159 feet: another was 180 feet high, and 18 cubits in girth at 4 feet from the ground. Many on the Choor are 26 feet round, 5 or 6 feet from the ground: it is very probable the largest have not yet been met. Maundrell in 1660 measured one of the Cedars of Lebanon 36½ feet in girth, which De Candolle believes to have been then about 600 years old: and if his calculation be admitted, some of our Himalayan specimens may be 1000 years old.

The Cedar is found on all the higher mountains from Nepal up to Kashmeer; and Dr. Griffith describes it as occurring "in vast abundance and size" on the Sufaid Koh and Tezeen Ranges, as well as those of Olipore, near the head of the Koonur Valley, towards Kafiristan; where it is called *Nokhtur*, and flourishes at from 6,500 to 10,000 feet above the sea. Dr. G. has, I understand, asserted that he could not detect any distinction between the fruit and seeds of the Lebanon and Himalayan Cedar; and it would be curious, and tend to establish their identity, if the tree could be traced in a continuous line from Afghanistan along the mountains of Persia, to Mount Taurus in Asia Minor and Lebanon. These last two mountains are of limestone, while the *Kelou* seems to avoid the limestone ranges of Budraj, Mussooree, the Kurol, and Soorkunda; and to the best of my recollection, does not grow or at all events abound, on the limestone mountains East of the Tones river; but this may arise from other causes, such as the proximity of the plains: it occurs, however, on the Gagur range above Bumouree. Major Harris incidentally alludes to a Cedar "which graces the Alps of Northern Abyssinia."

The *Cedar of Lebanon* (Cedrus *Libanotis*) attains a considerable size in many parts of France and England, and is supposed to be more abundant now in the latter than on Lebanon itself, where Solomon's 80,000 hewers must have committed no small havoc. Very fine specimens exist at Chelsea, at Sion House, near Richmond, in Richmond Park, and one in the Jardin des Plantes at Paris was, I believe, planted by Jussieu. They are all remarkable for their huge, wide-spreading arms, and tabular branches, and except in the extremely dark green of the foliage, seemed to me identical with the *Kelou*. The cones are perfectly similar, and grow in precisely the same manner. Scientific observers, however, who have compared the two trees together in Europe, consider them to be quite distinct. The *Kelou* is said to differ by having its cones upon stalks (which I have not observed to be the case), and by its leaves being longer and more distinctly 3-sided: by its producing great quantities of turpentine and tar, and its very fragrant, fine-grained, and durable wood; while Loudon pronounces the Timber of C. *Libanotis* to be coarse-grained, perishable and inferior to the worst English deal: the Penny Cyclopædia says it "produces deal of very indifferent quality;" and the British Cyclopædia agrees that the Timber is "far inferior to the common Scotch Fir." It has accordingly been doubted whether Cedrus *Libanotis* be the true Cedar of the ancients; but we must recollect, that while the *Kelou* is tested by the qualities it possesses on its native mountains, the experiments on the Cedar of Lebanon are carried on with specimens very probably grown in the rich alluvial valley of the Thames, where the trees have to "contend with conditions differing much from those to which nature had originally submitted them;" and that the timber may very well be as inferior to that from the rocky heights of Lebanon, as that of the Scotch fir grown in the low lands and stiff clays of England is known to be, compared with the same timber from the Scotch and Norwegian mountains. The want of turpentine and tar may be accounted for by its removal from a very elevated to a very low site, for the Psalmist specially notices the Cedars of Lebanon as being "full of sap:" and to obtain a just estimate of the comparative value of the two Cedars, and thereby a means of deciding whether, so far as the test of timber extends, they are specifically distinct, samples of wood should be imported from Lebanon and Taurus. Virgil notes the wood of the Cedar as being particularly adapted for houses; and it is not likely that Solomon, who, among his other acquirements, is said to have been a Botanist, would have selected so perishable a material for his Temple, which in fact lasted about 500 years, and was finally destroyed by fire, and not by natural decay.

The *Kelou* preserves the characteristic habit of huge horizontal boughs, clothing the trunk nearly down to the ground, with all the lesser branches on the same level. When planted in thick groves, the tree grows erect, in a spiral form, with shorter lateral boughs; but when solitary or in clumps on an exposed knoll, or when the leading shoot has been injured, the branches spread horizontally to a great extent, with a flat tabular summit, quite resembling the Cedar of Lebanon, and so unlike its more ordinary form, that many are led to think it must be a different species. In young trees also the boughs sometimes droop, sometimes ascend, and we may, occasionally, observe the branchlets so short, and pendulous, as to give the tree more the appearance of the Cyprus than Cedar; and this also has probably been the reason why travellers have supposed there were two distinct kinds; but the Cedar of Lebanon, even in England, varies in exactly the same manner: some growing in a conical shape, some with a great shadowy head, and others with several stems, so as to form a vast bush. This last peculiarity is very observable in many of the *Kelou* trees at Simla: where broken off, or cut down, while young, a few feet above the ground, it has the power of throwing out upright branches; or, the horizontal ones change their direction to the perpendicular; and hence, we often see a tree with half a dozen stems of considerable size, each furnished with its portion of lateral branches: this tenacity of life is, I think nearly peculiar to the Cedar. Burkhardt notices, that the oldest trees on Lebanon have from four to seven trunks springing from one root.—(*Travels in Syria.*)

The leaves of the *Kelou* are from 1 to 2 inches long, and except on the leading shoots, where they are scattered, (as in Abies,) are collected into tufts of from 30 to 60, on very short and numerous branchlets; these tufts are not bound by sheaths into fascicles, as in Pinus: and Lindley ingeniously observes, that in the Larch, as well as the Cedar, they originate in the non-developement of branches; for, once the branch commences growing, the leaves of the tuft are, necessarily, scattered: on young trees, the leaves are of a bluish green tinge, and the general aspect of the tree is exceedingly graceful, but as it grows older and larger, the color deepens through various shades of bright into a dark green, and the branches assume a stiff and solemn appearance. It flowers in September, and the seeds are ripe in all October and November, requiring above a year to come to maturity. The male catkins, though solitary, are very numerous, erect, 2 to 3 inches long, and abounding in yellow pollen: they are, at first, oval; but gradually become cylindrical. The majority of the trees have these, and the seeds bearing cones on separate plants; but a considerable number of trees are monœcious, i. e. have both male and female strobili; the cedar of Lebanon is, also, both monœcious and diœcious. The cones are erect, thick, nearly cylindrical, about 4 inches in length and diameter; and as soon as the seeds are ripe, they break up, and both scales and seeds, fall to the ground, as they do in Picea, which has also erect cones.* This appears to be a very remarkable provision of nature, as from the position of the cone, were the scales persistent, the seeds could never fall out; while, in the genera Pinus and Abies, where the scales are persistent, and the cones remain long on the branch after the seed is ripe (above 20 years, it is said, in Pinus *pungens*, a species found in Virginia and North Carolina) the cones are pendulous, and the seeds drop out only too readily for those who wish to collect them in any quantity. In the Larch, this adaptation of means to ends may appear lost sight of, as the cones are erect, the scales persistent, and the seeds so difficult to extricate, that the planter is forced to apply gentle heat in a kiln, and then thresh the cones, but in effect the branches of the larch are so pendulous and flexible, that the erect position of the cone becomes of less importance, and a gale of wind must speedily disengage the seeds from the small cones as soon as they are perfectly ripe.

It has also been supposed by those who search for final causes (a search which Lord Bacon says is fruitless, like a virgin dedicated to God,) that the cone-bearing trees are furnished with their *acerose* or sharp, slender leaves, to enable them to endure without injury the brunt of the snow and storms of winter, which other trees avoid by casting their leaves; the idea is ingenious, and might be true were it general, but the fact is, that many of these trees are indigenous, where snow seldom or never falls, so that the enquiry seems to lead us into the blunder of the old gentleman, who observed the kindness of Providence in its having so ordered the course of great rivers, that they should run by great cities.

About a month after the cedar has flowered, we may perceive the young cones covered with a bluish bloom of a cylindrical form, sessile and solitary on the tuft of leaves. The mature seed is excessively resinous, and has a deltoid, straw-coloured wing, about an inch long, and the same width at the end. There is a bird at Simla (probably a species of Loxia) which devours the embryo of the *Kelou* and *Cheer* in spite of the turpentine by which it is surrounded. The embryo is very large, green, with ten or eleven cotyledons or seed-leaves, and quite resembles a minature tree, except that the leaves are all in one whorl.

Whether imported or sent to Europe, all possible despatch should be made with pine seeds, for like other resinous seeds, these are perishable, unless sown within a few months after the cones have been gathered. They preserve better in the cones; and in either case the box containing them should be kept in an airy place on board ship, and on no account put into the hold. With respect to the Cedar of Lebanon, however, Loudon states that the cones, which are imported from the Levant, should be kept for a year, at least, before it is attempted to take out the seeds, which he adds, will retain their vegetative powers

* Roxburgh's description of the cedar is very imperfect, and decidedly erroneous, where he states the scales of the cones to be so close as to prevent the escape of the seeds without help.

for many years. The cones of the *Kelou* fall to pieces when ripe. He also states that the cedar of Lebanon is very impatient of pruning; the *Kelou* appears to flourish, however mutilated. These differences add to the probability of the trees being specifically distinct.

The *Kelou* is the *Larch* of Fraser and other Himalayan travellers, and is still occasionally called so at Simla; it differs essentially, however, in being an evergreen, and in its large cones with deciduous scales; the cones of the larch are not above two inches long (with very small seeds), and when young, are of a beautiful crimson in one variety, and of a peagreen in another, and each scale has a large bract which is not seen in the *Kelou*. The foliage is disposed in tufts, but is of a bright yellowish green in the larch, becoming ruddy in autumn before the leaves fall. Fraser, more than once, enumerates "two sorts of larches" in these mountains, especially in Bulsun, and between Choupal and the Girree, one evidently the *Kelou*, the other "differing in colour and in the tufted appearance of its leaves, but the tree retained its character." Captain A. Gerard also distinguishes on Huttoo "a species of Larch" from the *Kelou;* and in Mr. Walter's Section of the Khasya Hills (As. Res. xvii) I observe Fir and Larch trees marked about Nungklao. Lord Macartney's embassy found "the towering larch common on the mountains in China, in latitude 30°, where its wood is in much request for building, and Dr. Griffith fell in with a true larch in Bootan; and an undescribed pine is said to grow on Deobun, between Simla and Mussoorie. The *Kelou*, however, has so many modifications of form and colour, depending on age, elevation, exposure, and perhaps on sex, that I am inclined to resolve Messrs. Fraser's and Gerard's larch into one of these or even some other known pine; for Dr. Griffith observes that near Tussangsee in Bootan, PINUS *excelsa* has "much the habit of a *larch*," and in another place he speaks of ABIES *Smithiana* as "an elegant *larch-like* species of pine." The sites, however, noted by Messrs. Gerard and Fraser, deserve a careful investigation.

The timber of the cedar is held in the highest estimation in the Himalaya, being considered almost imperishable, and peculiarly exempt from the attack of worms and insects. It has the advantage of requiring little or no seasoning, takes the saw kindly, but will not split into planks. Its only defect for building purposes lies in its being extremely inflammable; and on this account brands of it are often employed as torches. In the walls of temples in Kunawar, beams were pointed out to me, shewing no signs of decay, except being a little charred and blackened on the surface by the action of the sun and weather; and these temples were said to have been built from 600 to 800 years ago. This is probably an exaggeration, but Captain P. Gerard lived in a house at Summerkot, between Rooroo and Rampoor, the property of the Buschur Rajah, and ascertained to be 200 years old, in which the timber was as sound as the day it was cut. It is in great request for the walls and roofs of temples and houses, and for granaries, chests, and other purposes, where the ravages of insects, &c. are apprehended.

Mr. Aikin's report is singularly meagre; he is contented with "PINUS Deodara: Himalayan cedar from Nepaul; wood very fragrant," which is just the degree of information Virgil gives us, where he mentions the "*Olentem*" and "*Odoratum*" *Cedrum;* every house at Simla proves the truth of these epithets; after residing in one of them for six or eight months, my trunks acquired its odour, which was frequently remarked in Europe. The Penny Cyclopædia, after noting its extremely durable wood, uninjured in temples from 200 to 400 years old, says that Moorcroft obtained specimens from a bridge in Ludakh, where it had been exposed *to the water* for nearly 400 years, and was still sound.* There is a slight error here: the bridge in question is over the Jelum at Kashmeer; Moorcroft's words are, "The most valuable tree of Kashmere is, however, the *Deodar*, a variety of Cedar, the timber of which is extensively employed in the construction of houses, temples, and bridges, pieces of it from the Zein-ul-kadal bridge were found little decayed, although exposed to the action of water for four hundred years." Travels II, 152, at page 121, he describes the great Jumma Musjid of that city, built by Aurungzebe, as almost entirely constructed of Cedar; "Such also, is the durability of the Timber of the *Deodar*, that in none of the columns was any vestige of decay from exposure or insects to be discovered, although they have been erected above a century and a half, and have received for some time past very little care or attention." Mr. Vigne follows on the same side, and tells us that in Kashmeer, "bridges, boats, and musjids are built of the imperishable *Deodar*."

In the Journal of the As. Soc. of Bengal, for July 1833, in the notes to "The Birth of Uma, a Legend of Himalaya, by Galidasa, translated from the Sanscrit by (I believe) Dr. Mill, then Principal of Bishop's College, the word *Devadaru* is rendered *Cedar*, the "Pinus *Deodara* of Dr. Roxburgh, and which, as Dr. Wallich informs me, is very nearly allied to the Cedar of Lebanon. * * * * Its wood is very hard and durable, retaining a lasting fragrance; the turpentine extracted from it far exceeding other kinds in scent: a full account of the tree (though not a good drawing) is given by Mr. Lambert in his splendid work on Pines." It appears from these notes, that in Nepal, the Cedar does not occur at a less elevation than 10,000 feet above the sea, which coincides with the statements of Goorkhalees of the Nusseeree Battalion.

From Mr. Mines I have received the following notice of the Cedar wood:—"It has a peculiar and strong odor, so that no insect will touch it; the grain is open and straight; it is not liable to warp, even in thin boards exposed to all weathers, and may, in a word, be considered the best wood of its class in the world. Like all other woods, if cut young, it will soon decay, when in contact with mineral damp." It is said, however, to be inferior to the *Cheer* in resisting pressure at right angles to the fibres; but good experiments on the comparative strength of the Himalayan woods, especially, are still a desideratum; some are in progress under the superintendence of Major Abbott, Engineers, and the following numbers shew the result of recent trials by him; but many more are requisite, before any safe conclusion can be drawn: the numbers give the ratio of direct strength of Simla specimens:

Koel 363,
Cheer 593 picked specimen: a ditto from Kumaoon gave 458,
Rai. 565,

* The wood of the *Alder*, felled at midsummer, is reckoned in England very durable under water; we have a species (Alnus *obtusifolia*) abundant in these mountains, fringing the banks of the Pabur, Roopin, Tons, Jumna, &c. from 4000 to 6000 feet above the sea, which would probably be equally useful in similar situations, the tree is called "*Checlouk*," near Simla, as is also the *Poplar (Populus Ciliata.)* Lindley says the wood of *Pyrus aria* is "invaluable for Axle trees," a very similar species, *P. lanata* called *Palloo* or *Bun Pultee*, is abundant, and grows to a large size at Nagkunda, Huttoo, &c. &c.

Keloo, 469: but a picked specimens from Kumaoon, 6 or 7 years old, gave 760: shewing the wood in this case to be stronger than the best *Cheer*: from experiments carried on in Europe, it appears that very different results are sometimes obtained from specimens derived from the same tree.

The bark of the Cedar is, occasionally, employed in roofing huts, and the leaves are also given to cattle: Dr. Royle mentions that they and the young twigs are much used in native medicine. But after its timber, the most valuable product of this tree is its turpentine, called *Kolou ke tel*, "small split pieces of the wood, prepared for the purpose, with smothered heat, produce a useful oil, of the odor of the wood, but which has not been brought to the consistency of tar." (Mr. Mines) It is "much valued in upper India as a stimulating application to foul and indolent ulcers;" is an excellent remedy for mange in horses, and for sore feet in cattle. It is, probably to this, that Horace (De Arte. Poet.) refers, "Carmina linenda Cedro, et lævi servanda cupresso:" and Pliny, XVI. 39, "Cedri oleo peruncta materies nec tineam nec cariem sentit." Captain A. Gerard affirms, that when rubbed on any other kind of timber, it renders the wood less liable to decay and the ravages of vermin. Shakspeare has remarked. "A Tanner will last you nine years, because his hide is so tanned with his trade, that he will keep out water a great while; and your water is a sore decayer of your whoreson dead body," whether in the genus Homo, or Pinus; and it would really be worth testing whether "extreme unction" of *Cheer*, *Kail*, and other perishable wood might not tend to their preservation from dry rot, worms, and the ruinous effects of damp.

The fair long branches, numerous, thick boughs, shadowing shroud, and exalted height (Ezekiel xxxi.) of the Cedars of Lebanon, appear to have exercised pretty much the same influence on the imagination of the Hebrew Poet, as the Deodar Cedar continues to have on the minds of the Himalayan Mountaineers, and in former times on those of the Hindoo Poets. In the one we read of the "goodly Cedars." "The Cedars of God" "excellent as the Cedars," &c.; in the other we find the tree designated Devadara. "Tree of God:" the temples constructed of its timber, are, unless perched on the bare summits of the mountains, almost invariably shrouded in lofty groves of the *Kelou*, of which the sombre color, dense foliage, and serried stems produce very nearly the "dim religious light" and other solemn effects of our Gothic Cathedrals, with their majestic apparatus of clustered column, and endless pointed arch. The tree is unquestionably held in considerable veneration, and I have been informed by the villagers, that they do not much relish using the timber in their houses, when any other is procurable, for fear of incurring the displeasure of Debee, who is its supposed patroness. Near Muteeana, they point out a temple of the great goddess: and while the Ghoorkhalees kept a garrison there, I was told that they felled two of the trees of the sacred grove: the sacrilege was forthwith punished by a pestilence, which carried off two Sirdars and a host of inferior men; nor did it cease till the angry goddess was appeased by the offering at her shrine of two minature Cedars in gold. I record the legend merely to prove that the *Kelou* may very well be the true *Deodara*; for during these last ten years, a kind of Trojan war has raged at Simla between the Botanists, and certain members of the Society, practically well-informed as to the names of the *Coniferæ* of these provinces, who maintain that the former have committed a palpable error in identifying the *Kelou* and the *Deodara*:

and some of them are still strongly tempted to deny the *Kelou* its pretensions to be a Cedar at all. The resemblance however was noticed very early; Captain A. Gerard wrote many years ago, "The Keloo seems to be either the Cedar of Lebanon, or something very like it." Colonel Hodgson twice identifies them (As. Researches XIV. 65. 112.), and as long ago as 1812. Moorcroft repeatedly admires the fine forests of "Pine, Cedar, and Cypress, by Josheemuth on to the Neetee Pass:" by Cedar he means the *Deodar* or the *Kelou;* and by Cypress, either the CUPRESSUS *torulosa* or JUNIPERUS *excelsa:* and yet his editor (As. Res. vol. XII.) always corrects Cypress by Pine in his notes. Colonel Hodgson notices the splendid forests of Cedars between Sookhee and Bhairoo Ghattee; but unless his "high feathery Pines" be the Juniper or Cypress which abounds there, he has not discriminated them. He tells us that at Bhairoo Ghatee, "The great Cedar Pines, those gigantic sons of snow, fringe these bare rocks, and fix their roots where there appears to be very little soil," which is exactly the position affected by the Tree Juniper in Kunawur. Bishop Heber describes our Cedar as "a splendid tree, with gigantic arms, and dark narrow leaves, which is accounted sacred, and chiefly seen in the neighbourhood of ancient Hindoo Temples, and which struck my unscientific eye as very nearly resembling the Cedar of Lebanon." In fact the doubt is now whether it be actually a different species. What remains is a question of words and names, which, if not very important has the merit of being very easily solved: it is, whether Dr. Roxburgh was justified in imposing on the Cedar the specific title *Deodara?* It is true beyond doubt that this word, as used by the mountaineers all about Simla, designates not the *Kelou* or Cedar, but the Cypress, and also the red Juniper wood, brought down from Kunawur, strongly resembling the common pencil wood "hitherto called (or miscalled) by us Cedar" (Colonel Hodgson,) both of which are burnt as incense to the gods: and this popular, but erroneous application of the term *Cedar* to the produce of an American and Himalayan Juniper, has probably tended to mislead some, and induce them to deny the *Kelou* to be a Cedar. Dr. Royle however clearly specifies "the Himalayan Cedar-wood, JUNIPERUS *excelsa,* found on Gosainthan (in Nepal,) in Kumaoon, and on the confines of Tartary," and hence Botanists cannot be justly charged with ignorance of its existence, and the difference between it and the Cedar tree. They were perfectly aware that the Cedar of Solomon's temple was the produce of the CEDRUS *Libanotis,* nearly allied, if not the same as Keloo: and that the red wood of Kunawur, and of our black lead pencils, also called cedar, is yielded by the JUNIPERUS *excelsa, Bermudiana,* and *Virginiana.* The name *Deodara* is very vague, nearly as much so as cedar, which in the West Indies is also applied to the produce of a species of CEDRELA or *Toon;* while in Bengal *Deodara* denotes the GUATTERIA *longifolia,* quite a different tree from any of the *Coniferæ,* though it has somewhat of their erect spiral habit. Even in the Simla mountains, the true vernacular name of cypress is *Gulla* or *Gulain;* and of the red-cedar-wood or Juniper, *Newur Shookpa* and *Shoor;* the term *Deodar* being wholly unknown in Kunawur. It is, at the same time, equally certain that it is applied in Gurhwal, Kumaoon, and Nepal to the *Kelou;* and hence as this tree first became known to us in these quarters, it was not improperly called CEDRUS *Deodara.* Mr. Traill always uses the name *Deodar* for the *Kelou* in his reports on the Kumaoon, and Dr. Falconer assured me it is known by no other name to the Persians and Kashmerians.*

Messrs. Moorcroft and Vigne always mention the tree as so called in Kashmeer, and the latter even makes a nice distinction—"near the town (of Kishtawur) on the northern side, is the finest *Deodar* (or, as it is here called Devidar,) or hill-cedar, that I had ever seen." Travels I. 205. Avicenna, who flourished at Bokhara above 800 years ago, defines "*Deodar*" thus, "Est ex genere *Abhel* (JUNIPERUS) quœ dicitur pinus Inda; et syr deodar est ejus lac." Now as neither the cypress or juniper yield any turpentine, it appears that the *kelou ke tel* must be intended, and that the tree which produces it must have been known as the *deodar* to the northern nations above 800 years ago, and is so to this day according to Dr. Falconer; this is equally true of Gurhwal; Colonel Hodgson (As. Res. XIV. 112,) says, "The *deodar*, or as it is called to the westward, the Kailou;" and at page 112, "the *Deodar* or Cailow Pine, which I suppose to be the Cedar of Lebanon, is the largest, most noble, and durable of all trees:" on which Dr. H. H. Wilson remarks in a note, "It is the PINUS *Deodara* of Roxburgh; the *Devadaru* of Sanscrit writers." The Penny Cyclopædia says, "according to Mr. Moorcroft, from whose notes in Mr. Lambert's Monograph of the genus we borrow much of our information, the Hindoos call it the *Devadara*, or god-tree, and hold it in a sort of veneration;" which is followed by Loudon in his Supplement. Captain Raper (As. Res. XI. 468) says, "near the temple of Bohan Devi, stood a fine spreading fir of the species which the natives call *Deodar*;" but he afterwards applies the same word to another species, probably the *Pindrow*, and tells us, lastly, that "*Deodar* is a name which the natives of Gurhwal indiscriminately apply to all the different kinds of firs." Never having been myself in these countries, and desirous to have personal proof on this matter, Captain O'Brien had the kindness to select some intelligent men, of the Nusseree Battalion, from Gurhwal, Kumaoon, and Nepal, who all, without hesitation, assured us the *Keloo* was only known as the *Dewar* and *Deodar* in their country; and that the Cypress, the *Deodar* of Simla, was there called *Soorye*. Their statement hardly bears out Captain Raper's of the vagueness of the term "*Deodar*;" on the contrary, I was distinctly informed that *P. excelsa* is called *Chilla* in Gurhwal; and *P. longifolia*, *Kholain*; while in Kumaoon and Nepal, the latter is known as *Sulla*. Dr. Mill must have had Dr. Wallich's sanction to his translation of Cedar for *Deodaru*; and on the whole it appears to me there is no just cause for objection to the "CEDRUS *Deodara*" of Botanists. The specific term can only be altered now to *Libanotis*, should the tree be found identical.

Calidas's notice of the Deodar is connected with Gungautree:

> ——— "Its snowy white way,
> Down dizzy heights plunging great Ganges' young river
> Full darts its precipitous torrent for ever,
> Or shaking the fragrance of tall Cedar trees," &c.

Every one must have perceived the fragrance of the Cedar on passing through the forests of Muhasoo, &c., and perhaps the Biblical commentators had better explained "the smell of Lebanon" by a reference to its Cedars than to its wines; but critical honesty compels me to avow that as either the Cypress or the tree Juniper (I am not certain which) grows in perfection and abundance towards Gungautree, Buddreenath, Keedarnath, &c., the poet may have intended it rather than the Cedar. The general opinion among the natives appears to be, that the *Deodaru* of the Shastras is the JUNIPERUS *excelsa*; and it would be worth ascertaining to what tree the Brahmans at the above holy sources apply the term, as tradition may have handed down to them more correct particulars than exist elsewhere. At the same time it must be admitted these reverend men are probably bad botanists; at least they seem to have satisfied PILGRIM that what in all probability is a fine species of FRITILLARIA at Kedarnath, was nothing less than a genuine LOTUS. The druggists of the Simla bazaar sell the red Juniper wood of Kunawur as the true *Deodar;* and tell me it is known as such, and used for incense over all Hindostan.

I have referred above to the veneration in which the Cedar is held by the Hillmen; and to the fact that the Temples of Debee are always embosomed in its groves; but Debee is the same as Parbuttee, and this "mountain nymph" is the mythic daughter of Himalaya. Dr. Mill extracts a story from another poem by Calidas, relating how Parvati adopted one of these "Devadaree Cedars," and nourished it as her own daughter; and which, when damaged by an elephant, had, at her instance, a guard placed over it by Siva, in the person of his servant, "turned for that special purpose into a fierce lion." Does not the actual association of Debee and the *Kelou*, probably received by tradition from ancient times, tend to shew the latter to be the tree intended by Calidas, and that Professor Wilson is correct, especially also when we find that in Kishtawur the tree is still known as the *Devidar.*

It is a curious coincidence, that Virgil styles the Pine "Sacra Pinus," which the commentator explains "sacra magnæ deorum matri Cybele, propter amicum Atyn in pinum commutatum." Cybele and Debee may be considered as identical; and Atys was the Phrygian Apollo, perhaps, from *atush*, fire; fabled to be commuted into a pine on account of its combustible wood. Richardson also gives "*Deev-awurd,*" or the "spirit-bearer," as a Persian appellation of the Pine; and *Deevdal* as the Persian for the Poplar, probably from its trembling leaves.

It is to be regretted that Dr. Mill never published, so far as I know, the completion of Calidas's Poem, abounding, as it does, in allusions to the scenery and natural productions of the Himalaya. Some of these Dr. Mill treats as fabulous, as for example, the reference to the *Jyotis Mati*, or "*Luminous Plant,*" of which he considers the CARDIOSPERMUM *halicacabum* as the equivalent; but which has no known luminous property; unless there be supposed a far-fetched allusion to the white heart marked on its black seed: but why not admit that the ancient Hindoos, better instructed as they evidently were than their descendants, had observed the curious phenomena of the DICTAMNUS *fraxinella*, which generates an inflammable vapor that has several times been observed in combustion in Europe? An allied plant, the DICTAMNUS *Himalayensis* of Royle, grows about Jumnotree, Cheenee in Kunawur, and no doubt many other places in these mountains; and the numerous Pilgrims to the sources of the sacred rivers may easily have remarked and communicated the fact: or the *Tuberose* (POLIANTHES *tuberosa)* may be the *Luminous Plant;* for it has been observed of a sultry evening, after thunder, when the atmosphere was highly charged with electricity, to dart small sparks of lucid flame in great abundance from such of its flowers as were fading: and this is a favorite flower in Indian gardens. Pliny mentions the *Nyctigretum*, a plant of Gredrosia, as having luminous roots when dry; and Ælian ascribes the *Lunaris* and *Aglao-phytis*, which last seems a translation of *Jyotismati.* The injudicious Josephus (wars, B. 7.) gives us a ludicrous relation of the wonderful properties of a plant found near Machairus, and of the precautions to be taken in gathering it: for it was sovereign for the expulsion of demons, but, in some particulars, it agrees with the above: "its color is like that of flame, and *towards the evening* it sends out a ray like lightning; it is not easily taken by such as would do it, but recedes from their hands like the sensitive plant. Perhaps many of these apparently incredible stories are founded in fact: thus, the fable of the Upas tree is a jumble of the properties of a really very poisonous tree with the equally deadly effects of a deep valley, charged with the carbonic acid gas, both in Java. When Captain James Abbott was at Khiva, the Khan asked him, "have you ever seen Bab-ul-mandeb, where an angel stands whirling a fiery sword?" and the Envoy replied, that he had never heard of the Angel: but the truth is, that till within these few years, an active volcano flamed on the Arabian shore of the Strait, and was held in much terror by the native seamen; and as late as 1835, the islet called Jubul Tyr, 900 feet high, and only a little within the Strait, was also an active volcano: and as "distance lends *enchantment* to the view," by the time the knavish or credulous pilgrims from Mecca had reached their homes in Khauriam, the flaming crater was transformed into an angel of light, armed with a fiery sword. I have heard Irish heretics ridicule the Catholic miracle of Saint Patrick heating an oven with snow: but if the Saint had the wit to store it well beforehand with quick-lime, the thing was feasible enough.

Dr. Mill also mentions the plants *Sunfeevunee* and *Visulya kurun*, whose juice could revive the dead: the Shastras also speak of the *Kalpa birch*, or tree that grants all desires; and of the *Umur phul*, which made Raja Bhurtri immortal; but what these may be in the nomenclature of Linnæus and Jussieu, must be left to the researches of future travellers, with the remark that the *Visulya kurun* will be recognised by its yellow leaves, its red and golden flowers, and the millions of *Grandharvas, Rakshasas*, and others, who jealously guard this tree of life. Of the true one, Horace Walpole observes, that not even a shoot or sucker has descended to us, though if any weight be allowed to popular names, it is either the tall Cypress, or, the *Arbor vitæ*. We have still, however, some powerful agents against the invisible world not acknowledged in the Pharmacopœias: thus, that rather insignificant plant, the common *Vervain*, so honored in the ceremonies of the Roman augurs and heralds, still maintains its reputation in Ireland, where it is called *Luibh na gras*, or Herb of Grace, but is not endowed with any peculiar virtue unless pulled with this incantation:

> "Vervain! thou growest upon holy ground:
> In Mount Calvary thou wert found:
> Thou cur'st all sores and all diseases,
> And in the name of the holy Jesus,
> I pull you out of the ground."

The same people hold the Elder tree accursed, as being that on which Judas hung himself; and the Highlanders are of opinion, that the tremulous motion of the Aspen leaves arises from the tree having furnished the wood for the cross, which has the merit of being a poetical explication of the phenomenon. The SEMPERVIVUM *tectorum*, or *Houseleek*, is another venerated plant in Ireland, chiefly perhaps from the prevalence of the zodiacal number 12, in its calyx, corolla, stamens, and carpels: and perhaps also from the anthers producing seed instead of pollen: any prodigy of reproduction being sure to entail a religious respect in most nations. The Mountain Ash perhaps owes its fame as a preservative against witchcraft and sorcery, to the circumstance of its being one of our first trees to come into leaf and flower, and therefore a favorite of the sun, the grand enemy of all the powers of darkness: while the moon, on the contrary, was the Lady Patroness of all necromancers and witches. It would appear to be still a disputed point what tree afforded the "indestructible Cedar-wood" of the Greeks. The Library of Entertaining Knowledge describes it as being "so bitter, that no insect will touch it, and it seems to be proof against Time himself. We are told, that the timber in the temple of Apollo at Utica, was found undecayed after the lapse of two thousand years, and that a beam in the oratory of Diana at Saguntum in Spain, was fetched from Zante two centuries before the Trojan war." Some refer it to the beautiful, hard, deep brown timber of CALLITRIS *quadrivalvis* (or THUJA *articulata*) *the Sandarach tree*, said by Royle to be the *Koos* of the Arabs, and to produce the resin called *Sundroos* or *Sandarach*, from which pounce is made. It is a native of Barbary, especially the Province Rif or Errif, and all the higher Sierras or Mountain Chains; "the wood is fragrant, very finely grained, and extremely durable, as is shewn in the roof of the Cathedral of Cordova, built in the ninth century, which is of the wood of this tree." The genus CALLITRIS has about 20 species in New Holland: they resemble the CASUARINA in habit. Lindley (Introduction to the Natural System) says, "I have seen a plank two feet wide of the tree that produces *Sandarach*, and which is called the *Arar tree* in Barbary; hence it is, probably, the THUJA (*articulata*,) for the Juniper never reaches these dimensions. The wood of the *Sandarach tree* is considered by the Turks indestructible, and they use it for the ceilings and floors of their mosques." The common Juniper may never attain these dimensions, but the JUNIPERUS *excelsa* of Kunawur greatly exceeds them. I have seen a tree at Soongnum, which Captain Hay tells me is 20 feet in circumference, and about 100 feet high. Golius gives *Arar* as the Arabic for the Juniper, and *Sindroos* for its resin; and *Sundrut* as the name of a tree from which bows and arrows are made; but I cannot find, that he mentions the *Roos* of Dr. Royle. The Penny Cyclopædia gives *L'Aris* as the Berber name of the THUJA *articulata*, of which the timber is known in commerce by the name *Alerce*, which is nothing more than the Arabic *Āl-araz*. "The Cedar," or any other coniferous tree, the word *araz* seeming as indefinite in Arabia as *Deodara* is in India. The Editor considers *L'Aris* as the origin of our *Larix*, in preference to the Celtic *lar*, fat, or the Welch *llar*, wide spreading, which, heretofore, were given as its derivation. Loudon gives "*Alerce*" as the Spanish for Larch. Mr. Lambert refers the Cedar of the Greeks to CUPRESSUS *horizontalis*, the spreading variety of *C. Sempervirens*, Sprengel, to JUNIPERUS *Oxycedrus*, a native of Spain. Homer in the Odyssey, distinguishes between *Cedar* and *Thuja* or *Thuian*; but mentions both as being aromatic. (Odyss. V. 59. 60.) Theophrastus describes the *Thuja* as growing in Cyrenaica, and as resembling the Cypress.

It is probable that the seeds of the CALLITRIS *quadrivalvis*, *Arar* or *Sandarach* tree, might be obtained at Gibraltar by some of our outward-bound Overland Travellers; and by visiters to New Holland might be imported to the Himalaya those of several highly useful and ornamental trees, now frequently seen in conservatories, or the open air, in England; such as ARAUCARIA *excelsa*, the *Norfolk Island Pine*, a superb tree, of which some specimens measured by Governor King, were 220 feet high and 11 in diameter; *A. Cunninghamii*, the *Moreton Bay Pine*; and *A. Brasiliana*, which grows 100 feet high, and has also edible fruit. The DAMMARA (or AGATHIS) *Australis*, the *Kawrie* or *Cowrie tree* of New

Zealand, grows 200 feet high, and produces a light compact wood, free from knots, and a greenish transparent resin making excellent varnish* and the DACRYDIUM *taxifolium*. The *Kakaterro* tree of the same Island is not less lofty, and affords spruce. Nothing can be more elegant than the DACRYDIUM *cupressinum*, 20 feet high, with graceful, pensile branches, also from New Zealand, or more curious than the species of PHYLLOCLADUS, *Fern-leaved Pines*, from Van Diemen's Land; the seeds of SALISBURIA *diantifolia*, (the *Gingko* of Japan, and the *Quachow* of China) and PODOCARPUS *nervifolia* are large and edible: the *Gingko* grows well, but does not perfect its fruit in England; the PODOCARPUS *macrophylla*, with lanceolate leaves, the *Goonsi* of Nepal affords an article of food; "the peduncle of the fruit, but not the fruit itself, is edible." It is also found at Penang, Singapore, and in Japan, as is *P. latifolia*, on the mountains of Silhet, where it is called *Soplong*. All these would, probably, succeed either at Simla or Subathoo, where Botanic gardens are now in contemplation, in which I hope the *Sweet Chesnut* may also have a trial; it is mentioned as occurring in China.

Sec. 2. Cupressinæ.

1. CUPRESSUS. In this genus, the leaves are mere scales, closely imbricated, or *tiled* over each other, generally in four rows; and the Strobili, or cones, are more or less round, composed of 8 or 10 corky or woody, peltate scales; dry, when ripe, with a projecting point or boss in the centre. The male and female flowers are on the same tree; in the former, the four 1-celled anthers are inserted on the lower sides of the scales.

The Genera THUJA, CALLITRIS and TAXODIUM, are very similar, and differ, chiefly in the number of scales to the cone, and of seeds to the scale. The cone of THUJA *(the Arbor vitæ* of English gardens) has six scales, with 2 seeds to each, placed at the base, and with only two cotyledons: the male catkins conical, with the pollen in four cases attached to the inside near its base. CALLITRIS has solitary cones, with four scales, only two of which are fertile; the male catkin a cone, with the scales in four rows, each with 3 or 4 anthers at the base. TAXODIUM has the male catkins in clusters; the pollen in 5 cells: the cone has only two to each scale, each with five cotyledons or seed leaves.

All the Genera exude resin, but differ from the *Abietinæ* in not affording turpentine.

1. CUPRESSUS *torulosa;* the *twisted Cypress,* called *Deodar* by the mountaineers in all the districts around Simla, but in their own vernacular tongue *Gulla, Gullain,* and *Kullian;* probably, the *Sooryi* or *Soor-eye* of Kumaoon and Gurhwal; and some Chumba Shepherds called it *Newr* and *Lewr:* but this is more correctly the *red Cedar* wood, JUNIPERUS *excelsa.* The Cypress is abundant in Koolloo; in Bhujee (in the valleys about Shallee) about Kothaee; on the lower declivities of Muhasoo; and there are whole forests about Nynee Tal, and on the Gagur mountain in Kumaoon: Dr. Griffith mentions the "weeping Cypress" as being very ornamental about castles and temples, from 2000 to 7000 feet above the sea, in Bootan; but this may be a different tree, the CUPRESSUS (or THUJA *Pendula,* or *Pensilis* of China and Tartary, which the Chinese plant by groves.

* The "white dammer" of Amboyna is, I believe, produced there by AGATHIS *loranthifolia*, the "DAMMER *Pine*" of the Eastern Islands, which has elliptical, lanceolate leaves, much broader than any of the European Pines. *Indian Dammer* is the resin of the Saul.

Elphinstone informs us, that the straight Cypress grows a hundred feet high in the gardens of Kohaut and Peshawar, and that "Cedars and a sort of gigantic Cypress are also among the natives of the mountains" of Affghanistan. Probably, the CUPRESSUS *torulosa* does not extend so far; Dr. Falconer did not find it in Kashmeer; and in Moorcroft's Travels, we only read of its occurrence, once in Mundee (a fine wood, 2 miles long, with trees 80 feet high, between Gamha and Rowara,) and again (Travels I. 211) at Labrung or Darcha, about 11,000 feet above the sea, the frontier village of Lahoul in Koolloo and the Ladakh country. "Some of my people had begun to strip them of their dry branches for fuel, when one of the conductors of our caravan came to me in great agitation, and implored me to command them to desist; the trees he said were sacred to the deities of the elements, who would be sure to revenge any injury done to them by visiting the neighbourhood with heavy and untimely snow." These were most likely Junipers.

The CUPRESSUS *torulosa* does not grow spontaneously at Simla, but a group of about a dozen trees may be seen to the right hand on the Fagoo road, 2 or 3 miles from the bazaar. The natural site of the tree appears to be limited to elevations from 4000 to 7000 or 8000 feet above the sea line, but Royle (page 40) says it is found in Kumaoon above the limit of the forest, and I have also been told by another Botanist of great reputation, that it abounds near Gungautree, Kedarnath, &c. Subsequent information leads me to believe, that this is a mistake, and that the tree found at these great heights is JUNIPERUS *excelsa;* the Cypress preferring the lower and warmer hills, so that it will, probably, be tender in England. The natives, certainly, confound both under the name *Newr* or *Lewr;* and the name "Shoor" used in Kunawur for the Juniper, appears to be the same as the *Sooreye* of Kumaoon. Royle says, that the JUNIPERUS *excelsa* "in its foliage resembles CUPRESSUS *torulosa,* specimens of which, indeed, are mixed with those of *J. excelsa* in the East India Herbarium." "Wherefore by their fruits ye shall know them;" and the mistakes above noticed must be attributed to a neglect of this infallible rule.

The *Himalayan Cypress* grows to a great size; trees from 10 to 15 feet or more, in circumference, are common, and one at Urcho, in the Kothee state, a few coss north of Simla, is described to me as being 6 or 7 feet in diameter. The bark is of a reddish brown, peels off in numerous long strips, and frequently appears twisted, which I suppose is the origin of the specific name. The tree has an erect, free habit of growth, and might easily be mistaken, at a short distance, for a pine; when young, the branches decline pretty much as in the *Norway Spruce.* "Pilgrim" describes the limestone (?) Mountains of Nynee Tal as being covered from about the upper limit of PINUS *longifolia,* 4,500 feet to upwards of 6,200, with "Clumps of most stately Cypress trees; the height of many of them must be at least 150 feet, and all as straight as an arrow. The branches and foliage droop slightly towards the ground, and are so arranged as to make the tree appear a perfect cone. One of a small size which had fallen down, I found to measure 102 feet." The foliage is green, with a tinge of yellow, and the spray, or small branches come off the boughs laterally on each side; they are considerably subdivided and covered closely by the numerous oval-pointed, scale-like leaves, arranged in four rows, resembling so many green cords. The fruit is round, of somewhat oblong, about ¾ of an inch long, and is produced in great abundance in dense clusters. Each cone consists generally of ten scales, peltate (*i. e.* like a shield with its handle) convex, with from 4 to 6 facets, rising into a kind of boss in the centre; stiff, and woody when ripe. The seed is ripe about Simla in November, and is small and nearly flat, of a bright brown, with a short wing round its border. There are 6 or 7 seeds to each scale, which have only 2 cotyledons. The timber is white, with a tint of red and yellow, and is exceedingly fragrant, the odour somewhat like that of aniseed. The natives burn it as dhoop, or incense, in their temples, a practice which explains the name *Thuja*, from *thus* fragrance, or *thuio*, to sacrifice: and it answers the double purpose of pleasing the gods, and scaring away the demons, for these, like the common plague, cannot resist the process of fumigation. The Hebrew term *copher*, denoting both the *Cypress tree* and expiation, may be traced to the same source. The timber of our Cypress appears to me too soft to be of much use in architecture; but Mr. Barron says it is "considered by the natives of the hills to be quite as valuable as the Deodar, (*i. e.* the Cedar) which in England, even, is fast superseding every other kind of Pine fir. It appears, on the best native authority, to last in buildings for centuries," ("Pilgrim") and again, "The Cypress wood has been found most valuable for the roofing of buildings, and every other purpose" at Nynee Tal. Such ought to be the case from the quality of the other species: and a few years will suffice to prove, whether it deserves the commendation of the natives.

The name Cupressus is derived by some from the Island of Cyprus: but as this appears to have been known to the Hebrews in very early times as Kitti, the Citium of the Greeks and Phœnician Coins, it is much more probable that the converse is true, and that the island was named from the tree, as Brasil from the dyewood so called (probably *Bukum* or *Sapan* wood), being plentiful there. This will account for the entry of Brasil wood as an import in the records of Pisa, prior to the discovery of America, a fact which Dr. Wiseman, President of the English Catholic College of Rome, notices in his Lectures as most mysterious and inexplicable. Had he been an Irish Catholic, Dr. Wiseman would, perhaps, have found this matter less mysterious: *Brasil* being a sort of Aerial Paradise of the Celts, of the same nature as the Arabian Gardens of Irem, the Grecian Hesperides, and many more; and though it has, I believe, been invisible since Father Matthew's ascendancy, it is celebrated in Milesian Romance, and enters into the name of places and persons to this day, as Clanbrassil. This Elysium was commonly seen amidst the glowing clouds of the setting sun, and hence, no doubt, a red wood took its designation of "Brasil," of which Dr. Johnson observes, "Huet shews it had been known by that name many years before the discovery of that country." If we believe Ovid, the Cypress is no other than the "tall and slender" youth Cyparissus, metamorphosed into this tree by Apollo for killing one of his deer; an offence, for which, in modern times, men are only transported; but the etymologists, who, as Cowper says, often hunt a word into Noah's ark, have, in the present instance, done so literally, for they affirm the identity of Cupressus with *Gopher*, of which the Ark was constructed, referring this last to Cupressus *Sempervirens* common in all the South of Europe and the Levant, where it grows as high as 50 feet, with timber uncommonly fragrant, hard, close grained, and durable. The doors of Saint Peter's at Rome were put up of this wood in the time of Constantine, and were found perfectly sound after a lapse of 1,100 years, when Pope

Eugenius IV. replaced them by *brass ones;* (Professor Martyn.) It is this tree which we see in the Taj Gardens, and known in India by its Arabic names, *Suroo* and *Surus; Suroo Suhee* being the straight, and *Suroo-azad* the spreading, Cypress. I have read in Arrian, I think, of Alexander (to the best of my recollection,) building a fleet of boats on the Euphrates from the Cypress trees, which abounded on its banks, which are generally fixed as the scene of the Ark-building also; some suppose the Thuja *Articulata* afforded the materials; but that tree seems confined to Morocco and Barbary: whatever it were, the specification of the wood used, sufficiently attests the estimation in which it was held, whenever the account was composed, for durability and power to resist the effects of damp—*Gopher* occurs in the other place; Frey defines it to be a resinous tree, and Gapherith is Sulphur; it is probably identical with *Copher*, which twice occurs in the Canticles, and is rendered Camphire, perhaps from the analogy of the Arabic, Kafoor; but in the Margin by Cypress, which is the more probable, as the Camphor tree is there unknown, and the similarity of sound is so great. The root is *Cophara*, he covered, atoned, &c., alluding to the use of Cypress wood in buildings, and perhaps in sacrifices. Pliny gives it a high character, "Cupressus cariem et vetustatem non sentet * * * adversus cariem tineasque firmissima." The word Cypress found in Isaiah only, in our version, is in the original *Thirza* which the Greek, and almost all other translations, render the *Ilex*.

The Cypress has many historical associations; Virgil alludes (A. En. II. 75) to the veneration with which it was regarded, "Juxtaque antiqua Cupressus Religione patrum multos servata per annos." According to Royle it is called in the East, *Shujrut ulhueyut*, or the *Tree of Life*, "and its berries, as its leaves, thought to be a cure for every disease;" and Dr. O'Shaughnessy tells us, that "the Oriental Physicians used to send their patients labouring under lung diseases to breathe the air of Candia, where the Cypress was abundant, in the persuasion that the emanations were particularly wholesome." General Tapp assures me, that the Thuja *orientalis* grows wild in Bundelkund, where it is known as "the Tree of Life." It is somewhat curious, that both this and the Cypress are, in Eastern Gardens, generally found "in the midst of the garden" like their original. The Cypress, however, is in the West, connected with death and witchcraft more than with life; "The ancient Romans, on the death of any high-born individual, were wont to place a branch of Cypress before the door of the house where the corpse lay previous to interment; boughs were also strewn on the bier, and borne by the mourners to the grave." The custom of planting the tree in burial grounds, still universally observed by the Turks, &c., seems very ancient; its evergreen foliage, long life, durable wood, and aspiring form, pointed it out as the emblem of immortality; and the Yew seems to have taken its place in Northern Europe.

The great tenacity of life possessed by the *Aloe*, and its name *Sibz* or *Moosubbur* (Patience), is perhaps the cause why it is found planted by all the graves at Alexandria; adumbrating the patience with which those resting beneath wait for the resurrection. Mrs. Hey of Leeds, however, in "The spirit of the Woods," mentions a less devout reason for the funereal use of the Cypress. "It is said, that the ancients chose this tree when they celebrated their funeral obsequies, from a notion that if once cut down, it never sprang again," and it is doubtless in this sense the French plant is in Pere la'Chaise. Horace makes the

Sorceress Canidia use it in her diablerie, as Shakspeare's witches do "Slips of Yew,"

> "Jubet sepulchris caprificos erutas,
> Jubet cupressus funebres."

And he almost carries the tree into the next world:—

> "Linguenda tellus, et domus, et placens
> Uxor: neque harum, quas colis, arborum,
> Te, præter invisas cupressos,
> Ulla brevem dominum sequetur,"

which his commentator explains:—"Funebres Arbores, Ideoque *Invisas* appellat, Horatius; Proserpinæ Ditique Sacra, ex Servio, Festo, Plinio, Hic, lib. 16. cap. 33. ita scriptum reliquit, "natu morosa, fructu supervacua, baccis torva, folio amara, odore violenta ac ne umbra quidem gratiosa."

Byron gives this "stoic of the woods" a more amiable character:

> "Dark tree! still sad when other's grief is fled,
> The only constant mourner o'er the dead."

The Italians introduce it largely into their somewhat formal Terrace Gardens; and it is also a favorite in Greece. The Athenians deposited their heroes, and the Egyptians their sacred cats and crocodiles in cases of Cypress wood, which is so bitter that no insect will touch it. "For building there is no timber superior to the Cypress, which lasts almost as long as stone itself."

The Cedar of Goa is the CUPRESSUS *Lusitanica, glauca,* and *pendula,* of different botanists; it may be seen in gardens at Bombay, with a free, drooping growth, long, light grey, bi-forked branches, and singularly glaucous leaves. It is still uncertain whether Goa or Cintra be its native spot: or whether both had it from China.

CUPRESSUS *thuyoides* (the THUJA *spheroidea* of Sprengel) or white Cedar, grows 70 or 80 feet high in the swamps of Virginia, &c. The wood is lighter than that of the *red Cedar* (Juniper), and less durable. The wood of THUJA *occidentalis* is also called white Cedar; it grows in the swamps of the United States and Canada, to 25 (some say 50) feet high, with very light and soft grained, but highly durable timber. THUJA *orientalis* occurs of a prodigious height in the valley of Yang-chow-foo in China.

The TAXODIUM *Distichum, Deciduous or Bald Cypress (the* CUPRESSUS *disticha of* Linnæus: the SCHUBERTIA *disticha* of Mirbel,) is pretty common in England, and is a favorite from its extremely elegant foliage and tint: unlike the Cypress and THUJA, its leaves are linear, flat, disposed in two ranks like those of the Yew (TAXUS,) and deciduous in winter. The timber is much used in building, being highly valued for its durability. It flourishes in the low lands and swamps of Virginia and Louisiana and Florida; also in Mexico, rising 120 feet in height, and from 25 to 40 in circumference. It is this tree which gives name to the "Cypress swamps." It has the curious habit of throwing up from the roots the hollow knobs called "Cypress Knees," as high as two feet, and four or five across at the base.

At Chapultepec in Mexico, there is said to exist a specimen of the deciduous Cypress no less than 117 feet 10 inches in circumference, believed by De Candolle to be above 5000 years old. When the Canon Recupero was engaged in some researches on Etna, his ecclesiastical masters recommended him not to make his mountain older than Moses had done; and M. De Candolle has been reprehended for making his trees older than the Deluge; his opponents overlooking the fact, that if an Olive tree survived that catastrophe, so might a Cypress or a Baobab. The Deciduous Cypress might flourish in the Delta of the Ganges as it does in that of the Mississippi.

The THUJA *dolabrata* is described by Kœmpfer and Thunberg, who met it in Japan and China, as the most beautiful of all the Cupressinæ, "a lofty, vast, and beautiful tree, of all evergreens the fairest." It had not been introduced into Europe twelve years ago.

What Mr. Traill's "*Parpinja*," or *Creeping Cypress* of upper Kumaoon may be, I know not (As. Res. xvii. 10.): if it be the creeping Juniper, the mistake will render it likely that his "*Soorgis*," or *Arbor vitæ* of the same tract, is also a Juniper.

II.—JUNIPERUS. In this genus, as in CEDRUS, the tree is sometimes monœcious, but generally diœcious. The leaves are short, sharp-pointed, usually in whorls of three: but sometimes, they are mere scales, as in the Cypress: and occasionally, both kinds occur on the same tree at different stages of its growth. The male Strobili are small and ovate, at the end of the branch, or at the axil of the leaves, with from 4 to 8 one-celled anthers at the back of each scale. The fertile Catkins consist of three fleshy scales, at first nearly concealed by imbricated bracts, from which they gradually rise, grow more succulent, and finally become consolidated into a small, round, spongy berry, enclosing 2 or generally 3 bony seeds, convex on one side, angular on the other. The berries are, for the most part, deep purple, black, or blue.

As to the etymology of the word, Lindley states (after Royle, he says) that the Juniper is called the Tree of Life in the East; which would point to the Sanscrit Jiv or Jeoo, Life, as one of its elements: Dr. O'Shaughnessy, however, (in the Bengal Dispensatory) mentions the well-known property of the *Savin* or JUNIPERUS *Sabina*, of the South of Europe, which causes it to be "often used for the purpose of procuring abortion:" and hence the obvious derivation from *Juvenis* and *Pario*.

1.—JUNIPERUS *excelsa*. The *Shoor*, *Shoorpa*, *Shookpa* and *Shooko* of Kunawur, in the Thibetan dialect; but *Newur* and *Newr* or *Lewr* lower down; it is the *Dhooprее Chundun* of the Ghoorkhalies; and, perhaps, the *Sooryi* of Kumaoon. The name *Thiloo* or *Theloo* is always used, I think, for one of the small species. This tree is found in many parts of Kunawur; as Leepee, Songnum, the Roonung, Hungrung, and Binung Passes; between Nisung and Moorung; on Gosainthan in Nepal: in Kumaoon near Neetee; on the Janghee ghat, to the Southward of Rol, near the Shatool Pass; and probably at Gungautree, &c. Dr. Royle says his collectors found it between Simla and Fagoo; but I have never been able to procure any thing but the Cypress from thence. The Juniper appears to flourish at elevations of from 9000 to 13,000 feet above the sea, and this species is said to extend to Siberia. Dr. Griffith found it in Bootan about temples and in woods, with birch from 9000 up to 11,500 feet; and Major Wilcox mentions it, or some similar species at 12,494 feet, on a mountain dividing the valley of the Burrumpootur from that of the Irrawady. Captain Graham includes JUNIPERUS *excelsa*, under the name *Tete*, as a timber tree of Shoa (Abyssinia.) Major Harris calls it *Det*, and says that it grows 160 feet high, and 4 to 5 in diameter at the base. The form is that of the Cypress, the timber very inferior, though much used for huts and churches, by which latter the tree is often planted, and twigs are often strewn upon corpses before the grave is filled up. Roxburgh notices Juniperus *elata* as a large timber tree of Pulo Penang. Mr. Batten mentions, that in upper Kumaoon, above the oaks and elms, towards the Juwahir Pass, whole forests of Cypress, some 27 feet in girth, which I take to be Juniper, and the same as Mr. Traill describes under the name *Sooryi* or *Arbor vitæ*, with trunks from 20 to 25 feet in circumference: (J. A. S. Oct. 1833, and As. Res. xvii. 9.) In the former work, No. 133 of 1843, there is an account of a forest of Juniper trees, from 18 to 30 feet high, on a table-land 8 miles from Quetta in the province of Shawl, "affording an inexhaustible source of fire-wood, and also rafters for buildings. The wood of this tree is exactly similar to that used in Cedar pencils, and the scent equally aromatic." My experience rather inclines me to prefer Mr. Aiken's estimate. "The Cedar of Himalaya, harder and less odorant than the West Indian Cedar: an excellent light wood." It is red, close-grained, fragrant, and on account of its exemption from the ravages of insects, is in much request at Simla for making boxes, and among the natives for incense, under the name of *Deodar*. Some of the Temples in Kunawur are built of it. I have not seen this tree for above 14 years, and can only recollect that it has a spreading form, and that the trunk often branches from near the ground. Captain Hutton says: "it sometimes attains a goodly size; though generally it is dwarfish, and crooked in the extreme." Loudon describes the Siberian tree as having "leaves opposite; bluntish, glandular in the middle, and imbricated in four ways" or rows.

From the confusion among Europeans and Natives, the leaves of the Himalayan tree must resemble those of the Cypress, as do those of Juniperus *Virginiana* (the *American Red Cedar*) while young: but when old, they become more loose and feathery, in whorls of three. In Juniperus *Bermudiana* the tree, while young, has long, narrow, spreading leaves, in whorls of three: but when old, they are shorter, and more scale-like, and in whorls of four, like those of our Cypress. Captain A. Gerard says, that the fruit of all the *Himalayan Junipers*, except the *creeping species*, is very bitter; which coincides with Dr. Gerard's account of the berries of *J. excelsa*, which he says are like those of the *bushy species*, "but strongly impregnated with turpentine, and very unpalatable." He also mentions small cones as being thinly studded amongst the berries, which were, either the male cones, if the tree be monœcious, or the young berries; those of the Juniper sometimes requiring two years to repair; most of the Junipers are diœcious.

2.—Juniperus *squamosa*. The *creeping Juniper*, called *Pama, Thiloo, P'huloo:* and in Kumaoon, *Bindhara;* very abundant on Choor, Changsheel, and Kudarkanta, as well as on the Snowy range from Nepal up to Kashmeer; covering large tracts with its low creeping branches, some of which are as thick as a man's thigh, and are furnished with many short, erect branches, very troublesome to a pedestrian. It occurs from about 11,000 to 14,000 feet above the sea-level, in the Himalaya: but Vigne found it in Kashmeer, as low as 6000 or 7000 feet. In Norway, it reaches the Arctic Circle. The leaves are said to be in whorl of three, sharp, narrow, and of a light bluish green: it flowers in June and July, and the berries are ripe in October and November, (probably those of the previous year;) they are of a very dark purple, almost black, and have the same sweet taste and aromatic flavour as those of the European Juniperus *communis;* a handsome erect shrub, 6 to 15 feet high, very common in poor dry soils in the North of Scotland; and of which there is an arborescent variety in Sweden.

2. A variety of the common Juniper, called *Bilhara, Pudma,* and *Pumaroo*, grows in Kunawur, and near the Neetee Pass, from 3 to 6 feet high, forming a dense, diffuse, irregular bush, with acute, stiff, linear leaves, fragrant, of a pale green, and in sets of three. Berry solitary, size and shape of a small pea: sweet, aromatic, and three seeded: probably the same as those sold in the Indian Bazars under the names *Ubhul* and *Hoobair;* it is reported to grow at higher elevations than the creeping species near Leepee and Kanum, where it is called *Thiloo.* Mr. Loudon states, that the common European Juniper "on the sides of hills has a long (procumbent) trunk; but on the tops of rocky mountains and on bogs, grows to be a tufted shrub." Such a difference of habit may induce doubts whether our Himalayan species have not been needlessly multiplied.

3. Juniperus *religiosa?* This is said by Royle to be called *Googul,* and to be used as incense, which agrees with what some Soongnum men told me of a shrub a foot or two high, very fragrant, and of which they present sprigs to the Deotas. They called it *Phuloo,* and mentioned another sort.

4. Juniperus *recurva?* called *Aroo* and *Uguroo,** growing 3 or 4 feet high, also esteemed as Dhoop; but this is, perhaps, the variety of *J. communis;* No. 2 and No. 4 may be the "*Bettir,* another sort of Juniper," mentioned by Captain A. Gerard, as reaching to 13,000 feet. The wood seems synonymous with his "*Bidel-gung,*" but the people of Chumba, Koolloo, &c., whom I asked here, all applied the word "*Betr, Beetur,* or *Bytr,*" to *J. squamosa,* of which alone I had a specimen to show them.

The whole subject remains involved in much obscurity. Mr. Traill states, that in Upper Kumaoon, the sprigs of the *Bindhra Juniper,* and of the *Sooryee, Arbor vitæ,* are used in the preparation of Yeast (Balma:) as the aromatic crushed berries of the common Juniper are in Europe to flavour *Gin,* which plebeian word is an abbreviation of the French and Dutch, Genievre and Gennever, for the Juniper: but so high is the duty on this fruit in England, that our distillers often, fraudulently, substitute Oil of Turpentine. Mr. Vigne tells us, that in Ludakh, small branches of the *dwarf Juniper,* fried in goat's grease, are used for incense in the temples, as well as in magical incantations: probably No. 3.

The red Cedar of America, Juniperus *Virginiana,* grows in deep sandy loam in Virginia and Carolina (and I believe in Jamaica,) and as far North as 44 or 45°; it flourishes most by the sea, where it grows 40 or 45 feet high, and 12 or 14 inches in diameter. The berries are deep blue, and have only two seeds in each. The Sapwood is white, but the heart wood is red and fragrant; strong, close-grained and durable; it is used for pencils; but for this purpose, as well as cabinet work, that of Juniperus *Bermudiana,* being soft and extremely fragrant, is preferred. It grows to be a large tree in the Bermuda Islands, and its berries are of a dark red.

The word Juniper occurs three times in our version of the Old Testament, but the original word "*rothem*" has no reference to this

* *Uguroo* is properly the Eagle-wood of Ava and Siam, *Aquilaria agulocha.*

plant, and denotes, no doubt, the SPARTIUM *monosperma*, a species of broom, which is still known to the Arabs by the same name, *Rutum*, defined by Golius, '*Genista frutex*.' Any of the camel drivers, between Cairo and Suez, will point it out under this name to the traveller, who may see it of a much larger size among the gullies in the volcanic rocks above Back Bay at Aden: one cannot contemplate its thin, drooping, glaucous, and almost leafless branches, without feeling, that their scanty shade was ill adapted to diminish the indignation, or assuage the grief, of the prophet. It compensates the florist, indeed, by a profusion of white blossoms in the spring, and is abundant by the sea shore about Gibraltar. Our translators had, probably, the "Juniperus gravis umbra" in their minds: and when they make the Psalmist denounce "coals of Juniper" on the head of the wicked, they may have thought it a poetical justice that those who have so often abused the fruit should smart by the stem. The truth of the allusion is, however, wholly lost: for to this day the *Rutum* is extensively converted into charcoal. Job speaks of the poorest as using its roots for food, or perhaps as a means of getting it. Juniper charcoal is said to retain its heat for a very long period, even 12 months have been mentioned; and the "heavy shade" perhaps refers to the circumstance that grass will not grow under the tree.

Sec. 3. Taxinæ. The Yew Tribes.

I. TAXUS: the *Yew Tree*. This genus, as well as DACRYDIUM, PODOCARPUS, PHYLLOCLADUS, and SALISBURIA, above mentioned, have been separated by Lindley from the *Coniferæ*, and formed into a distinct order, *Taxacea:* for though the Genus Yew has leaves like the Silver fir, those of the rest rather resemble the leaves of the Ferns: and in none can the fruit be properly called a cone, being a solitary hard seed, either, "altogether naked," as Lindley says, or, as in the Yew, surrounded by a succulent, colored, cup-shaped pericarp; nor does the tree afford, I believe, either resin or turpentine.

The word *Taxus* is probably like the Greek *toxon*, a bow, from *Taxo*, to pull, to draw: man having learned the arts of war and hunting before his language was perfected. The Italian is still *Taxo:* our "*yew*" and the French "*if*" are said to come from the Celtic "*iw*" "green."

1. TAXUS *baccata*. *Thoona*, *Birmee*, and in the Chumba and Kooloo mountains, *Riker*, the *Postil* of Kashmeer. Moorcroft gives "*Tooner*" as the name of the *Toogasee* mountain towards the Neetee Pass: and Traill, "*Thuners*" in Upper Kumaoon. According to Royle "*Tooners*" marks the TAXUS *nucifera*, which is a species that I am unacquainted with: *Thoonera* is the PICEA *Pindrow* at Fagoo and Bhujjee. The TAXUS *baccata* is common to Europe and the Himalaya; it does not grow at Simla, but is found in abundance and of vast dimensions on Kumuloree, Choor, Huttoo, Kedarkanta, and all over the main range and its spurs, from 8000 to 11,000 or 12,000 feet above the sea. It flowers in May and June, and the fruit is ripe from November to January. The male and female flowers are generally on separate trees; the former consisting of a number of scales, out of which the 8 or 10 connected anthers grow like a minute cluster of primroses; the fertile

flowers, like those of the Juniper, are enveloped in scales, from which they gradually emerge, and when ripe, open at the top, displaying the ripe nut, a bony seed, seated in a red juicy cup. The ancient naturalists held the fruit to be poisonous: and, even the shade of the tree to be noxious; but this last accusation is groundless, and many are now of opinion, that the fruit also is harmless; and I have been informed, that the hill men eat it with impunity, probably in small quantities. Major Harris says of the *Sigha* or TAXUS *elongata* of Shoa, in Abyssinia, "to tarry beneath its shade, or to inhale the smoke of burning yew-wood, is regarded as particularly noxious." The seeds of TAXUS *nucifera* are an article of the Chinese dessert. De Candolle holds the succulent cup of the fruit of the common yew to be deleterious, and the leaves are "by common consent, deemed poisonous," and are especially fatal to horses and cows. I believe the berries are offered in incense to the Himalayan Gods, as Captain P. Gerard tells me is also the wood. Dr. Royle mentions, that the leaves of both species of Himalayan Yew are exported to the plains, being much used in native medicine; and Mr. Vigne (Journ. A. S., September 1837) tells us, that in Kashmeer "slips of Yew bark are used instead of tea, and the decoction is drank as freely. The Booltees of Ludak carry a great deal of Yew from Kashmeer for this purpose." The Kunawurees at Simla tell me of a tree called *Sungdun* or *Sungcha*, which has an aromatic bark, the decoction of which is drank for rheumatism, &c. I was disposed to refer this to the Yew, but it is more likely to be Royle's TATRANTHERA *apetala*, or CINNAMOMUM *albiflorum*, generally called *tez-pat*. I think it is Captain Hutton who mentions a kind of green tea produced at Jaghul or Jukhul, between Rampoor and Seran, as well as the bush *Pangcha*, near Leepee in Kunawur, the leaves of which, exposed to the sun for two days, and mixed with the *Changta* or *Jatta*, gum of a tree called *Trin*, found near the same place, are also used as tea. It would be interesting to know, whether the Leepee Shrub be a species of CAMELLIA, or whether they have the RHAMNUS *theezans*, from which the poorer classes in China extract a sort of tea.

Dr. Royle mentions, that in Kumaoon, Tea is made from the leaves of the shrub OSYRIS *Nepalensis*: and this is, probably, the Green Tea of Bisehur, which Moorcroft (Travels, I. 352,) describes as being imported into Ludakh under the name of *Maun* or *Bisehur Tea*; the produce of an evergreen shrub, 4½ feet high, growing on a dry soil in Koolloo and Busehur, on the banks of the Sutlej, and especially about Jhagul, between Rampoor and Seran. The leaves are gathered from July to November, and, after infusion in hot water, are rubbed and dried in the sun. They sell at the rate of three seers per rupee, and are not much in request. The first infusion is reddish, and is reckoned heady: the second, which is used, is yellowish-green. The OSYRIS *Nepalensis* grows to be a large shrub, 10 or 12 feet high, in the Kotar Khud, above Subathoo, and between Kussowlee and Kalka, where it is called *Krecoontee*, *Keoontee* and *Kuneentee* and also *Loonkt*. The fruit is known by the name of *Peepla* or *Peepra*, also applied to that of MURRAYA *exotica*. The natives here use the leaves medicinally, but not I believe as Tea. The Black Tea of Busehur, Moorcroft describes as the produce of a deciduous shrub, found near Usrung and Leehhee in Kunawur, of which the leaves are pulled in July and August. The infusion is of a dark red color. Usrung is very elevated, for a species of *Rhubarb* flourishes in the neighbourhood. Major Harris mentions that in Abyssinia, a kind of

Tea, prepared from the dried leaves of the *chaat* or *kat* (CELASTRUS *edulis*) is in general use.

The wood of the English Yew is red, beautifully veined, and very hard and smooth; it has been famous for bows, since the time of Homer; and is still much valued for floodgates, axle-trees, cogs of mills, pins for pullies, and various articles of the turner. It seems quite neglected in the Himalaya.

Mr. Aiken reports on the TAXUS *virgata*, called *Dheyri* and *Lolsi* in Nepal; "timber strong and good, axis very eccentric, wood softer, of a paler color, and less lustre than English Yew." The timber of the trees on Huttoo is of a most brilliant red. Major Harris tells us, that in Shoa, the timber of TAXUS *elongata* is tough, and used for works of art, which are to last some time. It is called "*yellow-wood*" at the Cape of Good Hope.

In the "Spirit of the Woods," Mrs. Hey states that by Statute Law, every Englishman was formerly obliged to possess a bow of Yew, *awburne*, or some other fit wood: and adds, that *awburne* is supposed to be Alder: this is an oversight; it is well known to be the *Laburnum*, which is still called *Awburne Saugh* (or *willow*) in many parts of Scotland, and in Germany '*Bohnenbaum*' or *Bow-tree*. The old French is *L'Aubours*, which, as well as *Awburne*, are probably corruptions of the Latin *Laburnum*.

Many of the Yew Trees of Great Britain are, or were, of enormous dimensions, and quite a patriarchal age. One in the Churchyard of Harlington, near Hounslow, is 58 feet high: and another at Hedsor, in Buckinghamshire, 27 feet in diameter.

Some trees at Fountain Abbey, near Ripon in Yorkshire, were, in the year 1770, more than 1,200 years old, and 1,214 lines in diameter; and one in the Churchyard of Crowhurst in Surey, said to be alive still, was in 1660, 1,287 lines (or 30 feet) in diameter, and believed by De Candolle to be 1450 years old. At Fortingal, in Perthshire, there was a monstrous Yew, which in 1770 was 2,588 lines (or 56½ feet) in diameter, and calculated to be 2500 or 2600 years old: the Romans had a fortified camp at Fortingal ("The fort of the Strangers,") so that "if the chronicles lie not," as Don Quixote says, this tree must have been about 1000 years old, when these invaders appeared in Scotland; and, perhaps, existed before the Caledonians themselves peopled the country. A Yew in the Churchyard of Braburn, in Kent, was in 1660, 2,886 lines in diameter, which, if it still exists, must be 3000 years old! At Ankerwyke, near Staines, is said to grow the Yew under which Magna Charta was signed.

In addition to his report on the timber of TAXUS *virgata*, in Nepal, Mr. Aiken states, probably on the authority of Dr. Wallich, that "the green branches are used to adorn houses during certain festivals." Mr. Loudon informs us (Ency. of Gard.) that the spray of the Yew was substituted for palm leaves by the ancient Christians. It is still so called in Ireland, and used on Palm Sunday; but in England the yellow flowers of the *Black Willow* (SALIX *Capræa*) are, I think, called *Palms*. The practice may be a remnant of the Druidical worship, which, with its circles, Cromlechs and Cairns, still reigns, altered merely in name, in many parts of the country. One strange rite, still in vogue at Ardmore, in Waterford, consists in squeezing the body under a great stone lying on the sea shore; or through a narrow crevice between two stones: and thus gaining absolution. This outward and visible sign of the Palingenesis of Pythagoras is still in full practice at Pak Patun on the Sutlej, and other holy spots in India. (Vide notes to Major Lawrence's "Adventurer in the Punjab.") Moor (Hindoo Pantheon) mentions one in the Deccan, and gives a ludicrous account of a fat Mahratta Chief, who got jammed into a "fix" in executing the mystic feat. Mrs. Hey enumerates among the living superstitions of England the "passing a sick child through a young ash, cleft for the purpose:" the ash yqqdrasil, according to the Edda, having been the parent of the human race; an origin which is, also, recorded by Hesiod, who derives the men of his brasen age from the MELIA or *Ash*-tree, though his commentators explain this to allude only to their warlike propensities; the ash forming the shafts of spears in times of old. On Innisfallen Island, Killarney, there are some magnificent Ashes, and I think it is through a chink in one of them that the visiter is begged to pass for good luck. The very beautiful custom, now becoming obsolete, of decorating churches at Christmas with *holly*, *misteltoe*, and other evergreens, is well known to have come down to us from the Pagan Saxons, who were accustomed at this season to hail the return of the sun from the Southern Tropic as a new birth: and hence it is, that under his various designations, we always find some evergreen, or other, consecrated to him; the *Ivy* to Bacchus, which not only preserves its leaves, but blossoms and ripens its fruit in winter; the *Bay* to Apollo, not only from its fragrance and being an evergreen, but perhaps because it "possesses, in a remarkable degree, the power of resuscitation; long after it has appeared dead, if left undisturbed, it will put forth leaves again, and assume its pristine vigor." Thus the Vedas term the *Doob Grass*, a deity, not subject to age or death. The *misteltoe* was sacred to Balder, the Scandinavian Apollo, and was held in much veneration by the Druids, probably because it flourishes through the winter, and detached from the earth. It appears, however, that this veneration was only due to the misteltoe when found on the Oak, where it seldom, if ever occurs: just as the Hindoos say the man's fortune is made who finds the root of the "etherial creeper" *Akash-Bel*. I am ignorant whether any tree be particularly devoted to Krishna, the Indian Apollo, who, with the rest, is so evidently nothing more than the impersonation of the Sun, the Eye and Soul of the universe, as he is so frequently called by Shakespeare and Indian Poets. Should it be thought desirable to preserve these time-honored customs at Simla, the materials, *holly*, *ivy* and *misteltoe* are in abundance at hand: the last growing on the wild Pear Trees, and called *Bunda*, seems identical with the VISCUM *album* of Europe.

There is a species of Yew peculiar to Ireland, which Lindley calls TAXUS *fastigiata;* it was first found on the hills of Fermanagh, and differs from the common kind in its erect cypresslike growth, and by the leaves, which are very dark, being scattered round the stems, instead of being in two ranks. There is also a species of *Furze* peculiar to the same country, which, from its stiff, erect habit, is called ULEX *striata;* these with the ARBUTUS, the *London Pride*, *Mediterranean Heath*, *Mackay's Heath*, and that of *Saint Dabsec* (MENZIESIA *Dabœcii*) a beautiful plant, comprise all, or nearly all, the flowering plants in which Ireland is richer than England; while there is a heavy per contra account of English plants unknown in Ireland. Fraser mentions his delight on recognizing the *Heather* near Gungautree; but the Himalaya possess neither heath nor furze; the former being CASSIOPE *fastigiata*, nearer to ANDROMEDA than to *Frica*, and so called in Royle's Illustrations; and the furze consists of various species of CARAGANA, GENIST, and ASTRAGALUS.

Dr. Royle gives Japan, Nepal, Kumaoon, Choor, and Kedarkanta as the sites of TAXUS *nucifera*, of "*Thooner*." It has been referred by Bronquiart to the genus SCHUBERTIA *or* TAXODIUM.

Though attaining such huge dimensions, and of such utility as Timber Trees, the Coniferæ possess an organization inferior to that of other forest trees, the "hard wood" of the Scotch, including two small orders, *Cycadeæ* and *Gnetaceæ;* they are classed by modern botanists by the term '*Gymnospermæ*', because the female-flowers have no pericarpial covering, but consist of naked ovules, to which fertilization is communicated directly from the pollen, without the interposition of a style or stigma, which is analogous to the ova of reptiles in the animal kingdom. The male flowers consist of catkins formed of a number of scales, in the body of which the pollen is contained in two or more cells.

The *Cycadeæ* (CYCAS, ZAMIA, and ENCEPHALARTUS) have cones like the pines and firs, with naked ovules; the imperfect structure, also, of the spiral vessels of their woods, as well as its being marked with circular discs, approximates them to the *Coniferæ*. They have the gyrate or circinate vernation of the Ferns, i. e. they unroll their young leaves like the crook of a shepherd's staff, and Linnæus referred them to this tribe; and Lindley observes "so great is the resemblance between certain LYCOPODIUMS or Club Moss *(L. Phleqmaria,)* and certain *Coniferæ* (CUNNINGHAMIA *Sinensis*), that I know of no external character except size by which they can be distinguished;" some of the *Cycadeæ* have the long pinnated leaves and the simple cylindrical stems of the Palms; but there the resemblance ceases; and their true position is next the *Coniferæ*. CYCAS *circinalis* is not uncommon in Indian Gardens, and is said to grow naturally from Tellicherry to the foot of the ghauts; it affords Sago, but the true Sago Palm is C. *Rumphii*. The Genus ZAMIA yields a kind of Arrow root. Both genera are found in a fossil state in England, forming one of the many proofs of the great alteration which has taken place in its climate.

The Genus EPHEDRA comes very near Coniferæ; but the male flower has a coloured perianth; Royle mentions EPHEDRA *Gerardiana* as occurring in Kunawur: and the sandy wastes of Shekhawatee and the "Indian Desert" to the Sutlej, are covered with the "*Phok*," another species, which in the hottest season of the year, when everything else is burnt up, covers the country with verdure, and is greedily devoured by camels. This shrub produces abundance of pretty pink flowers in March and April, and the seed is ripe in June: instead of a wing, it is covered with rough, brown fibres like a coarse wig. Elphinstone describes it as "a plant from 4 to 5 feet high, quite green, although it has no leaves. Its branches run into tender twigs, which terminate in bunches of the same material, but still softer and fuller of sap. It bears clusters of flowers, which are eaten by natives, and has its seed in a pod."

In the Journal of the Asiatic Society for 1841, Captain Halsted mentions a large creeper called *Jabroon Nony*, as being common on Chedooba, and says that it is very useful to the Islanders from its stems, when cut across, yielding abundance of a good palatable water; a piece two feet long, and as thick as a small wrist, affording more than half a pint of water; it is probably the GNETUM *Scandens* of botanists. GNETUM *and* EPHEDRA from the small order *Gnetaceæ* of Lindley.

EQUISETUM or *Horsetail*, of which there is a species common by the streams below Simla, and CASUARINA, resemble *Coniferæ* in several particulars; and Lindley considers the former as a "degenerate" genus of that tribe. It is remarkable for the quantity of silex contained in its stems in minute crystals, which are obtained by burning the plant, and are very useful in polishing. CASUARINA *muricata*, "The *Tinian Pine*," is a native of Chedooba and many of the Eastern Islands; it is a beautiful tree, and is now thriving in many gardens, avenues, &c. from Calcutta up to Kurnaul; with a general resemblance to the *Jhow* or *Furas* (TAMARIX) for which it is sometimes mistaken, but which is quite a distinct tree.

NOTES TO THE FORGOING ARTICLE ON THE CONIFERÆ.

It has been stated in the text, that the RHODODENDRON *Arboreum* cannot, unprotected, support the severity of an English winter; of this fact there is, I believe, no doubt, and yet the result of observation at Simla and Muhasoo during the past winter, inclines me to refer it to mismanagement, arising from inattention to the conditions under which the tree flourishes in its native mountains. Here, though found almost everywhere, it seems to prefer the Northern to any other exposure, and not only to grow more abundantly, but to exhibit a loftier height and a more exuberant bloom than on the other aspects. Owing to our very dry and warm autumn, it commenced to flower in December, and continued with little or no intermission till the middle of the present April, to impart a splendor and gorgeousness to our woods which must be seen to be realized, and which will justify my adding a few words on the probable means by which this scarlet Lady of the Himalaya might be naturalized as a citizen of our green but more sober English Woods. Not to mention several minor falls, and many nights and some days of hard frost, the snow fell on the 10th February to the depth of from 3 to 5 feet at Simla, where patches of it remained till early in April, yet with its roots enveloped by this chilly bed, and the branches exposed to the most boisterous and bitter storms of rain, hail, sleet and snow, the blossoms continued to develope themselves unchecked. We must therefore conclude, that it is more the dampness than the coldness of our English climate and soil which proves so unfriendly to the Tree Rhododendron. In Great Britain, the different shrubby species from Pontus and the United States are generally planted in a rich soil and on a level site: in the Himalaya, on the contrary, the RHODODENDRON *Arboreum* affects the steepest declivities, which are, of course, thoroughly drained, and where a poor, cold soil rests on a substratum of rubble, commonly of clay slate, or mica slate, tending still further to keep the site dry. Were these particulars imitated in England, and the young trees merely defended in the manner we find them here, viz. by a screen of *Oak Nurses*, I am inclined to think, the Rhododendron might be thoroughly acclimated.

2. PINUS *excelsa*. This tree is called *Cheeloo* and *Cheela* in Gurhwal and Kumaoon. The Aphides which have been mentioned as covering the branches here last autumn, and secreting a kind of manna from its

sap, have survived the severity of the winter, and continue (April, 1845,) their work in countless multitudes, but the heat of the sun seems to prevent the manna from concreting, as it did towards the conclusion of last season.

Professor Ehrenberg, distinguished for his accurate Microscopic researches into the organisation of the infusory animalcules, &c., explains, from personal observation in 1823, the production of manna near Mount Sinai from the tree which he calls the Tamarix *Mannifera,* and which resembles closely that known as *Furas* or *Jhow* in N. W. India. "Manna," says he, "continues still to fall in the Peninsula of Mount Sinai, though not from heaven, but from the Tamarisk bush. The thin branches of the Tamarisk are covered with numerous insects which perforate the bark in innumerable places not visible to the naked eye. From these wounds in the tree, there exudes after rain, a clear, slowly-running juice, which the Arabs collect, generally from the ground, less rarely from the tree itself, and eat it with bread, as if it were honey." On the authority of the Professor's Microscope, we may, therefore, perhaps safely conclude by analogy, "that the Manna of P. *excelsa* exudes from the tree directly, and is not a secretion of the insect."

3. Pinus *Gerardiana.* The leaves of this species are only from 3 to 4 inches long, in unsheathed packets of threes. It is a straggling tree, and by what I have heard from more recent travellers, I am inclined to believe, I have overrated its height in comparing it with that of the *Cheer*, P. *longifolia.*

4. *Picea Pindrow.* From my notes, I find that this tree is also known as the *Bola-row, Boorhur* and *Boorla*, and Dr. McGregor heard it called *Booldoo* at Nagkunda. I measured one there in 1830, 13 feet round at 6 feet from the ground, and another 17 feet at 3 feet from the ground, but in the Choor, &c., they considerably exceed these dimensions. The *Pindrow* seems to be the *Rehee* of Gurhwal, and to the best of my belief, the *Ragha* of Kumaoon is Abies *Smithiana,* though, in my notes, I also find it affixed to Picea *Webbiana.* Perhaps some gentleman resident in Kumaoon would favor Dr. McGregor with a distinct enumeration of the provincial names of the various pines. The word *Koodrow* (the *Khutrow* of Dr. Royle?) implying, I am told, the prickly or thorny pine, is applied between Joonug and Muhassoo, indifferently to Picea *Pindrow* and Abies *Smithiana* (*Uslee Row*) the Pinus *Khutrow* of Royle; and if the words be identical, and the etymology be just, the term *Koodrow* more aptly describes the Abies *Smithiana.* Repeated inquiry, and from independent sources, is absolutely requisite to ensure any certainty in native nomenclature; and the name should always be procured where the subject is abundant and familiar.

5. The snow of the past winter has gone far to disprove the hypothesis alluded to in the text, that nature had provided the cone-bearing trees with acicular leaves in order to obviate its destructive effects in overthrowing or breaking them by its weight; so far as the Cedar is concerned, the provision, if such there be, has proved so completely fruitless that were such heavy falls of snow to occur yearly, the species would be, perhaps, exterminated. Both in Simla and Muhassoo very many fine trees, and a vast number of smaller ones, were thus destroyed; quite as much as the *Ban* and *Mohroo* Oaks with their broad leaves. The larger trees were generally uprooted, while the younger ones were snapped in two, every where blocking up the roads and woods. However, the author of the notion has still the Frenchman's consolation,

"If the facts do not agree with my theory, so much the worse for theirs."

6. While on the subject of the Cedar, I may state that Messrs. Erskine, Cartwright and Dunlop, in 1840, measured one near Chansoo, in the valley of the Baspa, on the Northern face of the Himalaya, which was 36 feet in girth, probably the same which ten years before, the Messrs. Inglis had estimated at 36 feet 8 inches. Two measured in 1830, by Captain Pepper and myself near Taranda, were, respectively, 19 and 21½ feet in circumference; and two others, between Taranda and Nachar, were, one 20 and the other 36½ feet round at 5 or 6 feet from the ground; the last is the tree referred to in the text. At the height of 30 or 40 feet, the trunk divided into eleven stems, each a tree in itself. The Chansoo tree is single. A writer in the Gleanings in Science for February 1830, under the initials of J. A. H. (probably Hodgson) says, "I have frequently measured the larger trees, and found them 24 feet in circumference * * * at 6 feet from the ground; but those of about 18 feet in circumference are more common." He says, "you know that the red wood used for black lead pencils is usually called Cedar; it is really a species of Juniper, * * * but the tree which I have in this note denominated Cedar, is the great Pinus *Cedrus*, the Cedar of Lebanon, with the description of which it agrees in every particular; the cones, the leaves, the spreading branches, great size of the tree, the durability yet brittleness of the wood, and its peculiar smell. This noble tree, which towards the Sutlej is called *Cailou* or *Cailang*, but in Gurhwal and the Eastern mountains *Deodar*, flourishes on the N. W., North and N. E. faces of the mountains, and at the elevation of from 6000 to 9000 and 10,000 feet, though occasionally below and above both those limits: its nature seems to suit best with an elevation between them." Hodgson says of the wood, "It is reckoned the most durable of all timber, and most valuable in house-building; but, it is too brittle for ships' masts." It seems, however, flexible enough in the beams of the houses at Simla. Of its inflammability, we have lately had too unquestionable evidence in the accidental destruction by fire of Mr. Charles Gubbins' house on the 1st of April, the spacious roof of which, once ignited, burned with the utmost fury and rapidity, while the "Choolls" or great beams imbedded lengthways in the walls continued to burn for three days till the whole were consumed. Perhaps, however, the Cedar wood is not to bear the whole blame, as near the chimnies, there was a coat of pitch which greatly aggravated the natural combustibility of the timber, and there the fire originated.

The cones of the Himalayan Cedar make but a trifling, if any, increase in size during the winter months; and early in April, when the new leaves, begin to shoot forth are not above an inch long, but are still quite large enough to exhibit the formation of the seeds. From May forward, they rapidly attain their full developement, and are ripe in October. The young plants spring up at Simla in the following March, when the narrow green cotyledons or seed leaves, about 1½ inch long, bulging out at the base, but confined above by the integument of the seed with the wing at the top, exhibit a balloon or cage-like appearance. Of 100 which I examined, one had 8, sixteen had 9, thirty-five had 10, thirty-two had 11, twelve had 12, and four had 13 of these seed-leaves. I have somewhere read that the Cedar of Lebanon requires 27 months to mature its seeds: if this circumstance be true and constant, it would seem to establish the fact of a specific difference between it and the *Kelou*, which only requires a year. Dr. Royle states that the fungus known in Europe as the Morel, the *Khana Kutchoo* of India, called *Cheeoon* in the Himalaya, is brought for sale to the Hurdwar Fair from Kashmeer; it is also produced in abundance about Simla, especially under the young Cedar tree; and is brought to market by the Hill men in March and April, and being savoury in sauces and stews, meets a ready sale. It is the MORCHELLA *esculenta* of Botanists, or a nearly allied species.

7. CUPRESSUS *torulosa*. "The *Loo*" and "*Bool*" appear to be its names in Joobal; and *Lewr* or *Leawr* about Gungautree, &c., but I have already expressed the doubt whether this be not the tree Junipêr: *Sooryi* and *Sooraee* appear both Gurhwal terms for the Cypress. The last occurs pretty abundantly in the mountains of Jounsar above Mooshk, near Nausoo, on the route from the Choor to Mussooree.

8. JUNIPERUS *excelsa*, also known in Kunawur as the *Shirkoo* or *Shiryoo*. A reference to some notes kept there in 1830, informs me that the specimen at the Soongnum Temple, alluded to in the text, measured in that year thirteen feet in girth at five or six feet from the ground. Either Captain Hay's admeasurement in 1844 was made lower down, or the tree has grown considerably in the interval of fourteen years. There is also a fine specimen of this tree by the Temple at Leepee. At Nunghees, the frontier village next to Shipkee in Thibet, I noticed small altars on the roofs of the houses decorated with sprigs of this tree.

Lieutenant Herbert, when he went up the Jahnavi river (the main source of the Ganges) found the Juniper Cedar in the form "of a small tree." (Gleanings in Science, Feb. 1830.) This work (p. 118) informs us, that neither the Rhododendron, the *Kelou*, nor any of the pines of the N. W. Mountains are to be found at Darjeeling.

9. Mr. Erskine informs me that the wood of the Yew is not unfrequently employed at Simla for the shafts of Jampans, a purpose for which it is well adapted by its toughness and elasticity. On further enquiry, I find that the proper Hill name of the OSYRIS *Nepalensis* (used for tea in Kumaoon) is *Karu* or *Kurwa*. The shrub grows plentifully in the warmer parts of Kurol mountain and in the glen of the Asun, thence up to Joonug. As the native names are so uncertain, the shrub will be best identified by its round yellow or orange berry with one seed.

10. With reference to the circumstance of the house-leek being planted on the thatched roofs of houses in Ireland, I find on looking over Ellis' edition of Brand's Popular Antiquities, that the same custom is followed in some parts of England, with a view to preserve them from thunder and lightning. The plant seems there to be called *Syngreen*. This work gives us some curious particulars of the superstitious veneration in which a similar plant, the Orpine, or Midsummer men (SEDUM *telaphium*) is, or was, held in some parts of England, being reported to possess magical powers when planted in houses on the eve of the day of the Summer solstice. Gerard says of it, "This plant is very full of life. The stalks set only in clay continue a long time, and if they be now and then watered, they also grow green." And Spenser sings of "Orpine growing still." It was doubtless the tenacity of life which imparted its sacred character, as to the *Doob* Grass of India and the Aloe in Arabia. Brand also mentions the veneration paid by our ancestors to St. John's Wort (HYPERICUM *perforatum*) gathered and fixed over doors at the Summer solstice (St. John's day) and which had the valuable property of driving away all witches, &c., and its Greek name imports that the ancients decorated the images of their gods with it.

There are several handsome species in these mountains, especially Hypericum *cernuum* called *Kureroo*; but I cannot find that either this or any of our Sedums are regarded with any feelings of religious estimation. The Botanical superstitions of India seem to have affected the useful rather than the spiritual, and to have been rather connected with the art of transmuting the metals into gold, than that of persecuting and injuring old women. Mr. Brand also states that the practice of passing sickly children through a cleft ash-tree, in order to effect a cure, is still rife in some parts of England, the tree being carefully bound up again on the completion of the ceremony, as by a kind of vegetable magnetism the life of the patient is supposed thence-forward to depend on that of the tree. The existence of such a superstition illustrates the cosmogony of the Edda and of Hesiod, which derives our race from an Ash-Tree. Brand furnishes the particulars of several other heathenish rites, and also the proper materials for various spells and charms, such as Fern-seed, to enable the bearer to become invisible, which would be a truly dangerous privilege.

In an early portion of this paper, I quoted the second book of Samuel, in evidence that so long ago as the time of David, *fir-wood* was in use in the construction of musical instruments. A reference, however, to the parallel passage, in the first book of Chronicles (xiii. 8) tends to destroy this proof; for there, a very trifling difference of the letters and their allocation, gives quite a different sense to the passage, and excludes all mention of *any* wood; and as the Greek translators have, in both places, followed the latter reading, the other is probably a corruption of the text, which will leave Virgil in full possession of his prophetic honors with respect to the "Cremona."

Notes to the Preceding Article on the Cedar or Deodar.

Since the observations in the text were written, a friend has furnished me with Professor H. H. Wilson's definition of the word "Devadaru" in his Sanscrit Dictionary: "A species of Pine (Pinus *Devadaru*:) in Bengal it is usually applied to the Uvaria *longifolia*, and in the Peninsula to another tree (Erythroxylon *Sideroxylloides*.) From *Deva*, a deity, and *daru* timber:" which last is from the root *dri* to tear, split, divide.

Dr. Wilson's explanation of Kedar is "a field, a mountain, a name of Siva, Kedar, part of the Himalaya; a basin for water round a tree, a bed in a garden:" from *ke* the earth or the head, and *dri* to divide: and Kedar, from the same roots, is actually given as "the name of a plant;" as is Kadar, "a white sort of Mimosa" (also in Persian, "the name of a fragrant plant,) from *ka* water, and *dri* to tear or divide. This last signification of *ka* ("water") is evidently that from which Messrs. Traill and Conolly derived their translation of Kedarnath, "Lord of the running or abounding streams," and if it be supposed the Greek word Cedar had a Sanscrit origin, Conolly's second rendering "Lord of the Cedars" is also admissible—"the earth-splitter" being no bad description of the Cedar with its great roots. I have preferred referring the Greek word to an Arabic origin, as the tree only grows where that language, or one of its dialects, was in use; of these, also, the Arabic *Kadar* and the Hebrew *Kidron*, are said to denote "opaque" "obscure," which might allude to the deep color or shadow of the tree: but if a Greek derivation be insisted on, the only one I am acquainted with is that supplied by the learned friend above referred to, who suggests, but with doubt, *Keo* uro, and *idrio* sudo, "that which sweats on being burnt," which may allude to the process of obtaining the Cedar oil, in such high esteem among the ancients; that is supposing the process to resemble that now followed in the Himalaya to extract the *Keloo* oil. Thus PINUS, from *pion*, fat. With respect to the word *Juniperus*, my friend quotes the Sanscrit verb *Jun*, to bear, or be born; *Juni*, birth; with which *Juno*, the Queen of heaven, is obviously related in her character of *Lucina*, so also the word *yoni*, all more or less allied to the etymology hinted in the text.

To descend from these cloudy regions of conjecture, the following list of measures of 18 of the largest Cedar trees at Annandale, and 25 of those above the South waterfall, taken at five feet from the ground, may be acceptable; the very superior dimensions, which they attain in the interior, seems to corroborate the idea that the vicinity of the plains is inimical to the growth of this species.

Annandale.

No.	1	feet	13-0
——	2	,,	11-0
——	3	,,	10-6
——	4	,,	10-6
——	5	,,	10-6
——	6	,,	10-4
——	7	,,	10-0
——	8	,,	10-0
——	9	,,	10-0
——	10	,,	10-0
——	11	,,	9-9
——	12	,,	9-6
——	13	,,	9-6
——	14	,,	9-0
——	15	,,	8-8
——	16	,,	8-6
——	17	,,	8-4
——	18	,,	8-4
		Total,	177-5

Or an average of very nearly 10 ft.

South Waterfall.

No.	1	feet	15-6
——	2	,,	14-3
——	3	,,	13-0
——	4	,,	12-10
——	5	,,	12-4
——	6	,,	12-0
——	7	,,	12-0
——	8	,,	11-6
——	9	,,	11-1
——	10	,,	11-0
——	11	,,	11-0
——	12	,,	10-6
——	13	,,	10-6
——	14	,,	10-4
——	15	,,	10-4
——	16	,,	10-3
——	17	,,	10-0
——	18	,,	10-0
——	19	,,	9-7
——	20	,,	9-6
——	21	,,	9-5
——	22	,,	9-4
——	23	,,	9-4
——	24	,,	8-10
——	25		8-7
		Total,	273-0

or an average of very nearly 11 feet; but of 11, 10-18ths if the first 18 only be reckoned.

The greater size of the trees to the South, which are also at a considerably lower level than the others, is probably due to their greater age: of the Annandale trees No. 1, and of the others, No. 3, seem to be double or twin trees. I do not know that the latter phenomenon is ever exhibited in the vegetable kingdom, and conclude rather that owing to the extreme closeness with which the young trees spring up, two or more of them have cohered together, towards their root, and each produced its proper stem independently afterwards. Near Deotee, in the Kothee State, to the N.E. of Simla, examples of 4 or 5 trees, so bound up into one, are to be seen, a circumstance which, as well as its patience under clipping, before referred to, is very characteristic of the Cedar.

This tree is now being largely introduced into England; but to secure a return of such timber as it supplies in the Himalaya, care must be taken that the ground be thoroughly drained, and when practicable, chosen on the steep declivities of hills, which the tree seems to prefer in its native mountains.—*From the Quarterly Medical and Literary Journal, N. W. Provinces.*

Monthly Proceedings of the Society.

(Wednesday, the 12th November 1845.)

Charles Huffnagle, Esq. Honorary Member, in the Chair.

The minutes of the last General Meeting, and of the Special Meeting of the 17th September, were read and confirmed.

Member Elected.

H. Vansittart, Esq. Superintendent of the Deyrah Dhoon, who was proposed at the last meeting, was duly elected a member of the Society.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :

D. McCullum, Esq. Firm of Mackenzie, Lyall, and Co.—proposed by Mr. Joseph Agabeg, seconded by the Secretary.

Capt. R. Ouseley, P. A. G. G. A. S. W. Frontier—proposed by Col. J. R. Ouseley, seconded by the Secretary.

C. T. Buckland, Esq. Civil Service, Chittagong—proposed by Mr. A. Sconce, seconded by the Secretary.

Lieut.-Col. Alexander Speirs, Resident at Nagpore—proposed by the Secretary, seconded by Mr. John Cowie.

G. Lovell, Esq. (Firm of Revely and Co.) Penang—proposed by Mr. L. Wray, seconded by the Secretary.

B. S. Collins, Esq. Calcutta—proposed by Mr. W. G. Rose, seconded by Mr. Wale Byrne.

Baboo Gungadhur Seal, Calcutta—proposed by Mr. W. G. Rose, seconded by Mr. E. L. Ryder.

Presentations to the Library.

1. Agricola's Tropical Agriculture ; and Observations upon the manufacture of Sugar in the Colonies. *Presented by the Royal Agricultural Society of Jamaica.*

2. The Calcutta Journal of Natural History, No. 23. *Presented by Dr. McClelland.*

3. Journal of the Asiatic Society of Bengal, Nos. 77 and 78. *Presented by the Society.*

4. The India Journal of Medical and Physical Science, Nos. 10 and 11, of vol. 3. *Presented by Dr. Finch.*

Garden and Museum.

1. A collection of Straits fruit-trees, consisting of the Mangosteen, Rambutan, Dorian, Namnam, Rohan, Rambie, and five other sorts. *Presented by Col. Low, Resident at Penang.*

2. A box containing Nutmeg, Cinnamon, Cacao, Star-apple, Brazil cherry, and a few other varieties of fruit-trees. *Presented by Geo. Gardner, Esq., Supt. of the Royal Botanic Garden at Peradenea, Ceylon.*

In his communication advising the despatch of the above plants, Mr. Gardner intimates his intention of sending by another opportunity a few of the Dwarf and King cocoanuts, and of the green Pine-apple of Ceylon, and expresses his readiness at all times to meet the wishes of the Society to the best of his ability.

Mr. Gardner adds, that he is about despatching to Mr. Vansittart, Supt. of the Deyrah Dhoon, in accordance with the request of the Society, a quantity of Coffee seed selected from the best trees in the Peradinea Garden.

3. A few Indigo-giving plants from the Tenasserim province. *Presented by E. O'Riley, Esq.*

4. A fine supply of Cereal Grains, Hemp, Clover, Rape, Mangulwurzel, field Carrot and Turnip, Tares and other *Agricultural* seeds. *Presented by the Court of Directors.*

(Further particulars of this consignment will be found in the body of the proceedings.)

5. A small selection of English Vegetable seeds from Veitch and Sons of Exeter. *Presented by Capt. G. E. Hollings, Secretary of the Agri-Horticultural Society, Lucknow.*

6. Seeds of the Jersey Kail, or Cow Cabbage, of Mummy wheat (Triticum compositum), and of Turnip-radish, procured from Mr. Saunders, Nurseryman at Jersey. *Presented by A. F. Smith, Esq.*

7. A few seeds of Melons of sorts. *Presented by Colonel J. R. Ouseley.* Colonel Ouseley mentions that of these Melons, one of the green kinds is a superb variety, the flesh and skin and seed are all green; the rest are also good. The Water Melons, Col. Ouseley adds, are the largest and best he has ever seen.

8. A small assortment of English Vegetable seeds. *Forwarded by Dr. Royle by the August Overland Mail.*

9. A few seeds of the Hibiscus Africanus. *Presented by J. Stikeman, Esq.*

10. Specimens of oils, consisting of Poppy, Sunflower, Safflower, Radish, Cotton, Mawah (Bassia latifolia), Hingun (Ximenia Egyptiaca) and Cossim (Schleichera trijuja); also sample of the Butea Kino. *Presented by C. B. Taylor, Esq. of Palamow.*

In an interesting letter forwarding the above Oils, Mr. Taylor offers a few remarks in reference to two or three of the specimens. He adds, he has been induced to send them with the view of assisting to carry out the wish of the Society, as expressed in its proceedings of last year, namely, to collect, as far "as possible, all the indigenous Edible oils of India, in order to ascertain their comparative qualities, and to improve the manufacture of them, with a view to their becoming in this country equally good substitutes for butter with the Olive oil in the hotter climates of Europe, and preferable for many purposes to any animal oil."

Mr. Taylor's letter was referred to the Committee of Papers.

11. A log of the Yew tree. *Presented by Capt. Percy Eld.*

Capt. Eld states, that this log has been pronounced by Dr. Wallich to be the *veritable* Yew, and he adds, "it was discovered by Mr. Wood and myself in the Naga hills, S. E. of Assam last year. There were only three trees on the hill side, at a height of about 4000 feet. We did not see another throughout the whole of our trip. We searched in vain for young plants or seeds."

Metcalfe Hall.

The subject which first occupied the attention of the Meeting had reference to the Metcalfe Hall. The Secretary mentioned that, with the view of assisting to liquidate at once the amount of the Society's proportion of the debt on the Building, (6000 Rs.) four of the members, namely, Rajah Suttchurn Ghosaul, Baboo Ramgopaul Ghose, Dr. Huffnagle, and Mr. Rustomjee Cowasjee, had consented to advance as a loan, without interest, the sum of 3000 Rs.; the two former gentlemen one thousand each, and the two latter, five hundred each; whereupon the following notice of motion for the next General Meeting was given by Mr. Staunton, seconded by Dr. Huffnagle:

"That the Society having undertaken to pay Rs. 6000 as its share of the debt due on the Metcalfe Hall, and four members of the Society having volunteered a loan of 3000 Rs. for two years without interest, the Secretary be authorised to borrow the balance, Rupees 3000, on deposit of Company's Paper belonging to the Society, the said sum to be replaced out of the additional subscriptions, recently agreed to and after payment to, the members who have advanced the 3000 Rs. as above mentioned."

The Secretary also laid on the table a list of subscriptions received during the past month, amounting to Rs. 350, towards the same object. The principal part of this sum, he observed, had been contributed in the shape of *donations*, by about one-third of the number of the Society's life subscribers, who, as such, are exempt from the additional temporary subscription, agreed on at the late Special Meeting; while the remaining portion had been made up by a few other members having paid their additional proportion in advance.

In connection with this subject, the Secretary read a letter from Sir Lawrence Peel, in reply to his (the Secretary's) letter forwarding copy of the Resolution of the Special Meeting expressive of the Society's acknowledgment to Sir Lawrence for his handsome donation towards payment of the debt on the Metcalfe Hall. Sir Lawrence observes, "In making this donation, I was mainly influenced by a desire to aid the funds of a Society which has done, and is doing, much good, and whose future exertions in the same direction might have been crippled if resort had been had to the small balance in favour of the Society. I did not look for the reward which I have received, and for which I offer the Society my warmest acknowledgment."

The Secretary mentioned, that an application had been made to him by several gentlemen connected with the private subscription

Concerts, of which there are four during the cold season, to know whether it were possible to allow them the use of the Society's large hall for their entertainments and for fortnightly practice. After some little conversation it was agreed, that the hall might be lent for the purposes in question, subject to the permission being revoked in the event of any inconvenience arising therefrom.

Horticultural Exhibition.

A list of the prizes, amounting to 86 rupees, which were awarded at the show of Vegetables and Fruits, held on the 24th of October, was next submitted. In the remarks appended to the list it is mentioned, that this exhibition was not so good as that held in October of last year. The heavy falls of rain experienced during the first half of the month, most probably had an injurious effect on most of the esculents, and caused a later season than that of 1844. The best specimens, it is stated, consisted of turnips, carrots, leeks, onion, lettuce, endive, cabbage sprouts, asparagus, tomato, and French beans. Of potatoes there were only three baskets, and a like number of celery, with a scarcity of beet, and not a single specimen of peas.

Among the fruits the best specimens were those of custard-apples, pomegranates, sapotas, pine-apples and pumplenose. The assortment of indigenous vegetables was tolerably varied.

Nursery Garden.

A report from the Garden Committee was next read. The Committee allude to the circumstance of thirty thousand canes having been distributed from the Nursery during October, and applications for ten thousand more having been registered. They refer to the great demand for the China and Singapore varieties, and to their inability to meet them; and state that they have taken measures to increase the cultivation of these two sorts considerably, with the view of meeting a probable large demand next season. The Committee next refer to the progress making in the fruit-tree Nursery, and to the receipt since their last visit, of small consignments from Penang and Ceylon; (as detailed under the head of "Presentations to the Garden") the former in tolerable good order, and the latter in excellent condition.

They suggest the erection of a small conservatory, at an expense not exceeding 85 rupees, immediately adjoining the flower garden, and refer to a few other matters of minor importance connected with the improvement of the garden. The report of the Committee was confirmed.

Provision for Garden and Flower Seeds for 1846.

The Secretary submitted a memorandum, suggesting that an equal amount to that voted for garden and flower seeds for 1845, be again allowed to meet the cost of consignments for next year; when it was proposed by Mr. Staunton, and agreed, that the sum of Rs. 3,500 be reserved for that purpose, and that it be left to the Garden Committee to arrange the details, and report the result at the next meeting of the Society.

Vernacular Hand-book of Agriculture, Horticulture, and Farming.

A letter was read from Mr. Fenwick, announcing the completion of his Hand-Book of Agri-Horticulture; Mr. Fenwick states, that the delay in re-submitting it has been occasioned "by the revisions it has undergone in conformity to the suggestions of the learned natives, to whose inspection it was successively submitted."

It was agreed, previous to making any arrangements for the printing of the work, to transmit the MSS. again to Mr. Tucker, with the view of ascertaining if the work, in its present revised state, has been drawn up in accordance with his suggestions, and if, in other respects, it fully meets his approval.

Julalya Wheat and white Linseed from the Nerbudda.

The Secretary informed the members, that since the announcement at the last meeting of the receipt of the fine supply of Wheat and white Linseed from the Nerbudda valley, obtained through the kind assistance of Col. Ouseley, he had received the following reply to a communication which he had addressed that gentleman, requesting to be favored with the particulars of the cost of the same: "It gives me much satisfaction to find you are pleased with the supply of wheat and linseed to which you allude in your's of the 4th September. There is nothing to pay for it, as I am only too happy to be instrumental in bringing to general notice such valuable staples."

Resolved,—That the best acknowledgments of the Society be tendered to Col. Ouseley for this useful and handsome present.

Donation by the Court of Directors of a large supply of Agricultural Seeds.

Two communications from Professor Royle, respecting the consignment of cereal grains and other seeds referred to among the presentations, were next submitted. Professor Royle intimates, that this fine and acceptable supply of seeds has been presented by the Court of Directors of the E. I. Company, in compliance with their promise to the Society of occasionally sending out seeds of an useful nature, and as the present assortment, though sent by ship, has received much attention at the hands of Messrs. Wrench, to whom the order was given, he hopes to hear a favorable report regarding them.

The Secretary stated, that the seeds had arrived in excellent condition outwardly, and he had lost no time, after their receipt, with the view of saving the season, in despatching portions of them to members of the Society at Bhauglepore, Patna, Mirzapore, Gorruckpore, Tirhoot, Rungpore, Dinagepore, Benares, Allahabad, and such other quarters as he thought most desirable; besides meeting applications from several parties resident in lower Bengal.

Communications on various subjects.

The following papers and letters were also submitted:

1. From J. Thornton, Esq. Secretary to the Government N. W. Provinces, placing at the disposal of the Society, by direction of the Hon'ble the Lieut.-Governor of the N. W. P., a copy of Dr. Jameson's report on the tea experiments now being carried on in Kumaon and Gurhwal.

2. From R. Dodd, Esq., submitting his promised note on the mode of preparing madder.

These two communications were referred to the Committee of Papers.

3. From G. A. Bushby, Esq., Secretary to the Government of India, intimating, with reference to the Society's application of 23rd February 1844, that the Court of Directors, are arranging to send annual supplies of seeds to the Society by steamers, but at present

the great charge of freight will oblige them to send consignments by sailing vessels.

4. From the same, enclosing copy of a letter from the Secretary to the Government of Ceylon, in which is preferred a request for Carolina paddy, and asking if the Society can meet it.

The Secretary mentioned, he had replied to this letter to the effect that the Society had no seed in store, but that probably a small portion might be reserved from the large consignment expected in March next, and which had been ordered by Government on the representation of the Commissioner of Arracan.

5. From C. Beadon, Esq., Under Secretary to the Government of Bengal, applying for twenty ounces of silk-worms' eggs for transmission to the Government of Bombay.

The Secretary stated, that arrangements were being made to meet this application.

6. From H. Piddington, Esq., annexing the following extract of a letter to his address from the Honorable Sir Edward Ryan, regarding his (Sir Edward's) picture:

" The Picture for the Agricultural Society still remains unfinished. Mr. Say, as you have probably heard, has been for a long time so unwell as not to be able to paint, indeed I thought he would not live, and still think his life very precarious. However, he says it will be done by the beginning of next year; the face has long been painted, and the rest of the picture alone requires his care, and it can always be done without me whenever he is able to work; pray, explain this to the Committee."

7. From Capt. S. F. Hannay, Commandant Assam Light Infantry Battalion, dated Jeypore, Upper Assam, 15th September 1845. Capt. Hannay intimates his desire to correct the statement made by Dr. McClelland, and incorporated in the published Proceedings of the general meeting of the Society, held on the 13th August, in reply to his (Capt. Hannay's) former communication, pointing out that the assertion made by Dr. McClelland in his memoir of Dr. Griffith, at page 32 of the present volume of the Society's Journal, was an erroneous one; namely, " that the Nagas were in the habit of decapitating whole guards of the Assam Light Infantry while they were asleep."

Having offered a few preliminary remarks, Capt. Hannay observes, as follows:

"With regard to Dr. McClelland's allusion to the attack made on the station of Suddyah in 1839, and the death of the late Lieut. Colonel White, I cannot see that he has done any thing else than shewed further inacquaintance with Assam affairs, which need not have been displayed, had he given himself a little trouble to gain better information than he seems to be possessed of. I now consider it necessary to state, for the information of the members of the Agricultural and Horticultural Society, that the attack made upon the head-quarters station of the A. L. I. was the result of an insurrection of the revenue-paying population—Khamptis, and others residing in the district of Suddyah in the plain of the Burrumpooter, who had become disaffected in consequence of being taxed, and having lost their slaves. These people were in the daily habit of visiting the cantonment for years before, their villages being but a few miles distant. The attack was long thought of, well planned, and made the advantage of the most consummate treachery at an hour when every one was supposed to be asleep excepting the guards of the station. The object, (Suddyah being a very isolated and remote position,)—the destruction of our military resources in Upper Assam, —(the whole of the arms and accoutrements being kept in buildings composed of the most inflammable materials,) and thus causing risings and plundering on every side until assistance could have been obtained from Bengal. Happily, however, although there was good cover for an attacking party within a few hundred yards of the different guards, the assailants, from 600 to 800 in number, were repelled at every point, within 15 minutes after the attack, by about 50 men, including the whole of those on duty at the time.

"My late respected and gallant Commandant, Lieut.-Col. White, lived in a remote corner of the cantonment without a guard, and on the first alarm appears to have got up, put on a surtout coat over his night dress, and with his sword in his hand proceeded in the direction of the station magazine. He had scarcely, however, gone one hundred yards from his own house when he came upon 20 to 30 of the enemy, who immediately recognized and attacked him. Colonel White bravely defended himself for some time, wounding one of his assailants in the hand, but was eventually overpowered, having received both a shot and spear wound through the back, and a severe cut, about two inches deep, on the left side of the neck: this, however, does not amount to decapitation, as stated by Dr. McClelland. The party who committed this murder were well known; and apparently terror-stricken at the magnitude of their crime, immediately fled. The body was found by the Sergeant-major of the corps, on his way to the parade a minute afterwards.

"To shew also that the troops, however much taken by surprise, were not inclined to lose their heads, the assailants left 26 bodies behind them, in and about cantonments, most of them having been killed in the vicinity of the guard. My own sentry promptly loaded, fired, and killed one of the attacking party on my bungalow, and without doubt, saved my life. The sentry (outlying) of the rear guard behaved as promptly, but was afterwards cut down. The bugler at the magazine guard, (which was also a jail with 16 chained prisoners in it,) was cut down in the act of putting the bugle to his lips to sound the alarm, by a man who was instantly bayonetted by a sipahee of the guard. I also saw four sipahees kill as many of the assailants, not 15 yards from where I stood at one of the bells of arms, scarcely two minutes after the first alarm, a position where there was only one sentry before the attack. The greater portion of our killed, ten in number, were of those not on duty; and here the Subadar-major of the corps at his own threshold, in defending himself against numbers, next to decapitated an antagonist before he fell himself. These and other instances which I could give, are I hope sufficient to shew Dr. McClelland, that a *wholesale decapitation* of disciplined troops is not so easily effected, as he seems to think, as well as to point out to the members of the Society how unwarranted and uncalled-for are his published statements regarding the Assam Light Infantry Battalion.

"I arrived in Assam very soon after the Tea commission left it, and up to this date have travelled in various directions amongst the different hill tribes. I must say, however, I feel quite at a loss to discover where this Tea commission could have reached the point in the Naga hills 20 miles beyond the Assam frontier. The very ferocious Naga tribe mentioned by Dr. McClelland ought, I think, to be named. With regard to the Nagas generally, although *au fait* at decapitation amongst themselves, and in the plunder of defenceless villages in the plains (in days long gone by) they have, and particularly the tribes near the scene of the travels of the adventurous Tea commission, a wholesome dread of the sound even of a musquet.

"It may be as well to add, that Suddyah is about 120 miles to the North and East of Gabra Purbut, a tea locality mentioned by Dr. McClelland, under the hills. The tribes in the hills near Suddyah are called Abors and Mishmees. These have never made themselves particularly obnoxious to the British Government; gangs of Mishmees, men and women, smoking their short pipes, may be seen all over the Upper Assam plains in the cold weather, and the same may be said of the Nagas nearest the Assam valley, on a line of frontier extending upwards of 120 miles, many of the tribes being regular traders.

"I shall now conclude this rather lengthy epistle, by again requesting, that the statements put forth in the Journal of the A. and H. Society, viz. 'that the Nagas were in the habit of decapitating whole guards of the Assam Light Infantry while they were asleep,' may be contradicted in the most public manner possible."

8. From Captain Gabb, Secretary Madras Agri-Horticultural Society, applying for a copy of the rules and regulations of this Society's Cattle Shows, as a guide to them in their contemplated establishment of exhibitions of a similar nature.

9. From Col. H. C. M. Cox, dated Jubulpore, 13th October, intimating that teak grows in great abundance throughout the whole tract of country east of Jubbulpore, both on the banks of the Nerbudda and Sone rivers. Col. Cox states, "perhaps it would be worth while testing the strength of the Sone and Nerbudda teak with that of Malabar and Rangoon; I can easily send you samples if you wish it."

Col. Cox adds, "I tried sometime since Col. Stacy's plan [published in a late number of the Journal] of having cuttings sent by dawk banghy packed in the stem of a plantain, and I have great hopes it will succeed: out of 38 cuttings, 30 were alive when I received them from Barrackpore, and I trust most of them will soon put out shoots."

10. From Capt. W. W. Dunlop, Secretary Cuttack Branch Society, applying for the annual donation of 50 Rupees from the Parent Society. Captain Dunlop adds, "I shall not ask you for medals this year, as the two which you were so kind as to send me last year were not given away, but reserved for this year."

Letters were also read from the Secretaries of the Royal Agricultural Society of Jamaica and the E. I. and China Association, and from the Secretary to the Society of Arrarat; all returning thanks for the Journals and Transactions of the Society.

For all the foregoing communications and presentations, the best thanks of the Society were accorded.

(Wednesday, the 10th December, 1845.)

The Honorable Sir J. P. Grant, President, in the Chair.

The minutes of the last General Meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting, were duly elected members of the Society, viz.:

Messrs. D. McCullum and C. T. Buckland, Captain R. Ouseley, Lieut.-Col. Alex. Speirs, Messrs. G. Lovell and B. S. Collins, and Baboo Gungadhur Seal.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election:

Thomas Watkins, Esq. Raneegunge Collieries, Burdwan, proposed by Dr. Wallich, seconded by the Secretary.

William Cockburn, Esq. Raneegunge Collieries, Burdwan, proposed by Dr. Wallich, seconded by the Secretary.

G. M. Gasper, Esq. Calcutta, proposed by Mr. Joseph Agabeg, seconded by the Secretary.

Presentations to the Library.

1. Journal of the Royal Asiatic Society of Great Britain and Ireland, Part 1, No. 16. *Presented by the R. A. Society.*

2. Journal of the Asiatic Society of Bengal, No. 79. *Presented by the Society.*

3. India Journal of Medical and Physical Science, No. 12, of Vol. III. *Presented by Dr. Finch.*

4. Proceedings of the Sixteenth Anniversary Meeting of the Society of Natural History of Mauritius. *Presented by the Society.*

5. Three copies of Voigt's "Hortus Suburbanus Calcuttensis." *Purchased by the Society.*

Garden and Museum.

1. A fine collection of Mango, Loquot, Guava, Pears, Apples, Figs, Peach, Grape, Vines, and other fruit trees; also a small assortment of flower plants. *Presented by Capt. G. E. Hollings, Secretary of the Lucknow Agri-Horticultural Society.*

The Secretary intimated that, with the exception of a couple of Vines and a few Strawberry plants, the whole of this fine collection had arrived in excellent condition, and been transferred to the Garden Committee. It was directed, that the best thanks of the Society be given to Capt. Hollings for this acceptable supply.

2. A variety of Egyptian Melon seeds, one kind of Wheat and Lupin seeds, and a species of Bean; also two Date trees, (male and female.) *Presented by Dr. Henry Abbott, of Cairo.*

3. A small quantity of Upper Egyptian Wheat, a few Pear seeds from Mount Sinai, and some of the Beans used for feeding cattle in Egypt. *Presented by Lieut. E. J. Robinson, Supt. of the Bhuttee Territory.*

4. A few plants from the Straits, consisting of the conical Pine-apple, dwarf Cocoanut, Attap, and Chokermanis. *Presented by Dr. K. M. Scott.*

5. A box of seeds and bulbs from South Africa. *Forwarded by the Rev. David Livingstone, at Lattakoo.*

The Secretary mentioned, that at the suggestion of Dr. Wallich, the contents of this box had been divided between the Botanic Garden and the Society's Nursery for immediate operations.

6. A supply of Coffee, the produce of his garden at Chittagong. *Presented by A. Sconce, Esq.*

7. A second specimen of Madder root, the growth of the Botanic Garden at Sewneri. *Presented by Dr. Alexander Gibson, Supt. H. C. Botanic Garden of Western India.*

Dr. Gibson states, that this specimen has been more carefully dried than that previously sent, which will admit of a better judgment being formed of its quality. Dr. Gibson promises to send a quantity of seed so soon as he has collected it.

8. A box of Sydney Maize. *Presented by Captain Townley, Commander of the "Orwell."*

9. Six varieties of Dahlias and five of Crysanthemums, the produce of his garden. *Presented by Mr. R. Wood, Junior.*

These cut specimens were much admired by the meeting for their extreme beauty.

Metcalfe Hall.

The motion, of which notice was given at the last Meeting to the effect, that,—" The Society having undertaken to pay Rs. 6000 as its share of the debt due on the Metcalfe Hall, and four members of the Society having volunteered a loan of 3000 Rs. for two years without interest, the Secretary be authorised to borrow the balance, Rs. 3000, on deposit of Company's Paper belonging to the Society, the said sum to be replaced out of the additional subscriptions recently agreed to, and after payment to the members who have advanced the 3000 Rupees as above mentioned,"—was first brought forward, and duly agreed to.

Provision for Garden and Flower Seeds for 1846.

The following report from the Garden Committee, regarding consignments of vegetable and flower seeds for the year 1846, was next read :

In accordance with the Resolution of the last General Meeting, " That the sum of 3,500 Rs. be reserved for garden and flower seeds for 1846, and that it be left to the Garden Committee to arrange the details and report the result at the next meeting of the Society," your Committee beg to state the mode in which they have endeavoured to meet the wishes of the Society, as arranged at a meeting held on the 17th November.

Flower Seeds from England.—Taking into consideration the great disappointment experienced this year in the seeds received from Messrs. Veitch, of Exeter, and Messrs. Carter, of London, and referring to the excellent condition in which the consignment of Agricultural seeds sent out by Messrs. Wrench and Sons, of London Bridge, by direction of the Court of Directors, has reached the Society; your Committee have indented on that firm, through the Secretary, for a choice assortment of flower seeds, sufficient to be subdivided into 400 packets. The said consignment to arrive here, if possible, in all May, or not later than June, and the cost not to exceed £ 60, or Rs. 600.

Vegetable and Flower Seeds from America.—The vegetable and flower seeds forwarded this season by Messrs. Landreth and Muns, of Philadelphia, having again given satisfaction—so far as your Committee have been able to ascertain—they have requested the Secretary to direct that firm to send another consignment, to consist of 400 packets of flower seeds and 500 packets of vegetable seeds, being one hundred packets of the latter in excess of the supply for 1845. With the view of enabling Messrs. Landreth and Co. to meet this extra demand, and to send a much larger quantity of peas and beans, a choicer collection of flower seeds, and a larger quantity of each variety; and, in fact, to render the consignment in every respect more acceptable to the members, your Committee have authorized them to draw on the Society for 200 dollars in excess of their last bill, which will make the present bill equal to 1,650 Rs. The consignment to reach this in all July.

Vegetable Seeds from the Cape.—In consequence of the garden seeds received this year from Messrs. Villet, of the Cape, having proved very unequal, and altogether inferior to the supplies usually sent by them, the Committee have been induced to suggest that only 400, instead of 500, packets be sent next season, to arrive here in May or the early part of June; and to inform the Seedsmen, that upon the result of this consignment will depend a continuance of the Society's patronage. This order to Messrs. Villet is limited to 1,200 Rs., making, with the cost of the supplies from England and America, in the aggregate, Rs. 3,450.

In conclusion, your Committee have the pleasure to append to this Report copies of the several lists transmitted for the guidance of the Seedsmen, and trust that the selection and quality of the seeds distributable during next year may give satisfaction to the Society in general.

(Signed) RICHARD DODD.
" WM. G. ROSE.

Exhibitions of Flowers, Vegetables, and Fruits.

Another report from the Garden Committee presenting a schedule of prizes, amounting to Rupees 150, to be awarded at the fourth and last exhibition of flowers for the current year, was also submitted. The Committee suggest, that the show be held on Tuesday, the 30th of December, at 11 A. M. This was agreed to, and it was further resolved, that the first show of vegetables and fruits for the year 1846, take place on Monday, the 2nd of February, and the anniversary dinner on the evening of the same day.

Vernacular Hand-Book of Agriculture, Horticulture, &c.

A communication from H. Carre Tucker, Esq. the Collector of Goruckpore, returning Mr. Fenwick's revised work, was next brought to the notice of the meeting. Mr. Tucker states, that the general opinion of the respectable natives of Goruckpore is favourable to the work, both as to the matter and manner; and that he himself thinks it is much improved by the revision which has been given to it; is likely to be useful, and does great credit to the author.

Resolved,—That the work be referred to the Committee of Papers, to make the necessary arrangements in regard to printing, &c.

Progress of the Bhauglepore Branch Agri-Horticultural Society.

The paper next submitted was a letter from Major Napleton, Honorary Secretary of the Branch Society at Bhauglepore, communicating the pleasing intelligence of the progress of that association, in the shape of a report of a meeting held at the station on the 14th ultimo. Among other gratifying items, the report states that thirty-eight new subscribers have been added to the list since the 30th of May last; that the donations during the year amount to Rs. 293, exclusive of the annual donation of the Parent Society of two silver medals and 50 rupees; that there have been several presentations of plants, seeds, &c., and the balance in favor of the Society, after paying all demands, amounts to Rs. 416. The report was transferred to the Committee of Papers for the next number of the Journal.

Communications on various subjects.

1. From F. J. Halliday, Esq. Secretary to the Government of Bengal, submitting copies of further correspondence connected with the Government Cotton Experiments at Dacca.

2. From L. R. Reid, Esq. Secretary to the Government of Bombay, forwarding a Memorandum, with plates, drawn up by Dr. Burn, Superintendent of the Government Cotton Experiments at Broach, explanatory of an experiment made by him in crossing the indigenous Cotton plants of India.

3. From J. W. Laidlay, Esq. presenting a Memorandum on the fertilizing properties of the well-water of Calcutta.

4. From J. McClelland, Esq. presenting a Note on the Kang Punneah Naga tribe.

5. From G. T. Lay, Esq. H. B. M. Consul at Amoy, giving a few items of agricultural information connected with the Island of Koolangsen.

The above five communications were transferred to the Committee of Papers.

6. From J. Forsyth, Esq. Secretary to the Medical Board, furnishing copies of communication from the Surgeons of the General, Native, and Medical College Hospitals, to the effect that no opportunities of testing the supposed virtues of the root of the *Cissempelos convolvulacea* as an antidote to poisonous snake-bites, have yet been afforded.

7. From Captain Barr, Secretary of the Agricultural Society of Bombay, intimating, with reference to a promise made some time ago, that no papers of sufficient interest for publication in the Journal of the Agricultural Society of India have been received by their Society up to the present time.

8. From Captain Gabb, Secy. of the Agricultural Society of Bombay, acknowledging the receipt of a supply of *Agricultural* seeds sent by this Society; Capt. Gabb gives a list of the parties among whom portions of this supply have been distributed, and promises to communicate the results of their experiments in due course.

For all the above communications and presentations the best thanks of the Society were accorded.

James Hume, *Hon. Secy.*

Report of the Agricultural and Horticultural Society of India, for the year 1845.

Following the example set in 1835, and acting on the hope then expressed that a similar summary would be given at the close of each year, the Society has now the pleasure to submit, in its Eleventh Annual Report, the following brief outline of its proceedings during 1845.

Introduction.

And first, commencing with the more immediate concerns of the Society, as connected with its internal economy, it may be mentioned that since the close of the last year, there has been an accession of Fifty new Members. Of these nine are Civilians, in the service of Government, fifteen are Medical and Military Officers, two are Indigo Planters, one is a Minister of the Gospel, twenty-one are Mercantile, and two are of the Legal profession. The loss from resignations has been exactly the same as that of last year, but less by deaths.* There have been nine deaths, and thirty-four resignations, besides seven whose names have been removed from the list, five on account of insolvency, and two (Mr. F. A. J. Elson and Baboo Woomeschunder Roy) for non-payment of subscriptions; in all fifty.

Economy of the Society.

The following tabular statement in continuation of those in former reports, affords full details, and represents, at the same time, an analysis of the constitution of the Society:—

	In 20 former years.	In 1841.	In 1842.	In 1843.	In 1844.	In 1845.	Gross Total.	Total real number at the close of 1845, after deducting lapses.
Honorary Members, ...	8	2	0	1	0	0	11	9
Free Members, ...	0	0	1	0	1	0	2	2
Civilians, in the service of Government, ...	152	19	21	14	17	9	232	164
Merchants and Traders, ...	129	13	18	16	10	15	201	129
Indigo and other Tropical Agriculturists, ...	139	21	7	15	6	2	190	89
Military Officers, ...	102	21	4	16	4	13	160	97
Medical ditto, ...	54	10	9	1	4	2	80	33
Asiatics, ...	37	8	6	5	1	6†	63	38
Clergy, ...	10	1	1	1	0	1	14	3
Law Officers, ... m	28	0	6	2	2	2	40	25
Miscellaneous, ...	5	0	2	0	2	0	9	5
	664	95	75	71	47	50	1002	594

* Since this was written, the Society has had to lament the loss of three more Members, viz:—Major G. Broadfoot, Captain P. Nicolson, and Captain D'Arcy Todd, who fell at the battles of Moodkee and Ferozeshuhur, on the 18th, 21st and 22nd December.

† All these are engaged in mercantile pursuits.

Of this number thirty-eight are Members who have compounded for their subscriptions; one hundred and twenty-four are absent from India, nine are Honorary, and two are Free Members; leaving four hundred and twenty-one as the actual number of *paying* Members on the books of the Society, or twelve less than last year. This small decrease arises, not from the circumstance of the total number of Members on the list being less than that of last year, but in consequence of the departures to Europe, many of them temporary, being greater, and the returns not having been in a proportionate ratio; added to which it may be observed that, by a late regulation of the Society, Members while resident at the Cape (of whom there are five at present) are likewise absolved from payment of subscription till their return to India.

The Society cannot quit this subject without the expression of its regret that, while in the elections of the year, Merchants and Traders are represented by the goodly comparative number of twenty-one, and while all other Members of the community bear a tolerably fair proportion, *two only* of so respectable a class as the Indigo Planters should have joined its ranks during that period. Should such be the case, when it is considered that this section is more closely connected with the objects of the Society than perhaps any other? Should it not rather naturally look to them, before all others, for that support which the nature of their pursuits so well enables them to bestow? The Society would indulge the hope that this body will, during the next year, not allow a similar remark to be made, but that they will rally round an Institution which should derive its principal assistance in every way from the Indigo Planter and other Tropical Agriculturists.

Necrology.

Among the calamities which have befallen the Society by the hand of death, the loss of the late Mr. William Griffith, one of its Vice-Presidents, has been the most severe. The Society has already recorded its sense of the loss it, as well as the science of Botany, has sustained, in the demise of so valuable a Member. The memoir from the pen of Dr. McClelland, published by the Society in the present volume of its Journal, and the tribute to his memory in the report of the last Anniversary Meeting of the Royal Asiatic Society, have assisted in bringing to more prominent public notice the labors of this most eminent, original, and indefatigable Botanist. In this Report it is now only left us to repeat, with feelings of deep regret, our sense of the amount of information which has been lost to the scientific world by the premature demise of this distinguished Member.

The other Members who have been lost to the Society, are Mr. E. S. Hodges, Indigo planter; Mr. James Pattle, of the Civil service; Mr. Alexander Holmes, Merchant; Mr. F. J. Morris, of the Civil service; Major Delafosse, of the Artillery; Messrs. L. J. H. Grey, and E. V. Irvin, both of the Civil service; and Dr. James Morton, of the Medical service.

Sugar Duty Question.

In the last Report allusion was made to the formation of a Special Committee in reference to some prominent steps being taken by the Society for the purpose of representing the interests of India in the proposed changes by the British Parliament, during the session of 1845, of Custom Duty on East-Indian grown and other Sugars. As this was the first subject of importance which engaged the attention of the Society in the opening of the year, it may be proper to allude, before passing on to the consideration of other matters, to the result of the labors of the Committee in this respect. The report and draft of a petition* drawn up by the Committee were, in the first instance, submitted at the General Meeting in January, and referred to a Special Meeting held in the following week, at which the draft was agreed to, though not unanimously, and subsequently circulated to about 100 of the resident Members, (the approaching departure of the mail not admitting of a more extended circulation) signed by 70 or thereabouts, and then transmitted, as previously agreed on, to the E. I. and China Association. At the May Meeting a reply from Mr. Stikeman, Secretary of the Association, was read, intimating that the petition had arrived most opportunely, and been entrusted to the care of Mr. Hogg, in the House of Commons, who presented it on the 17th March, and to Lord Monteagle in the House of Lords. The details of the "Sugar Bill," which was read for the third time in the Commons' house of Parliament, and passed on the following day, and the conse-

* This draft and the minutes of the Members in detail will be found in the Fourth Volume of the Journal.

quent decreased scale of duty on certain descriptions of Sugar, the growth of any British possession within the limits of the E. I. Company's Charter, imported into the United Kingdom, are too well known to need a repetition in a summary of this nature.

Agricultural Department.—Donation from the Court of Directors of Wheat, Barley, and other seeds.

The circumstance of a renewed application to the Court of Directors for occasional supplies of Agricultural and other seeds of an useful nature, to be placed at the disposal of the Society, in virtue of a promise to that effect given by the Court three years previously, was also referred to in the last Report. The Society has now the pleasure gratefully to record that, in conformity with this promise, the Court has been pleased to transmit a fine assortment of Cereal and other seeds, such as mangul-wurzel, tares, rape, clover, flax, hemp, field-carrot, and turnip.* This supply reached in October,

* In justice to Messrs. Jacob Wrench and Son, of London Bridge, to whose care the preparation of this consignment was entrusted, it may here be remarked that the seeds arrived in most excellent outward condition. The following extract of a letter from Major Napleton, dated Bhauglepore, 6th Nov. acknowledging receipt of the first despatch for the use of the Bhauglepore Branch Society, and for general distribution in the district, may also be quoted as corroborative of the above observation:—

"I have now the pleasure to acknowledge the receipt of two boxes of wheat, barley and clover, being a present from the Parent to our Branch Society, for which I am directed to tender our best thanks. I beg to add, that the five bags of wheat have arrived here in excellent order, so much so that it would be difficult to find seed wheat in such fine condition in the hands of the most careful Zemindar or Agriculturist. The same remark is applicable to the barley and clover. The five sorts of fine wheat, together with the barley and clover, shall have spots of ground allotted for their reception in our Agricultural department, and every care taken in weeding, &c. until harvest time, and I shall make a full report to you as to how each batch turns out, numbering them from one to seven under their respective denominations.

"It is my present opinion, that one and all will turn out remarkably well, and prove a boon to our district. I observe your intention of forwarding us a further supply of cereals, and I can promise you that there are many enterprising Agriculturists in this, and the neighbouring districts, who will be too happy to give them a trial in the soil of their respective farms."

Mr. H. C. Tucker, in a letter under date 14th Dec. writes, "I have received and distributed widely the boxes of seeds, which were mostly in beautiful order. You shall hear how they succeed in different places and hands."

Capt. Hollings also remarks,—"The wheat and other seeds reached me apparently in good order on the 13th instant" (December.)

and was immediately distributed over various parts of the country.* The Society will give the result of this distribution in the next yearly summary, now merely expressing the hope that it may be of a sufficiently favorable nature to induce the Court to despatch similar supplies annually, with the view of assisting to improve the Agricultural capabilities of the country.

Agricultural Department.—Australian wheat, French Madder seed, wheat and white linseed from the Nerbudda valley, seed of Cæsalpinia coriaria, Nerium tinctorium, and Carolina paddy.

It was likewise mentioned in the last year's summary, that a sum of £ 20 had been voted for a small consignment of fine seed corn from Launceston and Sydney, and also a small sum for the provision of Madder seed from the South of France. The Society states, with regret, that the former consignment was unfortunately lost by the wreck of the *Hydrabad*. The Madder seed (two maunds) was received in May in good germinating condition,† and was distributed, shortly after, in parts of the country supposed to be the best adapted for the culture of the plant. The Society has not, up to the present time, received all the returns, but so far as its information extends, the experiments have been very unsuccessful, the seed having, in nearly every instance, failed to vegetate. It is probable, from this untoward result, that the seed was injured *in transitu*, although it was carefully packed and despatched to all the localities by the most speedy mode of conveyance. Thus, for the present, has the object of the Society for the introduction of this plant, as a substitute for Munjeet, been frustrated. To Colonel Ouseley the Society is again indebted for a second fine supply of the white linseed and Julalya wheat of Central India, the

* Besides meeting applications for a limited quantity of these seeds, large supplies have been sent to the following gentlemen for distribution in their respective districts:

Major Napleton, Secretary Agricultural and Horticultural Society of Bhauglepore,—E. C. Ravenshaw, Esq. Commissioner of Patna,—H. C. Tucker, Esq. Collector of Gorruckpore,—M. C. Ommaney, Esq. Collector of Customs at Mirzapore,—D. F. McLeod, Esq. Magistrate and Collector of Benares,—R. Lowther, Esq. Commissioner of Allahabad,—J. O. B. Saunders, Esq. Allahabad,—Captain G. E. Hollings, Secretary Agricultural and Horticultural Society of Lucknow,—James Grant, Esq. Collector of Dinagepore,—H. Rehling, Esq. Rungpore,—J. W. Yule, Esq. Tirhoot,—the Secretary Agricultural Society, Madras.

† Many plants were raised from this seed in the Society's Nursery garden, and a few of them are still on hand.

great demand for which, but particularly the former, was alluded to on a former occasion. Its thanks are also due to Dr. Wallich for having placed at its disposal a quantity of seed of the American Sumach, or Divi-divi, (Cæsalpinia coriaria) the produce of the H. C. Botanic Garden. The valuable properties of this plant for tanning purposes are now beginning to be fully appreciated, and its culture will, in all probability, be generally extended throughout the country. From Dr. Robert Wight, at Coimbatore, the Society has also received and distributed a supply of Nerium tinctorium seed. The leaves of this tree have long been known as affording a superior description of indigo, but its cultivation on this side of India appears to have been altogether neglected in favour of the well-known indigo of commerce, the produce of the Indigofera tinctoria. Some interesting information on this subject, from Mr. Taylor of Palamow, and Mr. Fischer of Salem, will be found in the present volume of the Journal.

In connection with this department, and as a matter of record, it may be here remarked, that the Government of Bengal have taken steps to carry out the recommendation of the Society, and of Major Bogle, the Commissioner of Arracan, as noted in the last Report, for the obtainment of 500 maunds of Carolina paddy, to reach this in March 1846, with the view of introducing this superior description of rice, on a large scale, into that province, so aptly designated " the granary of Bengal."

Nursery—Orchard and Flower Garden.

The improvements and additions to the Nursery, to which allusion was made in the last summary, have been carried out during the year under the superintendence of the Garden Committee. Mango and other fruit trees of superior varieties have been procured from Malda, Lucknow, Madras, Bombay, Ceylon and the Straits. These supplies have materially assisted towards stocking the portion of ground appropriated for an Orchard, for the express purpose of enabling Members of the Society in due course to obtain grafts of choice trees. To Capt. Hollings, the Society is under great obligations for the fine assortment of fruit-tree grafts which he has so kindly supplied from the Garden at Lucknow; also to the Bombay and Madras Societies, and to Mr. Gardner, Superintendent of the Royal Botanic Garden at

Peradinea, Ceylon. The Society is likewise indebted to Sir Lawrence Peel for a supply of flowering shrubs and plants, presented for the purpose of stocking a portion of the Nursery, about two beegahs, which has been formed into a flower garden with the same object in view as has influenced the formation of an Orchard. A sum of money has been voted for the laying down of walks throughout this piece of ground, and for the erection of a small conservatory adjoining thereto. Both these improvements will be completed in the early part of 1846.

Nursery.—Sugar Cane culture.

The Society has the pleasure to state that the distribution of Sugar cane this season has far exceeded that of the three previous years. Upwards of 36,000 canes have been disposed of, leaving a stock of about 10,000 to meet any further demands during January and February of next year. The greater proportion of cane this season consists of the Otaheite kind, but in consequence of an equally great demand for the China and Singapore varieties, the Committee have taken steps to increase the cultivation of both these sorts considerably, to meet another probable large demand next season. It is gratifying to add that the return from the canes already disposed of has met three-fourths of the ordinary expenses of the garden.

Nursery.—Useful cultures.

Simultaneously with the above the culture of various other useful products, for the seeds and bulbs of which there is generally a steady demand, has met with attention at the hands of the Committee; among these may be enumerated guinea grass, tobacco of superior sorts, the Brazilian and Tenasserim yams, ginger, arrow-root, Mauritius screw-pine (Pandanus vacoa) and American maize.

Extension of Nursery.

Before closing this portion of the report, it may be observed that the additional piece of ground applied for in 1844, consisting of about twenty-five beegahs, has been granted by the Government of Bengal on the recommendation of the Superintendent of the H. C. Botanic garden.

Horti-floricultural Department.—Vegetable and fruit exhibitions.

While however the Society has paid due attention to subjects more particularly connected with Agriculture, and the growth of superior varieties of sugar cane, fruit trees, &c., it has by no means been unmindful of the claims of other though minor departments of its labors. Three shows of vegetables and fruits have been held during the year, namely, in January, May and October, with the view of continuing that steady encouragement to the native gardeners which the Society has fostered for so many years. The experiment which was commenced in 1844, of substituting quarterly for annual exhibitions, appears to work well, and there is every reason to hope that the same stimulus which has so materially contributed towards improving the quality of vegetables introduced from other parts of the world, will much assist in the principal object contemplated by this altered arrangement, namely, the bringing of these products earlier into the market, and retaining them longer in season, thereby affording a supply of peas, cauliflowers, turnips and other esculents for six or seven months of the year, instead of limiting them, as at present, to four or five. The total sum awarded during the year under this head for prizes, amounts to rupees 312, besides five silver medals.

The last report alluded to the circumstance of rupees 264 having been placed at the disposal of the Society by one of its Members (W. P. Grant, Esq.) for the express purpose of inducing the market gardeners, by the offer of handsome rewards, to pay more attention to the culture of celery, the improvement of which has not kept pace with other European vegetables. Although due notice was given of this intention, the result has not been so satisfactory as could be wished. At a meeting which was held in March, independently of the other shows,—that being the month when this vegetable is at its greatest comparative perfection,—the specimens exhibited were so inferior to what had been anticipated, that less than three-fourths of the sum set apart for prizes was awarded; the samples brought forward at the succeeding shows in May and October, were by no means so superior as to entitle the producers to any extraordinary mark of patronage.

Horti-floricultural Department.—Flower shows.

The attempt made during 1844, to create a greater degree of interest for the culture of flowers by the establishment of periodical exhibitions, has been continued during the present year. Four shows have been held, namely in February, April, August, and December, and a total sum of Rs. 432, awarded from the handsome yearly donation,* placed at the disposal of the Society by one of its Vice-Presidents, Sir Lawrence Peel. Taking into account that these shows are yet in their infancy, the display of flowers, both indigenous and exotic, has been as varied as could perhaps be expected, while a spirit of competition has been evinced, which is likely to keep up a desire for the introduction of rarer varieties, and the improvement of the indigenous stock.

Horti-floricultural Department.—Imported vegetable and flower seeds.

Under this head it may be mentioned that a supply of garden seeds has been imported during the year from the Cape, garden and flower seeds from America, and flower seeds from England. The seeds from the Cape have not proved equal to the assortment usually sent by Messrs. Villet, which circumstance has been duly notified to them. The supply from America has, it is believed, given satisfaction, but its arrival late in the season, has prevented many of the more distant members from participating in the distribution. The measures now taken by the Garden Committee will, in all probability, prevent a recurrence of this nature. The flower seeds from England, both the selection from Messrs. Veitch of Exeter, and Messrs. Carter of London, have again, unfortunately, failed to germinate. The order for the next season, it may be added, has been given to Messrs. Wrench and Son, and it is to be hoped, from the excellent condition in which the supply of Agricultural seeds sent by that firm has come to hand, that better success may attend their consignment.

Branch and other Agricultural and Horticultural Societies.

An active correspondence and interchange of seeds have been carried on during the twelve months with the Branch Societies and kindred institutions at the other Presidencies, tending, it is hoped, to stimulate the efforts of all in the good work, while aiding in the introduction of new cultures and in the improvement of old ones in their respective districts.

The Branch Society at Bhauglepore, continues to increase in strength and usefulness. Established only three years ago, this institution already numbers about 240 Members, and, commanding

* The Annual grant is 400 rupees, but a surplus from last year's donation has enabled the Committee to exceed that sum by thirty-two rupees.

as it does a fine centrical position, will, in all probability, add annually to its ranks. Several exhibitions with a view to the improvement of grains, vegetables, fruits and flowers, have been held during the year under its auspices, assisting to strengthen that desire for the amelioration of the agricultural resources of the district, which its earlier efforts have so materially aided in raising in the minds of the wealthy and influential zemindars of the district.

The Lucknow Society and Garden still continue under the zealous management of Captain G. E. Hollings, whose handsome donation of plants has been already referred to; and the Cuttack Garden is also still indebted to the care of Captain W. Dunlop. To this garden, as likewise to the others, the Society has accorded all the assistance in its power, in the way of seeds, plants, &c.

The society alluded in its last report to the formation of two public Gardens at Benares and Budaon. It has now the pleasure to add that of Mirzapore to the list.

Literary Department. Journal of the Society.

The substitution of a Journal in parts for the former monthly issue, which was commenced last year, has been carried on steadily during the present; the fourth, or closing part of vol. III. and three parts of vol. IV. having been published during that period. While acknowledging its obligations to all its correspondents, the Society would more particularly draw attention to the interesting papers from A. Sconce, Esq.—"A comparative account of the relative position of landlords, tenants, ryots, produce, labor and wages in India and England;" to the Memoir of the late W. Griffith, Esq. from the pen of Dr. McClelland; to certain "Observations on the applicability of artificial manures to the cultivation of the Sugar cane," &c., by T. F. Henley, Esq.; to Capt. S. F. Hannay's "Observations on the quality of the principal timber trees growing in the vicinity of Jeypore, in Upper Assam;" to a "Method of ascertaining the amount of crystallizable Sugar in Khar or Muscavado," by J. W. Laidley, Esq.; and to a series of interesting communications regarding the valuable properties of the American Sumach, and the propriety of introducing the tree in India, communicated by Dr. Wallich; all which have appeared in consecutive pages of the Journal.

Literary Department.—Vernacular Hand-Book of Agriculture.—The Sugar Planter's Companion.

The Society has the pleasure to mention, that the offer made in 1844, by H. C. Tucker, Esq., Collector of Gorruckpore, to award the sum of 300 rupees and a gold medal, to the author of a good Hand-Book of Agri-Horticulture, in the Vernacular, has been responded to by Mr. H. Fenwick, of Calcutta. The work prepared by this gentleman, having been favorably reported on by Mr. Tucker and by many of the respectable natives of Gorruckpore, the Society has transferred the *MS.* to its Committee of Papers, to arrange for its publication. The entire proceeds of the first edition, consisting of 500 copies, will be transferred by the Society to the author.

In connection with the Literary Department of its labours, it may not be out of place to mention in this part of the report, that the Society has also voted the sum of three hundred rupees to Mr. L. Wray, in acknowledgment of his labor in the production of the work entitled the "Sugar Planter's Companion," which was published, in parts, in the second and third volumes of the Journal.

Metcalfe Hall.—Bust of Dr. Carey.

The public subscription which was commenced by the Metcalfe Hall Committee in 1844, having failed to realize more than a fifth part of the balance due on account of the building, a special meeting of the Society was convened in the month of September, to take the subject into further consideration. A munificent offer on the part of Sir Lawrence Peel to bear one-fourth of the debt, provided this Society and the Public Library engaged to liquidate the remainder within a certain period, was submitted on that occasion, and the Society immediately agreed to be responsible for the payment of its proportion (Rs. 6,093) liquidating the amount by an additional quarterly subscription of two rupees from each Member for the space of a couple of years. At the following general meeting in November, it was announced that with the view of assisting to pay this proportion at once, four Members of the Society, namely, Rajah Sutteechurn Ghosaul, Baboo Ramgopaul Ghose, Dr. Huffnagle, and Rustomjee Cowasjee, Esq. had most handsomely consented to advance as a loan for two years, without interest, the sum of 3,000 rupees, the two former gentlemen 1,000 rupees each, and the two latter 500 rupees each ;* whereupon a notice of motion was given, and agreed to at the next meeting, to the effect that the Society should borrow the balance on deposit of Company's paper belonging to its vested fund.

The Society has the pleasure to intimate that this has been fully effected. The Library having also paid its proportion, the apartments intended for the Society are now available, and will be taken possession of at the beginning of next year.

The Society is happy to state that the bust of the late Dr. Carey, to meet the cost of which the sum of £ 120 was transmitted in 1843, to Professor Royle, has been received, and will shortly occupy the place appropriated for it in the lower hall of the Metcalfe Building. It may here be remarked, that the Society of Arts has awarded Nubboocomar Paul, a self-taught native sculptor of this city, its silver Isis Medal, for a clay bust of the venerable founder of the Society. The bust was prepared at the requisition of the Society, who forwarded it to the Society of Arts, for such recognition of the genius of the sculptor as it might deem him to deserve.

Conclusion.

In conclusion, the Society would remark, that though the work which has engaged its attention during the past twelve months, as detailed in the foregoing brief summary, may not perhaps be considered of so important a character, when viewed abstractedly, as that embraced in some of the reports of previous years, yet it is hoped that the sum total of the endeavours which have been made to carry out those objects which come more immediately within its province, and the countenance afforded by the Executive to various other matters which have engaged its attention, will afford sufficient satisfaction to earn for the Society the continued support of all its old Members, and to hasten an influx of new and additional assistance.

* Since the above was written, Dr. Huffnagle and Rustomjee Cowasjee, Esq. have most generously presented their respective advances as a free gift to the Society.

Report of the Finance Committee.

The Finance Committee in offering their Annual Report, beg to submit the following statements of the receipts and disbursements, &c. of this Society for the year 1845, exhibiting the state of the funds of the Society, and showing *the receipts* for the past year to have been Rs. 25,926-6-1 ; including, however Rs. 5000 obtained as a loan for the purpose of liquidating the liabilities incurred for the completion of the Metcalfe Hall.

The total *disbursements* for the same period, amounting to Rs. 18,919-2-10, include an investment of Rs. 500 in a Government Promissory Note, and the expenditure of Rs. 500 for furniture ; Rs. 600 as rewards for essays ; Rs. 595 for flower bulbs ; and Rs. 200 for a drawing of the Metcalfe Hall ; aggregating 2,395 rupees, the four last items being extra expences, which are not likely to be again incurred.

The disbursements on account of the "Nursery Garden," Rs. 2,227, although apparently heavy, are relieved by a credit of Rs. 1,691, for Sugar canes sold during the year.

The cash balance amounts to Rs. 8,598-4-2, but of this Rs. 1,868-4-2, can only be considered as available for the ordinary purposes of the Society, as the remainder, Rs. 6,730, must be appropriated for the payment in full of the Society's debt on account of the Metcalfe Hall.

The Society's *vested fund* now amounts to Rs. 10,933-5-4 in Government securities ; 7,233-5-4 being deposited in the hands of the Government Agent, and Rs. 3,700 as the collateral security for the loan of 3000. For the payment of this loan the Society has provided by levying the extra subscription of two rupees per quarter, and the Committee are most happy to state, that the Members generally have willingly acquiesced in this arrangement.

The amount of Bills payable and liabilities, is less than that of last year, and the amount of subscriptions collected during 1845, for the ordinary purposes of the Society, exceed that of 1844 by Rs. 1,400. Our list of arrears is also in an improved condition, and would no doubt have exhibited a still more satisfactory result, but for the arrears upon the additional temporary subscription above referred to.

In conclusion, the Committee have great satisfaction in congratulating the Society on the state of its Finances.

CHARLES HUFFNAGLE,
M. S. STAUNTON,
Members of the Finance Committee of the Agri-Horticultural Society of India.

Calcutta, Dec. 31*st* 1845.

C

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India, from 1st *January to the* 31st *December*, 1845.

RECEIPTS.

From Members, subscriptions collected during the year for the ordinary purposes of the Society, ...			13,310 15 9
,, Ditto additional temporary subscriptions to assist in meeting the Society's proportion of the debt on the Metcalfe Hall, ...	366 0 0		
,, C. Huffnagle, Donation ditto ditto, ...	500 0 0		
,, Rustomjee Cowasjee, ditto ditto, ...	500 0 0		
,, Various other Members, ditto ditto, ...	364 0 0	1,730 0 0	
,, Baboo Ramgopaul Ghose, Loan for 2 years without interest, ditto ditto, ...	1000 0 0		
,, Rajah Shutteechurn Ghosal, ditto ditto, ...	1000 0 0		
,, Bagshaw and Co, Loan with interest at 5 per cent. ditto ditto, ...	3000 0 0	5,000 0 0	6,730 0 0
,, Government annual donation, ...		1,045 0 0	
,, Do. Monthly allowance for 12 months at 135-13-6 per month,		1,630 2 0	2,675 2 0
,, Sir Lawrence Peel, donation to the Society for the year, to encourage the culture of flowers, &c.			400 0 0
,, Accruings of interest on fixed assets, ...			427 1 4
,, Proceeds of Sugar cane delivered from the Nursery Garden, in 1845, ...		1,691 11 0	
,, Do. of a portion of surplus Cape vegetable seeds sold in 1844 and 1845, ...		582 0 0	
,, Do. of copies of the Transactions of the Society, ...		55 12 9	
,, Do. by advertisement inserted in Journal, ...		33 5 3	
,, Do. of 15 old seed boxes sold, lined with tin, ...		11 8 0	
,, Do. of copies of the Journal of the Society, ...		7 0 0	
,, Do. of gumlahs, &c. furnished from the Nursery Garden,		1 14 0	2,383 0 0
Total Receipts Co.'s Rs.			25,926 6 1
,, Balance in the Bank of Bengal on 31st Dec. 1844, ...		946 9 9	
,, Ditto in the hands of Government Agent on ditto, ...		644 7 2	1,591 0 11
Grand Total Receipts Co.'s Rs. ...			27,517 7 0

DISBURSEMENTS.

Foreign Vegetable and Flower Seeds.

By C. N. Villet, for Cape garden seeds, ...	1,500 0 0	
,, Messrs. Landreth and Co. of Philadelphia, for American vegetable and flower seeds, ...	1,394 1 3	2,894 1 3

Cotton, Maize, Wheat, etc. Seed.		
By Messrs. Landreth and Co. of Philadelphia, for American cotton and maize seeds, ...	224 7 0	
,, J. Mackey and Co. for a quantity of wheat seed ordered from Van Dieman's Land and Sydney, ...	309 3 0	
,, J. Cowell, for cost and transit charges of two cases (about 2 maunds) madder seed, ...	89 0 0	622 10 0
Fruit Trees and Flower Bulbs.		
,, Dr. Lamb, for 100 mangoe grafts from Malda, ...	70 8 0	
,, H. Groom, for a supply of flower bulbs, ...	595 15 3	666 7 3
Library.		
,, Books purchased during the year for the Library, ...		166 9 6
Printing.		
,, Sundry parties for printing receipts, &c. ...		80 8 0
Journal.		
,, Bishop's College Press, for printing Part 2, 3 and 4 of Volume 3, and Part 1, 2 and 3 of Vol. 4, ...	2,194 2 0	
,, Lithographing plates for Journal, ...	120 0 0	
,, Ostell and Lepage, for a ream of paper for plates for the Journal,	10 8 0	2,324 10 0
Nursery Garden.		
,, Ordinary expences incurred on account of the Nursery Garden, from 1st December 1844 to 30th November 1845, ...	2,046 2 6	
,, Additional expence (in part) for making a walk through the Garden, trenching about 15 beegahs of ground, &c. ...	81 0 0	
,, Ditto for burning bricks for flower garden walks, ...	100 0 0	2,227 2 6
Establishment.		
" Amount for Establishment, from 1st December 1844 to 30th November 1845, ...		4,320 0 0
Medals.		
,, Hamilton and Co. for gold and silver medals, ...		640 5 0
Pecuniary Rewards.		
,, Prizes to Mallees for vegetables and fruits at the Exhibitions held on the 15th January, 13th May, and 24th October, ...	312 0 0	
,, Do. to do. for flowers at the Exhibitions held on the 14th February, 15th April, 25th August, and 30th December, ...	432 0 0	
,, Do. to do. for Celery at the Exhibition held on the 11th March, ...	61 0 0	
,, The Bhauglepore Branch Society, Annual donation, ...	50 0 0	
,, The Cuttack, ditto ditto, ...	50 0 0	
,, The Hooghly, ditto ditto, ...	50 0 0	
,, Mr. L. Wray, the amount awarded at General Meeting of 9th April, for his work entitled "the Sugar Planter's Companion,"	300 0 0	
,, Mr. H. Fenwick, for his Hand Book of Agri-Horticulture in the Vernacular, being the amount placed at the disposal of the Society by H. C. Tucker, Esq. ...	300 0 0	1,555 0 0

Society's Vested Fund.						
By The Government Agent for the purchase of a four per cent. Government Promissory Note to be added to the Vested Fund, ...				500	0	0
Furniture for Metcalfe Hall.						
,, Messrs. Currie and Co. second payment on account of furniture, ...				500	0	0
Metcalfe Hall.						
,, W. Clarihew, for a drawing of the Metcalfe Hall, ...				200	0	0
Advertisements.						
,, Advertising in the public prints, notices of meetings, distribution of seeds, sugar cane, &c. &c. &c.				397	9	0
Stationary.						
,, Stationary for office books, and for the use of the office, ...	74	3	0			
,, Ditto 14 reams of brown packing paper for packing seeds, ...	135	0	0			
				209	3	0
Freight.						
,, Freight on boxes of seeds, plants, fruit trees, &c. from America, Cape, Bombay, Bhauglepore, Lucknow, &c.				378	4	10
Postage and Sundry other charges.						
,, Postage on the Journal, on letters sent and received, and for petty expences, ...	710	0	0			
,, Messrs. Grindlay and Co. for expences incurred by them in the despatch of fruit trees, flower, &c. seeds, receipt, and distribution of the Society's Journal, postage, &c.	222	11	6			
,, Eggs of silk worms, &c, procured on account of Government, ...	17	0	0			
,, Making three analyses of soils from the Tenasserim Coast, ...	48	0	0			
,, Engrossing wheat and sugar petitions, ...	68	0	0			
,, Amount advanced by Villet and Son, for insuring Cape garden seeds, ...	57	0	0			
,, Extra Packermen for subdividing seeds, ...	23	1	0			
,, Extra Writers, for writing on papers of ditto, ...	7	0	0			
,, Present to Constables and Burkundauzes for attending at Horticultural and Floricultural Exhibitions during the year, ...	84	0	0			
				1,236	12	6
Total Disbursements Co.'s Rs. ...				18,919	2	10
Balance in the Bank of Bengal on 31st December 1845, ...	8,026	11	8			
Ditto in the hands of Government Agent, on ditto, ...	571	8	6			
				8,598	4	2
Grand Total Co.'s Rs. ...				27,517	7	0

MEMORANDUM.

Disbursements.

To Amount of Disbursements during the year 1845, as per Statement, ...		18,919 2 10
,, Balance in the Bank of Bengal on the 31st December 1845, ...	8,026 11 8	
,, Ditto in the hands of the Government Agent on ditto, ...	571 8 6	
		8,598 4 2
Total Co.'s Rs. ...		27,517 7 0

Bills Payable and Liabilities.

Amount due by the Society for expences incurred for English flower seeds in 1845, ...		556 6 0
Liabilities. Amount of Loan taken from the Universal Life Assurance Society with interest at 5 per cent, ...	3,000 0 0	
Ditto from Rajah Shutteechurn Ghosaul without interest for 2 years, ...	1,000 0 0	
Ditto from Baboo Ramgopaul Ghose ditto,	1,000 0 0	
		5,000 0 0
Amount for prizes for improvement in Indian Churka, ...		620 0 0
Total Co.'s Rs. ...		6,176 6 0

Receipts.

By amount of Receipts during the year 1845, as per statement		25,926 6 1
,, Balance in the Bank of Bengal on the 31st December 1844, ...	946 9 9	
,, Ditto in the hands of the Government Agent, ...	644 7 2	
		1,591 0 11
Total, Co.'s Rs. ...		27,517 7 0

Dependencies.

Amount invested in Government Securities, lodged in the Government Agency office,	7,233 5 4	
Ditto lodged with the Secretaries of the Universal Life Assurance Society, in satisfaction of Loan of Rs. 3,000 as per contra, ...	3,700 0 0	
		10,933 5 4
Amount of subscription in arrear,		8,679 0 3
Total Co.'s Rs.		19,612 5 7

Moon's Phases.	Observed at 9 H. 50 M.					Observations made at Apparent Noon.					Observed at 4 P. M.					Observations made at Sunset.					Rain. Gauges.	
	Barometer reduced to 32° Fahrenheit.	Temperature.			Wind.	Barometer reduced to 32° Fahrenheit.	Temperature.			Wind.	Barometer reduced to 32° Fahrenheit.	Temperature.			Wind.	Barometer reduced to 32° Fahrenheit.	Temperature.			Wind.	Elevation.	
		Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from Sunrise to 9 h. 50 m.		Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from 9 h. 50 m. to Noon.		Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from 2 h. 40 m. to 4 p. m.		Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from 4 p. m. to Sunset.	Feet. 56 Upper.	Feet. 7 Lower.
	Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
	29,728	85,5	85,8	80,0	N. W...	29,702	88,9	88,0	81,0	W.	29,626	91,0	90,8	80,0	N. W...	29,636	88,0	88,0	80,0	N. W...	..	..
	,776	88,0	89,0	81,5	W.	,748	91,0	91,0	81,0	W.	,667	92,0	92,0	77,0	W.	,678	88,0	88,0	79,8	W.	..	..
	,764	90,0	91,0	82,8	S.......	,745	92,0	92,0	82,2	W.	,643	93,0	92,6	81,7	W.	,662	89,0	89,0	81,5	W.	0,92	1,19
	,744	87,0	88,0	80,8	N.	,715	90,0	90,8	80,5	N. W.....	,619	92,0	92,0	79,8	N.N.E.	,639	81,0	79,8	76,0	N.	1,40	1,84
	,740	89,5	90,0	81,5	E.	,718	89,0	83,5	77,5	E. N. E.	,636	83,0	83,9	77,4	E. N. E.	,652	82,0	82,5	78,2	E. N. E.	0,23	0,28
	,727	89,0	89,0	82,0	E.	,706	91,0	91,1	82,8	E. N. E.	,633	93,0	92,0	81,6	E.	,655	84,0	85,0	79,0	S.......	..	..
	,747	89,0	89,5	82,0	S. W...	,721	91,0	92,0	82,1	S.........	,666	86,5	87,0	81,0	S.......	,674	84,0	84,0	80,8	S.......	0,18	0,28
	,819	86,0	86,0	80,9	S.......	,786	95,0	84,3	79,5	S. E.	,738	84,5	85,0	79,0	S. E. ..	,733	81,0	81,1	78,0	S. S. E.	0,12	0,16
☾	,824	85,4	87,0	80,9	S.......	,793	88,0	88,8	80,2	S. S. W.	,704	83,0	84,0	79,8	S. S. W.	,721	82,5	83,5	79,1	S. S. W.	..	..
	,788	87,0	88,0	81,8	S.......	,746	88,0	87,9	82,0	S. W. ...	,685	85,5	86,0	81,0	S.......	,711	84,0	84,9	81,0	S.......	..	..
	,781	86,4	87,5	81,0	S. W...	,750	89,0	89,0	82,0	S. S. W.	,666	88,0	88,0	82,2	S. S. W.	,699	85,0	85,4	80,9	S. S. W.	..	..
	,747	86,0	86,0	81,0	S. W...	,717	88,5	89,0	81,5	S. W.....	,665	80,0	79,0	77,0	S.......	,659	78,0	79,8	77,0	S.......	0,31	0,41
	,771	83,5	84,5	80,8	N. W...	,726	86,0	86,0	79,8	W.	,700	76,0	76,0	74,8	N. W...	,721	76,0	77,0	75,6	W.	0,23	0,47
	,789	85,0	85,0	78,0	S.......	,760	84,0	84,0	78,8	S.........	,689	87,0	86,0	78,0	S.......	,710	83,0	83,0	77,0	S.......	..	..
	,850	83,0	84,0	78,0	N. W...	,801	85,5	86,0	78,9	N. W. ..	,714	88,0	87,8	78,4	N. W...	,726	85,8	86,0	78,0	N. W...	..	..
○	,837	87,0	88,0	80,3	N. W...	,803	90,0	91,0	81,4	N. W. ..	,690	91,0	91,0	79,8	N. W...	,721	88,0	88,4	80,4	N. W...	..	..
	,804	87,2	89,0	81,0	N. E. ..	,770	90,0	90,9	80,0	N. W. ..	,700	83,0	83,7	77,8	N. E. ..	,712	80,0	80,2	79,0	N. E. ..	..	..
	,791	86,0	87,7	80,0	N. W...	,765	88,0	89,0	80,0	N. W. ..	,674	87,5	87,8	78,8	N. W...	,682	85,0	85,0	80,0	N. W...	..	..
	,741	80,0	87,5	79,4	N. W...	,706	89,0	90,0	81,4	N. W. ..	,624	89,5	89,4	79,4	N. W...	,629	86,0	86,5	79,5	N. W...	..	0,12
	,779	87,0	87,3	80,9	S. W...	,742	90,0	89,0	80,0	S.........	,672	90,0	89,5	79,5	S. W...	,701	86,0	86,0	81,0	S. W...	0,02	0,05
	,875	81,0	79,5	77,0	S.......	,849	81,0	83,0	78,0	N. W. ..	,779	85,0	83,0	78,0	N. W...	,794	81,9	82,9	79,0	N. W...	..	..
	,873	86,5	87,5	81,5	S. W...	,833	86,0	85,1	79,5	S. W.....	,728	90,5	90,0	79,5	S. W...	,729	87,0	86,8	79,6	S. W...	..	..
☽	,766	88,0	89,0	81,6	S. W...	,727	90,5	91,5	82,0	S. W.....	,632	91,5	91,0	81,4	S. W...	,659	87,0	88,0	82,0	S. W...	..	..
	,766	89,0	89,8	82,5	N.N.W.	,734	92,5	94,0	80,5	W.	,643	93,0	92,4	77,8	N.N.W.	,650	89,8	89,9	81,0	N.N.W.	.	..
	,752	90,0	90,6	79,8	N. W...	,733	93,0	93,4	81,0	N. W. ..	,631	94,0	93,0	80,0	N. W...	,630	89,7	89,8	81,5	N. W...	..	..
	,706	88,0	89,0	81,9	N. W...	,674	91,0	91,0	81,0	N. W. ..	,603	90,5	90,0	80,2	N. W...	,612	87,0	87,0	81,0	N. W...	..	..
	,710	89,0	90,0	78,5	S. W...	,667	92,0	92,5	78,5	S. W.....	,587	92,4	92,0	78,0	S. W...	,603	89,5	89,4	79,2	S. W...	..	..
	,770	89,0	89,5	78,0	N. E. ..	,740	91,2	92,0	80,0	N. E.	,672	90,0	90,8	79,2	N. E. ..	..	..	..	..	N. E...	..	..
	,830	90,0	90,5	81,5	S. E. ..	,793	92,8	93,0	81,0	S. S. E...	,719	94,0	93,5	79,0	S. S. E.	,728	89,8	89,0	79,5	S. E. ..	..	..
	,840	90,0	90,1	81,0	W.	,806	92,6	93,0	80,2	S. E.	,727	94,0	93,0	76,5	S.......	,743	89,0	89,0	77,4	S.......	..	..

The Observations during the present Month, have been made for the most part with a supply of new and first-
uments received into the Observatory, by orders of the Bengal Government, a brief description of the Instrum

Day	Observed at 9 H. 50 M.					Observations made at Apparent Noon.					Observed at 4 P. M.					Observations made at Sunset.					Rain Gauges.	
	Barometer reduced to 32° Fahrenheit.	Temperature.			Wind.	Barometer reduced to 32° Fahrenheit.	Temperature.			Wind.	Barometer reduced to 32° Fahrenheit.	Temperature.			Wind.	Barometer reduced to 32° Fahrenheit.	Temperature.			Wind.	Elevation.	
		Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from Sunrise to 9 h. 50 m.		Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from 9 h. 50 m. to Noon.		Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from 2 h. 40 m. to 4 p. m.		Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from 4 p. m. to Sunset.	Feet. 56 Upper.	Feet. 4 Lower.
	Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
	29,880	90,0	90,1	77,5	W.N.W.	29,854	92,0	92,0	76,0	W. N. W.	29,761	93,0	92,0	76,0	W.	29,763	89,5	90,0	80,0	W.	..	..
	,879	89,8	90,1	78,2	S. W...	,845	92,0	92,6	78,1	S.........	,737	93,0	92,0	75,0	S.......	,751	89,5	89,2	75,9	S.......	..	..
	,870	89,5	89,5	77,5	N. E. ..	,839	92,0	92,0	77,4	N. E.	,758	91,0	91,0	75,0	N. E. ..	,743	89,0	88,0	79,0	E. N. E.	..	..
	,872	90,0	90,4	79,0	S. E. ..	,842	92,5	91,5	78,0	N. N. E.	,765	90,0	90,5	78,0	S. E. ..	,766	88,0	87,8	79,0	S. E. ..	0,46	1,19
	,905	90,0	90,5	79,0	W.	,871	92,0	92,0	81,0	N. N. E.	,797	89,0	88,0	81,0	N.N.W.	,817	85,0	84,8	77,0	N. N. E.	..	..
	..	..	..	..	S. W...	..	..	..	..	S. W.....	..	..	..	..	S. W...	..	..	..	..	S. W...	..	..
	..	..	..	..	S. W...	..	..	..	..	S. W.....	..	..	..	..	S. W...	..	..	..	..	S. W...	..	..
	..	..	..	..	W.S.W.	..	..	..	..	W. S. W.	..	..	..	..	W.S.W.	..	..	..	..	W.S.W.	..	..
	..	..	..	..	N. W...	..	..	..	..	N. W.....	..	..	..	..	N.N.W	..	..	..	..	N. W...	..	..
	..	..	..	..	W.	..	..	..	..	W.	..	..	..	..	W.	..	..	..	..	W.	..	..
	..	..	..	..	S. E. ..	..	..	..	..	N. N. E...	..	..	..	..	N. E...	..	..	..	..	S. E. ..	..	..
	..	..	..	..	S. E. ..	..	..	..	..	E.........	..	..	..	..	S. E. ..	..	..	..	..	S. E. ..	..	..
	..	..	..	..	N. W...	..	..	..	..	N. W. ..	..	..	..	..	N. W...	..	..	..	..	N. W...	..	..
	..	..	..	..	N. E. ..	..	..	..	..	S. E.	..	..	..	..	S. S. E.	..	..	..	..	S. S. E.	..	..
	..	..	..	..	[illegible]	..	..	..	..	E. N. E.	..	..	..	..	N.W.N.	..	..	..	..	N.N.W.	0,92	0,50
	..	..	..	..	N.	..	..	..	..	E. N. E.	..	..	..	..	N. E...	..	..	..	..	N. E. ..	0,37	0,59
	,817	78,5	79,8	77,5	E. N. E.	,764	83,0	83,0	78,5	E. N. E.	,702	79,0	79,5	77,0	E.	,710	77,0	77,0	75,0	E.	0,23	0,36
	,775	80,1	81,3	78,2	N. E. ..	,741	81,0	80,5	78,5	E. N. E.	,660	79,0	79,0	77,0	E.	,688	78,0	79,0	76,5	E.	0,69	0,95
19.	,761	80,5	81,5	79,0	S. E. ..	,698	82,0	83,0	80,0	N. E.	,659	77,6	78,9	77,2	E.	,664	78,0	79,5	77,8	E.	0,69	0,85
20	,750	82,8	82,0	77,0	S. E. ..	,710	83,5	84,6	79,5	S. E.	,648	83,0	81,0	77,0	S. E. ..	,655	78,0	78,0	75,5	S. E. ..	0,23	0,34
21	,733	82,5	84,0	79,0	S. E. ..	,693	84,0	84,6	78,0	S. E.	,646	84,5	84,0	76,0	S. E. ..	,654	81,5	81,5	76,5	S. E. ..	..	..
22	,699	77,8	78,0	75,0	S. E. ..	,755	79,8	80,0	75,5	S. E.	,735	78,0	78,0	74,1	S. E. ..	,745	76,0	77,0	74,0	S. E. ..	0,05	0,08
23	,[illegible]70	82,0	83,0	76,0	S.........	,824	85,0	84,8	76,0	S. S. E. ..	,749	87,0	86,0	77,0	S. S. E.	,757	84,0	84,0	77,0	S. S. E.	..	..
24	[illegible]6	84,5	84,0	78,0	S. W...	,786	88,0	88,5	79,0	S. W....	,719	89,0	87,5	76,0	S. W...	,730	85,0	85,0	77,5	S. W...	..	..
25	[illegible]9	84,0	84,0	77,0	S. W...	,789	85,0	85,0	78,0	S. W......	,731	86,0	86,0	77,0	S. W...	,737	84,0	84,0	76,5	S. W...	..	..
26	[illegible]	86,0	85,0	77,0	N. W...	,839	86,0	87,5	77,0	W. N. W.	,766	88,0	87,0	75,8	WNW.	,778	85,0	85,5	76,0	W.N.W	..	..
27	[illegible]	86,0	87,0	77,7	N. W...	,885	88,5	87,9	78,8	N. N. W.	,823	89,0	88,0	76,1	N.N.W.	,841	86,0	86,5	76,5	N.N.W.	..	..
28	[illegible]	86,[illegible]	86,7	77,5	N. W...	,896	88,5	89,0	77,0	N. N. W.	,847	87,5	87,0	76,5	N. W.	,859	84,0	84,0	77,0	N. W.	..	..
29	3[illegible]	85,0	85,0	75,3	N.	,961	86,0	86,0	73,1	N. W. ..	,901	81,0	81,5	73,2	WNW.	,917	80,0	80,2	73,0	N. W.	..	..
30	[illegible]	80,2	80,8	69,5	N. E. ..	,962	84,0	84,5	71,8	N. E.	,886	86,4	85,0	72,0	N. E...	,893	82,5	82,0	71,2	N. E. ..	..	..
31	29[illegible]	[illegible]1,5	82,5	75,0	[illegible]	,954	86,0	85,8	75,5	N. E.	..	..	..	..	N. E...	..	..	..	..	N. E. ..	..	..

The Observations during the present Month, have been made for the most part with a supply of new and first-rate instruments received into the Observatory, by orders of the Bengal Government, a brief description of the Instruments seems necessary.

Barometer by Troughton, used prior to the 1st June 1844, Observations reduced to 32° Ft. = 29,493
" by Col. Everest, used from 1st June to 31st August, ... Ditto .... = 29,637
" [illegible] Barometer by Newman, used from 1st Sept. .... Ditto .... = 29,654

Observed at 9 h. 50 m.					Noon.					Observed at 4 p. m.					set.					Gauges.	
	Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.		Temperature.			Wind.	Elevation.	
Barometer reduced to 32° Fahrenheit.	Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from Sunrise to 9 h. 50 m.	Barometer reduced to 32° Fahrenheit.	Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from 9 h. 50 m. to Noon.	Barometer reduced to 32° Fahrenheit.	Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from 2 h. 40 m. to 4 p. m.	Barometer reduced to 32° Fahrenheit.	Of the Mercury.	Of the Air.	Of wet Bulb.	Direction from 4 p. m. to Sunset.	Feet. 56 Upper.	Feet. 7 Lower.
Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
30,011	82,5	83,4	74,0	N. E.	29,975	86,0	86,0	71,0	N. N. E.	29,906	88,0	86,0	71,0	N. N. E.	29,919	84,0	83,0	72,2	N. E. ..	..	..
,020	83,0	83,0	72,5	N. E.	,983	85,8	85,8	73,0	N. E.	,929	87,0	85,0	70,1	N. E. ..	,940	83,0	82,5	71,7	N. E. ..	..	..
,062	82,0	82,5	71,9	N. N. E.	30,006	84,5	83,0	71,0	N. E. ..	,941	86,0	84,2	71,0	N.	,950	82,0	82,0	70,6	N.	..	..
,021	81,0	81,9	70,5	N. N. W.	29,973	83,9	83,5	71,4	N. N. E.	,908	84,5	83,5	69,5	N.	,916	81,5	81,4	69,2	N.	..	..
,032	79,5	80,0	72,3	N. W. ..	,981	83,0	83,8	71,2	N. W. ..	,919	84,2	83,5	68,2	N. W...	,937	81,0	80,5	67,5	N. W...	..	..
,006	80,0	81,0	71,4	N. W. ..	,960	83,0	83,9	70,0	N. N. W.	,897	84,0	83,0	70,5	N. W...	,907	80,0	79,5	69,0	N. W...	..	..
,013	81,0	82,5	73,0	N. N. W.	,968	84,5	85,0	73,0	N. N. W.	..	..	..	..	N.N.W.	,922	82,0	81,0	76,0	N.N.W.	..	..
,005	81,0	82,0	71,6	N.	,956	84,5	84,8	70,9	N. N. E.	,901	85,2	84,0	68,8	N.	,908	81,0	80,1	70,0	N.	..	..
,004	81,0	82,4	72,5	N. N. W.	,972	85,0	85,0	69,2	N. N. W.	,898	86,0	84,0	68,0	N.N.W.	,902	82,0	80,2	69,0	N.N.W.	..	..
,035	82,0	83,0	73,2	N. E. ...	,987	86,0	84,8	71,5	N. E.	,936	87,0	84,5	71,0	N. E. ..	,951	84,0	83,0	74,9	N. E. ..	..	..
,054	81,8	80,9	71,0	N.	30,013	82,5	83,8	71,0	N.	,941	86,0	84,4	69,8	N.	,958	82,0	80,0	71,0	N.	..	..
,110	79,2	80,0	69,0	N.	,059	83,8	84,0	69,5	N.	,988	85,5	83,9	66,7	N.	,995	81,0	79,0	69,5	N.	..	..
,104	77,0	78,0	68,2	S.	,059	83,0	83,0	68,5	S. W.....	,984	85,0	83,0	68,0	S. W...	,990	79,0	76,0	67,0	S. W...	..	..
,100	78,0	79,8	66,4	S. W.....	,056	83,0	83,0	67,0	S. W.....	,988	84,5	83,0	66,0	S. W...	,991	80,0	77,5	65,0	S. W...	..	..
,129	78,5	79,0	70,0	N. W.....	,088	82,5	82,7	68,0	N. W. ..	30,022	84,5	82,2	66,0	N. W...	30,031	81,0	79,0	68,0	N. W...	..	..
,129	78,5	79,0	71,0	N. W.....	,114	81,5	81,0	70,0	N. N. W.	,049	84,0	82,2	67,0	N. W...	,043	80,0	77,5	69,0	N. W...	..	..
,146	79,0	80,0	70,8	W.	,101	82,5	82,5	70,9	W.	,027	84,0	82,0	69,5	W.	,034	80,2	78,5	70,4	W.....	..	..
,101	78,5	79,1	71,0	N. W.....	,052	82,5	82,0	70,6	N. N. W.	29,978	83,5	82,0	68,0	N. W...	29,999	79,5	78,8	66,0	N. W...	..	..
,103	75,5	76,0	68,5	N. W.....	,052	79,0	79,0	69,7	N. W. ..	,994	81,5	79,0	68,0	N. W...	,995	78,0	77,0	67,0	N. W...	..	..
,111	78,0	77,8	69,0	N. W.....	,061	80,0	80,0	71,0	W.	30,004	82,5	80,5	70,4	N. W...	30,015	78,0	77,0	66,0	N. W...	..	..
,139	76,5	77,1	70,0	N. N. W.	,088	80,5	80,8	70,2	N. N. W.	,025	81,0	79,9	70,0	N.N.W.	,030	79,0	78,0	70,0	N. W...	..	..
,136	78,0	78,6	70,5	N.	,077	82,0	82,0	70,5	N.	,010	82,1	81,0	69,0	N.	,018	79,0	78,0	69,0	N.	..	..
,111	78,0	78,0	70,6	N. N. W.	,066	80,5	80,5	69,5	N. N. W.	,000	83,0	81,0	69,5	N. W...	,010	79,2	78,0	68,0	N. W...	..	..
,067	76,0	77,0	67,0	N. W.....	,014	80,5	80,9	68,2	N. W. ..	29,937	83,5	81,5	66,0	N. W...	29,947	80,0	77,5	68,0	N. W...	..	..
,092	75,2	76,0	65,5	N. N. W.	,046	80,5	80,9	65,8	N. N. W.	,983	83,0	81,5	64,0	N.N.W.	,989	79,0	78,0	64,2	N.N.W.	..	..
,102	74,0	75,0	63,8	N.	,041	78,5	78,8	62,0	N. E	,950	81,9	79,4	62,0	N. E...	,953	77,5	74,0	63,5	N. E. ..	..	..
,056	74,0	74,5	63,5	N.	,004	78,0	78,0	62,5	N.	,947	80,2	78,0	67,0	N.	,951	76,5	73,8	68,0	N. ...	..	..
,051	74,5	75,0	65,5	N.	,002	79,0	78,8	63,0	N.	,930	80,0	78,0	67,0	N.	,925	77,1	75,8	68,5	N.	..	..
,052	75,8	75,2	63,5	N.	,014	78,5	78,0	65,0	N.	,942	76,8	74,9	67,0	N.	,944	76,8	74,9	67,0	N.	..	..
,007	75,0	75,5	66,2	N.	29,981	79,5	80,0	67,4	N.	,896	80,9	80,7	67,0	N.	,893	79,0	76,2	68,5	N.	..	..
30.071	78 5	79.1	69.5		30.025	82,1	82,1	69,1		29,959	83,5	81,9	68,1		29,965	79,9	78,6	68,8			

The Observations during the present Month, have been made for the most part with a supply of new and first-Instruments received into the Observatory, by orders of the Bengal Government, a brief description of the Instrum seems necessary.

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Monthly Proceedings of the Society.

(*Friday, the* 11*th of July* 1845.)

Rajah Radakant Deb Bahadoor, Vice President, in the chair.

The minutes of the last meeting were read and confirmed.

Members Elected.

Lieut. H. A. Olpherts, of the artillery, who was proposed at the last meeting, was duly elected a member of the Society.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election :

Major William Sage, (48th N. I.) Superintending Engineer, S. E. Provinces, proposed by C. K. Robison, Esq., seconded by the Secretary.

George Taylor, Esq., Barrister at law, proposed by the Secretary, seconded by Rajah Radakant Deb.

Presentations to the Library.

Journal of the Asiatic Society of Bengal, Nos. 72 and 73. *Presented by the Society.*

The India Journal of Medical and Physical Science, Part VII. of Vol. III. *Presented by Dr. Finch.*

Garden and Museum.

1. Specimens of winter Barley (Hordeum tetrastichum), and of two-rowed Barley (H. distichum). *Presented by Dr. Wallich.*

Dr. Wallich states, that these specimens have been sent down by Major Lawrence, who has reared them in Nepaul, from a small supply which he (Dr. Wallich) received from Dr. Royle at the India House in November last.

2. A supply of beet, cauliflower, artichoke, and mignonette seed, the produce of the Branch Society's garden at Bauglepore. *Presented by Major Napleton.*

3. Six Mazagon Mango seedlings. *Presented by C. K. Robison, Esq.*

4. Six specimens of Wood from Kursiong in the Darjeeling territory, from Dr. Campbell, Supt. of Darjeeling. *Presented by C. Beadon, Esq.*

5. Two specimens of Wood from the jungles South of Poorulea. *Presented by Capt. S. R. Tickell, Assistant Commissioner of Chota Nagpore.*

6. A small supply of Nerbudda white Linseed, produced at Monghyr, fully equal in size to the original grain. *Presented by P. Palmer, Esq.*

Floricultural Exhibition.

A report from the Garden Committee, regarding the next exhibition of flowers, was the subject which first occupied the attention of the meeting. The Committee annex a schedule of prizes, amounting to 120 rupees, for the best specimens of exotic and indigenous produce. They recommend, that the show be held at noon on Monday the 25th of August, and suggest two additional conditions, to the effect that prize plants be precluded from being brought forward a second time for competition, and that each competitor certify to the specimens having been, at least, three months in his possession.

The Report and additional conditions were agreed to.

The Timber Trees of Darjeeling and Poorulia.

Two interesting communications from Capt. Tickell and Dr. Campbell, on the subject of the specimens of Woods above alluded to, were next read. Dr. Campbell observes, that there are an immense number of excellent woods in the Darjeeling territory, which it would be highly desirable to introduce into the Calcutta market; and the specimens he now forwards are sent in order to learn the probable market value per 100 cubic feet, with the view of ascertaining if they could be profitably forwarded to Calcutta in large quantities. Dr. Campbell adds, that these samples have been taken from Kursiong, as that place is within five miles of hackery carriage, and that there are many more kinds of wood in the same place.

The following is a copy of Capt. Tickell's letter:

My dear Sir,—I beg to send you samples of two very beautiful kinds of Wood, which I have come accidentally across in the jungles south of this station. The specimen marked 1, is known to the jungle people (Sootals, Bhoomijes, &c.) who call it "Kendar" or "Kerria;" but I do not hear that they make any use of it. The appearance of the sample will speak for itself. To *my* taste—it is more beautiful than mahogany, having a *rosy* hue which that wood has not. The sample is cut from near the bark, so as to give a fair average idea of the wood. The heart is of course superior, and still richer in colour. It works easily and smoothly, does not chip or crack by the weather, and the grain, as you will perceive, is so fine, that the smallest work with the highest finish could be done in it.

The specimen No. 2, is coarser and inferior; but still, I think, handsomer than "Toon." The tree is unknown and unnamed here. The one from which the sample was taken, was cut down by a carpenter of mine, out of mere curiosity. This wood also appears to stand the weather well. I showed a log of it to Colonel Ouseley, G. G. Agent S. W. F., who appeared to think it was the "Rohunee," or mahogany of Upper India; but was uncertain.*

Of the trees, I cannot yet speak so as to describe them properly; but in the cold weather I shall endeavour to visit the jungle where they are found. (The trunks are large enough to give planks of two feet breadth). In the mean time I have sent people to bring in all the young plants they can find; also the seeds, (if on the tree); and I propose sending some of both down to you, if you consider them acceptable.

I cannot but think, that the production in places so near Calcutta of so beautiful a wood for the purpose of ornamental furniture, &c. is an object of some importance; and I would beg to suggest to the Society the advantages likely to be gained in forming large plantations of a tree which may perhaps, by better judges than myself, be thought mahogany.

The trees hitherto found are described to me as growing on the banks of water-courses at the foot of hills. The moist soil of Bengal might possibly be unfit for their growth; but the wood would be, I think, sufficiently valuable to cover the expense of land carriage from hence to Calcutta; or at all events from Bancoorah to Calcutta; supposing that the plantations could not be established at the latter place.

In conclusion, I shall be most happy to receive any instructions from judges in these matters—as to the points of information necessary to be furnished—previous to the Society coming to any resolution respecting the plantations, the establishment of which I earnestly hope will not be neglected.

I am, &c.,

Poorulia, June 19, 1845. S. R. Tickell.

At the close of the perusal of the above letters, the Secretary mentioned that he had requested Captain Tickell to favour the Society with seeds and young plants of these trees. He had, moreover, solicited

* Dr. Wallich has kindly offered to set this question at rest on receiving specimens of the leaves, &c.—Sec.

Captain Tickell to send him, if possible, a sufficient quantity of the specimen marked No. 1, (which was very generally admired,) to be worked up into a small table.

After some little discussion, it was agreed that all these specimens (with copies of communications) should be sent, in the first instance, to Capt. Goodwyn, with a request that he would oblige the Society by having them subjected to trial, and by making such other experiments on them as he may deem fit.

The Timber Trees of Upper Assam.

The Secretary next brought to the notice of the meeting a valuable paper from the pen of Capt. F. S. Hannay, containing a list of the principal timber trees growing in the vicinity of Jeypoor, in Upper Assam, with an account, based on his own experience, as to the quality of some of the kinds, the general opinion of the people as to the uses and properties of all, together with a few observations on the localities of different forests, and the practicability of obtaining the best kinds for exportation. Capt. Hannay observes, that most of the trees in the list will be found to correspond with those in Mr. Masters' catalogue of timber trees of Upper Assam, published in the third volume of the Society's Journal, and as he believes they comprise all of what may be called "Forest Timber Trees," growing on the plains and on the hills, it may be considered of importance, with reference to the future timber trade of Assam, that the different samples and list should find a place in the Society's rooms for the inspection of the timber merchant.

The Secretary mentioned that, at the request of Capt. Hannay, the above paper had been forwarded to him by Major Jenkins, who had moreover added a few notes thereto in reference to such of the varieties as had come more immediately under his notice. The specimens had been despatched from Gowhatti, but had not yet reached their destination.

Botanical Observations in Upper Assam.

The Secretary intimated the receipt of another interesting paper on the plants found in the district round Sibsagur and Nazera, in Upper Assam, which had also been forwarded by Major Jenkins, at the request of the author, Mr. J. W. Masters. Mr. Masters mentions, that the observations noted in this paper are confined entirely to that part of the valley of Upper Assam, lying between N. Lat. 26° 35′, and 27° 35′, and E. Long. 94° 30′, and 95° 30′, bounded on the E. and S. by the Naga Hills; on the W. and N. by the Brahmapootra river; and that nearly all the plants enumerated have been collected between the Dessi and Booree Dihing rivers, on elevations not exceeding 650 feet above the level of the sea.

It was directed, that the best thanks of the Society be given to Capt. Hannay and Mr. Masters for their respective communications, which were transferred to the Committee of Papers.

Horticultural Exhibition at Lucknow.

A letter from Capt. Hollings, Secy. of the Branch Society at Lucknow, was next read. Captain Hollings encloses a list of prizes, amounting to 68 Rs., which were given to the different Mallees belonging to the gardens in the cantonment and city of Lucknow, at a show held on the 9th June last. The exhibition of vegetables and fruits comprised many varieties; there was also a small assortment of flowers and field produce. The Mango to which the largest prize was awarded weighed 44 rupees. Captain Hollings adds, "The show far exceded our anticipations, and there cannot be a doubt that a periodical repetition will ensure the attainment of the object we have in view."

The Wheat of British India.

The following letter from the Secretary E. I. and China Association, was next submitted.

London East India and China Association,
Cowper's Court, Cornhill, 30th April, 1845.

SIR,—The present is to acquaint you, that Mr. Hutt has several notices before Parliament on the subject of Australian Wheat and Flour, and Wheat of British India, and that this Association has caused a petition to be presented to the House of Commons, numerously signed, in aid of your Society's petition presented the 4th June 1844, praying, that Wheats of British India may be admitted at the same rate of duty as Wheat and Flour the produce of Canada.

Yours, &c.
JOHN STIKEMAN,
Secy. E. I. and China Association.

Introduction of the Coffee Plant into the Deyrah Dhoon.

An interesting note from Mr. Vansittart, the Supt. of the Deyrah Dhoon, was next read. After alluding to the receipt of a quantity of

French madder seed from the Society, which seed he had long been trying to obtain, but unsuccessfully, and asking for a larger supply, with the view of giving it a trial at various elevations, Mr. Vansittart remarks :

"I have after numerous failures been very successful in growing coffee from seed obtained from the Neilgherry hills and the Mysore district. The plant grows well in these hills, and has much resemblance to the Bengal plant. The difficulty has been the obtaining seed fresh enough. I have no doubt that the cultivation of coffee will become a staple of the Dhoon. It is difficult to *overcome the apathy of natives*, but I have advantages in the energetic exertions made by the European grantees of the Dhoon grants.

"I wish that you could obtain some fresh coffee seed for me when the ripening season comes round. I am also sure, that cardamom and black pepper could be grown; but I have not been successful in obtaining any seed. I should be much obliged if you could assist me."

The Secretary mentioned that, through the kindness of Mr. W. Storm, he had been enabled to send a small quantity of pepper seed to Mr. Vansittart; and that Colonel Ouseley had obligingly offered to forward a good supply of coffee seed direct from his fine plantation at Burkaghur.

Formation of a Public Garden at Mirzapore.

Mr. Ommaney, the Collector of Customs at Mirzapore, communicates in a letter dated the 2nd July, the pleasing intelligence of the proposed formation of a Public Garden at that station, and requests the assistance of the Society in furnishing seeds and plants. Mr. Ommaney mentions, that the Magistrate and Collector has provided a fine eligible piece of ground for the purpose, and the residents have subscribed towards the project.

The Secretary was requested to meet this requisition as far as the means of the Society would admit.

Beneficial Effects of Under-draining.

In his letter forwarding the communications of Capt. Hannay and Mr. Masters, Major Jenkins alludes to the beneficial effects which have resulted from the system of under-draining on wet soil, the particulars of which were submitted by him last year, and published in the third volume of the Society's Journal. He states: "I gave you a short time back some account of my having rendered a bog tolerably good garden ground by under-draining it. I can now add, that it still continues to be very satisfactory garden ground. In the cold weather I had a fair crop of wheat and barley off a part of it, (the season was very dry and unfavorable): also good sugar-cane, and since, a very fine crop of maize; and about one-half I have now planted out with orange trees, for a permanent orange orchard, and all the trees are very thriving."

Communications on various subjects.

The following letters were also submitted:

1. From Dr. Robert Wight, enclosing a letter to his address from Mr. Fischer of Salem, which gives some useful information about the Nerium Indigo.

2. From P. P. Carter, Esq., of Bojepore factory, near Buxar, giving an account of the successful cultivation of the China sugar-cane.

The Secretary mentioned that, on receipt of the above letter, he had addressed Mr. S. H. Robinson of Dhoba, who had kindly given him such information as had enabled him to answer Mr. Carter's queries in a satisfactory manner.

The above two letters, and that of Mr. Robinson, were referred to the Committee of Papers.

3. From Capt. W. W. Dunlop, Secy. Branch Society at Cuttack, acknowledging the receipt of the French madder seed, and promising to give it every attention: stating also that the American Sumach has come up very well, and will be transplanted after the first rains. Capt. Dunlop adds:

"This year a considerable number of musk-melons have been raised in the Society's Garden from seed received from various quarters; the fruit readily formed and ripened, but the flavor of none was equal to what is grown in the bed of the Moosee river at Hydrabad. The fruit to which I allude is of a greenish colour, and of true melon shape, with rather rough skin. I have written for some of this seed to sow next year, and if I am fortunate enough to procure it, I will send you some."

4. From G. C. Cheap, Esq., dated Bauleah, 4th July, suggesting the importation of Egyptian onion and melon seed.

The Secretary was requested to carry Mr. Cheap's suggestion into effect.

5. From Col. J. R. Ouseley, intimating his readiness to comply with the Society's request for a further supply of wheat, white linseed, &c. from the Nerbudda valley. Col. Ouseley mentions, that the wheat has

been partially blighted, and will not look so well; but that for seed it will do as well as the most beautiful grain.

6. From Messrs. Smith, Huffnagle and Balfour, giving extract of a letter from Messrs. Bevan and Humphreys of Philadelphia, in acknowledgment of an order for 500 maunds of Carolina seed paddy, which was given to the first named firm, by the government of Bengal, in January last, with the view of carrying into effect the recommendation of the Commissioner of Arracan for the general introduction of this superior description of grain into that province.

Messrs. Bevan and Humphreys express their intention of shipping the paddy in November next, which will afford time for its arrival in Calcutta at the next sowing season, March and April.

7. From C. Beadon, Esq., Under Secy. to the Government of Bengal, intimating the remission of duty on the bust of Dr. Carey.

For all the above communications and presentations, the best thanks of the Society were accorded.

(*Wednesday, the 13th of August* 1845.)

The Hon'ble Sir Lawrence Peel, Vice-President, in the chair.

The minutes of the last General Meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society, viz:

Major Wm. Sage, Superintending Engineer of the S. E. Provinces, and George Taylor, Esq., Barrister at law.

Candidates for Election.

The names of the following gentlemen were submitted as candidates for election:

H. B. Beresford, Esq., Civil Service, Balasore, proposed by Dr. Strong, seconded by the Secretary.

Wm. Stalkart, Esq., Goosree, proposed by Mr. R. Dodd, seconded by Mr. C. K. Robison.

George Dearman, Esq., (firm of Livingstone, Syers and Co.) proposed by Mr. Dodd, seconded by Mr. John Jenkins.

Owen Potter, Esq , (firm of Potter and Co.) proposed by Mr. Dodd, seconded by Mr. Robison.

John Hamilton, Esq., (firm of Mackenzie, Lyall and Co.) proposed by Mr. Robison, seconded by Mr. Dodd.

H. W. Abbott, Esq., Deputy Secretary, Union Bank, proposed by Mr. W. G. Rose, seconded by Mr. John Storm.

Presentations to the Library.

1. Proceedings of the Ceylon Agricultural Society to the 31st of December 1844. *Presented by the Society.*

2. Transactions of the Society of Arts, vol. LV. *Presented by the Society.*

3. Journal of the Asiatic Society of Bengal, No. 74. *Presented by the Society.*

4. The India Journal of Medical and Physical Science, No. VIII. of vol. III. *Presented by Dr. Finch.*

Garden and Museum.

1. A small supply of fruit trees, consisting of mango, pumplenose, and bread-fruit grafts. *Presented by the Madras Agri-Horticultural Society.*

2. A few seedling mango plants from the Royal Botanic Garden at Mauritius. *Presented by C. K. Robison, Esq.*

3. A fine supply of rare varieties of plants and cuttings for the flower garden. *Presented by Sir L. Peel.*

4. A varied assortment of vegetable, flower, and fruit seeds; also samples of Nerbudda and English wheats, all the produce of the public garden at Lucknow. *Presented by Capt. G. E. Hollings, on behalf of the Lucknow Branch Society.*

5. A further small supply of two kinds of English Barley acclimated at Nepaul. *Presented by Dr. Wallich.*

6. A few seeds of the Bermuda Cedar, forwarded by H. E. Lieut. Col. Reid, R. E., Governor of Bermuda. *Presented by H. Piddington, Esq.*

7. A few seeds of the Hydrabad Melon, described to be a superior variety. *Presented by Capt. W. W. Dunlop, Secy. of the Cuttack Branch Society.*

8. A small supply of Nerbudda Julalya, and Sohalya Wheats, of white Gram and white Linseed, the produce of Chota Nagpore. *Presented by Lieut.-Colonel J. R. Ouseley.*

Colonel Ouseley mentions, that this seed was grown by a zemindar by name Heera Sing Chowdry, from seed supplied from his (Col. Ouseley's) garden; and he adds, "he has enough seed now to distribute among others, and I think it will extend, as it is in great request, and quite a wonder to the other gentlemen farmers."*

9. A small quantity of seed of the Hill Bamboo, of wild Indigo, and wild Coffee. *Presented by W. Storm, Esq. on behalf of J. Pontet, Esq. of Bauglepore.*

Mr. Pontet states, that the wild Coffee was only discovered by him last year, and owing to the careless way in which it has been gathered, namely, after it had been a month on the ground, the color is not so good as it would otherwise be. Mr. Pontet thinks, that it will nevertheless be sufficient to prove that the soil in parts of the Bhauglepore district is well adapted for producing coffee; and he adds, that wherever he has discovered the plant, it has been invariably in rather shady places, and protected by hills from the westerly winds.

10. Samples of Agricultural seeds, wheat, barley, mungal-worzel, hemp, flax, rape, tares, &c. *Forwarded by Dr. Royle, from the India House, by the June Overland Mail.*

In his letter forwarding this packet, Dr. Royle intimates, that the above are samples of a large supply of agricultural seeds, which the Court of Directors have authorised him to send to the Society. The whole consignment has been furnished by Messrs. Wrench, one of the longest established and largest seedsmen of London; and shipped on board the *Wellesley.* These samples have been sent by the Overland conveyance, with the view of submitting them to experiment, and comparing the result with that from the same batch of seeds sent by sea. Dr. Royle adds, that some oats and carrot seeds have also been sent by the Overland conveyance to Colonel Gwatkin, to submit to experiment in the North West Provinces.

11. A few shawls of Mysore manufacture. *Forwarded for exhibition by Dr. Mouat.*

(Further notice of these shawls will be found in the body of the proceedings.)

12. A fine collection of specimens of Assam Timber trees. *Presented by Capt. S. F. Hannay.*

A few musters of Satins and Muslins, dyed with common flowers by a lady resident in Purneah, were also exhibited, and much admired for the beauty of their colours. The process of imparting the tints is described as being very simple, consisting merely in steeping the flowers

* Shortly after the meeting had broken up, a second communication was received from Col. Ouseley, intimating that in accordance with the request of the Society, he had despatched 133 seers of white linseed and 82 of Julalya wheat, which had just arrived from the Nerbudda.—Sec.

in boiling water for half an hour or so, and keeping the stuffs in it for a certain time, according to the depth of tint required; they are then hung up to dry in the shade, without being subjected to pressure. The flowers employed on this occasion were those of the *Hibiscus rosa sinensis*, and *Mussænda frondosa*.

Sugar-cane, Fruit trees, Flower plants, and other Cultures at the Nursery Garden.

A report was brought up from the Garden Committee of a late visit to the Nursery. The Committee state, that the whole of the cane plantation is progressing favorably, and that the total quantity of cane for distribution during the season 1845-46, will average 43,000. They recommend, that the distribution commence from the 1st of October, and that a charge of six rupees per hundred be made inclusive of straw bands and the expense of packing, or 5-8 per hundred without packing. The Committee report favorably of the newly-formed flower garden, which has been mainly stocked with a fine supply of plants and cuttings presented by Sir L. Peel. They recommend pucka walks to be made throughout this plot of ground, at an extra expense not exceeding 115 rupees. The Committee allude to the receipt of a few fruit-tree grafts and seedlings from the Madras Agricultural Society, and from Mr. C. K. Robison, for the fruit-tree nursery, and state that all the other trees in this section of the garden are in good condition. They further intimate, that two beegahs of ground have been apportioned, and are in course of preparation for a kitchen garden; and close their report by an allusion to the state of the arrow-root, tapioca, ginger, Guinea grass, and other useful cultures.

The Report of the Committee was confirmed.

Application of Wind-mill power in India.

A communication from Dr. Buist, written at Alexandria, intimating his intention of preparing a paper for the Society's Journal on the application of Wind-mill power in India for raising water, and for other purposes, was next read. The following is extract of his letter, dated 7th of June:

"I write you from Alexandria on a matter of the Agricultural Society's business. Before leaving Bombay I had for some time been engaged in the construction of Wind-mills for the purpose of raising water, of such simple form as to be within the reach of native craftsmen. I made two for the Government garden at Kurrachee, and hope before leaving

England to hear of the result of their operation. When at Cairo I narrowly examined the numberless Wind-mills there employed in grinding wheat for the Pasha. I made some drawings, which I hope to have completed here. I wish to write you a long letter on the subject for publication in your Transactions, if you think it deserving of so much honor. Will you allow me to have wood-cut illustrations engraven for it in London? They would cost about £8, or Rs. 70. I shall have them stereotyped, so that the subject being of universal interest, the article might go the round of all the newspapers in India.

For Bombay, besides this I shall have a small working model made up at home, such as the stupidest native carpenter could copy: it will cost about £5. Would your Society like to have another of the same? When one sees the extent to which Wind-mills are employed in a country so barbarous as Egypt, it seems quite monstrous that we should have nothing but human labour called into use for the most ordinary purposes in India. Is there a single Wind-mill in the Company's dominions? The Egyptian Flour-mill is a very simple, workable, common-sense machine, cheap, and easy of construction, and scarcely capable of being mismanaged, and never by any chance out of order. Our sea-breeze at Bombay is three times as strong as the winds by which the mills at Cairo are driven.

"Will you kindly write me on these subjects. I shall most likely take the engraving into my own hands, and have the letter above referred to with illustrative wood engravings got up, and despatched on my own responsibility, before I can receive your reply. I shall trust to you for requital.

"It is as touching the model I wish you to write; this I shall not meddle with without your authority."

Resolved—That the thanks of the Society be given to Dr. Buist for his obliging offer, and that the expense for wood-cut illustrations and a model be incurred.

Rapid and satisfactory progress of Silk culture in the Mysore country.

The papers next submitted had reference to the shawls referred to under the head of presentations. Dr. Mouat states, that he sends these fabrics with the view of giving the Society an idea of the Mysore silk manufacture. The silk was obtained from worms reared in the neighbourhood of Bangalore, where, Dr. Mouat mentions, there is a splendid mulberry garden and stone worm-house containing an immense number of the insect in every stage, from the egg to its perfect and mature condition. "Captain Haines, the superintendent of the garden," adds Dr. Mouat, "has promised to send me an account of it with specimens of the cocoon and raw silk when reeled. The manufactured condition is well exhibited in the specimens now submitted, of which the dyes, patterns, and every thing connected with them are the unaided labours of the Bangalore manufacturers, with the single exception perhaps of the reels, some of which were constructed by Captain Green of the Madras Engineers, and are very simple and efficient; the shuttles used are all native, and of the rudest and most primitive form. It was my intention when I visited the garden and manufactures carried on within the pettah or native town of Bangalore, to have drawn up a short account of them for the Society; but as the Officer in charge of them, who is not only well acquainted with the subject but takes a great interest in it, has kindly promised to do so, the Society will be no loser by my silence. The silk manufactures of every part of India are so important and capable of being carried to so great a pitch of perfection, as to be worthy the attentive consideration of all who take an interest in developing and improving its resources."

Dr. Mouat concludes his letter with a few remarks regarding the vegetable products of Bangalore, and its natural advantages as regards climate and soil, which he thinks, might, with a little public spirit and enthusiasm in agricultural pursuits, be rendered much more productive, than at present, to the surrounding country.

In connection with the above letter, the Secretary drew the attention of the meeting to the first volume of the Society's Journal, page 196, wherein is published a correspondence which took place in 1841, between the Bangalore Society and this Institution, relative to the mode of manufacturing silk in Mysore at that period, with suggestions for its improvement. He stated, that it was in consequence of the specimens of raw silk forwarded on that occasion, being considered very coarse,—more like fine flax than silk,—that this Society was induced to furnish the Secretary of the Bangalore Society, through a correspondent, with a supply of eggs of the Bengal silk-worm. The result of this introduction, combined with the care and attention since paid to the culture,—judging from the manufactures now on the table,—was indeed very gratifying. To make the information on this subject more complete, he had the pleasure of submitting a report on these shawls in a communication with which he had been obligingly favoured by Mr. J. W. Laidlay, a member of the Society.*

* For this letter, see page 137 of Correspondence.—*Eds.*

The Metcalfe Hall.

A letter was read from Messrs. Burn and Co., intimating the receipt of Rs. 3,972 : 13 : 3 from the Metcalfe Hall Committee, and suggesting that a moiety of the balance still due to them on account of the Metcalfe Hall, be contributed by the Society, and the other half by the Public Library.

Communications on various subjects.

The following letters and papers were also submitted :—

1. From J. W. Laidlay, Esq., on a mode of ascertaining the amount of crystallizable sugar in *khar* or Muscavado.

2. From E. C. Ravenshaw, Esq., enclosing a letter to his address from Mr. Field, relative to the attempts lately made for the introduction of American cotton into the district of Shahabad.

3. From W. Haworth, Esq., submitting a report of experiments on indigo under various modes of treatment.

4. From Dr. Wallich, enclosing a communication to his address from Major Williams, in charge of the Kyouk Phyoo district, regarding a peculiar description of mango, some plants of which he intends sending to the Society.

5. From F. W. Russell, Esq., giving an account of his experiments with guano on vegetables.

The above communications were referred to the Committee of Papers.

6. From George Gardner, Esq., Supt. of the Royal Botanic Garden at Kandy, intimating his intention of meeting the wishes of the Society for certain descriptions of fruit trees from Ceylon.

7. From J. W. Yule, Esq., detailing the result of trials made by him at Ramnuggur, in the Champarun district, on a large assortment of seeds received from the Society.

8. From Major T. E. A. Napleton, Secy. of the Branch Society at Bhauglepore, returning thanks for a quantity of guano and madder seed.

9. From T. G. Cleeve, Esq., Secretary of the Moorshedabad Branch Society, applying for a quantity of seeds and plants.

The Secretary mentioned that this request was about being complied with.

10. From Captain S. F. Hannay, Commandant of the Assam Light Infantry, dated Dibroghur, Upper Assam, intimating that there is an erroneous statement in the memoir of Dr. Griffith, by Dr. McClelland, at page 32, of the present volume of the Society's Journal, relative to the Batta-

lion under his command, which he wishes to correct. Capt. Hannay alludes to that part where it is mentioned that whole guards of the Assam Light Infantry were occasionally decapitated at night by the Nagas as they lay asleep; and states that such could not have been the case, as that regiment was never in collision with the Baza tribes of Upper Assam prior to 1841-42.

The Secretary informed the meeting, that he had sent the substance of Capt. Hannay's letter to Mr. McClelland; who had, in reply, furnished him with a brief memorandum on the subject. Mr. McClelland observes, that when Mr. Griffith and he returned from the Naga hills on the occasion alluded to, they were informed that they had been amongst the worst tribe, or one of the worst tribes of Nagas. Further, that Capt. Hannay was not in Assam at the time adverted to; and that the Assam Light Infantry was then commanded by Major White, who was afterwards decapitated during a night attack, on at least four companies of the Assam Infantry at Suddya, if not by the Nagas, at least by other tribes, equally expert at their peculiar mode of warfare.

8. From Messrs. Smith and Campbell of Sydney, advising the despatch of the consignment of N. S. Wales and Van Dieman's Land wheat ordered last year by the Society.

The Secretary intimated, that the supply had been unfortunately lost, having been shipped on the *Hydrabad.*

For the foregoing communications and presentations, the best thanks of the Society were accorded.

(*Wednesday, the* 10*th September* 1845.)

C. K. Robison, Esq., Vice-President, in the chair.

The minutes of the last General Meeting were read and confirmed.

Members Elected.

The gentlemen proposed at the last meeting were duly elected members of the Society, viz.:

Messrs. H. B. Beresford, Wm. Stalkart, George Dearman, Owen Potter, John Hamilton, and H. W. Abbott.

Candidate for Election.

H. Vansittart, Esq. C. S., Superintendent of Deyrah Dhoon, was proposed as a member by the Secretary, seconded by Mr. Robison.

Presentations to the Library.

1. The Calcutta Journal of Natural History, No. 22. *Presented by Dr. McClelland.*

2. Journal of the Asiatic Society of Bengal, Nos. 75 and 76. *Presented by the Society.*

3. The India Journal of Medical and Physical Science, No. IX. of Vol. III. *Presented by Dr. Finch.*

Garden and Museum.

1. A fine supply, consisting of 133 seers of white Linseed, and 82 seers of Julalya Wheat from the Nerbudda valley. *Forwarded by Col. J. R. Ouseley.*

The Secretary informed the meeting, that owing to the precautionary measures adopted by Col. Ouseley, this supply had reached in excellent condition, and was now available for distribution to members.

2. Five seedlings from Arracan of the peculiar variety of Mango noticed in the last month's Proceedings. *Presented by Major D. Williams.*

3. One hundred Malda Mango grafts of six kinds. *Forwarded by Dr. John Lamb.*

The Secretary mentioned, that the whole of this supply had arrived in good order, and would be planted out shortly in the fruit-tree nursery.

4. Specimen of Madder root (Rubia tinctorum) raised at the Botanic Garden at Sooneri. *Presented by Dr. Alexander Gibson, Superintendent of the Botanic Gardens, Bombay Presidency.*

5. Specimens of Maize, the produce of his garden, from American seed. *Presented by Rajah Radhakant Deb, Bahadoor.*

Exhibition of Flowers.

A list of prizes, amounting to eighty three-rupees, which were awarded at the Floricultural Exhibition held on the 25th of August, was laid on the table. In the remarks appended to this list, it is stated that the collection of flowers brought forward, at this third quarterly show, was greater than was anticipated, considering the heavy falls of rain experienced at the end of July, and the greater part of August. The assortment of indigenous flowers was however much less varied than the present season of the year, so favorable for them, gave promise of. Among the exotics, verbenas of three kinds; roses, of three sorts; petunias, jatrophas, maurandyas, malphigias, and cordia sebastena, afforded about the best specimens; of the zinnias and passifloras there was a very poor collection, and of the kennedya monophylla, virgilea aurea,* and a few other kinds named in the list, there was not a single specimen. The prizes offered for these were accordingly transferred to some very pretty specimens of the justicia carnea, solanum coriaceum, xylophylla angustifolia and elongata, hemerocallis japonica, lophospermum scandens, and a few others as enumerated in the list.

The collection of indigenous plants and cut specimens, as before observed, was by no means equal to the foreign. There was, however, a large variety of ixoras, and some pretty kinds of balsams, thunbergias, &c. The cleredendrons and bignonias were a failure, and there were few or no specimens of the ipomœa, convolvoli and mimosa families, or of 5 or 6 others, for which prizes were held out.

The great preponderance of plants in pots over cut specimens was a good feature in this exhibition. With the exception of a couple of fine bouquets and a few vases of flowers, the whole of the room was occupied by healthy growing plants.

Horticultural Exhibition.

A report from the Fruit and Kitchen Garden Committee, regarding the next show of vegetables and fruits, was submitted. The Committee propose, that the show be held on Friday the 24th October, at 10 A. M., and give a schedule of prizes, amounting to 104 rupees, to be awarded on that occasion. The report was agreed to.

Defaulters to the Society.

An extract from the Proceedings of the last monthly Meeting of the Finance Committee was next read. The Committee state that, in virtue of the authority vested in them by the General Meeting of the 14th September 1842, they have addressed a few members of the Society, who are much in arrear with their subscriptions; that two of these gentlemen have taken no notice of their repeated communications, though both of them are more than three years in arrear, and they therefore suggest the publication of their names in the Proceedings of the Society, in terms of the following resolution :

"That the Finance Committee have the power to revise from time to time the list of subscriptions in arrear, and that they be empowered to publish periodically the names of those defaulters, the recovery of whose subscriptions is hopeless."

The Committee add, that they have allowed a longer time to the other members, as they have acknowledged their liabilities, and expressed a willingness to meet them.

Resolved—That the names of the two members referred to by the Committee be placed on the Proceedings, and published as defaulters to the Society, viz.:

Baboo Woomeschunder Roy of Santipore, and Mr. F. A. J. Elson of Chittagong.

The Metcalfe Hall.

Dr. Egerton, as a Curator of the Calcutta Public Library, laid before the Meeting a copy of the Proceedings of the Proprietors of that Institution, held at the Metcalfe Hall, on the 27th ultimo, and intimated that the subscription therein referred to, was progressing favorably. Whereupon, after a little discussion it was proposed by Mr. Robison, V. P., and unanimously *Resolved*—

"That with reference to the Proceedings of the Public Library Proprietors, furnished to this meeting by Dr. Egerton, a *Special* Meeting of the Agricultural Society be held at 4½ o'clock this day week, to consider all matters connected with the debt upon the Metcalfe Hall, and that the Secretary to the Metcalfe Hall Committee be requested to furnish this Society before that day, with all papers and accounts necessary for a due consideration of the subject."

Communications on various subjects.

The following letters were also submitted:

1. From Capt. F. S. Gabb, Secy. to the Agricultural Society at Madras, enclosing extract from the Proceedings of a Committee of the Society on the subject of certain prizes awarded for the best specimens of silk, the produce of the Madras Presidency.

2. From Robert Smith, Esq. of the Military Board Office, giving the result of certain experiments made by him with guano on flowers.

3. From Capt. J. C. Brooke, submitting a recipe for the preparation of the *salep-misree* root.

4. From the Secretary, Society of Arts, forwarding an analysis of the Shan black vegetable dye; and intimating that the Society's silver medal had been awarded to Nubboocomar Paul for his clay bust of Dr. Carey.

5. From Dr. Gibson, Superintendent Botanic Gardens, Bombay, presenting a few roots of Madder raised by him, and requesting a report thereon.

The above communications were referred to the Committee of Papers.

6. From H. Vansittart, Esq., on the subject of the wild Coffee of Deyrah Dhoon, and the cultivation of Tea in that locality. In regard to the former, Mr. Vansittart observes :—" The wild coffee, to which I formerly alluded, is now ripening; there are thousands of trees. It is my intention to pluck the fruit, prepare it, and distribute it among the zemindars; thereby proving that the coffee culture will be advantageous, and introducing a luxury hitherto unknown to the poorer classes. I shall also forward you a specimen of this wild coffee."

Mr. Vansittart remarks, that Dr. Jameson is engaged in preparing tea from the plants of the Government plantation, and he adds, " It appears likely that the success of the experiment will exceed our most sanguine expectations, in which case both the grantees and I, through my zemindars, will exert ourselves to extend the cultivation of it."

7. From P. J. Sarkies, Esq., Secy. to the Society of Arrarat, requesting to be favored with a complete set of the Transactions and Journals of this Society.

Mr. Sarkies states : " Our object in requesting this favor is to translate the useful productions they contain into the Armenian language, and publish them in our Society's Weekly Journal, the " Patriot, " for the perusal of those of our countrymen who are unacquainted with the English language, both here and at other places. The first number of the said publication I beg leave to forward you herewith."

It was agreed, that this request be complied with.

8. From Capt. G. E. Hollings, Secretary Agri-Horticultural Society of Lucknow, requesting that an application be made to Dr. Buist for a model of his Wind-mill on account of their Society.

Capt. Hollings also encloses a list of vegetable and flower seeds, which he has just received from Messrs. Veitch of Exeter, and offers a portion of any of the varieties to the Society.

The Secretary mentioned, that Capt. Hollings' request in regard to the Wind-mill model had been complied with, and that he had availed himself, to a limited extent, of his kind offer of the vegetable and flower seeds.

9. From Major T. E. A. Napleton, Secretary Agri-Horticultural Society of Bauglepore, applying for the annual grant from the Parent Society of two silver medals and fifty rupees.

10. From H. C. Tucker, Esq., Magistrate and Collector of Gorruckpore, applying for a large assortment of seeds, plants, &c., for distribution in that district.

The Secretary stated, that both these applications had been complied with.

For all the foregoing presentations and communications the best thanks of the Society were accorded.

(Wednesday, the 17th of September 1845.)

(SPECIAL MEETING.)

Baboo Ramgopaul Ghose, *Vice President, in the Chair.*

The Chairman read the following resolution, passed at the last General Meeting, on which the present meeting was called, viz. :—

" That a special meeting of the Society be held on the 17th Sept. at 4½ o'clock, to consider all matters connected with the debt upon the Metcalfe Hall, and that the Secretary to the Metcalfe Hall Committee be requested to furnish this Society before that day with all papers and accounts necessary for a due consideration of the subject."

The Secretary submitted a memorandum of Receipts and Disbursements on account of the Metcalfe Hall, brought down to the present time. He also laid before the Meeting a detailed account of the extra expenses incurred by the Committee on account of the Building.

The Secretary next submitted a statement, shewing that the sum (Rupees 6,093) which this Society would have to pay on account of the Metcalfe Hall, on the proposition for settlement made by Sir Laurence Peel, might be liquidated in two years by an additional quarterly subscription of 2 rupees from each member; whereupon it was proposed by Major Wm. Sage, seconded by Mr. Wale Byrne, and

Resolved,—That this plan be adopted, and that for the period of two years, commencing from October next, the subscription to the Agri-Horticultural Society be Rs. 10 per quarter, instead of Rs. 8.

It was proposed by Mr. Bushby, seconded by the Chairman, and carried unanimously—" That the special thanks of the Agricultural Society be presented to Sir Laurence Peel for his munificent donation towards payment of the debt on the Metcalfe Hall."

Meteorological Register kept at the Surveyor Gene[illegible] Office Calcutta for the Month of June, [illegible].

June. Days of the Month.	Moon's Phases	Observed at 9 h. 50 m.					Observations made at Apparent Noon					Observed at 4 p. m.					Observations made at Sunset.					Rain Gauges. Elevation.	
		Barometer reduced to 32° Fahrenheit.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of Wet bulb	Wind. Direction from Sunrise to 9 h. 50 m.	Barometer reduced to 32° Fahrenheit	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of Wet bulb	Wind. Direction from 9 h 50 m to Noon	Barometer reduced to 32° Fahrenheit	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of Wet bulb.	Wind. Direction from 2 h 40 m to 4 p. m	Barometer reduced to 32° Fahrenheit.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of Wet bulb	Wind. Direction from 4 p. m. to Sunset.	Feet. 56 Upper.	Feet. 7 Lower.
		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
18.		29,482	92,0	92,0	83,5	S. E.	29,460	95,5	94,8	84,0	S.... .	29,397	97,4	96,0	84,8	S.	29,421	90,0	92,0	84,0	S. S. W.	0,02	0,02
2		[illegible]81	87,0	85,5	81,0	E	,544	84,0	83,5	77,2	S. S. E ..	,495	81,2	81,0	[illegible]	S. E. ..	,520	79,0	79,4	74,5	S. E. ..	..	..
3		[illegible]33	88,0	89,0	82,5	S. W.	,617	93,0	92,2	82,7	S. S. E. .	,550	94,2	93,8	84,8	S.	,567	89,0	88,7	83,8	E.	..	..
4		[illegible]86	85,0	85,8	80,0	S. E ...	,661	89,0	87,5	81,0	S....	,557	94,0	92,0	82,[illegible]	S. S. E	,556	90,0	90,0	81,5	S. S. E.	..	..
5	●	,638	89,5	89,5	83,5	S. E.	,613	93,0	93,8	84,0	S. S. W	,524	97,0	95,5	83,0	S. S. W	,568	91,0	91,1	83,0	E. ...	0,17	0,25
6		,634	92,0	93,0	[illegible]	W. S. W.	,585	96,5	97,0	87,0	S. E .. .	,536	95,0	94,5	85,4	N. W. ..	,540	90,0	90,0	84,0	N. W...	..	..
7		,636	87,0	87,5	83,2	W. S. W	,629	91,5	90,6	85,0	W.	,571	94,0	95,0	85,0	W. N. W	,576	90,1	90,5	85,0	W. N. W.	0,23	0,27
8		[illegible]97	82,0	83,5	79,5	E. S. E ..	,679	87,0	88,4	82,4	E. S. E. .	,610	91,0	90,8	83,0	E. S. E.	,614	86,5	87,0	81,2	E. S. E	..	..
9		,725	92,0	92,8	84,0	W. S. W	,706	94,0	93,5	84,4	S. E	,631	83,9	84,0	77,2	E. N. E.	,612	82,0	83,0	79,0	S. E. ..	0,08	0,11
10		,756	88,0	87,8	79,5	S.	,710	82,9	82,2	80,8	S. S. E ..	,639	85,5	84,1	80,0	S. S. E	,639	83,0	83,8	79,0	S. S. E	0,02	0,03
11		,655	90,0	90,7	82,5	S. S. E...	,634	92,5	93,8	86,0	S	,578	84,0	89,0	85,0	S.	..	..	..	..	S. W...	..	..
12		,670	85,8	84,9	79,1	S	,643	90,5	91,3	84,5	S. S. E. ..	,573	89,0	89,0	81,5	S. S. E.	,610	86,0	86,5	81,0	S.	..	..
13	☾	,706	88,0	87,9	82,0	S. W.....	,682	88,8	88,9	83,0	S	,614	90,8	90,8	83,8	S. S. W	,620	86,8	86,5	81,0	S. S. W.	..	..
14		,711	90,5	91,0	83,0	N. N. E	,680	93,0	93,0	82,6	W.	,621	88,5	89,0	82,5	N.	,6[illegible]3	87,0	87,0	82,0	N. N. E	..	..
15S		,697	91,0	91,5	82,0	N. E	,682	92,5	93,7	81,5	N. E ...	,600	92,5	92,0	80,5	N. E...	,633	88,0	88,0	79,5	N. E ..	..	..
16		,710	91,0	90,5	82,0	S. W.....	,675	93,8	93,7	82,5	S. S. W.	,598	95,5	94,9	84,2	S. W...	,637	89,0	89,0	81,0	S. W. ..	0,21	0,2
17		,721	88,0	89,8	84,0	S. W....	,695	91,8	93,1	84,0	S. W	,602	92,5	92,0	82,0	S. W ..	,632	87,5	88,0	80,0	S. W. ..	..	..
18		,651	89,0	89,9	82,0	..	,623	93,0	93,5	82,5	S. E. ..	,536	92,0	92,5	82,0	S	,556	88,0	88,0	81,0	S	0,64	0,7
19		,580	82,0	83,0	75,0	S. W.....	,588	83,0	93,5	79,0	S. S. E. ..	,485	89,5	89,0	81,8	S. S. W.	,512	87,0	87,0	81,4	S. W...	..	..
20	○	,530	89,5	90,0	82,0	E	,513	93,0	93,5	83,5	W	,412	95,0	94,4	83,0	N. W...	,414	92,0	91,4	83,6	S. E ..	..	..
21		,530	92,5	91,7	83,0	N. E.....	,502	93,5	94,0	84,5	S.........	,427	94,0	89,0	79,0	N. E. ..	,434	84,0	84,5	79,3	E. ...	0,51	0,8
22S.		,510	89,0	89,0	81,6	N. W. ..	,483	90,5	91,0	82,0	N. E. ..	,396	85,5	85,0	80,7	N.	,411	84,3	85,0	80,0	N. W...	0,07	0,1
23		,385	85,0	87,0	81,5	W.	,355	89,8	90,0	81,2	N. W. ..	,256	86,0	84,7	81,4	N. W...	,279	85,0	85,0	80,0	N. W...	0,20	0,2
24		..	..	..	..	..	,192	83,0	83,9	79,8	W.	,098	82,0	82,5	79,0	W. ...	..	..	..	..	W. S. W.	0,67	1,2
25		,319	80,0	80,0	78,0	W.	,316	83,0	82,9	79,0	W.	,308	81,5	81,0	79,0	W	,356	82,0	82,9	80,7	S. W...	0,20	0,3
26	☽	,454	86,0	87,0	80,7	S. W.....	,416	89,0	89,0	81,2	W. S. W	,364	91,5	91,0	81,4	W. S. W	,416	79,0	79,5	77,4	S.......	0,20	0,5
27		,451	85,5	86,4	80,5	..	,425	89,0	89,0	82,0	N. W. ..	,371	83,5	83,0	79,0	N. E. ..	,396	80,2	81,2	79,0	S. E. ..	0,20	0,2
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	W. N. W.	,406	90,0	90,5	84,0	N. W. ..	,380	84,9	85,8	81,0	N. W...	,382	84,0	84,5	82,0	N. W.	0,16	[illegible]

[illegible]		,422	83,0	84,0	81,0	Calm.	,432	87,0	86,5	82,4	W.	,343	87,0	87,0	82,0	N.N.W.	,374	81,5	81,0	80,0	N. N.E.	4,35	4,91
30		,455	81,0	82,0	79,0	N. W. ..	,429	84,0	83,5	80,0	S.........	,413	86,0	87,0	82,0	S. W...	,450	84,0	84,9	80,2	S. W. ..	0,23	0,31
Mean.		29,588	87,5	88,0	81,5		29,553	89,9	90,1	82,5		29,483	89,6	89,2	81,6		29,514	85,9	85,2	80,8		8,16	10,66

D	Mo	Bar ed hei	Of	Of	Of	Di fro to	Ba ed hei	Of	Of	Of	Di fro m.	Ba ed hei	Of	Of	Of	Di fro m.	Ba ed he	O	Of	O	Di fr to	U
		Inches	°	°	°	●	Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches
1		29,549	88,0	88.0	83,0	W.	29,541	88,0	89,4	83,0	S........	29,493	91,2	91,1	81,0	S.	29,521	86,0	86,5	79,8	S. W...	0,31
2		,606	88,0	89,0	82,9	S. W ..	,610	89,5	88,5	82,9	S. W....	,556	88,0	87,9	82,8	S. W...	,554	86 0	86,0	81,5	S. W...	0,07
3		,673	89,0	89,1	83,8	W.S.W.	,650	85,0	84 0	80,0	S. S. W.	,568	90,0	88,8	82,5	S. W...	,585	85,8	86,3	81,5	S. W...	..
4	●	,600	87,5	88,4	82,0	S. W...	,582	89,5	89.0	81,2	W	,519	86,4	87,5	83 0	S. W...	,530	84,9	85,5	81,6	S. W...	0,17
5		,584	83,0	84,5	79,8	W.S.W	,556	84,5	84,8	80,1	S. W.....	,477	87,0	87,2	81,3	S. W...	,508	84 0	85,0	80,2	W.S.W.	..
6S.		,531	87,0	88,0	81,0	S. W...	,510	90,5	91,5	82,4	W.	,483	90,0	89,5	83,4	S. W...	..	..	..	..	S. W...	..
7		,518	94,0	92,0	83,0	S.......	,494	94,0	93,0	81,8	S. W.....	,463	93,0	93,0	83,0	S. W...	,462	88,0	88,7	81,7	S.......	..
8		,542	91,0	91,5	83,0	E	,525	95 0	94,8	84,0	W.	,489	91,2	92,0	84,0	N.	,488	87,0	86,9	82,4	N.	2,52
9		,559	79,5	81,0	78,0	W.	,534	82,0	83,0	78,6	W.	,477	83,5	84,0	80,0	W.	,478	83,0	83,0	79,3	W.	..
10		,510	88,0	87,5	82,0	N. E ..	,495	91,8	91,0	82,5	S. W.....	,415	92,0	90,5	83,8	S. E. ..	,460	83,4	83,7	81,0	N. E. ..	0,16
11		,547	89,5	85,8	80,1	S. E. ..	,534	88 0	88 5	80,7	S. E.	,451	88,0	86,0	81,0	S. S. E.	,494	84,0	85,0	80,0	E. S. E.	0,39
12	☾	,616	84,0	85.0	80,5	S. E. ..	,618	87,0	85,8	80,9	S. E.	,564	85,0	85,0	81,0	S. E. ..	,589	83,5	84,0	80,5	S E ..	1,38
13S		,647	80,0	82,0	80,0	E. ...	,634	84 5	84,0	80 5	E.	,597	84,0	84,5	81,0	E ...	,587	84,0	84,2	81,0	S. E. ..	2,08
14		,627	83 5	84 0	80.9	S. S. E	,601	88,5	88,0	83,0	S E.	,533	86,0	86,0	82,0	S. E. ..	,517	84,0	84,0	80,0	S.......	..
15		,543	87,5	86,0	80,5	S. W...	,530	88 0	87,0	80,0	W.	,489	88,9	87,6	81,2	W.	,472	84,0	84,0	80,0	W.	..
16		,552	89,0	88,2	80 8	S.	,536	90 0	89,5	81,2	S. W	,478	91,0	90,3	83,0	S. S. W.	,519	85,0	85,0	81,0	S.......	..
17		,587	89,0	89,0	82,0	S. S. W.	,555	90 5	90 0	82,0	S. W.....	,497	85,2	86,0	81,0	S.......	..	..	..	..	S. W...	0,08
18		,561	87,0	87,0	81,0	S. S. W	,529	85,2	85.0	80,5	S. S. W...	,450	85,4	86,0	80 8	S. S. W	,454	84 7	84,9	80,0	S. S. W.	..
19	○	,558	86,0	85 9	81.0	S. S. E.	,540	87,5	87,0	80.9	S. S. E. ..	,448	85,0	85,8	80 5	S. S. E	,504	85,0	84,9	80,0	S.......	..
20S.		..	..	..	..	S.E. ..	..	..	..	..	S. E ...	..	..	..	..	S. E. ..	,541	84,0	84,0	80,0	S. E. ..	0,14
21		,557	84 3	84,0	80,7	S.......	,548	88 4	86,2	80,0	E.	,496	88,0	88,0	81,0	S. E. ..	,516	84,5	84,5	80,5	S. S. E	0,69
22		,553	84,5	85,0	81,2	S. E. ..	,541	81,0	82,0	80,0	N. E.	,459	86 0	87,0	82,0	S. S E	,472	83,0	83,7	81.0	S	0,92
23		,531	80,0	80,7	79,0	S.......	,517	84 0	84,0	80,0	S.........	,461	87 0	87,2	80,0	S.......	,483	83,0	83,4	79,0	S.......	0,16
24		,566	86,5	86 0	80,8	S. W...	,539	89,0	89.1	81,6	S.........	,489	88,5	88,5	81,2	S.......	,514	85,0	85,0	80,0	S.......	..
25		,564	85 0	86,0	78 4	S.......	,534	85,0	87 0	79 8	W.	,468	90 0	90,0	81 0	W.	,489	85,4	86,0	81,1	S. W...	..
26	☽	,530	88,0	88,0	82,0	E.	,496	90,4	90,4	82,3	E.	,427	85 5	85,0	81.0	S.......	,443	83,5	84 0	79,5	S.......	0,09
27S		,477	87,0	87 1	80,3	E.	,443	89,0	89,0	82 0	S E. ...	,405	87,0	86,0	80,5	S. E. ..	,413	82,0	83,0	80,0	E.	0,87
28		,432	84,0	83,8	81,0	S. E. ..	,408	84,5	82,5	80 0	S. E.	,349	84 0	84,0	81 0	S E ..	,372	83,0	84 0	80,2	S. E. ..	0,37
29		,468	83,0	83.0	79,8	S	,443	87 0	87 0	82,0	E.	.413	85.8	84,0	81,5	S.......	,448	80,0	81,0	79,0	S.......	0,23
30		,585	86,5	85.4	80,0	S.......	,567	85 8	85,0	81,0	S	,534	83,0	83,5	78,9	S.......	,545	82,0	82,8	78,5	S.... ..	0,20
31		,652	82,0	83,0	80,0	S.......	,609	86 3	86.5	81,2	S.........	..	..	..	..	S.......	..	..	..	..	S.......	..
		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		29 182	88 1	87.3	81 2		29 500	84 2	84 2	80,4		10,72

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of August, [illegible].

August. Days of the Month.	Moon's Phases.	Observed at 9 H. 50 M. Barometer reduced to 32° Fahrenheit.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of Wet bulb.	Wind. Direction from Sunrise to 9 h. 50 m.	Observations made at Apparent Noon. Barometer reduced to 32° Fahrenheit.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of Wet bulb.	Wind. Direction from 9 h. 50 m. to Noon.	Observed at 4 P. M. Barometer reduced to 32° Fahrenheit.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of Wet bulb.	Wind. Direction from 2 h. 40 m. to 4 p. m.	Observations made at Sunset. Barometer reduced to 32° Fahrenheit.	Temperature. Of the Mercury.	Temperature. Of the Air.	Temperature. Of Wet bulb.	Wind. Direction from 4 p. m. to Sunset.	Rain Gauges. Elevation. Feet. 56 Upper.	Rain Gauges. Elevation. Feet. 4 Lower.
		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	°	°	°		Inches	Inches
1		29,..	..	..	..	S. E. ..	29,574	83,0	83,2	80,8	S.	29,479	83,5	83,5	80,0	S.	29,..	..	..	..	S.	0,11	0,06
2		,583	84,0	85,5	81,5	S. W. ..	,547	89,0	88,5	81,2	S. W.	,465	87,0	86,8	81,0	S.	..	..	..	..	S.	0,02	0,05
3S.	●	,550	86,5	87,0	81,0	N. W. ..	,526	89,0	88,5	81,0	S. W.	,448	89,5	89,5	82,0	S. W. ..	,466	80,5	80,5	78,0	S. W. ..	0,06	0,10
4		,489	84,0	84,0	80,0	N. E. ..	,469	88,5	88,5	81,9	N. E.	,365	91,0	91,0	82,8	N. E. ..	,387	84,0	83,5	81,5	E.	0,25	0,32
5		,440	85,2	85,5	80,0	N. W. ..	,426	89,0	90,0	82,0	N. W.	,352	87,0	87,0	81,0	N. W. ..	,352	85,0	85,0	80,7	N. W. ..	0,14	0,22
6		,432	85,0	86,0	82,0	S.	,409	84,0	84,0	82,0	S.	,361	84,2	84,5	80,2	S.	,386	83,0	83,0	80,0	S.	0,19	0,28
7		,5 1	82,0	82,5	80,8	S.	,487	82,0	82,5	80,8	S.	,439	85,0	85,0	81,5	S.	..	..	..	..	S.	0,05	0,07
8		,463	87,0	86,8	81,5	S. W. ..	,494	86,5	87,0	82,0	S.	,464	86,8	86,6	82,3	S.	..	..	..	..	S.	3,00	3,90
9		,472	85,4	85,7	81,6	E. N. E.	,465	86,0	86,2	81,8	S. W.	,412	87,0	86,8	81,3	S. S. W.	..	..	..	..	S.	0,69	1,28
10S.		,457	84,8	84,5	80,0	S.	,436	85,5	85,0	80,2	N. E.	,381	85,0	85,0	90,0	S. S. E.	,382	82,8	83,0	79,0	S.	0,09	0,14
11	☾	,525	84,0	84,0	80,2	S. W. ..	,517	85,0	85,0	80,6	S.	,461	86,0	86,5	81,0	S.	,456	84,5	84,9	80,0	S.	0,90	1,71
12		,542	82,2	83,0	79,5	S. W. ..	,504	83,0	83,0	79,0	W.	,441	79,0	80,2	78,0	W.N.W.	,436	80,0	80,7	79,0	W.	0,23	0,40
13		,423	82,1	82,5	80,0	S. W. ..	,388	87,0	88,0	82,0	S. W.	,313	90,0	88,9	82,0	S. W. ..	,312	84,5	85,0	81,5	E.	0,46	0,70
14		,394	86,0	86,0	81,0	E.	,376	85,2	86,0	82,0	S. W.	,309	81,0	81,0	79,8	W.	,331	80,0	80,0	78,4	S.	2,12	2,72
15		,422	78,9	79,0	77,0	S. W. ..	,426	79,0	79,5	77,5	S. W.	,373	80,0	81,5	78,0	W.	,399	80,0	81,0	78,0	W.	0,11	0,20
16		,535	83,0	83,5	79,5	S. W. ..	,510	86,0	86,1	81,0	W.	,421	90,0	89,0	81,3	W.	,443	86,0	85,0	80,2	S. W. ..	0,16	0,27
17S.	○	,573	87,0	88,0	81,5	S. E. ..	,543	89,0	89,0	81,5	S. E.	,482	83,5	81,0	77,0	S. W. ..	,505	81,0	82,0	79,5	S. W. ..	0,32	0,41
18		,565	86,5	87,0	81,5	N. E. ..	,538	89,4	89,0	80,8	S. E.	,464	90,0	90,0	80,0	E.	,495	83,5	84,4	79,5	E.	0,23	0,35
19		,524	86,5	86,9	80,7	E.	,504	87,0	87,0	80,0	E.	,415	86,2	86,0	81,0	E.	,439	80,0	81,0	77,5	E.	0,20	0,41
20		,512	83,0	82,5	77,5	S. E. ..	,477	85,0	85,5	78,4	S. E.	,428	85,0	85,1	78,0	S. E. ..	,457	82,0	82,0	76,5	S. E. ..	0,05	0,10
21		,590	85,0	85,0	78,8	E.	,579	86,0	86,0	79,9	S. E.	,526	86,0	85,9	79,0	E.	,530	83,0	83,1	79,0	S. E. ..	..	..
22		,648	87,0	86,5	79,8	S. E. ..	,630	89,0	89,1	80,1	S. S. E. ..	,584	85,4	85,2	79,9	S. S. E.	,600	83,0	82,9	78,0	S. E. ..	0,23	0,29
23		,740	86,5	87,0	81,4	S. E. ..	,707	89,2	89,5	80,4	S. E.	,640	86,5	85,8	80,2	S. E. ..	,663	83,0	84,0	79,5	S. E. ..	..	..
24S.		,746	86,5	87,0	81,0	W.S.W.	,724	90,0	90,5	83,0	S. S. E. ..	,614	92,0	92,0	81,0	S. S. E.	,624	88,5	89,0	80,5	S.	..	..
25	☽	..	..	..	..	S.	,678	91,0	91,4	84,0	S. W.	..	..	..	..	N. W. ..	..	..	..	..	E. N. E.	0,23	0,42
26		,750	86,5	88,0	83,0	S. E. ..	,715	90,0	91,0	83,1	S. E.	,623	92,8	93,0	82,5	S. E. ..	,654	82,8	83,0	78,0	S. W. ..	0,28	0,40
27		,753	88,5	88,2	80,5	N. E. ..	,745	81,9	80,4	78,0	N. N. W.	,633	83,0	84,0	80,0	N.N.W.	,637	81,0	81,0	78,0	E.	0,09	0,06
28		,686	86,5	86,5	80,8	N. E. ..	,638	89,0	89,5	81,5	N. E.	,564	85,2	86,0	80,0	N. E. ..	,565	81,0	82,0	79,0	E.	0,12	0,20
29		,646	88,0	88,0	82,0	S. W. ..	,629	85,0	82,0	78,0	E. N. E.	,548	87,5	88,0	82,8	E.	,558	85,8	86,0	81,2	S. E. ..	0,06	0,09

Barometer by Troughton, used prior to the 1st June 1844, Observations reduced to 32° Ft. = 29.493
[illegible] 1st June to 31st August, ... Ditto .... = 29.637

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