THURSDAY, JULY 11, 1872

ECONOMIC ENTOMOLOGY

WE have more than once had occasion to refer to the zeal with which the investigation of the insect pests so destructive to our crops of roots and fruits is carried on on the other side of the Atlantic. Three publications now lying before us—two from the United States, and one from Canada—furnish a text for a few further remarks on this subject. They are: "Fourth Annual Report of the Noxious, Beneficial, and other Insects of the State of Missouri," by Charles V. Riley, State Entomologist; "Second Annual Report on the Injurious and Beneficial Insects of Massachusetts." by A. S. Packard, jun., M.D.; and "Report of the Entomological Society of the Province of Ontario for the year 1871." These are all official publications; the two first being Reports made to the State Boards of Agriculture; the last printed by order of the Legislative Assembly. They represent the result of investigations made at the expense of the citizens of the respective States or Province, who are willing to tax themselves in order that the highest scientific experience at their command may be brought to bear on researches whose object is the material improvement of the resources of their country. The only similar efforts to which we can point in this country are the result of private enterprise. The Royal Agricultural Society has long engaged the services of a chemist to analyse manures and feeding-stuffs, and we recorded not long since the addition to its staff of a consulting botanist, and its intention to appoint also a consulting entomologist; but their investigations are carried on exclusively for the benefit of the members of their Society. The Royal Horticultural Society has also arranged for a course of lectures on Economic Entomology, and last year invited competition for prizes for collections of insects to illustrate this subject.

We have so often expressed our view on the relative advantage of having these investigations carried on by private enterprise, or under the direction of the State, that it is needless to repeat it here. Dr. Packard thus forcibly advocates the latter alternative, referring to M. Pasteur's labours in endeavouring to mitigate the scourge of the *pébrine* in the South of France:—"It should be remembered that this remarkable result is due primarily to the most abstruse researches upon microscopic plants by specialists, for the pure love of science. Their cloister studies, put to practical account, save the destruction of one of the largest agricultural industries in Southern Europe. In like manner, had the general Government or individual States encouraged the botanist and entomologist in their studies, and caused them to be turned to practical accounts, we should not have had to give up the cultivation of wheat in the northernmost States; our cotton crop would perhaps have been doubled; and our garden and field crops have regularly yielded a steady return to the producer." It must be recollected that the Federal Government at Washington is now spending large sums in the compilation and printing of enormous numbers of the Monthly Agricultural Reports, in addition to the money devoted by the separate States.

Mr. Riley's Report is one of a series, of which we have already noticed its immediate predecessor, and is a pamphlet of 150 pages, containing, independently of its special object, no small amount of valuable information of general interest. The higher the summer temperature, the greater appears to be the variety of the foes against which the agriculturist has to contend; and their number in the south-western of the United States is legion. After discussing the various insect-enemies to the potato, the cabbage, the apple, the walnut, the grape-vine, and other crops, the causes of their appearance, and the best antidotes artificial or natural, the greater portion of Mr. Riley's Report is devoted to the Silkworm, on the cultivation of which he has bestowed great attention. He describes the various kinds of silkworm, their mode of cultivation, their food in the larva, and imago conditions, and the various enemies, parasitic and others, to which they are subject; and this portion of the Report is illustrated by a number of very well-executed wood engravings. The practical results are thus summed up:—"There can be no good reason why silk-culture may not become one of the industries of this country, or of our State, especially if fostered at the start. I would, however, advise no one to enter into it on a large scale as a business. The raising of silk is seldom lucrative even in the most favourable countries; for in this, as in most other industries, the principal profits accrue to the middle men, reelers, and manufacturers; but on a small scale, and prosecuted in connection with other branches of agriculture and horticulture, it will give the most desirable returns for the time employed. The erection of a few reeling establishments is absolutely necessary to establish this industry."

Dr. Packard's Report treats of similar matters in a similar scientific spirit. It is interesting to note the reciprocity of indebtedness between this country and America in the matter of insect pests; we have received from them the *Phylloxera vastatrix*, so destructive to our vines; and have given them as a set-off our white cabbage butterfly, the *Pieris rapæ*, first introduced into the United States fifteen years since, and now spreading every year with terrible rapidity. It is curious that the chief check on the increase of the larva is a native, not an imported parasite, the *Pteromalus puparum*.

The Canadian Report is interesting, as being the result of the first appropriation of money for these purposes, as far as we are aware, by any of our American colonies. The Entomological Society of Ontario is subsidised by the Legislative Assembly, in order to encourage the devotion of its labours to inquiries of a practical character for the benefit of the colony. The present Report, of nearly 100 closely printed pages, well illustrated with woodcuts, gives promise of much useful work. The Report is divided into sections relating to insects injurious to the apple, grape, plum, currant and gooseberry, wheat crops, potato, cabbage, and cucumber tribe, by different competent members of the Society.

We have referred to these Reports in order to draw from them a lesson as to the direction of the labours of our botanists and entomologists at home. We have among us at least as high scientific talent in these branches as in the United States; but, with a few rare exceptions, this talent is not devoted to researches which

have a definite practical bearing on the welfare of the country. If, as we believe to be the case, the reason of this is that such researches can rarely pay the investigator directly, is not the reasoning sound which would advocate the devotion of public money to purposes which must inevitably yield such large returns to the community at large?

ORIGIN AND DESTINY OF MAN

Man in the Past, Present, and Future: a Popular Account of the Results of Recent Scientific Research as regards the Origin, Position, and Prospects of the Human Race. From the German of Dr. L. Büchner. By W. S. Dallas, F.L.S. (London: Asher and Co.)

The Martyrdom of Man. By Winwood Reade. (London: Trübner and Co.)

THE Science of Man has become matter of public interest. Fluent writers now popularise anthropological evidence, and even use it as a lever to force public opinion in some desired direction. The two clever books before us are in this way remarkable as signs of the times. They treat largely of Anthropology, but not so much for itself as in order to promote materialistic views of philosophy, and advanced schemes of social re-organisation. In briefly noticing Dr. Büchner's "Man," we shall not discuss his general doctrines on their merits. The development theory, if not by acceptance, at least by influence, has so far become part and parcel of modern thought, that it need not be re-investigated *à propos* of each new popular book which advocates it, thereby gaining a share of its prestige. The question for the critic, in judging the work of the self-appointed public instructor, is whether he deals fairly with his public, carefully weighing and testing for them the data which they cannot weigh and test for themselves. We regret to say of a writer so influential in Germany and England as Dr. Büchner, that on the present occasion at least he has not made out his claim to be a public expositor of a very serious subject. In fact, the seriousness of the subject, as demanding extensive study and careful judgment, is just what he fails to appreciate.

Dr. Büchner has the gift of easy exposition. Whether he is descanting on the drift implements and the antiquity of man, or tracing the analogies to successive orders of animals in the successive phases of the human embryo, or giving an account of the approaches made by other animals to the human mind and character, or commenting on theological dogma as opposed to scientific investigation, or pointing out how conscience can adapt itself to contradictory moral standards, or suggesting a re-adjustment of the laws of marriage in the interests of progressive society, his opinions run on with the same shapely smoothness, whether they happen to be solid or hollow. His generalities are put with praiseworthy neatness; his well-selected examples clinch them hard, and just in the right place. He is a capital expounder, when his facts and inferences happen to be sound. Unfortunately, however, his strength of rhetoric is not matched by strength of criticism, as we shall briefly show, choosing the department of anthropology as the trial-ground. In order to make the text of his work readable by the general public, Dr. Büchner has collected the copious materials which might alarm or tire the majority of readers in an Appendix, to which we are to look for actual details or more exact proof of what is enunciated in the body of the work. Looking into this Appendix accordingly, we extract some significant examples.

For a test in Prehistoric Archæology, a passage may be taken (p. 251), which shows our author not to be aware of the distinction in rude stone structures between the *dolmen* formed of several slabs and the single upright standing stone or *menhir*. His words are, "Still older than the so-called 'giants' graves' are the *Dolmens* or stone tables (also called *Cromlechs* or *Menhirs*), very ancient stone edifices, which have been found especially well-represented in Brittany. They consist of upright stones covered with slabs laid transversely upon them," &c. At p. 335 we find Dr. Büchner, on the question of low stages of human language, supporting his views by taking seriously such worthless remarks as the following: "The speech of the Fans of West Africa is, Du Chaillu says, a collection of guttural tones which no one can understand." We beg leave to refer Dr. Büchner to Captain Burton's observations in his "Wit and Wisdom from West Africa," on the grammar and vocabulary of the Fan language, which is in fact but slightly different from allied languages of the coast. In studying the relation between the lower animals and man, of course the problem of savage religion is important, and we looked curiously at Dr. Büchner's evidence. It begins with the following citation (p. 328): "Three large sections of the earth's surface, says G. Pouchet, which are still inhabited by savages, appear to have remained till now exempt from religious notions; they are the interior of Africa, Australia, and the Polar regions." And this in the face of twenty published accounts of the religious beliefs of the Australian and Esquimaux races! There are, it is true, ambiguities in the use of such terms as religion, behind which inaccurate statements may find a refuge. But as to such a subject as the arts of producing fire and cooking food, there can be no ambiguity. We take as they stand (p. 332) a series of statements on which Dr. Büchner relies. "There are still peoples, such as the Dokos, the Andamans, &c., who know not the use of fire, and devour all their food raw. Moreover, that the use of fire cannot be an attribute of humanity as such, is shown by the circumstance that so many peoples have been fire-worshippers, and in part are so still, that, therefore, they considered fire something extra and supernatural. In like manner, when Magellan set fire to the huts of the Marian Islanders, to whom fire was unknown, they looked upon it as a kind of living monster which devoured wood. Also in the Ladrone Islands the Spaniards found the natives unacquainted with the use of fire." We will take these sentences *seriatim*. As to the first, mention may be made of Dr. Mouat's account of the Andaman Islanders' practice of keeping fire constantly burning in hollow trees, covering it up with ashes, and cooking native pigs and fish in these natural ovens. As to the second, the inquiry suggests itself whether the fact of numerous tribes being water-worshippers proves the use of water not to be an attribute of humanity as such? As to the third and fourth sentences, it has to be pointed out that the contemporary account of Magellan's voyage knows nothing of the

Marian Islanders being unacquainted with fire, and looking on it as a living monster; this story was first told by an untrustworthy writer a century or two later.* Finally, after reading the last two sentences referred to several times, we cannot resist the inference from them that Dr. Büchner, putting down as separate data two fragments of one story, did so through not being aware that the Marian Islands and the Ladrone Islands are the same.

Mr. Winwood Reade's "Martyrdom of Man" is more careful as to evidence, though less shapely in arrangement, than Dr. Büchner's work. It begins with ancient Oriental history, then passes to primæval religion as leading up to Christianity and Mohammedanism, next proceeds to discuss negro slavery and its abolition, and lastly plunges into a dissertation on things in general, especially the origin of life, the evolution of orders of plants and animals, the development of the intellectual and moral faculties, and the rise and decline of religion. Mr. Reade's first principle affords him a theory which at any rate places these various topics along lines of continuity. "Mind is a property of matter. Matter is inhabited by mind. There can be no mind without matter; there can be no matter without mind. When the matter is simple in its composition, its mental tendencies are also simple; the atoms merely tend to approach one another and to cohere; and as matter under the influence of varied forces (evolved by the cooling of the world) becomes more varied in its composition, its mental tendencies become more and more numerous, more and more complex, more and more elevated, till at last they are developed into the desires and propensities of the animal, into the aspirations and emotions of the man. But the various tendencies which inhabit the human mind, and which devote it to ambition, to religion, or to love, are not in reality more wonderful than the tendency which impels two ships to approach each other in a calm. For what can be more wonderful than that which can never be explained? The difference between the mind of the ship and the mind of man is the difference between the acorn and the oak." Following this all-comprehensive doctrine, Mr. Reade works out in well-turned paragraphs the evolution of animal and human faculties, the development of science and art, the rise and change of social and moral laws. He especially dwells upon the imperfections and mistakes of early ages, which, while afflicting the world with temporary evil, yet prepare it to attain in later times to better things. This is what he means by the title of his book, of which the historical and scientific parts seem intended to give weight to a polemical point, that of urging all enlightened men to take part in the great work of demolishing one of those institutions which, once the highest attainable, has now become injurious. "Christianity must be destroyed." "I give to universal history," the author writes in his conclusion, "a strange but true title—'The Martyrdom of Man.' In each generation the human race has been tortured that their children might profit by their woes. Our own prosperity is founded on the agonies of the past. Is it therefore unjust that we also should suffer for the benefit of those who are to come? Famine, pestilence, and war, are no longer essential for the advancement of the human race. But a season of mental anguish is at hand, and through this we must pass in order that our posterity may rise. The soul must be sacrificed; the hope in immortality must die. A sweet and charming illusion must be taken from the human race, as youth and beauty vanish never to return."

Mr. Reade's plan of not making particular acknowledgment to the writers whose facts and ideas he incorporates, is likely to mislead his readers, some among whom may fancy him a great original thinker, while others will certainly set him down as a mere compiler. It is not our business to discuss either his fanatical anti-Christianity, or his promised "Religion of Reason and of Love;" but so far as concerns Anthropology, his book shows the results of considerable reading and observation, conveyed with a certain power of word-painting and epigram. Now that he has delivered himself on the great question of modern thought, and has probably ascertained that no individual martyrdom awaits him apart from the rest of his species, we should recommend him to turn his experience and ability as an ethnologist to doing more solid work in some special department of his science.

* See Tylor, "Early History of Mankind," p. 234.

OUR BOOK SHELF

The Scientific and Profitable Culture of Fruit Trees. From the French of M. Du Breuil; adapted for English cultivators by W. Wardle. Second edition, carefully revised by George Glenny. (London: Lockwood and Co., 1872.)

THREE practical men have been concerned in the writing and editing of this little book, which is on all grounds well worthy of a place on the bookshelves of every gardener and grower of fruit-trees. It professes to direct the gardener in all the operations necessary, from the insertion of the graft to the completion of the tree, and the proper management through all its stages; and the instructions in all the various kinds of grafting are full and comprehensive. The first portion treats of the different modes of grafting, pruning, and training, and instructs in the mysteries of grafting by approach or inarching, branch grafting, cleft grafting, crown grafting, side branch grafting, and budding, or shield grafting. The main part of the book is then devoted to directions as to the mode of cultivation of the pear, apple, peach, plum, cherry, and apricot, and their best varieties. The portions of the work which were specially adapted for French cultivators have been modified or enlarged by the editor, and the language is throughout plain and simple. It is embellished also by nearly 200 illustrative woodcuts.

Reports of the Mining Surveyors and Registrars (Victoria) for the quarters ending June 30, September 30, and December 31, 1871. (Melbourne, printed by authority.)

THESE reports show that the mining operations in Victoria continue to be assiduously prosecuted, the total yield of gold during the three quarters being estimated at 1,055, 808 oz. 4 dwt. 4 gr., of which 524,990 oz. 7 dwt. 21 gr. were got from alluvia, and 530,817 oz. 8 dwt. 7 gr. from quartz reefs. The quantity of gold, the produce of the colony, exported during same quarters, amounted to 916,114 oz. 6 dwt. During the quarter ending June 30, the greatest yield of gold occurred, and the largest quantity was exported. But the yield and export of each of the three quarters approach pretty nearly to the same figures, indicating that the working of the mines has got into a settled state, and that the produce for some time to come may be expected to be proportionate to the capital em-

ployed. A number of tables give some interesting details relative to the number of miners, the machinery in use, and its value, from which may be gathered some idea of the extent and importance of the several gold fields in the colony. Of these fields, that of Ballarat appears at the head of the list, showing a total number of miners employed of 13,892, the approximate value of mining plant being 516,825*l.*; 134½ square miles of auriferous ground are actually worked upon, and 189 auriferous reefs have been proved. In this district also occur the deepest shafts, two of which reach the depths of 866 ft. and 900 ft. respectively. The price of Ballarat gold varies from 3*l.* 13*s.* 6*d.* to 4*l.* 2*s.* 6*d.* per ounce, the latter appearing to be the highest price obtained for any gold in the colony. In this mining district 78,502 tons 10 cwt. of quartz were crushed during the last quarter of the year, yielding 5 dwt. 19·42 gr. of gold per ton; the average yield in the different gold fields being very variable. But in considering the relative importance of each district, we are reminded by Mr. Brough Smyth, the Secretary for Mines, that the table relating to machinery should be examined and compared, from which it appears that it is not always the mines that show the greatest yield of gold which give the largest return to proprietors. An interesting feature in these reports is the description by Dr. F. von Mueller (Director of the Botanic Garden of Melbourne) of certain new vegetable fossils which are met with from time to time in the deep auriferous drifts of older Pliocene age. These consist of the fruits of plants which, according to Dr. Mueller rejoiced in a milder climate, and displayed forms of tropical grandeur now foreign to the spot. Five genera are described and illustrated with beautiful lithograms. Of these, among fossil genera *Phymatocaryon* comes nearest to the extinct *Cupanoides*, *Tricarpellites*, and *Wetherellia* of the London Clay. Another genus, *Trematocaryon*, bears no very close alliance with any genus among living or fossil plants. The remaining genera are *Rhytidotheca*, with some affinities to *Chloroxylon* and *Flindersia*, *Plesiocapparis*, the real affinity of which is doubtful, and *Celyphina*, which appears to belong to the order of Proteaceæ. We are glad to learn that many other fossil remains have been secured, and are now under examination by Dr. Mueller. For the collection of these fossils palæontologists are indebted to the enlightened zeal of Mr. John Lynch, mining surveyor and registrar. When one looks over the long list of surveyors and registrars employed by the Colonial Government in gathering statistics, we can only hope that some, if not all, of these gentlemen will follow Mr. Lynch's example, and thus be the means of increasing our knowledge of the "old world" of Australia.

J. G.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

The Rigidity of the Earth and the Liquidity of Lavas

I WAS glad to see the powerful argument in favour of the solidity of the earth which Sir William Thomson has deduced from its great rigidity, republished in NATURE of January 18, since, though never attacked, it has been ignored by those who hold a contrary view. In a lecture before the Royal Institution in May 1867, I appealed to it in support of the notion which I have long maintained of a globe solidified from the centre; and I remember that for that and for other heresies in my lecture I was sharply attacked in the *Geological Magazine*, and in turn defended myself as best I might in the same magazine for February 1868. I there said that "the conclusions of Hopkins from the phenomena of precession and nutation, the investigations of Archdeacon Pratt on the crushing effect of immense mountain masses like the Himalaya, and the deductions of Sir William Thomson from the phenomena of the tides, showing the great rigidity of the earth, are so many concurrent evidences that our planet, if not actually solid to the centre, has a crust far thicker than can be accounted for by the theory of a liquid globe, covered only with a crust resulting from superficial cooling." This discussion of the subject at that time seems to have had the effect of bringing to the front the defenders of the latter theory, which, in the popular mind at least, has a mythological rather than a scientific foundation. It was, therefore, well that Sir William Thomson should repeat his arguments.

Mr. Fisher has in this connection, in NATURE for January 25, referred to the distribution of fluid ignited matter within the earth, and to the relation of volcanoes to great lines of elevation, which would seem to show that the local distribution of such matter may be connected with these lines. He says, "I have suggested that this fluidity may arise from a diminished pressure beneath mountain ranges, owing to their mass being partly supported by the lateral thrust which has upraised them," and adds, "If any of your correspondents can propose another explanation of this remarkable coincidence compatible with the supposition of a rigid globe it would be interesting to know it."

My present object in writing is to call attention to the explanation proposed by me in the *Geological Magazine* for February 1870, conceiving, with Archdeacon Pratt, that the condition of things beneath a great mountain mass is one of increased rather than of diminished pressure. I there said, "Pressure, which in the first case, that of simple fusion of anhydrous materials, prevents liquefaction by preventing expansion, in the second case (that of igneo-aqueous fusion, or liquefaction at high temperatures, by the aid of a small portion of water, as maintained by Scrope, Scheerer, and Elie de Beaumont) on the contrary, favours liquefaction by promoting the solution of the water-impregnated mass." As Sorby has shown, a conversion of mechanical into chemical force appears in the increase of solubility under pressure. In other words, pressure prevents fusion, when, as in most instances, it is a process of expansion; but favours solution, which is, with few exceptions, a process of contraction.

"Now since I place the seat of volcanic action in a region where solution, rather than simple fusion, is the cause of liquidity, I am led to consider pressure as one of the efficient causes of the liquefaction of rocks, and to regard its diminution as leading to solidification." (See also Amer. Jour. Science, ii., l. 27).

Montreal, June 21 T. STERRY HUNT

Fouling of the Nile

THERE is an account—of which I have unfortunately lost the reference—of the Nile becoming crimson and putrid, and its fish being killed, during the historic period, seemingly by microscopic algæ. If any learned contributor could tell me where I can find this fact recorded, and could give me any details of similar phenomena, he would do me an especial kindness.

Chester, July 8 C. KINGSLEY

Volcanoes of Central France

AFTER carefully reading through the two extracts from Sidonius and Avitus contained in your number of May 30, my impression was that notwithstanding some manifest improbabilities, the conclusion was inevitable that earthquakes and other volcanic phenomena had actually been witnessed at Vienne. However, after examining all the facts of the case, a theory has occurred to me by which both accounts may be consistently explained without any such phenomena having occurred there at all. It would only remain to be shown that my supposed facts are not contradicted by evidence actually on record.

First, as to the persons:—The whole matter centres in the great Gallic family of Avitus, belonging to Auvergne. The most distinguished member of this family was Marcus Mæcilius Avitus, a person of so much importance that in the year 455 he became Emperor, but so little fortunate that in October 456 he was conquered and driven from the throne. He was allowed to become Bishop of Piacenza, but fearing for his life, returned to Auvergne and took refuge in the Church of St. Julian.* We find shortly afterwards two members of this family in possession of the See of Vienne, father and son, in succession, and the latter was the author of our Homily.

It seems, therefore, highly probable that the bishopric was in the gift of the family, or in some way dependent on it. In the year 463 we first find St. Mamertus in possession of the

* According to Gibbon he died on the way; the one certain fact is that he was buried there.

See, and his brother C. *Ecdicius* Mamertus seems to have been closely connected with it; indeed, he seems to have composed music for the choir. We are warranted in conjecturing that this family must have had intimate relations with that of Avitus. The name of the author of the Homily is A. *Ecdicius* Avitus; Sidonius Apollinaris was son-in-law of the Emperor Avitus, and his intimacy and correspondence with "Lord Patriarch Mamertus" confirm the supposition.

We have seen that M. M. Avitus went to Rome as Emperor, A.D. 455. The first time we hear of Mamertus as Bishop of Vienne is A.D. 463. What, then, is the probability of the following facts?

When Avitus went to Rome, he took with him many of his intimate friends and connections, and among them St. Mamertus. He obtained for Mamertus some Italian See, of which the principal town was situate at no great distance from Vesuvius. It was walled, had a large forum, and was partly inhabited by the nobility of the country. Upon the expulsion of his patron, Mamertus exchanged to the See of Vienne, or obtained that See by some other means. During the short time he was in Italy he witnessed those earthquakes and showers of ashes described in the letter and the Homily.

Assuming these facts, how will they agree with the statements in these documents, and with the known history of Vesuvius?

It is clear, from the letter of Sidonius, that the reason why the people of Auvergne observed the Rogations was not the fear of earthquakes, but of the incursions of the Goths, against whose advances they formed the chief barrier; they lived in the midst of the "surrounding terrors," yet Sidonius himself had to make inquiries and get information (*Sciscitatio*) in order to become acquainted with the volcanic phenomena: he nowhere says that "the city divinely committed to Mamertus" was Vienne, and all the circumstances are connected with Mamertus personally, and with a town only through him.

St. Avitus succeeded his father A.D. 490, and died A.D. 525. At what precise date he wrote the Homily I suppose is unknown; it may, perhaps, have been written before he was Bishop. The date of his birth seems to be unknown, but he may very well have been old enough to have been with his father in Italy, and as a youth have witnessed the phenomena that were seen by Mamertus; and in the congregation that listened to the Homily, there may still have been "many" who had been there also (with the army?), and had also seen them.

The words "at that time" mean that the earthquakes, &c., occurred at the same time with the attacks of the Goths on the inhabitants of Auvergne and Vienne.

One astonishing circumstance is that the Rogations, though instituted (in Gaul at least) by Mamertus, say between 456 and 463, had already obtained in "nearly the whole world;" evidently no such rapid and wide extension could be due to the fear of earthquakes; but it is easily understood, if they were considered to be a protection against the attacks of barbarians; the time of their celebration shortly before Whitsuntide would, I suppose, be about the time of preparation for the usual summer campaign.

But how account for a Bishop of Vienne instituting at Vienne a ceremony which is alleged to have been occasioned by events that happened in Italy? Thus:—Mamertus, who had no previous knowledge of volcanic action, would be greatly struck by what he saw; and even to the Italians these manifestations were probably a novelty. Vesuvius had been comparatively quiet for 200 years, and these (by hypothesis) were among the first intimations of that renewed fury which reached its climax in 472, and is mentioned by Procopius (I have no access to his work).*

Struck with terror, the idea of the Rogations occurred to him while in Italy, possibly he may have instituted them there; but it agrees better with the claim of Vienne to suppose that before he had the opportunity of carrying out his idea, he found himself again in Vienne, and first instituted them there, not against earthquakes, but against the barbarians.

The two things together, the earthquakes and the wars, suggested to him the possible approach of the awful time indicated by Christ (Matt. xxiv. 15)—"Cum ergo videritis abominationem desolationis," &c.; hence the "abominabilia" and the "doom of desolation" of the Homily. The "magna tribulatio" would well agree with the constant wars, and the "ineffable distress" occasioned by them.

Norwich, June 5 HENRY NORTON

* A few days after writing this I read the passage in Procopius, and found that he expressly attributes the institution of Rogations to the action of Vesuvius.

The Wanderings of the Esquimaux

IT is very gratifying to find that Mr. Howorth, whilst holding the position he has taken up with augmented force, has accepted, in the same kindly spirit in which they were written, the observations on the migrations of the Esquimaux which I was led to make after reading his very excellent letter in NATURE of May 9.

Mr. Howorth now brings forward the language of the Esquimaux in support of his views. This may be a strong point, although, if I remember rightly, one or two distinguished ethnologists think differently. As for myself, having little or no knowledge of languages, I can express no opinion one way or other.

Open as I am and shall be to conviction, and ready to give up my opinion cheerfully if proved wrong, I find that so far, the able arguments brought forward by Mr. Howorth have not in the slightest degree unsettled my belief in the truth of the Esquimaux tradition, communicated through interpreters whose competence I proved in a very satisfactory manner, at the same time that I ascertained the reliability to be placed on information transmitted from one to another by the Esquimaux. This I did by comparing information given by the natives of Repulse Bay, through my interpreter, with portions of the narratives of Arctic explorers of distinction (with which it agreed very closely) written in the one case more than twenty, and in the other more than thirty years before; of course neither the Esquimaux nor the interpreter knew what was in these narratives.

Mr. Howorth quotes numerous authorities, and I have no doubt does it so correctly that there is no necessity to look them up. These I shall now endeavour to answer, and as nearly as possible in the order in which they appear in his letter.

I do not think that the fact of the "Arctic Highlanders" building "stone igloos instead of snow huts," or their "ignorance of boats, either kayaks or oomiaks," makes any "broad distinction" between these people and the "American Esquimaux."

In the far west, that is, from Behring Strait to the Mackenzie River, the Esquimaux live in wooden houses during winter, probably because driftwood is abundant. They also have both kayaks and oomiaks.

As you go eastward and get near the Coppermine River, snow-huts form the winter shelter, probably because little or no wood is to be found, and a stone house without fuel to make a fire, is, as I know by experience, much colder and more comfortless than a snow-house under the same circumstances. The food of these natives is principally reindeer, musk cattle, and fish, with some seals, but neither whales nor walrus, as far as I could learn, to give fat for fuel. Here, also, the oomiak or large luggage boat disappears, it may be because the Esquimaux are less numerous, more scattered, and live in smaller communities, and do not require it. Another reason may be that the sea is more ice-encumbered. The kayak is, however, still in use, and when it is requisite to transport a family or a heavy load across water, two or more of these are fastened together, poles or paddles laid across them, and thus a kind of platform is constructed, which will carry very considerable weights in perfect safety.

This state of things prevails as far eastward as the great Fish River, Boothia, Gulf Committee, Repulse and Hudson Bays, but as the Esquimaux travelled northward to latitudes 76° and 77° by the route I have supposed them to do, as described in a former letter, the difficulty of building kayaks would be increased in consequence of scarcity of wood to make the frames.* The necessity for them would also become less, as the sea became less free from ice, and if, as I suppose, they chiefly hunted and lived upon reindeer and musk cattle. The usual season for killing seals is before the ice breaks up, so no kayak is required for that purpose.

From the description given me of the numerous "moss-grown ruins of deserted huts" seen near Smith Sound and on the Parry Islands, I am led to believe that many of them were not dwelling places at all, but the ruins of large stone "caches," such as are found in many places on the shores of America, where the natives have collected a quantity of provisions, round which stones are built in a very solid manner as a protection against the attack of the fox, the wolf, their own dogs, and, worst of all, the wolverine.

Let me now say a few words about the Arctic Highlanders of

* In 1846 the Esquimaux of Repulse Bay had plenty of wood, but in 1854 many of them, who had been hoarding up seal skins for the purpose, could not build kayaks, because they had no wood to make the frames of.

North West Greenland. I suppose these build their igloos of stone because they have no wood, and prefer this kind of house to a snow hut, because the walrus which they kill in great numbers, and which, according to Drs. Kane and Hayes, forms their principal food, affords abundance of fat for fuel. A stone house with fire is warmer than a snow hut without it.

As the Esquimaux, of all people I have ever met with, most readily adapt themselves to circumstances at very short notice, I believe that these Arctic Highlanders could under every difficulty build kayaks for themselves, were they absolutely necessary, otherwise how can we account for the Esquimaux in the south of Greenland (whom Mr. Howorth believes to be the descendants of these Arctic Highlanders) having built both kayaks and oomiaks almost identical in form and construction with those in use among the "American Esquimaux" of Behring Strait and the Mackenzie, several thousand miles distant, with whom they could have no direct communication? This has always appeared to me a very curious circumstance difficult of solution, except by supposing that the "Skrelings" crossed Davis' Strait at its narrowest part from Cumberland Island to Greenland, a distance of 200 geographical miles—a theory which I do not think so probable as the one I have already advanced.

"The Arctic Highlanders have become alarmed at the rapid diminution of their numbers through famine and disease."

This feeling is not peculiar to the Arctic Highlanders, for both at Repulse Bay and at the Coppermine River a very similar story was told me.

Between 1847 and 1854, the dates of my two visits to Repulse Bay, forty or fifty of my old friends in that neighbourhood—men, women, and children—had died in one season, and nearly all from starvation, caused, I was told, by one of those erratic migrations of animals I have already mentioned.

Although there is every probability that the musk cattle, of which skulls are found scattered along the shores of Smith Sound, had been killed by the Esquimaux, the "absence of the lower jaws" is no proof that they were so killed. Wolves, foxes, or bears, would carry off these lower jaws and very likely "break them up," but the head itself would be rather an uncomfortable burden for the two first-named animals, and would not afford much nourishment to Bruin, and even his strong teeth would find an old musk bull's skull rather a hard nut to crack if he did attempt it.

"The American Esquimaux never go from their own hunting-range for any distance to the inhospitable north."

It is very difficult to define what "any distance" may mean, but I have known them go several hundred miles in one season to look out for fresh hunting-grounds or seas, either north or south, and if they find game they remain there. If the game moves away, the Esquimaux will follow it, whether north or south, if not stopped as trespassers by some of their own countrymen who have had previous occupation.

When I went to Repulse Bay in 1853, I was surprised and disappointed at finding no Esquimaux—for we wanted dogs from them—where a very considerable number had been in 1846-7. In the spring (1854) we found that none had wintered, as far as we could learn, within 200 miles of our winter quarters. The Chippewayan legend told by Sir John Franklin is well known to the Hudson's Bay Company's people.

The Indians resorted in old times to the deposits of native copper on the Coppermine River to obtain that useful metal, with which to make spear and arrow heads, &c.; and it was probably on one of these occasions that an Indian woman may have been carried off "across the sea" to Victoria on Wollaston Land," some points of which are within sight of and at no great distance from the Continent. Very likely, instead of being kept in slavery, some good fellow made her his wife, and treated her as such, much more kindly than she would have been treated among her own countrymen.

In fact, although the habits of the Esquimaux near the Coppermine have nothing of the Indian in them, the face and form of several that I have seen differ widely from the true Esquimaux type, thereby indicating a mixture of blood or races.

That admirable traveller and keen observer, Mackenzie, "certainly knew the country well," but he did not know much of the Esquimaux, for the simple reason that he had very little opportunity of becoming acquainted with them. As an authority on anything relating to the Indians, either east or west of the Rocky Mountains, no man could be more reliable.

Mackenzie says at p. 406 of his book, "They (the Esquimaux) never quit the coast." I think Sir Alexander Mackenzie meant by this that they never went inland; the only interpretation which would, I think, give his opinion any weight. If in saying "they never quit the coast," he meant that they never crossed the sea or ice to other lands or islands to the north, which he by his own observation could not possibly have known, it would be in perfect contradiction to the Chippewayan legend of the woman being carried across the sea, &c., and to our present knowledge.

It is not at all necessary for the American Esquimaux to cross Behring Strait to enable them to obtain articles of Russian manufacture from the Tchuktchi, nor for these to cross over to America for this purpose. A number of Russian trading-posts have for very many years been established in Russian America (now Alaska), and these traders have carried on a large and direct traffic in articles of Russian manufacture with the Tchuktchi and Esquimaux.

It is that very "fragment" of so called Tchuktchi, of Tchuktchi Ness, found in the extreme north-eastern part of Asia, and a few of the Kamskatkans, whose language, custom, or physique resemble, to some extent, those of the Esquimaux, which I humbly think give strength to my belief in the original eastward migration of those curious people.

That there may have been a subsequent re-migration, so to speak, of Tchuktchi from America westward across Behring Strait to Asia, is, I think, very probable.

The Esquimaux and Tchuktchi of America, although they meet to trade for mutual advantage, are by no means friends, for they are (or were very recently) often at war with each other.

I can scarcely think that the American Esquimaux have been "sophisticated" by contact with the Indians. At the present time they differ from the Indians in every particular. In their dress, in their manners, in their mode of pitching their tents, of cooking and eating, fishing and hunting, in the form of their fish spears and hooks, in sewing, in the way of treating their wives, &c. Indeed, even at Churchill, where they come much in contact with the Indians, they seem to have acquired none of their habits or customs.

This letter has increased in length far beyond the limits I had contemplated, and I am almost ashamed to forward it to you with any hope of its finding a place in the columns of NATURE, but I felt almost bound to write something: first because an answer of some kind was required to the several arguments so well and ably used by Mr. Howorth, and secondly because I wished to comply with the hope he so pleasantly expressed that I would bring orward some more facts on my side. JOHN RAE

The Aurora of Feb. 4

IN the February number of NATURE just to hand I find an interesting account of this aurora. It may interest your readers to know that a very fine aurora was visible at Eden, 230 miles south of Sydney, at the same time. The notice sent me states that the aurora was visible from 1 A.M. to daylight of Feb. 5 (*i.e.* from 3 P.M. to 7 P.M. Feb. 4, Greenwich time); the auroral light extended from S.E. to S.W., and to an altitude of 60°. No other particulars were sent by the person who saw it; but it would appear that the auroral display must have commenced before it was observed in Europe. H. C. RUSSELL

Sydney Observatory, May 15

THE ZOOLOGICAL STATION AT NAPLES

LETTERS from Naples inform us that the construction of the building for the Zoological Station is now advancing rapidly. As the building is close to the sea, the foundations had to be laid with especial care, the more so as the heavy pressure of the aquarium tanks, the laboratory tanks, the library and the collections, would require even on ordinary ground some precaution.

We are glad to hear besides that Dr. Dohrn is most effectively assisted in the technical parts of the construction by Mr. W. A. Lloyd, of the Crystal Palace Aquarium, Sydenham. This gentleman, having been in friendly relations to Dr. Dohrn some years ago, when still in Hamburg, has obtained from the Board of the Crystal Palace Aquarium permission to render all possible help to the Naples station, as to an institution of a purely scientific character. Whoever knows the technical difficulties of

such a construction will be exceedingly glad that so experienced a man as Mr. Lloyd lends his assistance in so disinterested a way to an establishment which we trust cannot fail to exert a powerful influence on the progress of scientific Biology.

We are further informed that Dr. Dohrn has already received considerable presents for the future library of the Zoological Station. The celebrated firm of Engelmann, Leipzig, has sent all works published by it on biological topics, and which had not yet formed part of Dr. Dohrn's private library. The value of these books exceeds 100*l.* Besides this Vieweg, of Brunswick, has sent all that he has published on Biology. Theodor Fischer, of Cassel, the well-known publisher of the magnificent "Palæontographica," has also made very liberal grants. Others are promised. We trust our English publishers will not hesitate to send their publications on biological topics as soon as application is made by the administration of the Station.

The entrance of these books, and of whatever goods may be sent to the Station, is freed from any duty by the Italian Government. Dr. Dohrn hopes to obtain in short time, from a great steamboat company, free transport for all the objects sent from England to the Station.

On all these and other points we hope to give more full and special information at the beginning of next month, when the Committee for the Foundation of Zoological Stations in different parts of the World, will publish its Report to the British Association.

ON ALPINE MAPS

MR. LESLIE STEPHEN says that the Alps are the playground of Europe, and he is not far wrong; but the majority of the boys who frequent this playground are acquainted with only a very few of its nooks and corners, and not a single one of them can pretend to know the whole of it. The Alps are not likely to be thoroughly explored for several generations yet to come; and I doubt not that it will be possible for men half a century hence to spend their ten or twelve seasons in the Alps, and still to find at the end of their time valleys which have not been described or even visited.

The Alps are very imperfectly known, and they are still more imperfectly mapped. A complete map of the entire chain of the Alps is yet wanting. I mean one embracing the whole of the land between the Mediterranean on the south and Munich on the north, and from the valley of the Rhone on the west to the frontiers of Styria and Hungary on the east. I believe it is correct to say that there is no map in existence on a scale of $\frac{1}{300000}$ of nature (or on nearly so large a scale) which contains the whole of the above indicated regions; and even the scale of $\frac{1}{300000}$ is much too small to permit justice to be done to the intricacies of the chain. So long as the Alps remain divided between several countries it is not likely that we shall possess a complete map of them upon an uniform scale; and as it is improbable that boundaries will be rearranged for the formation of an Alpine State, and more so that private individuals will be enterprising enough to meet the want, it is in the highest degree unlikely that a complete map of the Alps will be produced within many years. Nevertheless, materials for a complete map are rapidly accumulating; the greater part of the chain has been surveyed with considerable accuracy; and the attention of the reader is now invited to some of the more important of the maps which have been, or are being, produced after these surveys.

The Swiss Alps have been surveyed with a thoroughness which leaves little or nothing to be desired. The Government map of Switzerland, on a scale of $\frac{1}{100000}$ of nature, in 25 sheets, besides possessing in a most remarkable degree the essential qualities of accuracy and clearness, has, regarded as a whole, a unity and perfection which place it far in advance of any other maps of mountainous countries with which I am acquainted. I have carried it in hand over a large part of Switzerland; and whilst I have never been able to detect anything more than trifling inaccuracies, I have been continually filled with admiration for the consummate ability displayed even in its most minute details, and for its almost faultless expression of every variety of mountain form. It would be a poor compliment to it to say only that one can distinguish upon it slopes from precipices, jagged ridges from rugged ground, and the "ice-falls" of the glaciers from the gentle undulating snowy slopes of the upper regions. One can do much more than that. When its conventional methods of expression have been mastered (and it must always be remembered that line engraving is necessarily conventional), the peaks detach themselves from the valleys and soar aloft, and the mountaineer sees the Alps before him with all their marvellous diversity of architecture; nay, more, he can fix his line of assault, and will say, "Here, if anywhere, the summit may be gained."

The effect of the whole map is as satisfactory as its details. The junctions of the sheets are admirably effected and are scarcely perceptible,* the relief of the hills gradually augments from the lowlands upwards, and the *massifs* are projected—as it were embossed—with astonishing power; whilst the great features of the country (such, for example, as the upper valleys of the Rhone and of the Rhine) are depicted so clearly that a single glance is sufficient to fix them indelibly upon the memory. As a work of art (irrespective of its other merits) this map has extraordinary excellence, and, taken as a whole, I believe it to be perfectly unique.

There were special maps of several of the Swiss cantons before the great survey was undertaken, but the map in 25 sheets is the first general official map of Switzerland that has been produced. It is drawn with what is termed *oblique light*—that is to say, with the light proceeding from the left-hand top corner to the right-hand bottom corner; and this treatment (which the Swiss Staff maintain with reason is the natural and the only effective system possible for a mountainous country) is employed consistently through all the sheets. A great part of the artistic effect of the map when the sheets are joined together is due to this treatment. The system of *central light*, which is sometimes adopted for maps, does not answer for a mountainous country; for it is evident, if it is employed in a map with numerous sheets, that each sheet becomes isolated from the surrounding ones, and unity of effect is impossible.

The claims of the draughtsmen and engravers of the Swiss map are deserving of especial recognition. It could not have been produced in its wonderful perfection unless every person employed upon it had been devoted to the work, and possessed of rare ability. But I believe that the reason of the extraordinary uniformity in the excellence of its parts, and of the unity of the whole, is found in the fact that the entire drawings and plates (and a great part of the survey†) were executed under the direction of a single head, namely, that of General Guillaume Henri Dufour.‡ The map is popularly and properly termed the "Carte Dufour."

The Swiss are keenly alive to the value and uses of good maps, and since 1869 have commenced a great one, which, in its dimensions at least, dwarfs the Carte Dufour

* For an example of the admirable way in which these sheets will join together, the reader is referred to a map of the Canton Uri, issued by the Swiss Statsbureau in 1867, which is composed of portions of four of the sheets of the Dufour map.

† The triangulation was commenced at the end of the last century by the cantons, and in 1828 was taken into the hands of the Confederation. The triangles of the first order were brought to a conclusion in 1840. The first sheet appeared in 1845, and the last one in 1864. In connection with the survey the names of Bétemps, Coaz, Mohr, and Colonel Siegfried should be mentioned. The last-named gentleman is, since 1864, director of the Topographical Bureau.

‡ Born 1787; entered the Federal Staff 1817; Colonel 1827.]

to insignificance. The map of which I now write, when complete, will be in 546 sheets. The portion comprising the plains and the Jura will be on the large scale of $\frac{1}{25000}$, but the Alpine portion will be upon a scale of $\frac{1}{50000}$. As yet only 26 sheets are published. The large scale of this map admits of the introduction of details which would have overcrowded the Carte Dufour, and there is, indeed, scarcely anything omitted from it which could be inserted. Even the erratic blocks of the Jura are laid down. The rivers and torrents are printed in blue ink, the lettering and outline of the map is in black, and there is a third printing, in red, for contour lines. Originally it was intended to have had a fourth printing, in green, for the sake of the forests; but the idea was abandoned from considerations of expense. The engraving of the lowland portion of this map is of the most exquisite character, and the Alpine portions (which are lithographic) are extraordinary examples of drawing on stone. The published sheets have not, however, the relief which is such a picturesque feature of the Carte Dufour, and which makes that map so popular and so valuable for educational purposes. Notwithstanding this, the larger map will be found to be incomparably the more useful of the two. The contour lines are laid down on the Alpine portion at a height of 30 metres (= 100 Swiss feet), and on the lowlands at a height of 10 metres above one another. One can therefore determine at a glance the height of any point upon mountains, glaciers, or snow-fields, within a few feet; whilst the largeness of the scale renders it invaluable for purposes for which the Carte Dufour could not be employed.

There is also at the present time a third map of Switzerland being produced at Berne, which is a reduction of the Carte Dufour. This is upon the scale of $\frac{1}{250000}$, and will be in four sheets. Two sheets are already published, a third is complete so far as Switzerland is concerned, but is awaiting details of the Italian Alps, and the fourth sheet is scarcely commenced. The engraving of this map is not less admirable than of those which have been already enumerated; and as it will be sold at 10 fr. for the four sheets, it will be one of the cheapest, if not the very cheapest, copperplate map ever produced.*

There are, therefore, existing or in progress three maps of the Swiss Alps, each of which may be adopted with confidence as a basis for other maps; but if we pass to the French, Austrian, or Italian Alps we shall find a great inferiority in the materials at our command. The French Alps have been, perhaps, better surveyed than the Austrian, and the Austrian than the Italian; but all these countries are destitute of maps possessing anything like the perfection of the Swiss ones.

The survey of the Etat Major, for the great map of France in 258 sheets (subsequently extended to 263 sheets, in consequence of the annexation of Savoy), was commenced very many years ago, but there are about 20 sheets still remaining unpublished, and almost all of these belong to the Alpine part of the country. Sheet 189, published in 1866, is indeed the only one yet issued which embraces any very lofty peaks; and this one contains the whole of the so-called Pelvoux *massif*, which includes numerous splendid mountains ranging in height from 3,700 to 4,100 metres. The principal triangulation may have been performed, for aught I can say to the contrary, with the utmost precision; but there is in the engraved sheets of the Alpine portions of the map a general want of the intelligent rendering that is found in the Carte Dufour, and such inexactness in the topographical details that one's confidence is shaken in the whole work. I cite by way of example the *massif* of the Meije (3,987 metres), the highest mountain in the Alps which remains unascended. The glaciers and its ridges, both on the north and on the south sides, are very inaccurately represented, and upon the spot are scarcely recognisable; and in other places, even where attention has manifestly been paid to details, the work is very devoid of character, and has been freely generalised. One can only conclude, in regard to these matters, that the engineers either considered that details of the upper regions were of no importance, or else that they were ignorant of the meaning of the things which they regarded. No sheets have been published to the south of No. 189, and thus the greater part of the department of Hautes Alpes, and the whole of the departments of the Basses Alpes and of the Var (to say nothing of Nice) remain unmapped. It is, I believe, chiefly on account of the want of good maps that so few persons travel for pleasure in this beautiful corner of France. The means of communication are good, and living is cheap, but it is rare indeed to meet with a tourist anywhere; and the solitary pedestrian is likely to be mistaken by the natives (as I have been several times) either for a pedlar selling images of the Holy Virgin, or for a dealer in looking-glasses.*

The range of Mont Blanc, which partially reverted to France in 1860, was until quite recently one of the worst mapped portions of the entire chain.† Upon the annexation of Savoy, Captain Mieulet, of the Etat Major, was set to work to connect this part of the new territory with the great map of France. But before Mieulet's work was reduced, and indeed almost before his survey was completed, the range was mapped by an amateur, and the honour of first presenting to the world an accurate plan of the most important part of the greatest chain of mountains in Europe was secured by an Englishman. Mr. A. Reilly (the English amateur to whom I refer) in 1863 determined trigonometrically no less than 200 points, and in the winter of 1863-4 reduced his work to shape, and presented his map to the English Alpine Club. Its publication was immediately resolved upon, and in 1864 Mr. Reilly went over the ground again to correct his work. In June 1865 his map was published at the cost of the Alpine Club, in chromo-lithography, upon a scale of $\frac{1}{50000}$ under the title of "The Chain of Mont Blanc." In the mean time it had been represented in Paris that it would be a great advantage for Captain Mieulet to extend his work beyond the frontiers, and he accordingly carried his survey as far as Courmayeur. A special sheet on the scale of $\frac{1}{20000}$ was promptly engraved from the materials he accumulated, and was published in 1865 by order of the late Minister of War, Marshal Randon.‡ This map, however, included the central portion of the chain only, and Mr. Reilly's map remains, I believe, the only trustworthy complete map of the whole of the chain that is in existence.

In accuracy there is probably little difference between these two maps. The French one is superior to the other in giving numerous altitudes, but the English one has the merits of greater clearness and picturesqueness. Mieulet, on his survey, discovered that the highest peak of the Aiguille de Trelatête was only 3,932 metres, whereas an altitude 1,000 ft. greater had been previously assigned to it. Reilly, on his part, demolished the Pointe des Plines, a fictitious summit, which he showed was identical with the Aiguille d'Argentière, although it had in former maps been laid down as a mountain separate and distinct. Both maps have especial merits, but the Englishman's, from being the work of an amateur, is the more remarkable of

* All of the Swiss maps are remarkably cheap. The sheets of the great map in 546 sheets will be sold at an uniform price of one franc each. The price of the Carte Dufour (which measures 3·50 metres wide by 2·40 metres high) was reduced about three years ago, by order of the Federal Council, from 100 to 40 francs, in order that it might be available for persons of small means. The whole of these maps can be procured from the bookseller Dalp, of Berne, who is the agent appointed for their sale.

* Another proof of the rarity of travellers is found in the ignorance of the natives of all kinds of money except their own, and the traveller should well supply himself with napoleons and francs, to avoid loss by exchange.

† I do not of course in this remark include the Swiss portion of the range, nor the basin of the Mer de Glace. That renowned glacier and its tributaries were well surveyed by the late Prof. J. D. Forbes in the years 1842-50, and the resulting map, which was published in 1855, was, I believe, drawn on stone by Dr. Augustus Petermann himself.

‡ Under the title of "Massif du Mont Blanc, extrait des minutes de la carte de France, levé par M. Mieulet, Capitaine d'Etat Major."

the two, and notably illustrates how much a single unaided person may accomplish who makes his work a labour of love.

The condition of the Eastern Alps is even less satisfactory than that of the western part of the chain. The great French map will, doubtless, be completed sooner or later, and when it is finished the Western Alps will be fairly, although only fairly, represented. There is no immediate prospect of an equally perfect map being produced of the Eastern Alps. The map of Lombardo-Venetia, in forty-two sheets, on the scale of $\frac{1}{86400}$, is the most important one which touches these districts; and it is as much inferior to the great French map as the latter is to the Carte Dufour. Those who are intimately acquainted with these regions point to its too great generalisation of details and to its want of character, and observe that it (like other maps published at Vienna), although meritorious for its day, is now behind the times. Sundry amateurs have done good work in recent years in correcting or laying down afresh several of the *massifs* of the Eastern Alps, and amongst these individuals none are more worthy of mention than Mr. Tuckett and Lieutenant Payer. In the summer of 1864, Mr. Tuckett, of Bristol, devoted some time to the exploration of the Orteler group, and subsequently published a paper in vol. i. of the *Alpine Journal*, entitled "Contributions to the Topography of the Orteler and Lombard Alps:" This paper was accompanied by numerous outline sketches, and by a map. The latter, although roughly executed, gave, it is believed, for the first time with some approach to accuracy the positions and forms of the glaciers on the south side of the chain throughout the length of Val di Zebru, with the basins of the Vitelli and Nagler glaciers, and the lower portions of those of Sulden and Forno. All these were more or less incorrectly laid down (when represented at all) or vaguely indicated on the Government Maps. Further topographical corrections in connection with the Southern Orteler Alps (the result of visits in subsequent years) were recorded by Mr. Tuckett in the 2nd vol. of the *Alpine Journal*. With the labours of Lieutenant Payer the readers of this journal are already acquainted.*

Of the Alps of Piedmont there is no map in existence upon which dependence can be placed. A survey is said to be in progress, which will be eventually worked out upon a mammoth scale, and this will afterwards be adopted as the basis for a reduction of more moderate size. Many years must elapse before either of these maps can be produced, and in the meanwhile the old Sardinian Government map will be almost the sole authority. The shortcomings of this map are notorious, and one wonders at the rare ability of the draughtsmen who were employed upon it in projecting mountains which do not exist. The case of Mont Tseran is one of the most flagrant instances, but others could be quoted scarcely less audacious. Mont Tseran is laid down on sheet thirty-seven of the Sardinian map upon the northern side of the valley of the Arc, not far from the source of the river, and is credited with an altitude of 4,045 metres. There is no important mountain upon the spot which it is supposed to occupy, and Mont Tseran may be considered to be absolutely mythical. The late Mr. Cowell demonstrated that the peaks in this neighbourhood do not anywhere approach the height of 4,045 metres,† and those who cross the Mont Cenis Pass by the old road can easily satisfy themselves that no great mountain occupies the ground whereupon Mont Tseran was located by the Sardinian surveyors.

Several amateurs have endeavoured to reduce the Piedmontese Alps to a little order. Mr. Reilly (whose name has already been mentioned in connection with the chain of Mont Blanc) carried on a survey of the southern branches of the central Pennines in the years 1865-6, and afterwards projected his work upon the scale of $\frac{1}{100000}$. His map was published at the expense of the Alpine Club, and it is, I believe, the only one which at all fairly represents the southern side of Monte Rosa, the valleys of Valpelline, Barthelemy, and Tournanche, and the ranges which divide those valleys. Mr. R. C. Nichols has devoted several seasons to clearing up the topography of the Graians, and has from time to time communicated papers to the "Alpine Journal," some of which are illustrated by maps. But the full extent of his labours will not be known until a map is published, about which I have now a few words to say.

Some six or seven years ago the want of a general map of the Alps was a topic of conversation amongst those who habitually frequent those mountains, and ultimately a committee of the Alpine Club was appointed to superintend the production of a new map which was intended to rival the Carte Dufour in accuracy, and to comprehend the entire chain. The preliminary investigations quickly discovered that the plan must be modified, on account of lack of data; and it was at length determined to limit the scheme to the Central Alps, to the exclusion of the most eastern and western ones. Mr. William Longman, the eminent publisher, accepted the financial responsibilities, and Mr. Nichols was appointed editor.

This map will be in four large sheets on the scale of $\frac{1}{250000}$, and is being engraved on steel. It is now in course of production at the geographical establishment of Mr. Stanford, and it promises to be one of the most minutely and beautifully engraved maps ever published in this or in any other country. Its sheets are somewhat larger than those of the Swiss map on the scale of $\frac{1}{250000}$, and it does not extend quite so far to the north as the Swiss map, but in the south it embraces the important groups of the Graian Alps to the south of the Valley of Aosta, which include the Valleys of Locana, Cogne, Savaranche, Rhèmes, Grisanche, and the Tsère, with their peaks Tour de St. Pierre, Grivola, Grand Paradis, Grand Apparei, Aig. de la Sassière, Mont Pourri, and the Ruitor. All of these valleys and mountains are not included in the Swiss map. In the west the boundaries of the two maps are identical, but in the east the English one extends 10 kilometres beyond Landeck, thus taking in the Orteler group, the Zufallspitze, the Adamello and Presanella (all of which mountains will be just without the range of the Swiss map), but stopping short of the Oetzthal group, and thus excluding a great part of the Tyrol, the Bavarian Alps, and everything beyond. The map is expected to be completed in about two years, but it is not at the present time sufficiently far advanced to permit of an elaborate criticism. I believe, however, that it will be found to be little or not at all inferior to the Swiss maps in finish of engraving, in its relief, and in its accuracy, but will hardly be so clear as they are, in consequence of the introduction of details which would have been sufficient for a map of four times its scale. Still its appearance will be welcome to those who travel amongst or who are interested in the Alps, and it is to be hoped that the scheme as at first propounded will one day be carried out to its fullest extent.

In the foregoing rapid survey of maps of the Alps it has only been possible just to glance at some of the principal ones; but this glance has, I trust, enabled the reader to understand that an unlimited amount of work remains to be accomplished before the Alps can be said to be thoroughly explored, and that a splendid field still remains open for the employment of superfluous energy of men who desire to distinguish themselves. The efforts of individuals are scarcely perceptible upon so vast an extent of country; but a body of zealous observers, spread over its various districts, might break the neck of the work in a few years, and render it possible to produce for the first time a map of the entire Alps upon a uniform scale.

EDWARD WHYMPER

* Papers have appeared from time to time upon Lieut. Payer's work in the pages of Petermann's "Mittheilungen."

† See "Vacation Tourists and Notes of Travel." London, 1861.

EVANS'S STONE IMPLEMENTS OF GREAT BRITAIN*

WHEN Shakespeare represented his philosophical Duke, as finding "sermons in stones," and "books in the running brooks," he was but unconsciously exhibiting the prophetic faculty which has been attributed to all true poets. He could hardly have foreseen that his pretty yet fanciful conceit would one day be found to be sober earnest. But so it is; we have here a goodly volume of more than six hundred pages, illustrated by nearly as many excellent woodcuts, discoursing learnedly of nothing save stones and streams, and finding in them sermons of great and, to many readers, novel interest.

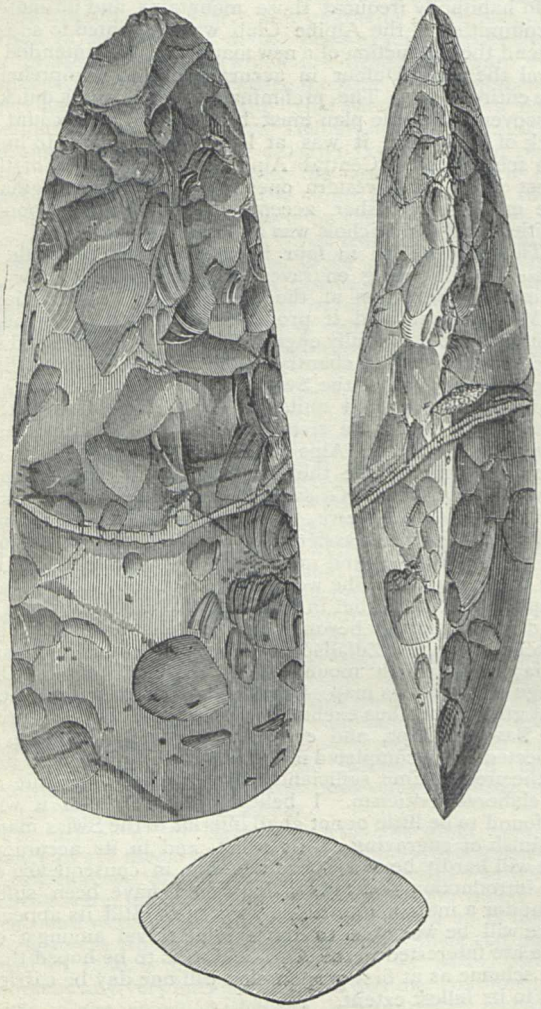

FIG. 1.—POLISHED CELTS, SANTON DOWNHAM, SUFFOLK

It might have been supposed, when Mr. Evans had published his well-known work on "The Coins of the Ancient Britons," that he had gone back as far as possible in the history of our land and nation; but in archæological as in other sciences, there is in the lowest known depth one lower still remaining to be fathomed; every chamber opened to the light discloses others lying beyond it. From a people who had no literature, or none of which they have left any trace beyond the rude characters inscribed on their rude coins, we are now carried back to tribes and races which possessed neither coins nor letters; people who have left us neither their sepulchres nor their ashes, nor indeed any trace of their existence, save the rude triangular or subtriangular fragments of worked stone which served them for tools or weapons; and even these are usually found buried beneath the wreck and ruin, it may be, of continents or islands which have long since been worn and wasted away.

The publication of this work is remarkable as an evidence of the quickened pace which characterises scientific research in our days. Palæontology and Geology, vigorous and flourishing as they are, are still hardly "out of their 'teens;" but Prehistoric Archæology has made comparatively more rapid progress than either. Not more than fourteen years have passed since the discoveries made by Boucher de Perthes of flint implements in the gravel beds of Abbeville and Amiens, although at that time discredited and disparaged by the geologists of his own country, were confirmed and supplemented by Mr. Prestwich and Mr. Evans. Previously to that time these objects had attracted but little notice; the things were "neither rich nor rare;" men looked at them and wondered, and then forgot them, just as before William Smith's time they gazed with a profitless curiosity on fossil shells and bones, and thought with Dr. Martin Lister, that they might be "the efforts of some plastic power, in the earth, being the regular workings of Nature, whereby she sometimes seems to sport and play, and make little flourishes and imitations of things, to set off and embellish her more useful structures."

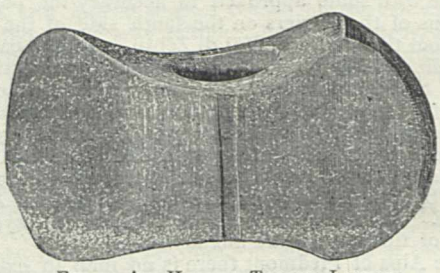

FIG. 2.—AXE-HAMMER, THAMES, LONDON

But since the discoveries in the Somme Valley were recognised, a flood of light has been shed upon the subject. These dry bones live, and these rude stones are found to be useful, indeed indispensable, materials for building up the earliest history of the human race. The *savans* of every country in Europe have hastened to take part in an inquiry so novel and so interesting; many volumes of memoirs have been written; our French neighbours, with their usual vivacity, have established a journal devoted to Prehistoric Archæology, as well as an annual *Congrès;* and these researches having been for several years conducted by so many able and eager observers, we need not wonder that Mr. Evans, having studied the whole bibliography of the subject both ancient and modern, and explored every considerable museum or collection, is now enabled to produce this Encyclopædia of the new-born science, which for want of a better word may, perhaps, be called Petrology or Petro-tomology. He has introduced us into the workshops and armouries of our most remote predecessors, it may be of our ancestors, as they existed not at any particular epoch, but in all probability through a long succession of ages; and he has shown us so clearly what were their weapons and tools, of which any vestiges remain, and how they were made and used; and has correlated them so accurately, as far as might be, with similar objects found in all quarters of the globe, as well as with those described by classical writers, or in use by modern savages, that in reading his work we know not which most to admire, the industry shown in the collection and examination of such a vast amount of material, or the skill with which the informa-

* "The Ancient Stone Implements, Weapons, and Ornaments of Great Britain." By John Evans, F.R.S., F.S.A. (London: Longmans and Co., 1872.)

tion thus obtained has been methodised and arranged. The book completely exhausts the subject, and will long continue to serve as a perfect manual for the collector, as well as furnishing most useful materials for archæologists and anthropologists.

Those who are not already somewhat versed in this science will be astonished to learn the infinite variety of uses to which the apparently stubborn and unmanageable rock called flint has been converted. We may, perhaps, doubt if in the very earliest ages it was used for purposes of warfare, and we prefer to give our progenitors the benefit of that doubt, and to believe that those were "golden ages"—times of primitive piety and peace; and that it was only for purposes of husbandry, and the chase, and domestic use that they worked up the materials found in their plains and valleys. Thus, we find descriptions of celts, or axes for felling trees, or hewing canoes, hoes, threshing machines—as now used in the East—or

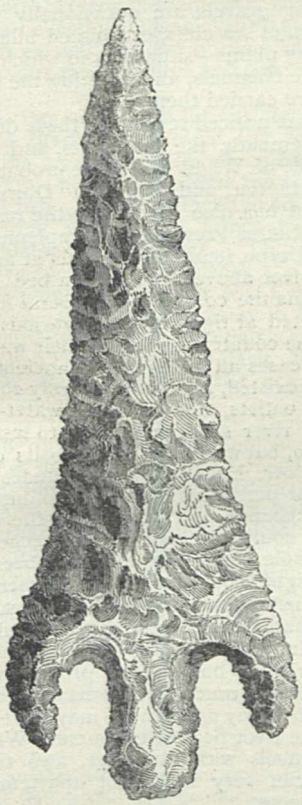

FIG. 3.—ARROW-HEAD, ISLE OF SKYE

perhaps harrows, scrapers for preparing skins, arrows for birds or other "small deer," knives, gouges, saws, mullers or pounding stones, chisels, hammer axes or picks, and polishing or grinding stones, of which there must have been great need; nor were the women of the period left destitute of their share of the stony spoil; for we find in these pages descriptions and figures of rings, armlets, amulets, spindle whorls, pestles, and, in the cave deposits, needles of bone of admirable workmanship, which might have been, and probably were, drilled by flint flakes.

As these primitive people have left us no record of their progress in arts and manufactures, and the material evidences bearing on the subject are found in a very confused and dislocated condition, it is a work of no small labour to classify and arrange them in order of date, or rather of sequence, and thus none but a rough and wide scheme of classification is possible. The Danish and French authors, as well as many of our own, usually divide the stone implement period into two principal stages only, the Palæolithic and Neolithic—unpolished and polished; placing them both before what has been called the Bronze age. This arrangement, however, although found convenient for popular use, and in that sense adopted by Mr. Evans, can hardly be regarded as scientifically accurate; as he has himself observed, there are blanks in the chronology of stone implements, which it is hard to fill up. The classification may be, and indeed is, too wide in one respect, and too limited in another. Whilst, on the

FIG. 4.—URQUHART

one hand, the drift and the cave implement periods, which are usually bracketed together as Palæolithic, are characterised by very various conditions, both palæontological and geological, and, indeed, technological also—conditions which may indicate their separation by a vast interval of time; so, on the other hand, as Mr. Evans has shown at the close of the fourth chapter, some of the unpolished stones, chipped or rough hewn celts, were probably of a date not earlier than some that were ground and polished; and, in Great Britain, at least, there are not wanting indications that the use of bronze was coeval with the polished stone period, if not, indeed, with one or two exceptions (which were probably imports) anterior to it.

One of the most perplexing questions suggested by the discovery of the drift implements relates to the means by which they came into their present position. They are often met with at a depth of twenty or even thirty feet,

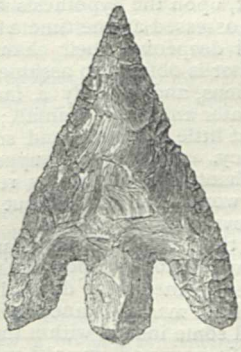

FIG. 5.—ABERDEENSHIRE

usually at or near the base of thick beds of coarse flint gravel, which in its turn is overlain by masses, more or less thick, of brick-earth or loess. Occasionally, and indeed not rarely, they occur entirely beneath the gravels, and on the surface of the subjacent rock, whatever it may chance to be. Mr. Evans deals with them merely as constituent portions of the beds of sand, gravel, and clay, in which they occur, and so indeed they now are, but they are something more. Although of the drift, drifty, each has its own separate history; for each has been held and fashioned by hands guided by an intelligent will, and thus

we are led irresistibly to inquire when, and why, and how did they come where we now see them, and why are they never found on the surface, nor under any other conditions?

To a certain extent this inquiry is involved in the far larger question of the forces by means of which the superficial gravels, of which the implements are as it were but the accidents, became dispersed—a subject which does not necessarily come within the scope of a work designed to be technological rather than geological. Mr. Evans has, however, very judiciously devoted one of his chapters to it; and as it is one of great interest, and is still involved in much obscurity, we may gladly welcome any attempt to deal with it, especially by one who has given so much attention to its investigation.

It was the opinion of the late Dr. Buckland, an opinion which was concurred in by Greenough, Conybeare, and other able writers of their time, that the general dispersion of gravel, sand, and loam, over hills and elevated plains, as well as valleys, was the result of a universal deluge, which is described as transient, simultaneous, and of a date not very remote; that the existing system of valleys was mainly due to the same cause, and that thus both valleys and gravels preceded our present river systems. Cuvier, and the French geologists generally, have held the same opinion, but of late years it seems to have been altogether discredited by English authors, with perhaps the exception of the late Sir Roderick Murchison. We may well entertain doubts as to the occurrence of a deluge that should be both universal and simultaneous; and it is probable that it is chiefly on that account that Dr. Buckland's theory has met with so little favour. Still, although we may be unable to adopt his views in their entirety, his statements as to the diluvial characters of the English drifts seem entitled to some further consideration before they are set aside altogether, and on this account it is fortunate that the recent discoveries of flint implements have excited so much interest in the gravels in question as to induce Mr. Evans to devote no inconsiderable portion of his work to the history and antiquity of the River drift.

In the last chapter he has adduced an elaborate argument in favour of the belief in fluviatile transport as opposed to diluvial, by showing first hypothetically the possibility that "deposits now occupying the summits of hills have originally been formed in and about river beds," and then, by reference to the actual phenomena, the probability that the implement-bearing beds were thus formed. No one can doubt, upon the hypothesis here stated, that rivers may have possessed at one time a far greater power of excavating and deepening their channels than now; but then the author is obliged to assume the prevalence of several conditions, and notably a far more rigorous climate, and a greater amount of rainfall; conditions as to which we have but little evidence, and some of that is of a doubtful tendency. If, as is now supposed, the hippopotamus and elephant and rhinoceros remained here all the winter, they would have fared but badly, had the climate been as severe as is supposed.

But passing by these topics as not bearing very immediately upon the question of transport, it cannot be doubted that submergence, by means of diluvial action, is quite possible, since we have many instances of it within the historical period, and some indeed within the last few years; and both modes of transport being alike possible, the probabilities of the case have alone to be considered; and, notwithstanding the various reasons so ably stated by Mr. Evans, it does not seem that there are sufficient grounds for rejecting Dr. Buckland's theory, and there are besides some inferences to be drawn from the position of the implements which, so far as they are concerned, are at variance with the theory of fluviatile transport. For instance, when met with in valleys, it appears that the implements are not found along the whole course of those valleys, as well where flint gravels are wanting, as where they abound, as would have been the case had they been carried down promiscuously by the streams from time to time; but, only in certain limited areas, and then usually in large numbers, and at about the same levels; and further, that in several of these deposits the implements are distinguished from those of neighbouring deposits by some slight difference in form. From these indications it may be inferred that they were made and left at or near the spots on which they are found, and afterwards covered up, and occasionally displaced, by the masses of drifted material which now overlie them; and this seems the more probable, when it is seen that some of them were formed from stones of the same kind as those composing the beds in which they rest, and that some of these appear to have lain exposed upon the surface for long periods before they were worked.

If, indeed, it had happened that these things had never been found elsewhere than in river valleys, the conclusions arrived at by Mr. Evans would have been irresistible, but so far from this being the case, it is certain that these implement-bearing gravels are occasionally found on the extreme margin of sea cliffs, or isolated hills on the verge of far-stretching plains—situations to which no river flowing in the same channels, and draining the same areas as now, could have carried them.

Mr. Evans has noticed several of these deposits as met with at Bournemouth, the Reculvers, and the Foreland cliffs in the Isle of Wight (to these probably should be added Southampton, and Brandon Down, and some others); and he has also alluded to the remarkable discovery in the Madras Presidency of implements of quartzite of true drift type, found on the cliffs at an elevation of three hundred feet above the sea, in a bed of ferruginous clay which forms the coast line for several hundred miles, and is intersected at right angles at various intervals, by the rivers of the country in making their way to the sea.

In all these cases all traces of the ancient rivers, if indeed they ever existed, have been entirely effaced; neither channels, nor outlets, nor adequate water-sheds, nor a single land or river shell, remaining to testify of them; and not only so, but we find many deposits of quaternary gravel (which Mr. Evans justly concludes to be of the same geological period as those of the implements, and to owe their existence and position to the same causes) on hills which could not have been reached by modern rivers. The whole country would have been a vast lake before such heights could have been submerged; and under such circumstances it may be fairly assumed that the same forces, whatever they were, that covered the hill-tops, may have partially filled up the valleys; the presence of gravel may suggest, but cannot prove, that the river brought it, however much it may have re-arranged and sorted it; both valley and gravel may have had an existtence before the river began its course. We have many valleys and gravels without rivers, and rivers without gravels; they can very well exist apart, and, doubtless, have often done so.

(To be continued.)

THE HUNTERIAN MUSEUM *

ONE of the most interesting features in connection with the annual election of Fellows into the Council of the Royal College of Surgeons, is the exhibition of additions about to be made to the Museum, and which have accrued since the last meeting. Prof. Flower, the Conservator, states in his Report that in the pathological collection eighty-eight additions have been made, against sixty-two during the past year, and that the microscopical characters of all recent specimens sent to the College, and thought worthy of preservation, had been carefully described and delineated by Mr. Goodhart, the Pathological

* From the *Medical Times and Gazette.*

Assistant, on whose great zeal a well-deserved eulogium is expressed.

Although but very little has been expended in the purchase of osteological specimens, the additions are of considerable importance. Amongst those specially mentioned is the skeleton of an extremely rare whale, the *Berardius Arnuxii*, purchased for the Museum by Prof. Wilson, F.R.S. The series illustrating the structural peculiarities of the human race has received two very valuable additions in skeletons of both sexes of the extinct aboriginals of Tasmania, presented by Mr. M. Allport, of Hobart Town. Both have been articulated. The male is in exceedingly good preservation; that of the female is unfortunately less complete, but still presents many interesting features.

The liberality with which the Smithsonian Institution of Washington is conducted has been shown by various important additions to the museum in former years, but especially during the present, in a series of skulls and skeletons of North American mammals, several of which were new to the collection. The College has reciprocated this liberality by presenting a set of casts of the interior of crania of various races of men and animals, and some duplicates.

Another important addition is the skeleton of an adult male Porbeagle shark, about eight feet long. This is valuable, from the great difficulties which have usually attended the attempts made to preserve the osseous system of cartilaginous fish. These difficulties have been overcome by the great skill of Mr. James Flower, the experienced articulator to the College. This will be found a very instructive specimen to students.

In the dermatological collection Mr. Erasmus Wilson still shows the deep interest he takes in it by presenting twenty-five beautifully executed models; and M. Voillemier, Surgeon to the Hôtel-Dieu, Paris, has presented two, representing elephantiasis of the scrotum, with its cure resulting from operation.

Amongst the contributors are Pro's. Gervais, of Paris, and Peters, of Berlin; Sir William Fergusson, who gives a great number of preparations; Sir James Paget, Messrs. Hilton, Holden, Busk, Clark, Gay, Curling, Wilson, Jackson, the Zoological Society. and the Smithsonian Institution. Mr. Kiernan, a late member of the Council, has presented the whole of his collection.

During the day of election the theatre, where these additions are displayed, was visited by a large number of the Fellows. It remains open for the inspection of the members and their friends for a few days.

NOTES

We reprint in another column a document which will be read with the greatest indignation by scientific men in every part of the world, and with shame by all Englishmen. We refer to the remonstrance presented to the Treasury by eleven of our most distinguished scientific men against the treatment which the eminent Superintendent of the Royal Gardens at Kew has received at the hands of his official superior, the Chief Commissioner of the Board of Works. Though we might take exception to some of the arguments brought forward by the memorialists, yet there can be but one opinion that the systematic discourtesy and want of consideration with which Dr. Hooker has been treated is entirely incompatible with the efficient conduct of the department of the public service with which he has been entrusted, and deserves the most searching inquiry on the part of the Government.

Prof. Agassiz's Second Report to the United States Coast Survey of the scientific results of the *Hassler* expedition, a portion of which we reprint this week, is one of the most important contributions to scientific knowledge which has appeared for some time. His remarks on the glaciation of South America, and the origin of the so-called "raised beaches" of Patagonia, are especially valuable.

The short communication from Dr. Anton Dohrn on the present position of the Zoological Station at Naples will be read with great interest. The mode in which the Italian Government is assisting this important undertaking forms an instructive contrast to the action, or rather want of action, of our own Government in the matter of the Tides Committee to which we recently alluded. When will Englishmen be able to compare with any other feeling than that of shame the policy of their own Government with that of any other civilised nation of the world in all matters relating to Science?

According to the constitution of the Institution of Civil Engineers, it consists of three classes, viz., Members, Associates, and Honorary Members, with a class of Students attached. Of these several grades there were on the books on the 1st inst. 756, 1,127, 16, and 243, respectively, making in the aggregate 2,142. The increase in the last three months in the different classes has been 11, 36, 2, and 9, representing an effective addition of 58.

We understand that Prof. Palmieri's account of the late eruption of Vesuvius is being printed at Berlin by Link and Reinke, and will be published in several languages. It will be illustrated by five lithographs taken from photographs.

M. Delaunay, director of the National Observatory at Paris, has taken possession of the Observatory at Montsouris.

The Society of Sciences of Haarlem has named the following subjects for competition for essays, to be sent in before January 1, 1874:—1. A study in detail and exhaustively of the influence which chemical and physical modifications of the solvent exercise on the form of carbonate of lime when deposited from aqueous solutions. 2. A critical examination of the various hypotheses on the origin of polar auroræ, and the relations between the polar auroræ and other natural phenomena. 3. On the changes which stone-fruits undergo during their development. 4. On a satisfactory means of determining the temperature, the degree of humidity, and the density of the atmospheric air at a considerable height above the surface of the earth. Also before Jan. 1, 1875:—An exhaustive study of some Linnean species, chosen from those which present more or less divergent forms. The prize for each of these Essays consists, at the choice of the author, of the ordinary gold medal of the Society, or a sum of 150 florins, with an additional 150 florins if thought worthy. The memoirs may be written in Dutch, French, Latin, English, Italian, or German.

Mr. L. H. Courtney, M.A., Fellow of St. John's College, Cambridge, has been appointed Professor of Political Economy at University College, London, in the room of Prof. Cairns. Two Slade Scholarships in Fine Arts, tenable for three years, have been conferred at the same Institution on Miss E. M. Wild and Miss B. A. Spencer.

At a meeting of the Council held on July 6, the Associateship of the Royal School of Mines was conferred on the following gentlemen:—Mining and Metallurgical Divisions—W. Charlton, O. Pegler. Mining and Geological Division—G. M. Dawson. Mining Division—E. Dillon. Metallurgical Division—F. W. Harrold, J. H. Huxley, O. F. Mondy, A. G. Phillips. The following awards were made:—First year students—The two Royal Scholarships of 15*l.* each to Mr. S. A. Hill and Mr. J. Taylor. Second year students—H.R.H. "The Duke of Cornwall's" Scholarship, 30*l.* for two years, to Mr. Edgar Jackson, and the Royal Scholarship of 25*l.* to Mr. C. Law, and the Murchison Medal and Prize of Books to Mr. S. W. Davies. Third year students—The Edward Forbes Medal and Prize of Books in Natural History and Palæontology to Mr. G. M.

Dawson. The De la Beche Medal and Prize of Books in Mining to Mr. W. Charlton.

THE forty-fifth annual session of the German Society of Naturalists and Physicians will be held in Leipzig next month. The meetings will commence on Monday, August 12, and end on Sunday, August 18. The secretaries announce that visitors from foreign parts will be welcome.

THE Vicar of Folkestone has written to the *Times* stating that the memorial west window which it is proposed to place in the parish church to commemorate Harvey will consist of eight subjects from Our Lord's Miracles of Healing, and that underneath it will be recorded on a brass Harvey's great discovery. This project is, we believe, entirely apart from that set on foot by the committee of which Dr. Bence Jones is treasurer, whose object it is to erect a statue to Harvey at Folkestone.

THE death of Rev. M. A. Curtis, of Hillsborough, North Carolina, which took place in April last, must be considered as among the most serious losses that natural history in the United States has experienced for some time. The attention of Mr. Curtis was directed especially to the fungi, although he was more or less familiar with all the plants of the Southern States. In his special department, however, he stood at the head of American botanists, occupying the position in this country of Mr. Berkeley, his correspondent, in England. Mr. Curtis prepared the report upon the fungi collected by the United States exploring expeditions, and has contributed various articles to the literature of this science. Among other works nearly ready for the press was one upon the edible fungi of the United States, illustrated by figures and descriptions of some sixty species. The qualities of most of these he had personally tested by experiment, particularly during the late war, when the food question was for some time a matter of serious moment.

A LATE number of the *Chemical News* contains a suggestion for the formation of an "Association of Manufacturing Chemists," which might hold annual meetings after the fashion of the Iron and Steel Institute, at which topics would be discussed connected with the various important branches of chemical manufacture. It is obvious that meetings of this kind, and papers read to such a body, with the discussion which would result therefrom, might be in the highest degree beneficial to a large body of men engaged in a manufacture requiring a large amount of scientific knowledge and acquaintance with technical details.

A WRITER in the *Food Journal* points out the advantages, to the Central Authority and to the Government, of a National Registration of Sickness. As a basis for sanitary legislation, as an indication for interference on the part of the Central Authority in local sanitary affairs, as a test of the health conditions of the country, as well as of its separate parts, no mass of information could bear comparison with that which would result from a well ordered registration of diseases.

Harper's Weekly records the safe arrival of Mr. Henry W. Elliott at the island of St. Paul, Behring Sea, on April 28. He left Washington last March under an appointment from the Treasury Department, as an assistant of Captain Bryant in looking after the interest of the United States in connection with the fur seals on the Pribylow Islands. Mr. Elliott expects to spend some time at St. Paul, and to devote much attention to the study of the islands, and in collecting specimens of their natural history. Wielding a ready pencil, he also proposes to make sketches from life of the fur seal, the walrus, sea-lion, &c., so as to give us a better idea of their general appearance than we can gather from the stuffed caricatures in public museums.

IN addition to Prof. Agassiz's Report, given in another column, several communications have been received from gentlemen connected with the *Hassler* expedition, all bearing testimony to the zeal with which the operations of the party have been prosecuted. Under date of March 12 it was reported that, after leaving Montevideo on Feb. 20, the dredging work was carried on with due diligence and with very interesting results, numerous radiates of great beauty, many of them undoubtedly of new species, being brought to light. Among the objects of particular interest were the floating stems of the giant kelp of the South Pacific, *Macrocystis*, which sometimes attains the length of 500 to 1,000 feet, the stems being a foot in diameter, and resembling trees in magnitude. The vessel entered the Straits of Magellan on March 13, and passing through, arrived at Talcahuana, in Chili, on April 11, where it was expected to remain several days for repairs and provisions. Prof. and Mrs. Agassiz proposed to spend the interval in a visit to Santiago and Valparaiso, while Count Pourtales and his assistants were to make a line of deep-sea soundings and dredgings from Talcahuana to the island of Juan Fernandez and back to Valparaiso.

THE United States Coast Survey has received advices from Mr. William H. Dall as late as May 5. At that time he was at Illulluk, Oonalaska, the head-quarters of his explorations. He has been diligently engaged through the winter in carrying out the objects of his mission connected with the geography and hydrography of the Aleutian Islands, as well as the weather would permit, a constant succession of storms of extreme violence having interfered greatly with his work. The lowest temperature recorded by him during the past winter was 13°, the average from October to March being 33°. Mr. Dall has devoted such time as he could spare while detained in port, to making collections of natural history specimens, and has obtained quite a number of forms, some of which he considers new to science.

A PROPOSITION has been entertained to tunnel under the Strait of Canso, between Nova Scotia and Cape Breton, where the strait is only two and a half miles wide, for the purpose of connecting the island of Cape Breton with the mainland. The cost is estimated at 2,500,000 dols. This idea is connected with a proposition to run a line of steamers from Glasgow, or other British port, to Louisburg, the most easterly point of Cape Breton.

THE *Panama Star and Herald* records the first arrival on April 2, at Panama, on its annual eastern migration, of the beautiful sphinx moth (*Urania leilus*). The immense flights of this moth, and the extreme regularity of their recurrence year by year, have repeatedly been dwelt upon by the *Star*, and much interest has been excited as to its starting-place and ultimate destination.

THE Report of the Winchester and Hampshire Scientific and Literary Society for 1870-71, congratulates the members of the Society on the successful results of the second year of its existence. Though no important discoveries were due to the labour of the Society during the year, and the weather was very unfavourable for out-of-door work, steady progress was made in some departments, especially in the list of the flora of the neighbourhood, which now includes nearly 700 species. Abstracts of papers on various branches of science, read at the meetings of the Society, are printed in the Report.

THE Malvern, Bath, and Woolhope Field Clubs met for a joint excursion on May 17, an account of which is printed in a separate form, and to it is appended the Report of the Annual Meeting of the Malvern Field Club, with the Address of its President, Mr. Edwin Lees.

A NEW journal has been recently started in New York called "Handicraft: a popular Journal of Progress of the Industrial Arts, designed for workers and thinkers." The number on our table contains papers and short paragraphs, on inventions in the mechanical arts, illustrated with woodcuts, with notices of books, &c.

MR. AYRTON AND DR. HOOKER

THE comments which have been made by several London journals upon the circumstances referred to in the subjoined memorial, seem, in the interest of all persons concerned, to render its publication in its entirety desirable. We cannot doubt that any delay which has occurred, or may occur, in the delivery of a reply to the memorialists, is due to the desire of the Prime Minister to deal with the important question at issue in a manner which, while it is not inconsistent with the interests of the public service, is not incompatible with a due regard for the interests of Science, and for fair dealing towards a very eminent scientific man.

To the Right Hon. W. E. Gladstone,

First Lord of the Treasury, &c. &c.

We, the undersigned, deeply interested in the condition of English science, and viewing with special concern the treatment which the eminent Director of the botanical establishment at Kew has systematically received at the hands of Mr. Ayrton since his appointment to the office of First Commissioner of Works, do most respectfully beg your attention to the following statements and observations.

In the year 1840 the private Botanic Gardens of Kew, which had previously been in the possession of the Royal Family, were handed over by the Queen to the Government.

A commission then appointed to report on their condition recommended that they should be enlarged and maintained as a national scientific establishment, which should form a centre of reception for the useful products of the vegetable kingdom, a centre of reference and distribution for England, India, and the colonies, and a means of augmenting the rational pleasure, increasing the knowledge, and refining the taste of the English public.

The late Sir William Hooker was at that time Prof. of Botany in the University of Glasgow. The founding of an establishment like that contemplated at Kew harmonised so completely with his scientific tastes and power of organisation, that, at a sacrifice of more than half his income, he offered to undertake the superintendence of Kew Gardens. His offer was accepted, and he was appointed Director of Kew, at a salary of 300*l.* a year.

Sir William Hooker was at that time the possessor of an excellent private herbarium and of a scientific library, both of which were wanting at Kew. To provide house-room for these an additional 200*l.* was granted by the Government. No allowance, however, was made for the maintenance or increase of either the herbarium or the library. The expense of both fell upon the director.

During his residence in Glasgow, the excellence of his collections had attracted to the house of Sir William Hooker various active investigators, the number of which increased materially after his arrival at Kew. Fourteen rooms of the house he occupied were devoted to his herbarium, which for twelve years was the resort of the scientific botanists of Europe. Unaided by the Government, save to the extent above mentioned, Sir William Hooker devoted his private means to the purchase of new books and specimens, and opened a correspondence with botanists of all lands. He thus made his house the most extensive botanical laboratory in this country, and the most important centre of reference regarding systematic, economic, and descriptive botany, as illustrated by his herbarium.

The gardens expanded equally under his vigorous and enlightened supervision; in ten years after his appointment they became the first in the world.

For twenty-five years he had been collecting textile fabrics, drugs, gums, dyes, and other products to illustrate the structure, uses, and physiognomy of plants. With these collections, made at his private cost, Sir William Hooker founded in Kew Gardens the first museum of the kind that had ever been established. Of such museums there are now three at Kew. They contain upwards of 50,000 named objects of scientific and economic interest, views of tropical vegetation, and maps illustrating the distribution of plants over the globe. These museums constitute concrete courses of instruction, unrivalled in concentration and completeness; and the public interest in them is proved by the number of persons who avail themselves of the stores of information thus provided.

The contributions of Sir William Hooker to these museums were his free gift to the country, for which he never received a farthing of remuneration.

In 1852 the director's salary, which had previously been raised to 600*l.* a year, was augmented to 800*l.*, together with a house which had become vacant at the time. The herbarium was then lodged in a separate building, and immediately afterwards donations and legacies (some to the director, some to the Government of the day) poured into it. The labour of naming the collections of expeditions, and of drawing up botanical reports, became at length so excessive that the public need of the herbarium was still further recognised by the Government. The director had previously borne the expense both of assistance and maintenance; of these he was now relieved, though he still continued to bear the cost of books for his library and of new specimens of plants.

Without this personal devotion on the part of the director, the development of Kew would have been a simple impossibility. For five-and-twenty years his purchases were made and his collections elaborated at his own expense and risk, though they were constantly employed in the work of the country. Before his death, knowing that his son could not afford to be as regardless of pecuniary considerations as he had been himself, he gave directions to have his herbarium valued by competent persons and offered to the Government at the lowest valuation. On these terms the collections which had previously been devoted to the nation's use became the property of the nation itself.

This is a brief but sufficient statement of the relationship of Sir William Hooker to Kew Gardens. It shows him to have been their virtual creator.

The antecedents and achievements of the present Director of Kew may be thus sketched. In 1839 Dr. Joseph Hooker was appointed Assistant-Surgeon and Naturalist to the Antarctic Expedition, the most perilous, perhaps, that ever sailed from these shores, and the scientific results of which exceeded in importance those of any other naval exploring expedition of this century. During this voyage Dr. Hooker received from the Government the pay of his rank as a medical officer. His outfit, his books, his instruments, were provided by his father. The expenses of travelling and collecting ashore during his four years' voyage of circumnavigation were defrayed from the same source, though this work was done with the express object of enriching a public establishment.

On his return, he waved his claim to promotion in the navy, and devoted four additional years to the classification and publication of the results of the voyage. He also aided his father as an unpaid volunteer in the development of the scientific branches of the Kew establishment.

In 1847 Dr. Hooker was sent to India, to explore, in the interests of Kew, an unknown region of the Himalaya; and he was directed to proceed subsequently to Borneo, to report on its vegetable resources. His outfit, both for India and Borneo, which embraced a large collection of expensive instruments, cost the Government nothing. To cover all expenses incidental to his three years' travelling and collecting, including the cost of assistants and specimens, a sum of 1,200*l.* was received, while the real disbursements of Dr. Hooker during this time amounted to 2,200*l.* The difference was contributed by Sir William Hooker and his son, in the interest of the establishment to which they had consecrated their best energies.

On his return from India, Dr. Hooker again devoted himself to the work of aiding his father in the scientific development of Kew. He was also employed by the Admiralty, during the nine years from 1851 to 1860, in publishing the botanical discoveries of various naval and other voyages, from Captain Cook's downwards, to parts of the world visited by Dr. Hooker himself. For this service he received three years' pay as a medical officer in the Navy, together with a sum of 500*l.*, which was accompanied by "the expression of their Lordships' approbation of the zeal, perseverance, and scientific ability displayed in bringing to a successful completion this great botanical work." For three years he was occupied with the arrangement and distribution of his Indian collections, and with the publication of his journals. To cover the expenses incidental to these labours, an allowance of 400*l.* a year was granted by the Government.

Besides the voyages and travels above adverted to, Dr. Hooker has made journeys to various parts of Europe, to Western Asia, and to North Africa. The expenses of these journeys, though they were made with the express object of adding to the interest and completeness of Kew, have been borne by himself, and the results given to the establishment of which he is director.

We place these data before you, not with a view of founding on them either censure or complaint. The labours of Dr. Hooker,

and the heavy drain upon his father's purse which his unexampled education as a botanist involved, constituted the discipline which made him the man he now is. But we think it highly desirable that you and England should know as much of his career as will enable you to decide whether its arbitrary interruption by your First Commissioner be creditable to the Government of this country.

In 1855, Sir William Hooker being then seventy years of age, Dr. Hooker was appointed his Assistant-Director, at a salary of 400*l*. a year, without a house; and from this time his share in the duties of the Garden were added to his more purely scientific ones. In 1858 his salary was increased to 500*l*. a year, with a house, and in 1865, on the death of his father, he succeeded to the Directorship without an assistant.

The liberality of his father and his own self-denying life in the public service have, we think, been sufficiently illustrated. We will therefore ask permission to place before you only one additional specimen of his conduct. As regards the Floras of Asia, Africa, and America, the Herbarium at Kew had been long unrivalled. Europe, however, was but scantily represented. Three years ago, a collection embracing the very flora needed for the completion of Kew was offered for sale in Paris. At his own private cost, Dr. Hooker purchased this collection for 400*l*., and presented it to the Kew Herbarium.

His income at Kew is 800*l*. a year, and here is one-half of it voluntarily devoted to the establishment which it had been the continual object of his father and himself to raise to the highest possible perfection. Had these things been known to the Parliament and public of England, the First Commissioner of Works would, we imagine, have hardly ventured to inflict upon the Director of Kew the unnecessary toil, worry, indignity, and irredeemable loss of time against which this memorial is a remonstrance.

Under the auspices of his father and himself, Kew Gardens have expanded from 15 to 300 acres. They have long held the foremost rank in Europe. In no particular does England stand more conspicuously superior to all other countries than in the possession of Kew. The establishment is not only without a rival, but there is no approach to rivalry as regards the extent, importance, or scientific results of its operations. Upwards of 130 volumes on all branches of botany, including a most important series of Colonial Floras, but excluding many weighty contributions to scientific societies and Journals, have been issued from Kew. To these are to be added guide-books and official papers. This vast literature has been produced and published through the efforts of the directors of Kew, for the most part at no expense whatever to the nation.

To these labours is to be added the correspondence of the directors with all parts of the world, a mere selection from which, now bound together at Kew, embraces some 40,000 letters addressed to the directors, and for the most part answered with their own hands.

Of the popularity of the Gardens, which has been attained without prejudice to their scientific use and reputation, it need only be stated that from 9,000 visitors in 1841, the numbers have risen to an average of nearly 600,000 a year. What they have done towards the elevation and refinement of the tastes and conduct of the working classes may be inferred from the fact that last Whit Monday 37,795 visitors entered and quitted the Gardens without a single case of drunkenness, riot, theft, or mischief of any kind being reported.

Since Dr. Hooker's accession the Gardens have been to a great extent remodelled, and the establishment wholly reorganised. A great saving in outlay has thus been effected, without any sacrifice of efficiency. During the ten years from 1863 to 1872 inclusive, the annual number of living plants sent from Kew to various parts of the world has been doubled, amounting on an average to eight or nine thousand annually. Of seeds ripened at Kew, or obtained by the director from various parts of the world, the annual average distributed amounts to about seven thousand.

Of the practical value of these labours, the introduction of the Cinchona plant into India, Ceylon, and Jamaica, the commercial success of which is established, constitutes one of many illustrations. The introduction of Ipecacuanha is another. This will be corroborated by Her Majesty's Secretaries of State for India and the Colonies. We would add, that there is scarcely a horticultural establishment at home or abroad which would not be willing to acknowledge its indebtedness to Kew.

In India upwards of thirty gardeners trained at Kew are now employed in forestry, cotton, tea, and cinchona plantations, Government gardens, &c., and a far greater number are usefully employed in other parts of the world.

By the joint efforts of the directors, a series of complete Floras of India and the Colonies was set on foot at Kew, of which those of the West Indies, all the Australian Colonies, New Zealand, Tropical Africa, the Cape Colonies, and British India are completed or in progress. These are standard works of inestimable value in the countries whose plants they describe, as well as to scientific travellers and institutions in Europe.

We have hitherto confined ourselves to a statement of Dr. Hooker's services in relation to Kew, and have said nothing of his labours in geology, meteorology, and other sciences, nor of his researches while Botanist of the Geological Survey. During his single year of office he contributed to the Records of the Survey two memoirs, which are to be regarded as landmarks in the history of fossil botany. In presenting the Royal medal to Dr. Hooker in 1854, the president of the Royal Society spoke of these memoirs as "one of the most important contributions ever made to fossil botany." We may add a reference to his adventurous explorations of the northern frontier of India, in regions never visited by a European before or since.

It is not likely that a man of these antecedents, accustomed to the respect which naturally follows merit of the most exalted kind, would in any way expose himself, and more especially in matters relating to the welfare of Kew, to the just censure of his official superiors. Until the advent of the present First Commissioner, he had never been the object of a censure, and was never interfered with in the practical discharge of his duties by the Board of Works. His proposals and suggestions were rightly scrutinised, and his estimates regulated by the opinions of the Board, but the current duties were left entirely to his conduct and supervision; the extension and improvement of the establishment being always the origination and work of the Director.

With this sketch of the early training of Dr. Hooker for his present post before you, you will be able to compare with it the early training of Mr. Ayrton for the position which, by your favour, he occupies as Dr. Hooker's master. You will be able to judge how far the First Commissioner is justified in treating the Director of Kew with personal contumely, and in rudely upsetting the arrangements which he had made with reference to the invaluable collections for which he is responsible, not to Mr. Ayrton alone, but to his conscience and his country.

Neither you, Sir, nor the English public have forgotten the speech of the First Commissioner on presenting himself for re-election at the Tower Hamlets, when he went out of his way to insult "architects, sculptors, and gardeners." That speech was a warning to every cultivated man who held office under the Board of Works, and it was, as you know, duly laid to heart by the Director of Kew. His desire to avoid all cause of offence was thus expressed in a letter addressed to yourself on August 31, 1871:—"Having regard to the tenor of the sentiments Mr. Ayrton is reported to have expressed in public on accepting office, I felt it incumbent on me to be especially circumspect in my conduct and demeanour under his rule."

Circumspection, under the circumstances, was of small avail, and one of Mr. Ayrton's first acts, after taking office, was to send a reprimand to Dr. Hooker. It was a new experience to the Director of Kew. During his thirty years of public service such a thing had never once occurred; indeed, the very reverse of it had always occurred, the respect due to intellectual eminence and moral worth having been always cheerfully accorded to Dr. Hooker by his official superiors. This first reprimand of his life was, moreover, not due to any fault of his, but arose entirely from the First Commissioner's own misconception.

The responsibility of the warming and ventilation of the plant-houses had, by special order, devolved upon the Director. After a searching inquiry, Dr. Hooker had been entrusted by a previous First Commissioner with the task of remodelling the heating apparatus throughout the establishment; and this led to the construction at Kew, in accordance with the Director's plans and estimates, of the most complete range of hot-houses for scientific purposes in existence. In 1871, however, he accidentally discovered that he had been superseded in the duty, without notice given or reason assigned. He wrote a respectful letter of inquiry to the First Commissioner, and received the short—we are persuaded you will agree with us in adding, insolent—intimation that he *had* been superseded, and would have "to govern himself accordingly."

He would, in our opinion, have been equally unfaithful to the

science of which he is a leader, and the public which he had so long served, if he had bowed in silence to this rebuke. He wrote a second letter of remonstrance to the First Commissioner, in which he expressed himself as follows: "The matter, therefore, stands thus: Several months ago I was, unknown to myself, deposed from the discharge of a function of great importance. I was left to hear this accidentally and, I have now to add, through one of my own subordinates.

"I do not for a moment question the First Commissioner's power to exercise arbitrary authority over the Director of Kew, but I do submit that there has been hitherto no plea whatever for such action as regards myself, and that the repetition of such acts, and the leaving me to be informed of them, *on each occasion*, by my subordinate, constitute a grievous injury to my official position, and tend to the subversion of all discipline in this department."

At this point, Sir, Dr. Hooker turned in the fullest confidence to you. He had undoubting trust in your will and power to protect both Kew and him from the arbitrary and, we would add, ignorant acts of the First Commissioner. He respectfully claimed the privilege of bringing the matter under the cognizance of the Right Honourable the First Lord of the Treasury.

You doubtless remember the letter addressed to you by Dr. Hooker on August 19, 1871. You could not fail to remark the reluctance with which he appealed to you, and his previous anxiety to take all possible measures to avert the necessity of such an appeal. "I cannot express to you, Sir," he writes, "the anxiety that this step costs me, nor how earnestly I have endeavoured, by suppressing all personal feelings, to conduct my duties here under Mr. Ayrton to his and to my own satisfaction.

"After upwards of thirty-two years spent in the public service at home and abroad without a suspicion of mistrust on the part of my many previous superiors, I have had since Mr. Ayrton's accession to submit to various arbitrary measures, which, though compromising my position and authority, have been concealed from myself and become known to my subordinates, through whom alone I have first been made cognizant of them."

From you, Sir, the Director of Kew received no direct reply to this communication; but by the First Commissioner he was requested to "furnish the dates and particulars of the conspicuous proofs of disregard to his office, and the particular occasions and facts with dates, of his being left to be informed through his subordinates of acts of arbitrary authority of the First Commissioner, and the dates and particulars of those acts."

To this challenge the Director of Kew replied by adducing five distinct acts of arbitrary interference, with their "dates," "proofs," and "particulars." * Among them was included what we have a right to call clandestine tampering with the subordinates at Kew. For example, the Curator of the Gardens was tempted by Mr. Ayrton, personally, to leave Kew by the offer of a higher position, involving authority over works at Kew; and he was requested by Mr. Ayrton to keep the fact from the knowledge of Dr. Hooker. To the loyalty of this man to a master whom he trusted and loved, the Director of Kew owes the discovery of proceedings which under any previous First Commissioner would have been impossible.

Your attention, Sir, was drawn to this reply in a letter addressed to you by the Director of Kew on the 31st of August, 1871. It is in every respect so excellent, and so sure to be appreciated by all who know the real meaning of scientific work, and the baneful effect upon such work of this harassing conflict with your First Commissioner, that we do not hesitate to reproduce it here *in extenso*.

"Royal Kew Gardens, August 31, 1871

"Sir,—I beg most respectfully to submit copies of my further correspondence with the Right Honourable the First Commissioner of Her Majesty's Works, &c.

"The acts detailed in the accompanying letter are, I believe, correctly described. I trust that I do not exaggerate in characterising them as grievously injurious to my official position, and tending to the subversion of discipline in this establishment; and I have evidently no protection from a repetition of them, except through the intervention of a higher authority.

"Of these acts, those referred to under 1, 2, 3, formed the subject of a prolonged correspondence between the First Commissioner and myself; that under 4, I brought to the notice of Mr. Stansfeld, and the result was the abandonment of the proposal; that under 5 will, I venture to hope, be revoked by your authority. I refrain from commenting on these acts of the First Commissioner in reference to their seriously interfering with the execution of my peculiar and multifarious duties here.

"These include the labours of a Scientific Botanist, a Horticulturist, and the administration of Public Gardens, Museums, and Pleasure Grounds, frequented annually by upwards of 600,000 persons.

"Besides the living collections, I have the direction of the largest and by far the most frequented Herbarium (by botanists and amateurs) in existence, and a very extensive Library.

"I conduct, without a secretary, a responsible and onerous correspondence with Foreign and Colonial Gardens, as also with the Admiralty and Indian and Colonial Offices, on all subjects connected with Horticulture, Forestry, Botany, and the appointment of officers to duties in connection with these matters, and the introduction of useful plants everywhere.

"I have, further, the editorship or control of various botanical works now being published, by order of Government, at Kew; and I have to devote every moment that I can spare from my duties to maintaining, by researches and publications of my own, a position as a Scientific Botanist.

"Until the accession of Mr. Ayrton, I have been enabled to fulfil these duties with satisfaction to myself, having been treated with uniform confidence, consideration, and courtesy by my superiors. I was invariably consulted on all prospective changes affecting my own and my subordinates' positions and duties. On the revision of my estimates at the Board, before their transmission to the Treasury, I was referred to; and amongst my other current duties was the control of the construction and repairs of the hot-houses and heating apparatus throughout this establishment.

"Subsequently to Mr. Ayrton's accession, my position has been materially changed in all these respects. He had hardly entered on his duties when he hastily administered to me a wholly unmerited reprimand (the first I ever received), and his last act (known to me) has been to take from me the above-mentioned control, without pretext, warning, or subsequent intimation.

"I venture to hope that this may be restored to me, if the reasons I have adduced in the enclosed letter to the First Commissioner are satisfactory to you. To these I would add, that in all similar establishments with which I am acquainted, in England or abroad, the opinion of the cultivator is entitled to the first consideration in all matters relating to plant-houses and heating apparatus; that to trust him with the care and treatment of invaluable collections, and make him amenable to the opinions of another in respect of the apparatus he requires, is as obviously wrong in principle as to refuse a surgeon his choice of instruments and hospital appliances. Nor would it be candid in me to withhold from you my conviction, that I have by this arbitrary act of the First Commissioner been lowered in the eyes of those who know no more of the circumstances than that I am deposed from the full control of buildings and apparatus which I was entrusted to erect and have still to use.

"Let me assure you, Sir, that I am unconscious of any feelings of personal animosity against Mr. Ayrton.

"Having regard to the tenour of the sentiments he is reported to have expressed in public, on accepting office, in respect of professional duties such as mine, I felt it incumbent on me to be especially circumspect in my conduct and demeanour under his rule. And in evidence of this let me add, that when still smarting under his unprovoked reprimand, I, at his special request, devoted many nights to examining and reporting upon various books and pamphlets on the public parks of England, France, and America, for his guidance—a labour not very congenial and wholly beyond my province as Director of Kew, and which I further undertook in the hope that it might lead the First Commissioner to judge more generously of the acquirements and duties of some of the officers of the department he controls.

"I am, Sir,

"Your most obedient Servant,

"Jos. D. Hooker, *Director*

"To the Right Honourable
The First Lord of the Treasury"

To this letter Dr. Hooker was honoured by a reply from yourself, couched in kind and considerate terms. You had communicated with Mr. Ayrton, and had received his explanations, which you forwarded to the Director of Kew, "in the hope that they would convey to his mind the assurance that there has been no

* Dr. Hooker's letter containing these charges was never answered, or even acknowledged, by Mr. Ayrton.

intention on Mr. Ayrton's part to disregard his feelings or withhold the consideration due both to his person and his office."

Stress of public duty is quite sufficient to account for the fact of your overlooking the serious omissions and inaccuracies of the First Commissioner's "explanations." These, however, were immediately pointed out to you by Dr. Hooker. His object in addressing you was not simply to complain of personal discourtesy on the part of the First Commissioner, but of five official acts subversive of discipline in the Kew establishment, and fraught with mischief to the public service. Had these acts merely affected him personally, he would have been perfectly willing to accept the assurance of Mr. Ayrton's consideration, though he failed to discover any trace of it either in his explanations or in the treatment which official papers sent from Kew continued to receive from the office of Works. He regarded it, however, as his duty, as an officer in the public service, to the Government and the scientific public, to spare no effort to procure a reversion of the policy introduced into the management of each and all of the departments of Kew (the Gardens, Museum, and Herbarium) by the present First Commissioner.

The specific acts enumerated by Dr. Hooker in answer to the request of the First Commissioner are thus summarised in a letter to yourself:—

"1. A transaction with my subordinate of a nature so new to my long experience of official life, and so repugnant to my principles, that I refrain from characterising it.

"2. Removing the Curator from his duties under me, without any communication with me.

"3. Empowering the Curator to act independently of me in regard to the times he should consider himself under my orders, and instructing me to make my arrangements in deference to his, and in concert with him.

"4. Submitting to the Treasury plans and estimates for extensive alterations in the Museum at Kew, without even informing me of his intentions; which works would have most seriously embarrassed me, as Director of the Museums, and would have involved a large expenditure, for which I believe no estimate was submitted, and which would have been in every respect detrimental.

"5. Superseding me, without previous or subsequent communication, in duties for the execution of which I held the Board's authority, and which I am of opinion should unquestionably be performed by the Director, *i.e.*, the control of the heating apparatus of the hot-houses, &c."

In Mr. Ayrton's letter of "explanations," which you considered so satisfactory, the first three of these charges are skilfully ignored, and the other explanations contain statements which are demonstrably at variance with fact.

In the very considerate note above referred to, which was addressed by you from Balmoral to Dr. Hooker, you say: "There must be some mistake about Mr. Ayrton's failing to see you at Kew, as he assures me that he paid the visit there for the very purpose of personal and friendly communication."

We respectfully ask you to consider how this "purpose" was carried out. Dr. Hooker was at home when the First Commissioner paid this visit to Kew. He omitted to inquire for the Director at his house, or at the Gardens, or of his subordinate, to whom Mr. Ayrton's visit was really paid. He held a conversation with this subordinate seriously compromising the Director's position and authority, which conversation he subsequently desired should not be communicated to the Director. The result of this conversation, moreover, was a communication to the Treasury affecting Kew, which was also kept from the knowledge of the Director. You will learn from these facts what the First Commissioner understands by "personal and friendly communication."

From its effects upon himself, Dr. Hooker could infer how disturbing the continual intrusion of this subject upon your attention must be. He was anxious to reduce this disturbance to a minimum, and therefore ventured to suggest that he should be put in communication with one of your private secretaries, to whom he might explain his position. To this request you, in the kindest manner, assented, and placed Mr. West in communication with the Director of Kew.

Sorely against his inclination, but driven to it by the necessities of the case, Dr. Hooker, at an interview with Mr. West on the 30th of October, distinctly pointed out the grave errors and omissions contained in the "Explanations" given by the First Commissioner to the First Lord of the Treasury.

The end of the year approached without any answer being made to these communications and representations, and towards the close of December Dr. Hooker wrote again to Mr. West, who thereupon replied that a plan was under the consideration of the Government which would materially alter his position with reference to the First Commissioner of Works. He was subsequently informed semi-officially that the scheme was maturing, and the hope was expressed that he would take no step likely to embarrass the Government. This was far from his wish or intention. But after waiting till the 21st of February, the Director was semi-officially informed that the Government plan for his relief, and for the protection of Kew, had been abandoned.

In the hope of a satisfactory settlement, the matter was subsequently placed by you in the hands of the Marquis of Ripon, and on the 13th of March, 1872, before a Committee of the Cabinet, consisting of the Marquis, Lord Halifax, and Mr. Cardwell, Dr. Hooker, by the desire of the Committee, handed in a memorandum containing a statement of the points wherein his relations to the Government required definition and correction.

The upshot of these friendly efforts was this: On the 15th of April, 1872, Lord Ripon was asked to convey the following verbal message from yourself to Dr. Hooker, which, the noble Marquis added, was to be regarded by the Director of Kew as a final answer to his appeal: "Mr. Ayrton has been told that Dr. Hooker should in all respects be treated as the head of the local establishment at Kew; of course in subordination to the First Commissioner of Works."

At this time the controversy had, unhappily, reached a pitch far too serious to be stilled by such a message. In a letter to your private secretary, written immediately subsequent to the interview on the 30th of October, Dr. Hooker put his case thus: "I am at a loss what to say as to my future position under a Minister whom I accuse of evasion, misrepresentation, and misstatements in his communications to the First Minister of the Crown, whose conduct to myself I regard as ungracious and offensive, and whose acts I consider to be injurious to the public service, and tending to the subversion of discipline. Granting," he continues, "that the functions of a Director are restored to me, how am I to act when ordered to undertake works that involve wasteful expenditure, or are otherwise detrimental? I should be thankful for Mr. Gladstone's instructions on this head."

With great deference, we submit that the verbal intimation conveyed from you to Lord Ripon, and from Lord Ripon, through Mr. Helps, to Dr. Hooker, by no means met the issues here raised by the Director of Kew. He had suffered from the secret tampering of the First Commissioner with his subordinates; he had successfully resisted extravagant and foolish proposals made by the same Minister. His duties and responsibilities as regards the warming of the plant-houses had, to the imminent jeopardy of plants of the rarest value, been transferred, without notice or justification, to the Director of Works. Another class of duties had, in the same secret manner, been transferred to the Secretary of the Board of Works. Surely, Sir, your message through Lord Ripon, to all intents and purposes, empowered the First Commissioner to continue his course of studied indignity? Wrong upon wrong had been committed, which your answer left unredressed. No wonder that, notwithstanding his esteem and regard for you personally, and his respect for all authority rightly exercised, the Director of Kew should be driven to address to you, on the 22nd of April, a letter containing the following remonstrance:—

"The fact is, that the Directorship of Kew, which was formerly subordinated to the First Commissioner alone, has been by Mr. Ayrton officially subordinated to the Secretary of the Board and the Director of Works in London, and this surreptitiously, without fault found or notice of any kind given, the Director being left to discover his altered position as best he could: and the Director has further been subjected to a series of arbitrary and offensive measures on the First Commissioner's part, against which he could not defend himself. These measures being destructive of discipline, and injurious to this establishment, the Director felt it to be his duty to bring both their nature and consequences officially under your notice, and to seek from you that justice which (as he had been assured by the officers of the Treasury) could be obtained only through an official appeal to the Prime Minister.

"After eight months' interval, during which further arbitrary measures have been resorted to by the First Commissioner (and four of which were passed under the assurance that a measure for effectual relief was under consideration), the position of the

Director of Kew is not better, but worse than when it was first brought under your notice; for within that period his views with regard to the scientific and other appointments in the establishment have been absolutely set at naught.

"These circumstances are well known to the Director's subordinates. They know that he has been virtually deprived of authority and responsibility, and that his official appeals have been unanswered, and his complaints ignored. The basis of all order and discipline in the establishment is thus sapped, and the position of the Director rendered so anomalous, that his desire and determination to uphold the interests of Science at Kew, strengthened as they are by the moral and material support guaranteed to him, hardly suffice to render that position endurable.

"Your own practical wisdom will enable you to judge whether such a state of things is to be remedied by the curt and vague announcement (and such you must allow me to call it) which you have been good enough to make me through Lord Ripon.

"I have the honour to be, &c.

"(Signed) J. D. HOOKER"

Your verbal announcement through the Marquis of Ripon was subsequently defined by Mr. West as a private and friendly communication; and your secretary proposed that, as an official answer would be sent to Dr. Hooker's official application, the letter from which the foregoing extract is made should be considered as *non avenue*. Dr. Hooker, however, had shown his letter to friends whose counsel he had sought in this matter, and he therefore pleaded that you ought to see that which had been seen by others. With regard to the character of the verbal communication, Dr. Hooker had been given distinctly to understand that it was *official* and *final*. He, however, cheerfully accepted the assurance of your secretary, and awaited the official reply. It came, and we hereby respectfully submit it to your calm interpretation.

"Treasury Chambers, April 25, 1872

"SIR,—I am directed by the Lords Commissioners of Her Majesty's Treasury to acquaint you that their Lordships have been in communication with the First Commissioner of Works as to the matters contained in the letter which you have addressed to the First Lord of the Treasury.

"Their Lordships find that there is no difference of opinion upon the question of your position, which may be briefly defined as that of head of the local establishment at Kew, of course in subordination to the First Commissioner, and they anticipate no difficulty in the future regulation of the relations of that important establishment to the office of the Board of Works, in which the duties and powers of management are vested by statute.

"The present form of estimate for Kew Gardens laid by their Lordships before the House of Commons cannot now be altered, but it will be acted upon, and will in future be framed in accordance with this letter.

"I am, Sir,

"Your obedient Servant,

"(Signed) CHARLES W. STRONGE, *Principal Clerk*

"Director of Royal Botanic Gardens, Kew."

The concluding paragraph of this document, which is evidently the really important one, has been submitted to various persons accustomed to the language of official life, and we do not believe that a single one of them is sure of its meaning. Dr. Hooker, while willing to put the best construction upon it, thought it necessary to make a final inquiry, which was preceded by these remarks:

"I am most desirous of giving their Lordships no further trouble, and am, of course, prepared either cheerfully to submit to their decision, whenever it is clearly given, or to resign the office which I hold; but I am unable to find in your letter any judgment whatever upon the points contained in the accompanying Memorandum, which have all been submitted to the First Lord of the Treasury in my letters of August 19 and 31, or to the Committee of the Cabinet which I had the honour of attending on March 13 at Lord Ripon's residence.

"I trust that their Lordships will observe, that in seeking their decision on these several questions, I am raising no superfluous difficulties, but that it is impossible for me to understand my position until it receives their Lordships' authoritative definition in respect of the above matters.

"I am, Sir,

"Your obedient Servant,

"(Signed) JOS. D. HOOKER, *Director*

"Charles W. Stronge, Esq."

"MEMORANDUM

"1. Up to the date of the appointment of a Director of Works (under the Board of Works) in 1870, I was entrusted, by a special warrant of the Board, with the duty of preparing the estimates for the construction and repairs of the plant-houses, museums, and warming apparatus in this establishment. This warrant has been cancelled, without fault found, inquiry made, or intimation given, and the duty transferred to the Director of Works.

"Will you be good enough to inform me if it is their Lordships' decision that the powers conferred upon me by that warrant be restored to me?

"Previous to the accession of the present First Commissioner to office, I was consulted whenever changes were made in the estimates which it is my duty to submit to the Board, prior to their transmission to the Treasury.

"Am I to understand that hereafter the estimates will not be altered by the Board without giving me an opportunity of stating my views?

"3. I was entrusted with the custody and distribution to scientific bodies, &c. of the copies of the first volume of the 'Flora of Tropical Africa,' a work the publication of which I am officially instructed to superintend at Kew. On the publication of the second volume, the undistributed copies of the first were withdrawn, without inquiry, from my custody, and sent, together with those of the second volume, to the stationery office for sale.

"Would you be so good as to state whether I am in future to be entrusted with the custody and distribution of scientific works of which I (the unpaid editor) am entrusted with the publication by the Board?

"4. Previous to the accession of the present First Commissioner to office, I was consulted in all cases of prospective changes in the position and duties of my subordinates, and in all cases of proposed works that might affect my duties and responsibilities.

"I shall be glad to know whether I am in future to be consulted in regard to such matters.

"5. The Department of Works having been brought under the rules of the Civil Service Commissioners, all candidates for employment at Kew are liable to be chosen by open competition, except in cases where the qualifications required 'are wholly or in part professional, or not ordinarily to be acquired in the Civil Service,' as set forth in Clause VII. of the Commissioners' Rules. The present First Commissioner of Works refuses to allow me to take advantage of Clause VII. in cases both of purely botanical and horticultural appointments.

"Am I hereafter to be allowed to avail myself of this clause, when it is of importance to the public service that I should do so?

"6. The Director of Works having been given power to interfere in matters for which I am still in part responsible, I am anxious to know—

"Whether I am to consider myself subordinate to the Director of Works in such matters, and to submit to his control in respect of them. "JOS. D. HOOKER

"Kew, May 1, 1872"

To this letter no answer has been received.

It but rarely falls in either with our duties or our desires to meddle in public questions; and not until we found Dr. Hooker maimed as regards his scientific usefulness—not until we saw the noble establishment of which he has hitherto been the living head in peril of losing services which it would be absolutely impossible to replace; not, indeed, until we had observed a hesitation upon your part which we believe could only arise from lack of information—did the thought of interference in this controversy occur to us. Knowing how difficult it must be for one engrossed in the duties of your high position to learn the real merits of a conflict like that originated by the First Commissioner of Works, we venture to hope that you will not look with disfavour on an attempt to place a clear and succinct statement of the case before you.

That statement invites you respectfully to decide whether Kew Gardens are or are not to lose the supervision of a man of whose scientific labours any nation might be proud; in whom natural capacity for the post he occupies has been developed by a culture unexampled in variety and extent; a man honoured for his integrity, beloved for his courtesy and kindliness of heart; and who has spent in the public service not only a stainless but an illustrious life. The resignation of Dr. Hooker under the cir-

cumstances here set forth would, we declare, be a calamity to English science and a scandal to the English Government. With the power to avert this in your hands, we appeal to your justice to do so. The difficulty of removing the directorship of Kew from the Department of Works cannot surely be insuperable; or if it be, it must be possible to give such a position to the Director, and such definition to his duties, as shall in future shield him from the exercise of authority which has been so wantonly abused.

CHARLES LYELL
CHARLES DARWIN
GEORGE BENTHAM, Pres. Linn. Society
HENRY HOLLAND, Pres. Royal Institution
GEORGE BURROWS, Pres. Roy. Coll. of Physicians
GEORGE BUSK, Pres. Roy. Coll. of Surgeons
H. C. RAWLINSON, Pres. Roy. Geogr. Society
JAMES PAGET
WILLIAM SPOTTISWOODE
T. H. HUXLEY
JOHN TYNDALL

PROFESSOR AGASSIZ'S SOUTH AMERICAN EXPEDITION

I.

PROF. AGASSIZ'S Second Report to Prof. B. Peirce, Superintendent of the United States Coast Survey, dated U.S. steamer *Hassler*, Concepcion Bay, June 1, is given in the *New York Tribune* of June 26. The Report is of so great value and interest, that we reprint it entire :—

Since I sent my first report concerning erratics in the Southern Temperate Zone, I have been much engrossed with this subject, and have turned my attention chiefly that way, leaving to Pourtales the superintendence of the dredging, and to Steindachner and Blake the care of the zoological specimens.

On the eastern coast of Patagonia I had but little opportunity of adding to the information I had already obtained at Monte Video. It was not till we put into San Mathias Bay for some repairs that I could gather a few new facts. This bay is particularly interesting, because one can there compare the position of the tertiary beds in the cliffs bordering the Atlantic with that of similar beds in the cliffs along the northern shore of the bay. The southern exposure of the latter runs for nearly a hundred miles at about right angles with the sea coast. In both cases the outcrops of the beds are so nearly parallel with the surface of the sea, that whatever may have been their changes of level with reference to the ocean, they still retain the horizontal position in which they were deposited. It is of the utmost importance to remember this point when considering the distribution of the erratics over this part of the country with reference to the agency that may have transported them to their present resting-place. Among these tertiary deposits are well-marked banks of colossal oysters of considerable extent, one of which coincides with the level of low water, while another stands at least twenty-five feet higher. The difference of level between these two great beds of oysters is so considerable as to suggest a subsistence of the sea bottom during the deposition of the tertiary beds. Higher up there are outer layers full of smaller fossils—some about ten, others about twenty feet above the second oyster-bed. The oyster-beds are perfectly parallel with one another, and separated by thin layers of clay and sand. And so, also, are the upper tertiary beds containing the smaller fossils. Among these, one bank consists almost entirely of large numbers of a species of *Scutella* with a single perforation in the posterior interambulacral area. This bank is particularly well marked. A bank of hard sand higher up is also conspicuous, and so is another of hard clay standing about 100 feet above the sea-line.

As we shall see hereafter, and as Darwin has already stated, these tertiary beds extend all over eastern Patagonia, including the Straits of Magellan as far as Sandy Point. In consequence of disintegration the harder beds form as many retreating shelves, like stairs, upon the slope of the shore bank. Wherever surface denudation has taken place these shelves give rise to terraces, stretching horizontally at various heights all over the plains of Patagonia. The scenery at Cliff End reminded me somewhat of Gay Head and its tertiary formation, except that the upper part of the Cliff consisted chiefly of sandy clays, alternating with which are two distinct horizontal beds of considerable thickness, formed entirely of pebbles, rather small and uniform in size. These pebbles vary from the dimensions of a pea or a hazel nut to that of the fist, or more; but there are no boulders or large fragments of rock among them. It is noteworthy that, while these pebbles alternate in regular stratification with the sandy clays in the upper part of the cliff, they also occur upon the shelves below. In the latter case, however, they form only superficial deposits, and do not penetrate with the beds on which they rest into the interior of the strata. It has occurred to me that similar superficial accumulations of pebbles upon the shelves bordering the bed of the Santa Cruz River may have been mistaken by Darwin for indications of successive upheavals. It is certain that there are no beaches here, marking successive steps of the upheaval of the country. What Darwin has considered as evidence of a gradual rise of the shore are the denuded surfaces of the horizontal tertiary deposits which everywhere form parallel terraces. As for myself, I see here no evidence of upheaval except the level of the fossil beds of oysters and other fossils in the tertiary beds above the water, and the presence of fresh shells of living species upon and above the shore banks. These, however, only indicate that an upheaval has taken place since the deposition of the tertiaries, and while the shells now living already existed, without pointing to the rise by successive steps. Still less does it appear to me that the country has been submerged during the transposition of the erratics. Toward the west end of San Mathias Bay, at Port San Antonio, where extensive denudations have taken place in the very formations here described, these same pebbles occur again. But at Port San Antonio, instead of being well defined, continuous horizontal beds above the sea-level, they are shore pebbles, covering in a deep layer the whole extent of the beach, the inequality of which they follow. Their position here shows, beyond the possibility of doubt, that the whole set of beds above which they rest in regular stratification at Cliff End has been completely broken down and recently removed by the action of the sea, and the pebbles themselves thus brought to the sea level. Of course it follows that these pebbles have not been ground upon the modern beach, but upon an older foundation, corresponding at the time to the level at which the pebble beds now stand at Cliff End.

So far the facts. I am inclined to add, as an inference from subsequent observations made farther south, the relation of which to the facts above stated seem to me clear, that these pebbles have passed through the mill of a glacier's bottom before they were worked up by the floods into their present position in the beds of Cliff End and upon the beach of San Antonio; and I do not see why the floods which formed these denudations could not as well have been the result of the melting of ice at the close of the glacial period, as the result of a change of level between land and sea. As soon as geologists have learned to appreciate the extent to which our globe has been covered and fashioned by ice, they may be less inclined to advocate changes of level between land and sea, wherever they meet with the evidence of the action of the water, especially where no marine remains of any kind mark the presence of the sea. As I have already said, the small and remarkably uniform size of the pebbles in Port San Antonio is particularly noticeable, and also the fact that none but hard rocks, indeed, only the very hardest kind of rocks, are represented among them.

(To be continued.)

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