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AND

AGRICULTURAL GAZETTE

FOR

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for several hours, we should say it is superior to the British Queen; it is large, oblong, or rather conical, with the same colour as that variety, but sweeter and richer. *It is said* by Mr. Sanders to be an excellent bearer, and to force well; in addition to which *it is reported* to be much hardier than the British Queen, nearly all which perished last winter round Tedworth, while this Nimrod suffered in no degree whatever."]

Effects of the Winter about Newark.—In this immediate district the frost of the winter has done more mischief than was done by the frost of last year. The common Laurels are killed by hundreds, at least cut quite down to the ground. Last year they suffered very little. The Cupressus macrocarpa, I fear, is killed. The Pinus insignis, which was untouched last year, has its spines turned brown half way through. The variegated Golden Holly has the white or golden leaves generally turned brown. The large Araucarias have their leaves tinged with brown many feet higher from the ground than last year. The Cryptomeria has not suffered much. Pinus Russelliana is killed. In several places the common Yew is burnt on one side, and the Cedar of Lebanon also. Altogether these two last winters have cut very short the catalogue of hardy shrubs. *D.*

Early Rhubarb (see p. 208).—Your correspondent who says his gardener last October covered over some Rhubarb with cement casks and fold-yard manure, which was added several times in order to force the growth, and again some four months afterwards covered over, in a precisely similar way, other roots on the same soil, which though last covered were ready first, should remember that he covered up at a time when Rhubarb was wholly at rest, and when it would require double the time and heat to start it that it would when he covered his second lot, growth at that time having already commenced. Besides, starting to force before midwinter does not ensure his cutting so much earlier, more especially if the Rhubarb had not been forced before; if, however, it has once been started early it will start about the same time ever after, with little trouble; but to begin too soon, as your correspondent states, would require something more than merely adding manure "several times," for every gardener knows too well the uncertainty of dung heat in hard weather. If, on the other hand, your correspondent should begin to force after midwinter, and continue the heat till he gets a supply of Rhubarb, and the next year commence a week or two earlier, he might not then fail. It must be remembered, however, that different sorts of Rhubarb naturally vary very much as regards earliness. *J. Divers, Maidstone.*

Does Sea-water Kill Seeds?—I have begun making some few experiments on the effects of immersion in sea-water on the germinating powers of seeds, in the hope of being able to throw a very little light on the distribution of plants, more especially in regard to the same species being found in many cases in far outlying islands and on the mainland. Will any of your readers be so kind as to inform me whether such experiments have already been tried? And, secondly, what class of seeds, or particular species, they have any reason to suppose would be eminently liable to be killed by sea-water? The results at which I have already arrived are too few and unimportant to be worth mentioning. *Charles Darwin, Down, Farnborough, Kent, April* 11.

Foreign Correspondence.

LEAVES FROM MY CHINESE NOTE-BOOK: No. 8.—*A Journey in search of a new Cedar or Larch, called Abies Kæmpferi.*—I have been acquainted with this interesting tree for several years in China, but only in gardens, and as a pot plant in a dwarfed state. The Chinese, by their favourite system of dwarfing, contrive to make it, when only a foot and a half or two feet high, have all the characters of an aged Cedar of Lebanon. It is called by them the *Kin-le-sung*, or Golden Pine, probably from the rich yellow appearance which the ripened leaves and cones assume in the autumn. Although I have often made inquiries after it, and endeavoured to get the natives to bring me some cones, or to take me to a place where such cones could be procured, I met with no success until last autumn. Then, however, I happened to visit a part of the country where I had not been before, and quite unexpectedly came upon some fine specimens of full grown trees covered with ripe cones. They were growing in the vicinity of a Buddhist monastery in the western part of the province of Chekiang, at an elevation of 1000 or 1500 feet above the level of the sea. Their stems, which measured fully 5 feet in circumference 2 feet from the ground, carried this size, with a slight diminution, to a height of 50 feet, that being the height of the lower branches. The total height I estimated about 120 or 130 feet. The stems were perfectly straight throughout, the branches symmetrical, slightly inclined to the horizontal form, and having the appearance of something between the Cedar and Larch. The long branchless stems were, no doubt, the result of their growing close together and thickly surrounded with other trees, for I have since seen a single specimen growing by itself on a mountain side at a much higher elevation, whose lower branches almost touched the ground.

I need scarcely say how pleased I was with the discovery I had made, or with what delight, with the permission and assistance of the good priests, I procured a large supply of those curious cones sent to England last winter. It was with great regret I read in this paper, and in a letter from Mr. Glendinning, that so few of these seeds had vegetated, and in order to increase the number by procuring another supply, I paid a visit this autumn to the place where I had been so successful last year, with what results I shall proceed to relate. Having arrived at the Monastery of Tsan-tsing—for that is the name of the place—I lost no time in visiting the spot of my last year's discovery. The trees were there as beautiful and symmetrical as ever, but after straining my eyes for half an hour I could not detect a single cone. I returned to the temple and mentioned my disappointment to the priests, and asked them whether it was possible to procure cones from any other part of the country. They told me of various places where there were trees, but whether these had seed upon them or not they could not say. They further consoled me with a piece of information, which, although I was most unwilling to believe it, I knew to be most likely too true, namely, that this tree rarely bore cones two years successively, that last year was its bearing year, that this one it was barren. A respectable looking man, who was on a visit to the temple, now came up to me and said that he knew a place where a large number of trees were growing, and that if I would visit the temple to which he belonged he would take me to this spot, and that there I would probably find what I wanted. I immediately took down the name of his residence, which he told me was Quan-ting, a place about 20 le distant from the temple in which I was domiciled, and at a much higher elevation on the mountains. Having made an appointment for next day he took his leave of me with great politeness, and returned to his home.

Having procured a guide for Quan-ting, I set out early next day to visit my new acquaintance. Leaving the temple of Tsan-tsing, our way led up a steep pass, paved with granite stones. On each side of the road were forests of fine Bamboos—the variety called by the Chinese *Maou*, the finest I ever saw. The forests are very valuable, not only on account of the demand for the full-grown Bamboos, but also for the young shoots, which are dug up and sold in the markets in the early part of the season. Here, too, were dense woods of Cryptomeria, Cunninghamia lanceolata, Oaks, Chesnuts, and such like representatives of a cold or temperate climate. The Chinese Chesnut appears to differ slightly from the Spanish, but it is superior to that variety. A very pretty small one, about the size and form of the Hazel Nut, is much esteemed; both, I think, worth introduction to Europe. I have sent them both to India, and I am happy to hear that both are now doing well on the Himalayan mountains. Chesnuts have long been a desideratum in India; many fruitless attempts have been made to introduce them, but with Ward's cases we now work wonders.

Our road was long and rugged, and we were gradually attaining a higher elevation. We reached the temple of Quan-ting at last, and had no difficulty in finding our acquaintance of the preceding day, Mr. Wang-a-nok, as he called himself. It now appeared he was a celebrated cook—the Soyer of the district—and had been engaged on this day to prepare a large dinner for a number of visitors who had come to worship at the temple. He told me he would be ready to accompany me as soon as the dinner was over, and invited me to be seated in the priest's room until that time. This little temple has no pretensions as regards size, and was in a most dilapidated condition. In one of the principal halls I observed a table spread and covered with many good things, which were an offering to Buddha, and before which the visitors, as they arrived, prostrated themselves. As the valley in which the temple is placed is fully 3000 feet above the sea, I felt the air most piercingly cold, although it was only the middle of October, and hot enough in the plains in the day time. So cold was it that at last I was obliged to take refuge in the kitchen, where Mr. Wang was busy with his preparations for the dinner, and where several fires were burning. This place had no chimney, so the smoke had to find its way out through the doors, windows, or broken roof, or, in fact, any way it could. My position here was, therefore, far from being an enviable one, although I got a little warmth from the fires. I was therefore glad when dinner was announced, as there was then some prospect of being able to get the services of Mr. Wang. The priests and some of the visitors now came and invited me to dine with them, and, although I was unwilling, they almost dragged me to the table. In the dining-room, which was the same, by-the-by, in which they were worshipping on my arrival, I found four tables placed, at one of which I was to sit down, and was evidently considered the lion of the party. They pressed me to eat and to drink, and although I could not comply with their wishes to the fullest extent, I did the best I could to merit such kindness and politeness. But I shall not attempt a description of a Chinese dinner which, like the dinner itself, would be necessarily a long one, and will only say that, like all good things, it came to an end at last, and Mr. Wang having finished his in the kitchen and taken a supply in his pockets, declared himself ready for my service.

Our road led us up to the head of the valley in which the temple stands, and then it seemed as if all further passage was stopped by high mountain barriers. As we got nearer, however, I observed a path winding up round the mountain, and by this road we reached the top of a range of mountains fully a thousand feet higher than any we had passed, or 4000 feet above the sea. When we reached the top the view that met our eyes on all sides rewarded us richly for all the toil of the morning. I had seen nothing so grand as this since my journey across the Bohea mountains. On all sides, in whichever direction I looked, nothing was seen but mountains of various heights and forms, reminding one of the waves of a stormy sea. Far below us in various directions appeared richly cultivated and well wooded valleys; but they seemed so far off, and in some places the hills were so precipitous, that it made me giddy to look down. On the top where we were there was nothing but stunted brushwood, but, here and there where the slopes were gentle, I observed a thatched hut and some spots of cultivation. At this height I met with some Lycopods, Gentians, and other plants not observed at a lower elevation. I also found a Hydrangea in a leafless state, which may turn out a new species, and which I hope to introduce to Europe. If it proves to be an ornamental species it will probably prove quite hardy in England.

We had left the highest point of the mountain ridge, and were gradually descending, when on rounding a point I observed at a distance a sloping hill covered with the beautiful object of our search—the Abies Kæmpferi. Many of the trees were young, and all had apparently been planted by man; at least so far as I could observe they had nothing of a natural forest character about them. One tree in particular seemed the queen of the forest, from its great size and beauty, and to that we bent our steps. It was standing all alone, measured 8 feet in circumference, was fully 130 feet high, and its lower branches were nearly touching the ground. The lower branches had assumed a flat and horizontal form, and came out almost at right angles with the stem, but the upper part of the tree was of a conical shape, resembling more a Larch than a Cedar of Lebanon. But there were no cones even on this or on any of the others, although the natives informed us they had been loaded with them on the previous year. I had therefore to content myself with digging up a few self-sown young plants which grew near it, and which I shall endeavour to introduce to England.

I now parted from my friend Mr. Wang, who returned to his mountain home at Quan-ting, while I and my guide pursued our journey towards the temple at which I was staying by a different route from that by which we had come. The road led us through the same kind of scenery which I have endeavoured to describe — mountains; nothing but mountains, deep valleys, and granite and clay-slate rocks—now bleak and barren, and now richly covered with forests chiefly consisting of Oaks and Pines. We arrived at the monastery just as it was getting dark. My friends, the priests, were waiting at the entrance, and anxiously inquired what success had attended us during the day. I told them the trees at Quan-ting were just like their own—destitute of cones. "Ah!" said they, for my consolation, "next year there will be plenty."

I cannot agree with Dr. Lindley in calling this an *Abies*, unless Cedars and Larches are also referred to the same genus. It is apparently a plant exactly intermediate between the Cedar and Larch; that is, it has deciduous scales like the Cedar and deciduous leaves like the Larch, and a habit somewhat of the one and somewhat of the other. However, it is a noble tree; it produces excellent timber, will be very ornamental in park scenery, and I have no doubt will prove perfectly hardy in England. *R. F.*

Societies.

ENTOMOLOGICAL: *April* 2.—J. Curtis, Esq., President, in the chair. Donations of books from the Royal Society, the Society of Arts, the Entomological Society of Stettin, Berwickshire Naturalists' Club, &c., were announced, as well as an extensive collection of specimens of aphides preserved in Canada Balsam presented by Mr. F. Walker, and a number of rare British Lepidoptera by Mr. H. Doubleday. Mr. Stainton also, with reference to the discussion respecting the currants of the pins with which insects are stuck, that he had only observed this to occur in one species of Nepticula (N. Acetosæ), and from the acid nature of the Sorrel upon which it fed it might be considered that the secretion was attributable to the nature of the food of the larva; the transformations of the species in question had been observed last year by Mr. Shield, of Dublin. Mr. Foxcroft exhibited specimens of 17 rare species of Lepidoptera which he had reared from larvæ taken last year in Fifeshire; he also exhibited specimens of Papilio Machaon reared from two very different varieties of larvæ. Mr. Bond exhibited a variety of Spilosoma Menthastri. Mr. Edward Shepherd exhibited specimens of Donacieæ, some stuck with the common pins and others with electro-plated pins; the former were rusted after a few months, infected with verdigris, whilst the latter remained uninjured. Mr. Samuel Stevens exhibited specimens of the very rare Enchirus longimanus male and female, brought to England by Madame Pfeiffer from the Eastern Archipelago; also specimens of Eudamus MacLeayii. A note was read from Mr. Wallace containing a description of a magnificent new species of butterfly belonging to the genus Ornithoptera from Borneo, which he proposed to name after the Rajah Brooke. Mr. Curtis read a note on the species of Galls, recently figured by himself in the *Gardeners' Chronicle*, suggesting that some of them might prove varieties. A memoir by Mr. Newborough was read on the natural history of the hive bee, being a continuation of his observations on the observatory hive, which had gained the prize recently given by the Society on that subject. The secretary gave notice that the Council had resolved to offer the duplicate insects in their collection for distribution among

food, especially Wheat. This tradition is the more remarkable because several naturalists have made the observation that corn does not grow wild in any part of the world. I do not know whether by a process of improvement our garden fruits can be derived from wild fruit; *it is well known, however, that the noble Vine Grapes grow wild in Colchis.* Whence, then, does corn come? My opinion is that God made direct provision for man; something was given to all, real Wheat to the Asiatics, and Maize to the Americans."

Can any scholar among our readers throw light upon the sentences printed in italics? They well deserve a commentary.

New Plants.

126. Zebrina pendula. *Decaisne in Revue Horticole, 4 ser., vol. 4, p. 141, t. 8.*

This is the common trailing Tradescantia-like plant so much cultivated in our greenhouses for the sake of its foliage, stained with purple beneath and striped with broad bands of white on the upper side. It was described in the *Journal of the Horticultural Society* in 1850, under the name of *Cyanotis vittata*, from which genus we see no sufficient reason for excluding it.

127. Taxus adpressa. *Carrière in Revue Horticole, ser. 4, vol. 18, p. 96, i.e. alias* Cephalotaxus adpressa *of Gardens.*

M. Carrière has shown that this beautiful hardy plant is a true Yew, and by no means a Cephalotaxus, as has been supposed. It has long been known that the species before us will not stand when worked upon the latter genus, although it does perfectly well on the common Yew, and it now appears that its fruit is precisely that of a Taxus.

VEGETABLE PATHOLOGY.—No. LXXIII.

316. Chlorosis 7. (*Accidental and Functional.*) Yellowness.—The form of Chlorosis which now comes under consideration is that to which the name of Icterus has been given by some authors, from the dull yellow green which is assumed by a large portion of the plant. It arises from various causes, or rather from conditions unfavourable to health, as from stagnant water, depressed temperature, especially when accompanied by deficiency of light, from deficiency of light itself, or from want of proper nutritious matter in the soil. The vital powers of the plant are depressed, but more especially those of the particular parts affected, insomuch that more favourable circumstances seldom produce a more healthy tint in the older plants, but only enable the plant to produce more healthy organs, by which the general end for which it is cultivated may be at length effected. Where there is mere absence of colour, as in bleaching, without any derangement of general health, exposure to light, if it be not too abrupt or accompanied by unfavourable conditions of dryness, whether of the soil or surrounding air, will soon remedy the evil, but in Chlorosis the tissues of the organs already formed are so affected that they are seldom in a condition to assume fresh energy. One of the most familiar examples is that of yellowness in Wheat crops, which in some seasons is so prevalent, and unless it be alleviated in good time is so prejudicial to the general produce. Other things being equal, want of strength in the soil, whether original or from defect of manure, is a most important circumstance in connection with the disease. A season like the present, of unusual cold and dryness, has afforded many opportunities of examining the circumstances under which the plant has suffered most, and it has been impossible to glance over two or three contiguous crops without observing that its intensity is in direct proportion to the natural deficiency of the soil or the negligence of the cultivator.* In wet seasons, accompanied by a constant prevalence of north-east winds, the effect is still more striking and more universal. In every case the only hope of a good harvest depends upon an amendment of the conditions which have induced the malady. If the soil is really in good heart, warm showers or an increase of temperature will ultimately remedy the evil, but if the sickly tint has arisen from poverty of soil, it can scarcely be expected that better weather will entirely mend the evil. In such cases the only practicable remedy is to apply some top-dressing, as soot or pigeon-dung properly mixed, which may be rapidly absorbed by the foliage itself or by the roots. Even where the plant has grown well at first and looked healthy, in consequence of no unfavourable conditions of climate, if the staple of the land is not good or there has been a deficiency of proper manure, the crop is sure to fall off just before the flower stem is produced, even under the most favourable external conditions.

317. Where plants are cultivated in pots it is often very difficult to secure a proper drainage, and much more frequently no due attention is paid to the subject. The surface of the soil, too, becomes compressed, so that the air does not penetrate into the pores, its original texture is not good, or algæ grow upon the surface, which are inconsistent with health; where the pots are very bibulous, evaporation is going on rapidly from the surface of the pot, and the temperature in consequence of that part which is in contact with the most active roots is depressed, where the pot is not sunk into the soil. Under such conditions many plants, as Calceolarias, Pelargoniums, Fuchsias, &c., are very apt to acquire a yellow hue, which is sometimes very difficult to remedy, and which renders such plants very unfit for propagation. The first point towards their recovery is to repot them with greater care as regards drainage and the texture of the soil; and if there is reason to believe that the evil has at all arisen from poverty, guano can be administered cautiously, or a little old and very rotted cow-dung may be mixed with the soil. The very best effect is also produced in some cases by the insertion of two or three small crystals of sulphate of iron in the soil, which gradually dissolve, and act probably as a tonic. Fuchsias which were apparently past all hope of recovery will sometimes revive rapidly under this treatment. *M. J. B.*

* Close to the place where I am writing are three contiguous fields, the first of which has not been fallowed for nine years, nor was the ground manured for Wheat; the second of inferior staple, with a Wheat crop following Oats; the third of much the same quality as the second, but manured with the refuse of skins used by hat-makers, with an intermediate patch under common cultivation. The difference is very striking. The manured crop is most luxuriant, the unfallowed land of rich staple covered with an excellent plant of a very healthy aspect; the patch under ordinary cultivation is yellow, and that succeeding Oats on poor land extremely yellow with little hope of recovery.

BEDDING PLANTS AND BOTTOM-HEAT.

The remark recently made by the writer of the Calendar relative to the propriety of planting out strong plants in June rather than weak plants in May is very judicious in a season like the present, when the ground temperature is excessively low, and when, too, in many instances from the losses of the winter, plants are not so strong as they are wont to be in more favourable seasons. I have frequently, both privately and publicly, pointed out the impropriety of early planting, that is before the 20th of May, and, except in very rare situations and in the case of unusually forward springs, I am quite convinced that there is not a day gained by planting before the first week in June. I have had several thousands of Geraniums and other plants bedded out since the middle of April, but they are standing on sheltered south and west borders, and have been nightly, and sometimes during the day too, covered with Spruce branches and mats, to protect them from the severity of the weather. These plants look well, are making root, have healthy green foliage, and have quite recovered the check they experienced at the time of putting out; but had they been planted in the flower garden at the same time, their safe protection would have been far more difficult, and the nuisance of the protecting material in a dressed garden quite intolerable. The advantages of this system of bedding out all established plants are very great; for you not only get a plant with an improved constitution, but one-third of the pots necessary under other circumstances will be found quite sufficient. The trouble of planting and transplanting will of course be urged as an argument against the plan by the advocates of the old system; and though I admit there is a good bit of trouble and time occupied, the saving in watering more than counterbalances it, while the rapid progress the plants make is another decided advantage. Cold as the weather has been, these plants I find are making root into an inch or two of leafy dung which was placed under them, and I have no doubt that they will remove to the flower-beds almost without sustaining any check, and will be in bloom in a week or two without presenting any of that rusty appearance so general in newly-planted things.

But independently of the risk we run in planting out before we have settled mild-growing weather, it is also of great import in a season like the present, that the ground should attain its natural heat before tender plants are committed to its fostering care. A week or two back we were told that Nettle seed would not vegetate at the same temperature as Groundsel, and that the generality of exotic seeds would not vegetate in a temperature below 46°. I have just been testing the temperature of the soil in the flower garden here, and I find it range from 44° to 46° at from 9 to 12 inches deep, according to the exposure and the time the beds were last digged, the highest temperature, that of 46°, only being found in a bed that was dug on a sunny day a fortnight back. Now, the mean temperature of the earth at 1 foot deep, as explained by an important table in Dr. Lindley's "Theory of Horticulture," just published, is April 46°, May 53°, and June 60°. The lowest temperature for May was in 1845, viz., 50°, the highest for the same month in 1848 56°; the lowest temperature for June is 56° in 1852, the highest 64° in 1846. Thus it will be seen that the ground at the present time is 4° colder than it has been known since 1844, and 10° below the highest temperature during the same period. Need we then be surprised if plants make slow progress? It is physically impossible that they could do otherwise until the earth attains something like its natural temperature, and the more plants are watered under such circumstances, except with water very considerably warmer than the soil in which they are growing, the greater the injury they must receive. To drench plants with cold water at the present time is labour worse than lost. But what is to be done? To plant even now until the earth has attained a temperature of 55° will not be a wise proceeding, yet plant we must. Fifteen years back, in my treatise on Cucumbers in pots, I recommended the "digging in" of solar heat for ridge Cucumbers, and I should now advise the same process to be observed with all flower-beds that are not stocked with plants. By forking the beds over after 4 o'clock every sunny afternoon for a few days, making or raking the surface of the ground tolerably fine, its temperature may be raised from 6° to 10° in a very short time, and it is I think quite unnecessary for me to explain that an increase of bottom-heat at the time of planting to that amount is a matter of much greater importance than hurrying the roots of plants into the ground the first fine day, just because the sun is shining or the air overhead is a little genial. What I am recommending is just what I have practised for many years, and if those who do not happen to think on this matter as I do will please to make the experiment, I know they will be satisfied with the result. Let them get heat into the soil, then plant and give a sufficient watering with warm water, and when it has soaked in leave the surface of the soil loose, fine, and smooth, and little after-watering, unless the weather is very dry, will be found necessary. Daily dribblings of water may be all very well to occupy the leisure hours of amateurs "who have nothing else to do;" but gardeners, and those under them, may spend their time far more profitably.

W. P. Ayres, Whittlebury Lodge, May 22.

DOES SEA-WATER KILL SEEDS?

As you have done me the honour to notice favourably my wish to ascertain experimentally the power of resistance in seeds to the injurious action of sea-water, you may perhaps like to have a report. As such experiments might naturally appear childish to many, I may be permitted to premise that they have a direct bearing on a very interesting problem, which has lately, especially in America, attracted much attention, namely, whether the same organic being has been created at one point or on several on the face of our globe. As geologist I feel a special interest on the possibility of plants being transported by sea to distant islands, owing to the great influence which it is very obvious the views of the late ever-lamented Edward Forbes have had on the subsequent writings of botanists and zoologists. Forbes, as is well known, boldly supposed that the north coast of Spain had formerly been directly continuous with Ireland, and he extended the continent of Europe as far as and beyond the Azores. To imagine such enormous geological changes within the period of the existence of now living beings, on no other ground but to account for their distribution, seems to me, in our present state of ignorance on the means of transportal, an almost retrograde step in science—it cuts the knot instead of untying it. Weighty objections might, I think, be urged against Forbes' hypothesis as applied in the above and many other cases, but this is not the proper place to discuss such a question. As I had not the least notion when I began, whether or not the seeds would be all killed by a single week's immersion, I at first took only a few, selecting them almost by chance from the different great natural families; but I am now trying a set chosen on philosophical principles by the kindness of Dr. Hooker.

The sea-water has been made artificially with salt procured from Mr. Bolton, 146, Holborn Bars, which has been tested by better chemists than men, namely, by numerous sea animals and algæ having lived in it for more than a year. The seeds were placed in separate bottles, holding from 2 to 4 oz. each, out of doors in the shade: the mean temperature has during the period been about 44°, rising during one week to a mean of nearly 48°. Most of the seeds swelled in the water, and some of them slightly coloured it, and each kind gave to it its own peculiar and strong odour. The water in which the Cabbage and Radish seeds were placed became putrid, and smelt offensively in a quite extraordinary degree; and it is surprising that any seeds, as was the case with the Radish, could have resisted so contaminating an influence; as the water became putrid before I had thought of this contingency, it was not, and has never been, renewed. I also placed seeds in a quart bottle in a tank filled with snow and water, to ascertain whether the seeds kept at the temperature of 32° would better resist the salt water; this water, like that in the small bottles, to my surprise became turbid and smelt rather offensively. In the following list I have no reason to suppose, except in the cases where so stated, that the seeds have endured their full time.

(1) Seeds of common Cress (Lepidium sativum) have germinated well after 42 days' immersion; they give out a surprising quantity of slime so as to cohere in a mass. (2) Radishes have germinated less well after the same period. (3) Cabbage seed: after 14 days' immersion only one seed out of many came up; I think this is rather strange considering that the Cabbage is a sea-side plant; in the ice-cold salt water, however, several have come up after 30 days' immersion. (4) Lettuce seed has grown well after 42 days; (5) of Onion seed only a few have germinated after the same period; (6) Carrot and (7) Celery seed well after the 42 days; (8) Borago officinalis, (9) Capsicum, (10) Cucurbita ovifera, have germinated well after 28 days' immersion; the two latter, rather tender kinds, were also tried in the ice-cold water, and have germinated after 30 days' immersion. (11) Savory, or Satureja, has grown somewhat less well after 28 days. (12) Linum usitatissimum: only one seed out of a mass of seeds (which gave out much slime) came up after the 28 days, and the same thing happened after 14 days; and only three seeds came up after the first seven days' immersion, yet the seed was very good. (13) Rhubarb, (14) Beet, (15) Oracle, or Atriplex, (16) Oats, (17) Barley, (18) Phalaris canariensis, have all germinated excellently after 28 days; likewise these six latter after 30 days in the ice-cold water. (19) Beans and (20) Furze, or Ulex: of these a few survived with difficulty 14 days; the Beans were all killed by 30 days in the ice-cold water. (21) Peas germinated after seven

days, but were all dead after 14 days' immersion out of doors, and likewise after 30 days in the ice-cold water. (22) Trifolium incarnatum is the only plant of which every seed has been killed by seven days' immersion; nor did it withstand 30 days in the ice-cold salt water. (23) Kidney Beans have been tried only in the latter water, and all were dead after the 30 days.

As out of these 23 kinds of seed, selected almost at hap-hazard, the five Leguminosæ alone have as yet been killed (with the exception of the Cabbage seed, and these have survived in the ice-cold water), one is tempted to infer that the seeds of this family must generally withstand salt water much worse than the seeds of the other great natural families; yet from remarks in botanical works, I had expected that these would have survived longest. It has been really curious to observe how uniform, even to a day, the germination has been in almost every kind of seed, when taken week after week out of the salt water, and likewise when compared with the same seeds not salted—all of course having been grown under the same circumstances, namely, in glasses on my chimney-piece, so that the seeds from the day of being planted have been always under my eye. The germination of the Rhubarb and Celery alone has been in a marked degree altered, having been accelerated. With respect to Convolvulus tricolor, not included in the above list, I may mention that many of the seeds germinated and came out of their husks, whilst still in the salt water, after six or seven days' immersion.

To return to the subject of transportal, I may state that in "Johnston's Physical Atlas" the rates of 10 distinct currents in the Atlantic (excluding drift currents) are given, and the average of them is 33 nautical miles per diem; hence in 42 days, which length of immersion seven out of the eight kinds of seed as yet tested have already stood, a seed might be readily carried between 1300 and 1400 miles.

I will conclude this too lengthy communication by observing that all the 40—50 seeds which I have as yet tried *sink* in sea-water: this seems at first a fatal obstacle to the dissemination of plants by sea currents; but it may be doubted whether most seeds (with the exception of the winged kinds), when once shed, are so likely to get washed into the sea as are whole or nearly whole plants with their fruit by being carried down rivers during floods, by water-spouts, whirlwinds, slips of river-cliffs, &c., continued during the long lapse of geologically modern ages. It should be borne in mind how beautifully pods, capsules, &c., and even the fully expanded heads of the Compositæ close when wetted, as if for the very purpose of carrying the seed safe to land. When landed high up by the tides and waves, and perhaps driven a little inland by the first inshore gale, the pods, &c., will dry, and opening will shed their seed; and these will then be ready for all the many means of dispersal by which Nature sows her broad fields, and which have excited the admiration of every observer. But when the seed is sown in its new home then, as I believe, comes the ordeal; will the old occupants in the great struggle for life allow the new and solitary immigrant room and sustenance? *Charles Darwin, Down, Farnborough, Kent, May* 21.

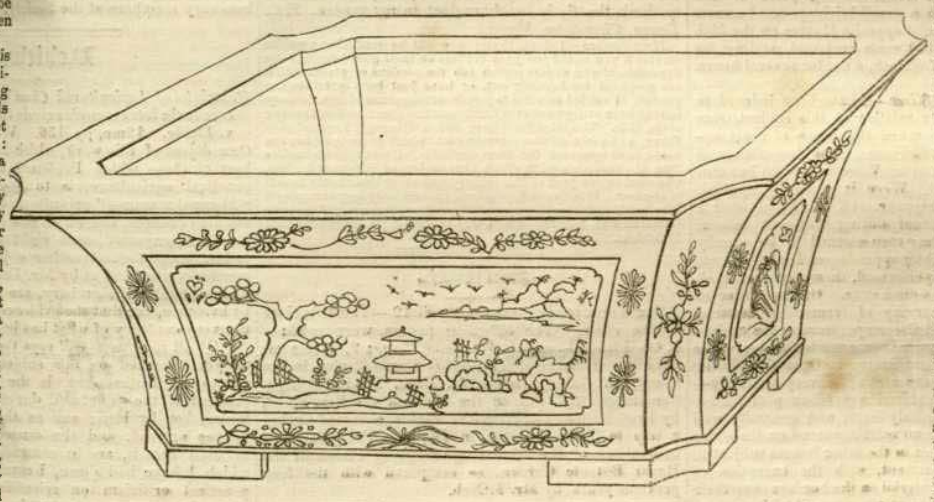
COMMON THINGS.

Preparing Scarlet Geraniums for Bedding. — The season has been so peculiar that the usual routine system of treating bedding plants has been completely upset. Few things have yet been planted out, and therefore considerable care has been required to keep them so long in a thriving state. To give Scarlet Geraniums intended for beds artificial heat after they have been struck and potted off, as is often done, would not answer this year; that would very much frustrate the end every good cultivator ought to have in view, viz., plants sufficiently healthy and hardy to profit by the naturally increasing warmth of the weather at planting out time, instead of, as is too frequently the case, receiving a check from which it takes them a long time to recover. If the plants are kept cool and properly hardened off by exposure to sun and air during the spring months whenever the weather will permit they will show more flowers in proportion to the size of the plants in June than similar ones which had been subjected to heat would in July. The same remarks are applicable to all other kinds of plants kept over winter for bedding purposes. In short artificial heat is unnecessary, even although the plants had been kept in the cutting pots during winter and required shifting in the spring; this can be easily accomplished without forcing them to make premature growths, which never get hardened before planting time. Too much shade, after they are kept in temporary quarters out of doors where accommodation is limited, also aggravates the evil. The result in both cases is that the plants shed their foliage, and for a long time look shabby.

Scillas.—These should be as common as Snowdrops and Crocuses in every garden where early spring flowers are sought for. They have many recommendations. Growing but a few inches high, and bearing for the most part blue flowers, they form beautiful beds, or margins to beds, in situations where now such plants as Crocuses and Snowdrops are almost exclusively depended on for the earliest bloom. The Snowdrop, as is well known, furnishes white blossoms only, and the Crocus supplies various tints of orange, white, yellow, and purple; but in neither is the pure blue colour to be found. Those, therefore, who desire to render their gardens ornamental at the earliest dawn of spring, should procure and plant Scillas largely; there are several kinds adapted for that purpose. S. bifolia grows about 3 or 4 inches high, and when growing freely, throws up several flower spikes, each of which bears from four to eight blue flowers, during April and May. S. verna grows about the same size, and bears a roundish head of purplish blue flowers, in May and June. S. amœna is also about the same stature, and produces largish drooping light blue flowers, in April and May. S. sibirica, another of these dwarf species, has drooping blossoms, of a beautiful clear light blue, which are borne in April. Of S. bifolia there are at least two very distinct varieties, one having white and another blue blossoms. They are easily cultivated.

CHINESE FLOWER POTS.

We have certainly made wonderful progress in plant culture during these last 25 years, and this may have induced us to cling so stoutly as we have done to the old stereotyped form of flower-pot; another reason why we have confined ourselves so much to that kind of pot may be the great convenience it affords in shifting plants from small pots into larger ones, and also the facility it furnishes of examining at any time the state of the roots. Besides there may be another reason, the most potent of all, for using almost exclusively our common form of flower pots, and that is their inexpensiveness. For some purposes, however, they may with advantage be dispensed with; *cultivate* plants in them if you please, but keep them out of the drawing-room, where they are anything but models of taste, and take a lesson from the Chinese. In the accompanying sketch you have a perspective drawing of a common Chinese garden flower-pot, which was sent me by Mr. Fortune embedded in the soil of a Wardian case, having some seeds sown in it. When cleaned it appeared to me to be very superior to our common pots. It is very smooth on the surface, and the colour that of a cake of Indian red paint. The ornaments are white and very agreeably relieve the tone of the Indian red; in fact, in point of form and finish it is an exceedingly tasteful article and fit for any drawing-room window. I am aware that attempts have been made to improve our common garden pots, but the forms hitherto recommended, and the offensive colour of the clay of which they were manufactured, rendered them anything but drawing-room ornaments. If something more classical and artistic in design were invented worthy of a place in a lady's sitting room, we should soon see the ugly green baskets with their covering of yellow sickly moss now employed vanish. Besides such huddling of plants together and smothering them in sphagnum is altogether as unnatural as it is at variance with good taste. *R. Glendinning.*



Home Correspondence.

Annuals.—A few words respecting this useful class of flowers may probably not be out of place, as I am of opinion that they are not encouraged as their merits deserve, chiefly perhaps from the almost general impression that their blossoms are but short lived. It cannot be denied that such is often the case, but I wish it to be known that this is owing more to mismanagement than to the real deficiencies of the plants. Some of them may be noticed in the parterres of our nobles, in the small gardens of the citizen amateur, and in the borders surrounding the humble cottage; but owing to carelessness or injudicious management they are rendered of ephemeral duration, although many of them have good recommendations, such as colour, habit, and profusion of bloom. The Zinnias even dazzle the eyes when looking on them beneath a hot summer's sun; the glittering Portulaccas, the dwarf and lovely Mesembryanthemum bicolor, the nice Calandrinia splendens, the beautifully veined Salpiglossis, the rich dark and light blue of Entoca viscida, and Nemophila insignis, the splendid Platystemon californicum, Phlox Drummondi, Campanulas, Stocks, Lobelias, Gilias, Asters, Indian Pinks, and a great quantity of others, arise in my memory and claim a notice, but particularly the truly handsome Sphenogyne speciosa. When well managed, a bed of this plant cannot be equalled for the richness of its peculiar colour—viz., orange yellow, with a dark eye, each flower being larger than a half-crown piece. Annuals are too often sown so thickly in the open border that the plants choke each other in growing, and are starved into a premature maturity. In this case the real resources of the plants are not developed, and premature decay is the natural result; the blossoms are no sooner partially produced than their career is run. The duration of some annuals, I must acknowledge, is brief, and to have a summer's display constant forethought must be exercised to keep up a succession, but still they are capable of a much greater degree of usefulness than they in general afford; many of them being of easy culture and soon out of bloom, we are careless in recognising the fact that they demand attention to induce them to fully develope their beauties. It often happens that annuals sown early under the protection of frames are kept too warm and thereby rendered weakly, and they are mostly too thick and in small pots; those placed in the borders or beds are either sown and left to grow without attention, or are transplanted from the frames in weak tangled masses, unable to struggle successfully with their change of circumstances, which renders their brief duration a great deal more limited. As a general rule, annuals should be treated as individual plants, at least this course should be adopted in the early stages of their growth; the greater length of time they flower, size of their blooms, strong and healthy habit are the best recommendations I can offer in favour of such a system. For some of the later annuals a good plan is to sow their seeds in some convenient situation, in a light shallow soil, well incorporated with fine leaf mould in order to induce an abundance of fibres. It is well to render the natural surface perfectly solid, and add artificially all the soil required. As soon as the plants are of sufficient size, they should be transplanted into a situation similarly prepared to that where the seeds were sown, and at sufficient distances from each other, to allow their removal with as little mutilation of the roots as possible. If a constant succession of plants is provided in this way they can be moved at any time in the summer months, and often without a leaf flagging. As a matter of course a cloudy day is desirable for the operation, but if they are grown as I have suggested, bright weather need be no obstacle to their removal. Leaf-mould is the best soil for growing them in until their final removal, as the fibres ramify so thickly in the decaying leaves, that in the process of shifting to their final destination little or no damage is sustained, and where a few beds or vacancies in the borders have to be filled up, a couple of young men with trowels and hand-barrow will soon accomplish the desired effect. Annuals that are required to remain as long a period as possible in bloom should never be allowed to perfect seeds; it should be remembered, as a physiological fact closely bearing upon practical gardening, that the great end of all organic life is to perpetuate its kind, and that by taking advantage of this principle and retarding such a consummation, a more protracted existence can be procured. By this practice plants naturally annuals are often rendered perennials. *John McArdell, late Gr. to H. Sharples, Esq.*

The Vinegar Plant (see p. 336.)—If your correspondent will try the undermentioned receipt he will find it answer. To three-quarters of a pound of coarse sugar add half a pound of treacle; put them into a stone or glass pot that will hold about two gallons, and is about 1 foot in diameter; its mouth should not be less than 8 inches in diameter with a rim, for the convenience of tying down. Having prepared the above, pour one gallon of boiling water on the sugar and treacle; stir well to dissolve them, and when cooled down to about blood-heat add your plant, keeping the part that was separated from the parent uppermost. Then get a piece

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every part except the very sutures, as in *G. Andrewsii*, *G. crinita*, &c. Examining some other genera, we found this to occur also in *Bartonia*, Muhl. (*Centaurella*, Michx.); equally so in both species, *B. tenella* and *B. verna*. In the former species, in which, as in *Obolaria*, four re-entering angles render the cell cruciform, the resemblance to *Obolaria* is striking and complete, as you will see from the enclosed sketch of a transverse section of the ovary of *B. tenella*. The only anomaly of *Obolaria* as a true *Gentianea* which remains, is the imbricative (instead of convolutive) æstivation of its corolla;—of which no parallel instance is known, so far as I am aware. It may however be expected to occur; for useful and reliable as the æstivation of the corolla often is, as an ordinal mark, it is seldom altogether constant.

I think I once mentioned to you an exception of this sort, or rather a variation, which occurs in a family in the arrangement of which you have employed æstivation of the corolla to great advantage, viz. the *Scrophulariaceæ*, in characterizing the *suborders* (as I would suggest they ought not to be called) *Antirrhinideæ* and *Rhinanthideæ*. The same accurate observer, Mr. Clark, long ago showed me that this character occasionally failed in *Mimulus*, especially in *M. ringens* and *M. moschatus*, which almost as frequently present the æstivation of the *Rhinanthideæ* (*i. e.* have some part of the lower lip exterior) as that of the *Antirrhinideæ*, to which the genus belongs. Last summer I noticed a second exception of the kind in a *Pentstemon* (*P. heterandrum*, Torr. & Gray, in Beckwith's Report of a Pacific Railroad Survey), which besides the anomaly of having the fifth stamen sometimes antheriferous and sometimes sterile, had also, in about half of the flowers examined, the lateral lobes of the corolla external in the bud, and covering the two posterior lobes as well as the anterior one.

On the Action of Sea-water on the Germination of Seeds. By Charles Darwin, Esq., Vice-Pres. R.S., F.L.S. &c.

[Read May 6th, 1856.]

During the spring of last year it occurred to me that it would be worth while, in relation to the distribution of plants, to test how long seeds could endure immersion in sea-water, and yet retain their vitality. As far as I knew, this had not been tried by bota-

nists, who would have been far more capable of doing it efficiently than myself; and I now find that M. Alph. DeCandolle, in his admirable work, "Géographie Botanique," regrets that such experiments have not been tried; I think, that had he known even the few facts here to be recorded, some of his opinions on the means of distribution of particular families would have been slightly modified. The Rev. M. J. Berkeley has likewise tested fifty-three different kinds of seeds, and has published a report in the "Gardener's Chronicle*," to which periodical I have also sent two brief notices on the same subject†. I intend here to give, with Mr. Berkeley's kind permission, an account of our joint experiments. I may premise, that not knowing, at first, whether the seeds would endure even a week's immersion, I selected a few by simple chance, taking, however, the seeds of different families; subsequently I have been aided by suggestions from Dr. Hooker.

I must briefly describe how my experiments were tried: the seeds were placed in small bottles, each holding two or three ounces of salt water, carefully made according to Schweitzer's analysis: as both *algæ* and marine animals have, as is well known, long survived in water thus made, there can be no doubt that the experiment was thus fairly tried. Mr. Berkeley sent his seeds to Ramsgate, tied up in little bags and placed in the sea-water, daily renewed; and they were thus immersed for three weeks, and when partially dried, but still damp, were sent off, but by accident were not unpacked for four days subsequently, so that their total immersion "was equivalent to one of more than a month." Some of my bottles were put out of doors in the shade, and were exposed to an average weekly temperature of from 35° to 57°; the other bottles were kept in my cellar, and were exposed to much less variation of temperature, viz. to a daily mean average of from 46° to 56°. Further, to test the effect of temperature, I immersed eighteen different sorts of seeds in salt water, in a tank, which, from containing much snow, was for six weeks at the temperature of 32°, slowly rising for the next six weeks to 44°; but the seeds thus tested did not seem to withstand the injurious effect of the salt water better than those exposed to a higher but variable temperature. I may remark, that amongst the eighteen kinds of seeds immersed in the cold salt water, there were seeds of a somewhat tender constitution, as capsicum and vegetable marrow, but the exposure to the cold in no degree injured their germination. In the case of some of the seeds which I first tried,

* Sept. 1st, 1855. † May 26th and Nov. 24th, 1855.

and which were put out of doors, I did not change the salt water for fifty-six days, and it became putrid and smelt offensively to a quite surprising degree, especially the water with the cabbage, radish, cress and onion seed, which also gave out strongly the odour of each kind; so that I thought the putridity would infallibly have been communicated to the seeds; but judging from the seeds of some of the same plants (but not actually from the same lot of seed) placed in salt water often renewed, and likewise kept in the cellar under a less variable temperature, neither the putridity of the water nor the changing temperature had any marked effect on their vitality. Cress seed (*Lepidium sativum*) and that of *Phalaris Canariensis*, after twenty-two days' immersion, were thoroughly dried for a week and then planted; they germinated pretty well, but the seeds themselves of this particular lot were not very good. At first I tried the seeds after each successive week's immersion, and they germinated at the same period as did seeds of the same kind which had not been salted; celery and rhubarb seed, however, were somewhat accelerated in their germination. Some kinds of seeds, as of *Trifolium incarnatum*, *Sinapis nigra*, peas, kidney and common beans, swelled much in the salt water, and they generally were killed by a short immersion; but the swollen seeds of *Lupinus polyphyllus* germinated better than those which did not swell. I was surprised to observe that most of the seeds of *Convolvulus tricolor* germinated after seven days under the salt water and lived for some time in it; as did likewise the fresh seed of *Tussilago farfara* after 9 days; after 25 days I took out some of the young plants of the *Tussilago* and planted them, and one of them grew: some of the seeds of the garden orache (*Atriplex*) also germinated under water after 56 days' immersion, but I failed in raising the seedlings; the other seeds of the same lot of the orache germinated excellently after 100 days' immersion.

The total number of seeds tried by Mr. Berkeley and myself amount only to 87, for unfortunately we happened to select some of the same kinds; in one respect, however, this has been fortunate, for we have thus tested each other's results, and they accord perfectly as far as they go; the seed of the tomato, however, germinated better after a month's immersion with Mr. Berkeley than after only 22 days with me; but my seed appeared to be old. And this leads me to remark, that I suspect that fresh seed withstands the salt water better than old, but yet good seed; this was the case with *Trifolium incarnatum*, *Phlox Drummondii*,

and I believe with *Sinapis nigra*. Of the genus *Godetia*, Mr. Berkeley found one species was killed by, and another survived, a month's immersion: but a far more curious case is presented by the varieties of the cabbage; for I found that good seed of the "Mammoth white broccoli" germinated after 11 days' immersion, but was killed by 22 days; seed of the "early cauliflower" survived 22 days, but was killed by 36 days; "Cattell's cabbage" germinated excellently after 36 days, but was killed by 50 days; and lastly, fresh seed of the wild cabbage from Tenby germinated excellently after 50 days, very well after 110 days, and two seeds out of some hundreds germinated after 133 days' immersion.

Of the 87 kinds of seeds tried, 23 or more than one quarter did not endure 28 days' immersion: capsicum has endured the trial best, for 30 out of 56 seeds germinated well after 137 days' immersion: of celery seed after the same period of 137 days, only 6 out of several hundreds germinated. The worst germinators have been dwarf kidney beans and *Hibiscus manihot*, both killed by 11 days' immersion; common peas were killed by 14 days'; *Tussilago farfara* germinated under water after 9 days, but the young plants kept alive for some time: the next worse germinators have been *Phlox Drummondii*, *Trifolium incarnatum*, *Linum usitatissimum*, and *Sinapis nigra*, very few of which survived 15 days' immersion.

From such scanty materials it is, perhaps, rash to draw any sort of deduction in regard to the power of resistance to salt water in the different divisions of the vegetable kingdom; but a few remarks may be permitted. Three out of the 17 Endogens and 20 out of the 70 Exogens were killed by a month or 28 days' immersion: this fact, together with the marked power of endurance in the *Atriplex*, *Beta*, *Spinacea*, and *Rheum*, lowly organized exogens, accords with, and is perhaps connected with, the fact, insisted on so much by M. A. DeCandolle, of the wider range of the Endogens and of the lowly organized Exogens, than of the higher Exogens*. The four *Solanaceæ* and two *Umbelliferæ* endured the salt water very well, and each included the longest survivor of all the species tried. Ten *Compositæ* were tried, and only one was killed by a month's immersion, that is excepting the *Tussilago* which germinated under water. Eight *Cruciferæ* were tried, and all withstood the influence well, excepting *Sinapis nigra*, which

* Godron in his "Florula Juvenalis," p. 16, states that the seeds of some plants, as of *Atriplex* and certain *Gramineæ*, germinate perfectly in salt-marshes, where they have been immersed during all the winter under salt water.

was killed by 25 days' immersion; three of the *Cruciferæ* survived 85 days: this power of endurance in the seeds of this family is, perhaps, surprising, considering the oil in their seeds. Nine *Leguminosæ* were tried; these all resisted the salt water badly, with the exception of the hard thin seeds of *Mimosa sensitiva*, which germinated pretty well after 50 days; three species of Lupine seemed just able occasionally to withstand about 36 days' immersion; the seeds of the other *Leguminosæ* having all been killed by much shorter periods. I suspect that it is the water, and not the salt, which kills the *Leguminosæ*; at least I found that a lot of fresh "Thurston Reliance" peas were all killed by 13 days' immersion in pure water*; and I have been assured that a much shorter immersion will kill kidney beans. Lastly, seven species of the allied families of *Hydrophyllaceæ* and *Polemoniaceæ* (six having been selected by Mr. Berkeley) were killed by a month's immersion, and so great a proportion can hardly be accidental.

From the great difference in the powers of resistance to the sea-water in the different families just specified, and even in the varieties of the same species; and from the *Leguminosæ* being apparently in this respect the tenderest, whereas they are generally believed to keep longer than any other seeds in a dry state, I think we may learn a lesson of caution, not to infer with too much certainty which seeds will endure longest when naturally buried in damp earth, from knowing what kinds will keep best in an artificial state.

I had intended trying many more seeds, as I at one time thought that these experiments would have thrown more light on the dispersal of plants than I now think they do. I soon became aware that most seeds, in accordance with the common experience of gardeners, sink in water; at least I have found this to be the case, after a few days, with the 51 kinds of seeds which I have myself tried; so that such seeds could not possibly be transported by sea-currents beyond a very short distance. Some few seeds, however, do float, as I have tried with some of those cast by the Gulf Stream on the coast of Norway. From knowing that timber is often cast on the shores of oceanic islands far from the mainland, and from having met with accounts of floating vege-

* Loiseleur-Deslongchamps says (Consid. sur les Céréales, Part ii. p. 234) that in wheat put into water the embryo comes out in the course of two days; as Mr. Berkeley's wheat survived after 30 days' immersion in sea-water, one may suspect that in this case, the seed would survive longer under sea-water than under fresh water.

table rubbish off estuaries, I assumed that plants, with ripe seeds, washed into the sea by rivers, landslips, &c., might be drifted by sea-currents during a period of some weeks. The closing of the capsules, pods, and heads of the *Compositæ*, &c., when wetted, and their re-opening when cast on shore and dried, the seeds being thus allowed to be driven inland by the first stormy winds, seemed to favour such means of transport. But in putting 34 plants of different orders, with ripe fruit, into salt water, one alone, the *Euonymus*, floated for a month, being buoyed up by its fruit; the others all sunk in 21 days, some in 5, and several in 7, 9, and 11 days. But I am not sure that I have made the trial fairly, for I kept the floating plants in too warm and dark a place, which might have favoured their decay. Finally I may remark, that the seeds of very few species are, as far as we yet know, all killed by 10 days' immersion,—that some plants will float for this period,—that the average rate of the ten currents in the Atlantic Ocean, given in Johnston's "Physical Atlas," is 33 miles per diem (the main Equatorial current running at the rate of 60 miles, and the Cape Stream at 80 miles per diem); and therefore I conclude, under the existing extremely scanty materials for forming any opinion, that some plants might under favourable conditions be transported over arms of the sea 300 or even more miles in breadth; and if cast on the shore of an island not well stocked with species, might become naturalized.

In the following list, to save repetition, I have marked the plants tried by Mr. Berkeley, and which germinated after a month's immersion, with †; when they did not germinate, this is expressly stated. The "cold water" refers to the seeds placed in salt water in the tank with snow.

I have arranged the families in accordance with Lindley's "Vegetable Kingdom."

ENDOGENS.

(Gramineæ.)

Avena (common oats): after 85 days' immersion germinated excellently; after 100 days some germinated; after 120 days some half-germinated.

Hordeum (common barley): germinated well after 28 days, but none after 42 days; in the cold water well after 30 days (†).

†*Triticum* (wheat).

Phalaris Canariensis: after 70 days nearly all germinated; in

another lot after 85, most of the seeds germinated, but the seedlings died off; after 100 and likewise after 120 days' immersion, in each case, a single seedling came up.

Holcus saccharatus: after 36 days germinated fairly; after 50 days all died.

†*Zea Mays*: none germinated after a month's immersion.

†*Arum maculatum.*

†*Anomatheca cruenta.*

†*Babiana plicata.*

†*Trichonema pudicum.*

†*Sisyrinchium iridifolium.*

Canna Indica: after 50 days several germinated, but not very strongly.

†*Colchicum autumnale*: did not germinate.

Allium cepa: after 56 days' immersion, 3 out of 15 germinated; after 82 days in the cold water, most of the seeds grew well; after 100 days, 2 or 3 grew out of about 25 planted (†).

†*Bulbine annua.*

†*Asphodelus luteus.*

†*Uropetalum serotinum*: did not germinate.

EXOGENS.

Ricinus communis (*var. major* and *minor*): both germinated after 36 days.

Cucurbita Melopepo (vegetable marrow): germinated after 100 days; of 4 seeds immersed in the cold water for 82 days, 2 germinated.

†*Cucumis Melo* (melon).

Cistus (mixed shrubby garden varieties): germinated well after 36 days, and some germinated after 70 days.

(CRUCIFERÆ.)

Lepidium sativum: after 85 days' immersion only one out of many germinated; after 56 days $\frac{6}{57}$ grew: in the cold water, after 65 days, $\frac{4}{60}$ grew. (†*var.*, golden cress.) These seeds gave out an astonishing quantity of slime in the salt water.

Brassica oleracea, var. "Mammoth white Broccoli:" germinated after 11 days' immersion, but after 22 days all died.

——— ———, *var.* "Early Cauliflower:" after 22 days, 5 out of 100 germinated; after 36 days all dead.

Brassica oleracea, var. "Cattell's Cabbage:" germinated excellently after 36 days; all dead after 50 days.

——— ———, *var.* growing wild on the Castle Rocks of Tenby; fresh seeds, after 50 days germinated excellently; after 110 days germinated very well; after 133 days only two out of some hundreds germinated (†).

†*Brassica Rapa* (*var.* yellow turnip).

Raphanus sativus: after 85 days, $\frac{2}{3}$ germinated; the cold water seemed to be injurious to these seeds, for after only 30 or 50 days all the seeds were dead (*var.* black radish) (†).

Erysimum Perowskianum: after 36 days germinated well; after 50 only one seed; after 70 days all dead (†).

Matthiola annua: germinated after 28 days; all dead after 54 days.

Sinapis nigra: seeds much swollen; germinated after 11 days; all dead after 22 days: *fresh* seed germinated pretty well after 15 days, but were all killed by 25 days' immersion.

Crambe maritima: after 37 days germinated well.

Tropæolum majus: after 37 days nearly all germinated, but after 50 days none did.

†*Limnanthes Douglasii.*

Hibiscus Manihot: all were killed by 11 days' immersion (†).

†*Malope grandiflora.*

Papaver somniferum: germinated well after 28 days; was killed by 54 days.

Argemone Mexicana: came up excellently after 50 days, and pretty well after 70 days.

†*Chryseis crocea* (germinated very imperfectly after the month).

Linum usitatissimum: after 7 and after 14 days only two or three seeds, out of very many, germinated; after 28 only one seed came up; after 42 days not one germinated. These seeds gave out much slime.

†*Silene compacta.*

Rheum Rhaponticum: germinated well after 82 days.

Atriplex (garden orache): some of the seed germinated under water after 56 days' immersion; the remaining seed germinated excellently after 100 days.

Beta vulgaris: excellently after 100 days (†).

Spinacea oleracea: excellently after 70 days; a few after 120 days; all killed by 137 days (†).

(LEGUMINOSÆ.)

Vicia Faba (*var.* "Johnston's Wonder"): two out of six lived

after 11 days' immersion; one half-germinated after 14 days; after 22 days all dead: many of these beans swelled greatly. I tried sixty after 28 days and found all dead. None survived 30 days in the cold water.

Pisum sativum: after 11 days some germinated; none survived 14 days; none survived 30 days in the cold water. Another lot of *fresh* seed ("Thurston's Reliance") all died after 12 days; none survived 30 days in the cold water. I found 13 days' immersion in pure water killed these latter fresh peas. (†None germinated.)

Phaseolus vulgaris (*var.* "early frame dwarf"): all died after 11 days' immersion; after 28 days' immersion, 80 were planted, but all dead. I tried another lot of *fresh* seed, but none of them resisted even 10 days' immersion; nor did they resist 30 days in the cold water: many of these seeds swelled much (†).

Trifolium incarnatum: all died after 11 days' immersion, and after 30 in the cold water. *Fresh* seed germinated excellently after 5 days' immersion, well after 12 days, and one single seed out of some hundreds germinated after 20 days. These seeds swelled much.

Ulex europæus: after 11 days germinated well; after 14 days two germinated; after 28 days all dead.

Lupinus polyphyllus: after 22 days, out of seven swollen seeds three germinated; seven others did not swell and were all dead; after 36 days' immersion one began to germinate and then died.

Lupinus luteus (pale *var.*): after 22 days $\frac{4}{12}$ lived; after 36 days' immersion $\frac{3}{18}$ germinated; after 50 days all dead.

†*Lupinus pubescens* germinated after a month, but Mr. Berkeley says the greater number were rotten.

Mimosa sensitiva: germinated excellently after 36 days' immersion, and pretty well after 50 days.

Geum coccineum (*var. splendens*): after 36 days germinated well, and after 70 days one single seed germinated.

Saxifraga incurvifolia: did not germinate after 30 days' immersion.

——— *aizoides*, nor did this species, but the seed was not very good.

(SOLANACEÆ.)

Capsicum annuum: after 137 days' immersion, 30, out of 56 planted, germinated well (†).

Solanum tuberosum: germinated excellently after 70 days, well after 100; all dead after 120 days.

——— *lycopersicum* (common tomato): one seed germinated after 22 days' immersion, the rest were killed by 36 and 50 days' immersion. († But Mr. Berkeley found that they germinated after a month.)

†——— *melongena.*

Convolvulus tricolor: after having been 7 days in the salt water, many of the seeds germinated, and the embryos came out of the husks: of those which did not germinate under water, one germinated after 36 days' immersion.

(POLEMONIACEÆ and HYDROPHYLLACEÆ.)

Gilia tricolor († was killed by a month's immersion).

Phlox Drummondii: of old seed none germinated after 11 days; but of fresh seed, 3 out of many germinated after 15 days, and none after 25 days' immersion.

Eutoca viscida.
Nemophila insignis.
——— *atomaria.*
——— *maculata.*
——— *discoidalis.*

† None of these were found by Mr. Berkeley to germinate after a month's immersion.

Borago officinalis: a few came up after 14 days' immersion, one after 28 days, and none after 42 days.

†*Nolana grandiflora.*

Satureja (common savory): after 42 days, 3 seeds out of many germinated.

Campanula Pentagonia († did not germinate after a month's immersion).

†*Fedia graciliflora.*

†*Fedia* (corn salad).

(COMPOSITÆ.)

Lactuca sativa (common lettuce): after 56 days' immersion $\frac{7}{10}$ of the seed came up; after 85 days only one out of several germinated. Cold water had no marked effect, but after 65 days they germinated rather better than the others (†).

†*Cichorium Endivia.*

Galinsoga trilobata: germinated after 22 days.

Aster Chinensis (mixed German varietes): germinated after 28 days; all dead after 54 days' immersion.

Ageratum Mexicanum: after 100 days, one seed out of many germinated; at much shorter periods these seeds did not germinate well.

Leontodon Taraxacum: germinated excellently after 61 days' immersion; the seeds were fresh.

Tussilago Farfara: fresh seeds being placed in the salt water, after 9 days, many of them germinated under water. After 25 days, I took out some of the young plants and planted them: one grew. The germination of these seeds is the more remarkable, as this is not a sea-side plant.

†*Monolopia Californica.*

†*Cenia turbinata.*

†*Cosmos luteus*: did not germinate after a month's immersion.

Clarkia pulchella: germinated well after 28 days; was killed by 54 days' immersion.

†*Godetia rubicunda.*

†——— *Lindleyana* was killed by a month's immersion.

Apium graveolens (*var.* "Cattell's white"): after 137 days only 6 seeds out of some hundreds germinated; after 85 days the seeds germinated excellently; they did not appear to germinate quite so well after 82 days in the cold water (†).

Daucus carota: a very few germinated after 85 days; after only 56 days $\frac{3}{30}$ grew (†).

On the Vitality of Seeds after prolonged Submersion in the Sea.

By James Salter, Esq., M.D., F.L.S. &c.

[Read May 6th, 1856.]

I should not have thought the observations which are the subject of this little communication of sufficient importance to occupy the attention of the Linnean Society, had it not come to my knowledge that one of our most distinguished British naturalists is at present engaged in investigating experimentally the question of the vitality of seeds after prolonged submersion in sea-water, especially in reference to the influence which that circumstance would have in explaining some of the problems of geographical vegetable distribution.

The facts which I am about to detail, and which came accidentally under my notice some years since, bear directly upon this subject, and while, as it seems to me, they establish the doctrine

that certain seeds *do* retain their vitality after submersion in the sea, probably for a considerable period, they suggest also, as far as these instances themselves are concerned, an explanation of the mode in which the seeds may have passed from one locality to another. The facts to which I refer are briefly these:—

In the year 1843, the authorities of Poole in Dorsetshire determined to deepen the channels of Poole Harbour to facilitate navigation. For this purpose a large number of ballast-lighter-barges were employed to scrape the mud from the bottom of the channels and convey it to the shore, where it was deposited in large quantities. During the winter sufficient mud was thus obtained to cover an area of some hundred square yards several feet in thickness, and this was accumulated to such an extent, that a quay was made of the hardened mud on the edge of the shore.

The quay however was never used, nor its surface disturbed.

Early in the following spring I was surprised to see that the surface of this harbour-mud exhibited abundant vegetation, of a character totally distinct from that of the neighbouring shore; and as the season advanced, and the species were recognized, the flora of this mud quay was not only found totally distinct from the littoral vegetation which surrounded it, but it contained plants which did not grow within many miles of the spot, and one which was probably foreign to the county. Immediately surrounding the mud quay was the ordinary vegetation of our southern harbour shores, *Statice*, *Salicornia*, *Atriplex*, *Carices*, &c., whilst on this exposed mud itself not one of them was to be seen; but instead of these there sprung up a large crop of oats and barley, some plants of *Lysimachia vulgaris*, one plant of *Centaurea calcitrapa*, and multitudes of *Epilobium hirsutum*; and besides these there were other plants which I did not recognize, or whose names I have forgotten.

To my mind it appeared conclusive, that the seeds which produced this crop of vegetation must have been in the mud at the time it was deposited on the shore by the lighters.

Taking the plants I have named as constituting part of the vegetation of this new-made land,—they none of them grew in its neighbourhood. The cereals, which constituted the most numerous of the plants, were not cultivated within a mile of the spot. This mud quay was made at the extremity of the peninsula upon which the town of Poole is built, and the nearest field upon which cereals are cultivated is on the other side of the town, and at least a mile from the shore.

Lysimachia vulgaris does not grow within four or six miles of the spot; *Epilobium hirsutum* two or three miles; and *Centaurea calcitrapa* is scarcely known in the county, and certainly not within ten miles of Poole.

Now remembering that none of these plants grew either on the shore around the spot, nor even within miles distant; remembering too that they were the sole occupants of this new-made land, and that the ordinary shore plants, growing in abundance only a few feet from its edges, were not to be seen on it, and further, that this abnormal vegetation showed itself the very next spring, even only a few weeks after it was completed, it must, I think, be conceded, that the seeds were in the mud at the time it was spread upon the shore; and that idea is still further sustained because a very possible explanation suggests itself, which would sufficiently account for the presence of the seeds of the plants named, in the situation from which the mud was obtained. The mud was collected in the main channel about midway between the head and the mouth of the harbour. At the head of the harbour two rivers pour their waters into it, the river Frome and the river Piddle. These rivers take their origin in the western parts of the county of Dorset, and in their course pass through districts having every variety of soil and capable of furnishing vegetation of great diversity; on their banks, moreover, two of the species I have mentioned (*Lysimachia* and *Epilobium*) grow in profusion.

Is it too much to suppose that the seeds from which these plants sprung had fallen into the rivers in various parts of their course, had gone with their waters into the harbour, and ultimately reached the position from which the mud and they had been collected? That explanation appears to me to be very probably correct; but whether it be received or not, the more important point,—that a variety of seeds had been for a period, probably considerable, at the bottom of Poole Harbour, soaking in water as salt as that of the ocean, had retained their vitality till brought under the influence of air and rain and warmth, and had then produced healthy vegetation—that is a point which I think cannot be disputed.

am anxious to state it, in order to clear myself of any suspicion of having borrowed from that distinguished writer without acknowledgment. W. OGLE

April 2

Rime Cloud observed in a Balloon

IN his letter, inserted in NATURE, vol. xxv. p. 507, Dr. Hermann Kopp says that "when Kratzenstein (1744) advocated the opinion anticipated by Halley (1686), that water-vapour may be condensed in a vesicular state, he availed himself of the *observation that in clouds and mists and condensed steam over boiling water, a rainbow is not to be observed in reflected light.*" I have good grounds to suppose these negative observations were made only because the intensity of reflected light was not sufficient, as a white rainbow is produced under these circumstances. In support of these assumptions, I may be allowed to quote an observation published by M. Faye in vol. xxviii. of the *Comptes rendus*, 1849, p. 244, where the celebrated astronomer says :—

"J'ai observé cette nuit un phénomène que je signale aux personnes qui l'occupent d'optique météorologique. En sortant d'une salle de travail qui donne sur le parc de l'observatoire, j'ai remarqué que la lumière d'un bec de gaz en arrière produisait en face de moi par la porte entrouverte un arc-en-ciel blanc semblable à un halo lunaire . . . Cet arc-en-ciel blanc doit être aisement réproduit par les temps de brouillards ; ou pourrait le faire naître a la lumière électrique . . . et l'étudier plus complétement que je ne l'ai fait."

It is to be regretted that the suggestion of the illustrious astronomer has not been taken into account by the physicists in an age when the electric light is so frequently in their hands. I believe that this kind of experimentation will elucidate the controversy, and afford some new ideas on the constitution of clouds under several circumstances, as artificial clouds may be produced by using jets of steam or condensing steam over a boiler. I believe a white rainbow, which is really the corona of the aëronauts, would appear under these circumstances, and the phenomenon would take another aspect when electric light falls on solid snow. The electric lighthouses now building will afford to the keepers many opportunities of making this observation. I take advantage of this opportunity to ask M. Hermann Kopp if he will obligingly suggest some observations to be made in a balloon for examining whether the minute particles of water are liquid or solid. By doing so, he will confer a great benefit on aëronauts next winter. W. DE FONVIELLE

The Kunnungs

HAVING just returned from an exploring expedition east of Asam, where I met a number of "Kunnungs," I may report that they appear distinct, both in language and physique, to the Naga groups south of Asam, and, in language, have affinities with Singphos. Those I saw, were with one exception, much more prepossessing in appearance than the other hill-savages, and in colour very pale, *i.e.* 33 and 45 of Broca's scale. I have got a limited vocabulary. They are great iron and steel workers, and extend from the Mli-kha to what they call the boundary of China, living on pile platform dwellings, raiding like all the hill-men about, having "morongs," or separate houses for the unmarried ; like others, also, their "morals" (as we should say) begin with marriage.

I am now preparing some notes of my trip, and send this as I am writing, as it may interest some to know whom these people seem like. S. E. PEAL

Subsagar, Asam

Burrowing Larvæ

IN his letter *ante* p. 265, Dr. Hagen states that he had "been informed by M. Lesquereux that a large number of magnolia leaves, from the Tertiary of Alaska, show serpentine trails not larger than a thread, running all over the leaves, apparently under the epithelium," and Dr. Hagen evidently believes them to be the mines or burrows of some Tineid larvæ. Precisely such mines are now made in this country, in the leaves of magnolias, by a larva of the genus *Phyllocnistis*, Zell. The moth has not been bred from the larvæ, but the mine and larvæ are indistinguishable from those made by *Phyllocnistis liriodendronella*, Clem., in leaves of *Liriodendron tulipifera*, and doubtless it is the same species in both of these allied trees. "What is a species?" however, is a doubtful question in *Phyllocnistis*, at least in our American species. No species of this or any other genus is known to burrow in the leaves of any of the other genera of plants named in Dr. Hagen's letter besides Magnolia, Liquidambar, and Sassifras. Another *Phyllocnistis* mines the leaves of Liquidambar, and has been described by me under the name of *P. liquidambar-isella*, but it is probably identical with *P. vitifoliella*, Cham. The mine is similar to, but distinct from, that of *P. liriodendronella*. The larva which mines Sassafras leaves is that of *Gracilaria sassafracella*, Cham., but it leaves the mine at a very early stage of larval life, when the mine is too small to be recognised in a fossil leaf, unless it has been unusually well preserved. In this connection I will add that I distinctly remember having *somewhere* seen a figure, by Lesquereux I think, of a fossil leaf of a species of *Acer*, on which there were several blotches, one of which bore a strong resemblance to the mine of *Lithocolletis aceriella*, now made in leaves of *Acer saccharinum ;* but as I saw only the figure, and not the fossil, I cannot be certain that it was a mine of that larva.

Covington, Ky., U.S.A., March 10 V. T. CHAMBERS

Vignettes from Nature

WILL Dr. W. B. Carpenter kindly tell us where in "South America" are the "coprolite diggings" from which he had "just seen a collection of sharks' teeth"? I am aware that at Bull River, South Carolina, North America, are vast deposits of "coprolites" (almost identical in character with those of our Suffolk Cray), which are largely imported into England from the United States. Of these Bull River sharks' teeth, &c., I have had many specimens. W. BUDDEN

Ipswich, March 23

Red Flints in the Chalk

AT one part of Caterham Valley, Surrey, there is an example of an abundance of red flints similar to that mentioned by W. Fream (NATURE, vol. xxv. p. 437). The colour is, doubtless, due to the presence of oxide of iron, but I have not tested it. I find that the red flints invariably contain the remains of sponges, the network of spiculæ of which, being coated with the oxide of iron, show up in crimson or orange on a ground of black flint, and are very beautiful objects under a lens. Thus it appears to me that the redness observable in these flints is mostly due to the inclosure of sponges which contain either oxide of iron or iron which afterwards became oxidised. The yellow oxide of iron is disseminated throughout the *chalk* itself, some strata being very much stained by it. JOHN BADCOCK, Jun.

270, Victoria Park Road, E.

ON THE DISPERSAL OF FRESHWATER BIVALVES

THE wide distribution of the same species, and of closely-allied species of freshwater shells must have surprised every one who has attended to this subject. A naturalist, when he collects for the first time freshwater animals in a distant region, is astonished at their general similarity to those of his native European home, in comparison with the surrounding terrestrial animals and plants. Hence I was led to publish in NATURE (vol. xviii. p. 120) a letter to me from Mr. A. H. Gray, of Danversport, Massachusetts, in which he gives a drawing of a living shell of *Unio complanatus*, attached to the tip of the middle toe of a duck (*Querquedula discors*) shot on the wing. The toe had been pinched so hard by the shell that it was indented and abraded. If the bird had not been killed, it would have alighted on some pool, and the Unio would no doubt sooner or later have relaxed its hold and dropped off. It is not likely that such cases should often be observed, for a bird when shot would generally fall on the ground so heavily that an attached shell would be shaken off and overlooked.

I am now able to add, through the kindness of Mr. W. D. Crick, of Northampton, another and different case. On February 18 of the present year, he caught a female *Dytiscus marginalis*, with a shell of *Cyclas cornea* clinging to the tarsus of its middle leg. The shell was ·45 of an inch from end to end, ·3 in depth, and weighed (as Mr. Crick informs me) ·39 grams, or 6 grains. The valves

clipped only the extremity of the tarsus for a length of 1 of an inch. Nevertheless, the shell did not drop off, on the beetle when caught shaking its leg violently. The specimen was brought home in a handkerchief, and placed after about three hours in water; and the shell remained attached from February 18 to 23, when it dropped off, being still alive, and so remained for about a fortnight while in my possession. Shortly after the shell had detached itself, the beetle dived to the bottom of the vessel in which it had been placed, and having inserted its antennæ between the valves, was again caught for a few minutes. The species of Dytiscus often fly at night, and no doubt they generally alight on any pool of water which they may see; and I have several times heard of their having dashed down on glass cucumber frames, no doubt mistaking the glittering surface for water. I do not suppose that the above weight of 6 grains would prevent so powerful an insect as a Dytiscus from taking flight. Anyhow this beetle could transport smaller individuals; and a single one would stock any isolated pond, as the species is an hermaphrodite form. Mr. Crick tells me that a shell of the same kind, and of about the same size, which he kept in water "extruded two young ones, which seemed very active and able to take care of themselves." How far a Dytiscus could fly is not known; but during the voyage of the *Beagle* a closely-allied form, namely, a Colymbetes, flew on board when the nearest point of land was forty-five miles distant; and it is an improbable chance that it had flown from the nearest point.

Mr. Crick visited the same pond a fortnight afterwards, and found on the bank a frog which appeared to have been lately killed; and to the outer toe of one of its hind legs a living shell of the same species was attached. The shell was rather smaller than in the previous case. The leg was cut off and kept in water for two days, during which time the shell remained attached. The leg was then left in the air, but soon became shrivelled; and now the shell being still alive detached itself.

Mr. F. Norgate, of Sparham, near Norwich, in a letter dated March 8, 1881, informs me that the larger water-beetles and newts in his aquarium "frequently have one foot caught by a small freshwater bivalve (*Cyclas cornea?*), and this makes them swim about in a very restless state, day and night, for several days, until the foot or toe is completely severed." He adds that newts migrate at night from pond to pond, and can cross over obstacles which would be thought to be considerable. Lastly, my son Francis, while fishing in the sea off the shores of North Wales, noticed that mussels were several times brought up by the point of the hook; and though he did not particularly attend to the subject, he and his companion thought that the shells had not been mechanically torn from the bottom, but that they had seized the point of the hook. A friend also of Mr. Crick's tells him that while fishing in rapid streams he has often thus caught small Unios. From the several cases now given, there can, I think, be no doubt that living bivalve shells must often be carried from pond to pond, and by the aid of birds occasionally even to great distances. I have also suggested in the "Origin of Species" means by which freshwater univalve shells might be far transported. We may therefore demur to the belief doubtfully expressed by Mr. Gwyn Jeffreys in his "British Conchology," namely, that the diffusion of freshwater shells "had a different and very remote origin, and that it took place before the present distribution of land and water."

CHARLES DARWIN

THE FISHERY EXHIBITION AT EDINBURGH

IT has now been placed beyond doubt that this exhibition will prove successful, so far as a great show of interesting exhibits is concerned. Such exhibitions, of course, partake in some degree of the nature of a commercial adventure—the projectors being dependent on the gate money to pay the expenses incurred, which are naturally heavy—although the prize list has been largely contributed to by private individuals and public bodies. Such an exhibition being a novelty will no doubt attract, from day to day, a considerable body of spectators, although it is deprived of many attractive features by reason of the place of exhibition not being fixed on the immediate sea-coast. It would have proved interesting, could the spectators have been shown the beam trawl at work, or have had displayed before them a suite of herring nets, or other items of the machinery of fish capture. Such apparatus will be largely displayed in the place of exhibition, but their effects cannot so well be judged as when they are seen in action. Upwards of seventy prizes are offered for "exhibits" and "essays"; the latter, indeed, seem to be a chief feature of the exhibition, and if they can be utilised for behoof of the public and the fisher people, some good may result. But, although a large number of prizes were given for essays at the Norwich Fishery Exhibition of last year, the public have not been made any the wiser in consequence. A very handsome surplus resulted from the Norwich exhibition—nearly a thousand pounds it is said. Why, then, has not a portion of that sum been devoted to the dissemination of the knowledge contained in the prize essays? As regards the "exhibits," they can always be seen and understood by those who please to look at them, and if there are half a dozen of the same sort, they can be compared one with the other, and the decisions of the judges can be criticised, so that persons in search of new boats or other fishing gear, can give their orders for the same in the direction they think most suitable. But with respect to the essays the knowledge contained in these productions—judging from what took place at Norwich—will remain buried in the brains of the committee! Of what possible use is it to bestow a prize on the writer of an essay, "On the Fish Supplies of Great Cities, with special reference to the best Methods of Catching and Packing," if the knowledge thus obtained is never to become public? The prize list of the Edinburgh Exhibition is rich in material for the essayist, many subjects of interest in the fishery world being selected for illustration, such as the salmon disease, oyster culture, the migrations and spawning of sea fish, the utilisation of fish offal, the best methods of preserving fish alive for markets, the pollution of rivers, the natural history of the herring, and twenty other subjects. In view of the still larger international fishery exhibition, which will take place in London next year, it is time this question of "what ought to be done with the prize essays," should be ventilated and settled. Up till this moment it remains a blot on the Norwich exhibition that none of the prize essays sent there have been made public. So far as we know, only one of the essays has become accessible; that is the essay, on the salmon disease, by Sir James Gibson Maitland, which, however, was printed at the baronet's own expense. The exhibition at Edinburgh will be very much on the lines of those which took place some years ago at the Hague and Arcachon, except that the most attractive feature of the latter exhibition will be wanting in the well-arranged aquarium. Neither in Edinburgh nor in London can we hope to compete with the great fishery show of Berlin, which was undoubtedly very complete, the American national exhibits being of much interest. At home we have no fishery collection of a national kind, if we except Buckland's Museum of Economic Fish Culture; and, so far, we are at a disadvantage with the United States, which possesses a very complete collection of fishery apparatus of all kinds. It is to be hoped, in the circumstances, that America will do for this country what it did for Germany, give us an opportunity of seeing and judging for ourselves how far

Freshman Seminar 24p: Getting to Know Darwin
Fall 2012 Harvard College/Professor William (Ned) Friedman

Letter 1661Darwin to J. D. Hooker
7 Apr [1855]

Down
Ap. 7th.

My dear Hooker

I wrote this morning to thank for the Rhododendrums.—

I have begun my seed-salting experiments,f1 & I shd. be extremely much obliged if you would tell me what kinds you would expect to be *most easily killed* by sea-water besides the Cruciferæ, which I had thought wd. be so, & which you confirmed; I had meant to have asked, but quite forgot, when I last saw you.—f2

If you can mention any that are easily procured, as Agricultural or Garden or flower seeds,—please enumerate **Just a few**.— Secondly will you tell me, at a *guess*, how long an immersion in sea-water you shd. *imagine* wd. kill the more susceptible seeds? Should you expect a week's fair immersion wd. destroy any of them?

I have looked in Lindleys Vegetable K. & understand what is meant.f3

Will you be so kind as to send me a brief note in answer, as I may thus be sooner put out of my pain, & end my experiments, which I daresay you think as foolish, as my splendid idea, that the Coal-plants lived in salt-water like mangroves which made you so savagef4

Adios | C. Darwin

My notions sometimes bring good; Dr. Davyf5 has been experimenting at my request, (in order to see how fishes' ova might get transported) on the retention of vitality; & he found that salmon's ova, exposed for 3 whole days to open air, & even some sun-shine, & they produced fine young fish. Dr. D. has sent a paper to Royal Soc. on the subject.—

N.B. Remember to ask about my *distinct* case of "a lady in N. America" who saw fishes' spawn adhering to a Ditiscus.f6

Footnotes

f1 CD's notes on his seed-salting experiments are in DAR 27.1 (ser.7): 1–23. Experiments were begun on 30 March 1855 (f. 7v.). Some notes dated 15 March 1855 and headed '**Casual** *notes* on my collection of seeds.' are in DAR 46.2: 3–4.

f2 CD had visited Hooker at Kew during his four-day visit to London, 20 to 24 March 1855 (letter to C.J. F. Bunbury, [20 March 1855], n. 1, and letter to Miles Joseph Berkeley, 7 April [1855]).

f3 This sentence follows a deleted passage in which CD said that he did not know which seeds were albuminous (see Manuscript alterations and comments). John Lindley's *Vegetable kingdom* divided dicotyledonous plants (exogens) into those orders whose embryos are furnished with abundant albumen and those with none or only a moderate amount (Lindley 1846, p. 246). Lindley believed the distinction to be as fundamental as that between oviparous and viviparous animals. To CD, the embryos with abundant albumen would be those most likely to last the longest under adverse conditions.

f4 The origin of coal was the subject of heated correspondence with Hooker in May 1847. See *Correspondence* vol. 4, letters to J. D. Hooker, [1 May 1847] and [6 May 1847]. CD's seed-salting experiments were in part prompted by a statement in J. D. Hooker 1853–5, 1: xx: 'I cannot think that those who, arguing for unlimited powers of migration in plants, think existing means ample for ubiquitous dispersion, sufficiently appreciate the difficulties in the way of the necessary transport.' Hooker recorded how he was then led to speculate on the possibility of a former landmass connecting, at various times and places, New Zealand with Chile, Australia, the Antarctic, and the several neighbouring Pacific islands. CD, on the other hand, entertained the possibility that seeds and young plants and the ova of fish could be transported by a number of means, including birds and other animals, by the air, by ice, and by floating in sea-water.

f5 See letters to John Davy, 25 March [1855] and 26 March [1855].

f6 CD had received an account of a water-beetle carrying the ova of fish on its legs through Richard Chandler Alexander, a botanist and acquaintance of the Hooker family. See letter from M. H. Morris to R. C. Alexander, 17 June 1855.

Letter 1669 Darwin to J. D. Hooker
19 Apr [1855]

Down Farnborough Kent
Ap. 19th.

My dear Hooker

Thank you for your List of R.S. candidates, which will be very useful to me.—f1

I have thought a good deal about my salting experiments, & really think they are worth pursuing to a certain extent, but I hardly see the use (at least the use equivalent to the enormous labour) of trying the experiment on the immense scale suggested by you.— I shd. think a few seeds of the leading orders, or a few seeds of each of the classes mentioned by you with albumen of different kinds wd suffice to show the *possibility* of considerable sea-transportal. To tell whether any particular insular Flora had thus been transported would require that *each* species shd. be examined. Will you look through these printed lists,f2 & if you can mark with *red* cross, such as you would suggest. In truth I fear I impose far more on your great kindness, my dear Hooker, than I have any claim; but you *offered* this, for I never thought of asking you for more than a suggestion. I do not think I could manage more than 40 or 50 kinds at a time, for the water I find must be renewed every other day, as it gets to smell horribly: and I do not think your plan good of little packets of cambric, as this entangles so much air. I shall keep the great receptacle with salt-water with the 40 or 50 little bottles, partly open, immerse in it in the cellar, for uniform temperature.— I must plant out of doors, as I have no green House.—

I told you I had inserted notice in Gardeners Chronicle; & to day I have heard from Berkely that he has already sent an assortment of seeds to Margate for some friend to put in salt-water; so I suppose he thinks the experiment worth trying as he has thus so very promptly taken it into his own hands.—f3 Reading this over it sounds as if I were offended!!! which I need not say is not so.—

I may just mention that the seeds mentioned in my former note have all germinated after 14 days immersion, *except* the cabbages all dead, & the Radishes have had their germination delayed & several I think dead; *Cress* still all most vigorous.— French Spinach, oats, barley, Canary-seed, Borage, Beet have germinated after 7 days immersion.—

It is quite surprising that the Radishes shd have grown, for the salt-water was putrid to an extent, which I cd not have thought credible had I not smelt it myself, as was the water with the cabbage-seed.—

Most truly your's | C. Darwin

I lean to the notion of taking the list of introduced plants in Asa Gray just as it stands, but wait till I hear from you to calculate: tell me whether you care to hear result.—

Footnotes

f1 See letter to J. D. Hooker, 13 April [1855], n. 1.

f2 Possibly the two catalogues issued in 1855 by John Cattell, seedsman in Westerham, Kent, which are preserved in DAR 46.2: 1–2. They are heavily annotated by CD in ink and pencil. See letter to J. D. Hooker, 13 April [1855], n. 6. There is no evidence that Hooker marked the lists.

f3 Miles Joseph Berkeley also sent a notice to the *Gardeners' Chronicle and Agricultural Gazette*, no. 17, 28 April 1855, p. 278. In his notice, Berkeley commented on CD's request for information and described experiments carried out by immersing bags of seeds in fresh sea-water. These experiments, carried out by a friend, George Henry Hoffman of Margate, were further reported in the *Gardeners' Chronicle and Agricultural Gazette*, no. 35, 1 September 1855, p. 580.

Letter 1680 Darwin to J. D. Hooker
11 May [1855]

Down Farnborough Kent
May 11th

My dear Hooker

I have just received your note. I am most sincerely & heartily glad at the news it contains & so is my wife.f1 Though the income is but a poor one, yet the certainty, I hope, is satisfactory to yourself & Mrs. Hooker. As it must lead in future years to the Directorship, I do hope you look at it, as a piece of good fortune. For my own taste I cannot fancy a pleasanter position, than the Head of such a noble & splendid place, far better, I shd. think than a Professorship in a great town.—f2 The more I think of it, the gladder I am. But I will say no more; except that I hope Mrs. Hooker is pretty well pleased.—

Just to answer your remarks in your note. The article on Job, is in Westminster Review, October 1853, article IV:f3 I could lend it you, & bring it up with me, if you can wait, for I doubt whether I shall come up for next Philos. Club for that is the day, when about 40 salted seeds "come due", & you wd. be surprised at the time which my little experiment takes, as I do everything with my own hand.—

As the Gardeners' Chronicle put in my question, & took notice of it,f4 I think I am bound to send, which I had thought of doing next week, my first report to Lindleyf5 to give him the option of inserting it; but I think it likely that he may not think it fit for a Gardening periodical. When my experiments are ended, (shd the results appear worthy) & shd. the Linnean Journal not object to the previous publication of imperfect and provisional reports, I shd. be *delighted* to insert the final report there; for it has cost me so much trouble, that I shd. think that probably the result was worthy of more permanent record than a newspaper; but I think I am bound to send it first to Lindley.f6 permanent record than a newspaper; but I think I am bound to send it first to Lindley.f6 I begin to think the floating question more serious than the germinating one; & am making all the enquiries which I can on subject, & hope to get some little light on it.

Thanks for information about Kerguelen insects; it will save me plaguing the museum men.—f7 The two sexes of moth is very curious.—f8

I shd. think Binney wd. be excellent for R. Soc:—f9

I hope you managed a good meeting at the Club.— The Treasurership must be a plague to you, & I hope you will not be Treasurer for long; I know I wd. much sooner give up the Club, than be its Treasurer.—

Farewell Mr. Assistant Director & dear friend | C. Darwin

I will not mention subject of Directorship to anyone.—

Footnotes

f1 Hooker had been appointed assistant director of the Royal Botanic Gardens, Kew. The appointment was not officially announced until July (see *Gardeners' Chronicle and Agricultural Gazette*, no. 27, 7 July 1855, pp. 451–2).

f2 An allusion to Hooker's disappointment at losing the election to the chair of botany at Edinburgh University in 1845 (see *Correspondence* vol. 3, letter to J. D. Hooker, [5 or 12 November 1845]).

f3 An anonymous article published in the *Westminster Review* n.s. 4 (1853): 417–50, praising the new school of biblicalcriticism emerging in Germany. The author was James Anthony Froude (*Wellesley Index* 3: 620). Froude complained that English scholars shrank from investigating the Bible as a secular text.

f4 See letters to *Gardeners' Chronicle*, 11 April [1855], and to J. D. Hooker, 19 April [1855].

f5 John Lindley was editor of the *Gardeners' Chronicle*.

f6 CD's report, 'Does sea-water kill seeds?', was published in the *Gardeners' Chronicle and Agricultural Gazette* on 26 May 1855 (see letter to *Gardeners' Chronicle*, 21 May [1855]). CD presented a more extensive report at the Linnean Society on 6 May 1856 (see *Collected papers* 1: 264–73).

f7 See letter to J. D. Hooker, 7 March [1855], and letter from J. D. Hooker, [before 17 March 1855] and n. 4.

f8 Probably the single species of moth found by Hooker on Kerguelen Land and mentioned in *Natural selection*, p. 292. Hooker described it as apterous (letter from J. D. Hooker, [before 17 March 1855]).

f9 Edward William Binney had published extensively on the Midland coal formations and their plants. He and Hooker had written a paper on fossil plants in bituminous formations (Binney and Hooker 1855). See letter from J. D. Hooker, 25 August 1854. Binney was elected a fellow of the Royal Society in 1856.

Letter 1681Darwin to J. D. Hooker
15 [May 1855?]**f1**

Down.
15th

My dear Hooker

You have been a very good man to exhale some of your satisfaction in writing two notes to me,—you could not have taken a better line in my opinion,—but as for showing your satisfaction in confounding my experiments, I assure you I am quite enough confounded—those horrid seeds, which, as you truly observe if they sink they wont float.—

I have written to Scoresbyf2 & have had a rather dry answer, but very much to the purpose & giving me no hopes of any law unknown to me which might arrest their everlasting descent into the deepest depths of the ocean. By the way it was very odd but I talked to Col. Sabinef3 for 1⁄2 an hour on the subject, & could not make him see with respect to transportal the difficulty of the sinking question! The bore is if the confounded seeds will sink, I have been taking all this trouble in salting the ungrateful rascals for nothing.—

Everything has been going wrong with me lately; the fish at the Zoolog. Soc. ate up lots of soaked seeds, & in imagination they had in my mind been swallowed, fish & all, by a heron, had been carried a hundred miles, been voided on the banks of some other lake & germinated splendidly,—when lo & behold, the fish ejected vehemently, & with disgust equal to my own, *all* the seeds from their mouths.—f4

But I am not going to give up the floating yet: in first place I must try fresh seeds, though of course it seems far more probable that they will sink; & secondly as a last resource I must believe in the pod or even whole plant or branch being washed into sea: with floods & slips & earthquakes; this must continually be happening, & if kept wet, I fancy the pods &c &c wd. not open & shed their seeds.—f5

Do try your Mimosa seeds at Kew.

I had intended to have asked you whether the Mimosa scandens & Guilandina Bonduc grows at Kew to try fresh seeds.— R. Brown tells me he believes 4 W. Indian seeds have been washed on shores of Europe.f6 I was assured at Keeling isld. that seeds were not rarely washed on shore:f7 so float they must & shall! What a long yarn I have been spinning.—

I am glad to hear of the elections for the Club,f8 but very sorry about De la Rue:f9 he does not appear like a gentleman, but all that he says at the Council seems very gentlemanlike & nice: I would not have the blackballing of such a man on my conscience for a couple of hundred guineas: what a mortification for him.—

Goodbye my dear Hooker | Ever yours | C. Darwin

If you have several of the Loffoden seeds,f10 do soak some in tepid water & get planted with utmost care: this is experiment after my own heart with chances 1000—to 1 against its success.— Are they of the so-called Mimosa scandens?—

Footnotes

f1 Dated on the basis of CD's fish-feeding experiment (see n. 4, below).

f2 William Scoresby, the Arctic explorer, was an authority on the temperature and properties of sea-water, particularly in the northern oceans.

f3 Edward Sabine. CD visited London during the first week in May (Emma Darwin's diary and letter to W. D. Fox, 7 May [1855]).

f4 Described in a note dated 5 May 1855 in DAR 205.2: 115. For the text of the note, see letter to W. D. Fox, 7 May [1855], n. 5.

f5 In a note dated 17 May 1855 (DAR 27.1 (ser. 7): 13), CD recorded the following experiment: In evening put quite open seed-heads of Tussilago farfara & Leontodon taraxicum into salt-water: they soon began to close by next morning heads closed. Their seeds floated whilst quite fresh., & this not owing to pappus, as seed itself rose first. Put old pods of Laburnum which were widely [*interl*] gaping into S.W. & they almost completely closed. so that seed cd not fall out.— Pods of Broom & Kidney Bean did not ['sink' *del*] open.— none of these pods sunk.— Heads of Luzula, with seed nearly ripe floated. The Compositæ sunk after a few days & every seed sunk, (even the capsule of Seakale after a few days in Hookers cellar Lit.

f6 CD had expressed interest in this case reported in *Correspondence* vol. 3, letter from J. D. Hooker, 12 December 1844. The reference is to Robert Brown's account of the seeds of *Guillandina bonduc* in Brown 1818, p. 481.

f7 CD visited the Keeling Islands during the *Beagle* voyage in April 1836. See *Correspondence* vol. 1.

f8 The members elected to the Philosophical Club of the Royal Society were George Busk, Thomas Henry Huxley, George Gabriel Stokes, and John Tyndall.

f9 Warren De La Rue, son of Thomas De La Rue, a printer, had invented the first envelope-making machine. He had been elected a fellow of the Royal Society in 1850 and was a member of the council. Bonney 1919, p. 41 n., states that at the meeting of 10 May 1855, 'a candidate was proposed, but not elected'.

f10 See letter from J. R. Crowe, 27 September 1855. The Loffoden Islands, off the north Norway coast, are now known as the Lofoten Islands.