America; a paper of much interest by Dr. Konrad Jarz on the ice caves of Frain in Moravia; a short account, from the Russian of Fetisoff, of the Jashil Kul or Kulduk Lake in Central Asia (40° 45′ N., 76° 42′ E.); and some account of the Fiji Islands, to accompany an excellent new map of the group.

BARON NORDENSKJÖLD has published the first volume of the "Scientific Results of the *Vega* Expedition." It covers 800 pages with maps and tables. Besides the papers on the Aurora, of which we have already given an account, there are papers on the Health of the Expedition, the Colour Sense of the Chukchis, on the Botanical Collections, Meteorological Observations, the Invertebrata of the Arctic Seas, and other matters, by the various members of the expedition.

MESSRS. MACMILLAN AND CO. have published a sixpenny edition of Waterton's famous "Wanderings in South America," with the biographical introduction and explanatory index of the Rev. J. G. Wood, and 100 illustrations.

CAPT. BURTON and Commander Cameron have returned to England from their visit to the West Coast of Africa.

THE Geological Society of Stockholm will send a party to Spitzbergen this summer for the geological survey of that island. The two members selected for this object are the well-known geologists, Dr. Nathorst and Baron de Geer, who will leave Drontheim on June 1 in the whaling smack *Bjona* for their destination.

FOOD-PLANT IMPROVEMENT [1]

THE food question may be divided into two parts. 1. Its production (raw material). 2. Its preparation when produced. It is my intention to consider the first part only—food production. This, again, seems naturally to divide itself into: 1. Plant-food. 2. Animal food. And again, I propose to speak mainly of the first alone, alluding only incidentally to animal-food, upon which I will commence by making what remarks I have to make in order to clear the ground for the consideration of *plant*-food, the subject upon which I have been invited to address you. The improvement effected in the production of animal-food by the careful breeding or long repeated selection of sheep, cattle, and swine is so well known as to render it quite unnecessary to occupy much of our time in its consideration; I will only adduce one or two striking illustrations to show the *kind* of change which has been thereby accomplished. There is very strong ground for believing that the celebrated improved breed of shorthorn cattle is descended from a race originally black. Now black seems to have been in the eyes of all the best breeders of it a colour to be got rid of or wiped out, and this most certainly has been effected, for no single instance of it is now to be found. The improvement in the outward form of the animals has been carried almost to the breeders' ideal of perfection. These are external changes. Early in the history of shorthorns the breeders in Yorkshire made the production of milk their chief point, while those in Durham saved for breeding purposes the progeny of those cows only which showed the greatest tendency to lay on meat, and the result is the "Improved Durham," the pride and glory of the modern cattle show, but which are very poor milkers; while the "York" shorthorn is synonymous with a cow specially productive of milk. These are internal changes effected in *animals* by selection. When we turn to plants what do we find? The first thing, aud which is apparent to everyone, is that each produces "fruit after its kind." But close observation shows something more than this, viz. that, although each produces "after its kind," no two plants of any kind are absolutely alike. I speak not of monstrosities, of which the characteristics are not heritable, but of that ever present tendency throughout nature to variation, of which the horticulturist has availed himself. These variations, of which we can profit through the great principle of inheritance are generally slight, so much so, indeed, as to be quite inappreciable by the untrained eye or hand, but they are, nevertheless, striking enough to one competent to observe them. I will give a familiar illustration of this. Nothing can well seem more alike to an ordinary person than the sheep composing a well-bred flock, but the shepherd knows them all apart as well as if each had a name. To him they are no more "all just alike" than are the members of his own family. That these differences, apparently so slight, can be practically availed of, the existing improved breeds of sheep prove beyond doubt. I have already said that no two plants are absolutely alike. Of any two, then, one must be (in the direction of the difference between them) superior to the other. This fact, coupled with the principle of inheritance, is the very key-note of all possible plant-improvement. But, it may be asked, do plants offer opportunity of improvement by breeding equal to that presented by animals? Surely much greater. A cow or ewe produces at a birth one (or two) only—a single grain of wheat has produced a plant, the ears upon which contained 8000 grains all capable of reproduction. Now we can plant all these, and of the resultant 8000 plants reserve only the best one of all to perpetuate the race, rejecting every other. Can anything approaching such a choice as this be afforded any breeder of cattle or sheep, no matter how extensive his herd or flock? The advantage on the side of the wheat becomes almost infinite when it is considered that in the case of the above animals three years (instead of one) are required for each reproduction.

Before giving a few examples of results already obtained in cereal development, I will mention analogous improvements obtained in vines and in beetroot cultivated for sugar. Many years ago an old friend from Piedmont, having a relative a vine grower in Italy, carried back with him from here a sufficient knowledge of my system of selection to enable him to explain its principle. Some seven years after, upon my friend again visiting me, he told me that his relative, knowing him to be in London, had written to ask him if he could arrange there for the disposal of his wine, and that he, without reading this letter through, at once replied in the affirmative. This he did, as he knew the small extent of his relative's vineyard—some 12 acres. "You may judge of my astonishment," said this gentleman to me, "when upon reading his letter to the end, I found that he had, without having increased the extent of his vineyard, three times the quantity of wine he formerly produced, and this simply through having followed the plan of selection I had suggested to him." The cultivation of beetroot for sugar is a very important one, and any increase in the percentage of sugar contained in it is of very high value. The following from Toronto, Canada, appeared in the *Gardener's Chronicle and Agricultural Gazette* of March 22, 1873, under the head of "Foreign Correspondence":—"The most vital point, however, of the beetroot grower is the quality of the seed he uses; when beets were first grown for sugar, 5 per cent. of sugar was the amount obtained, now 15 per cent. is obtainable in favourable instances. This has been attained entirely by the improvement of the pedigree principle of the seed. The quality of richness in the root was attained by Vilmorin in the following manner:—Each root is a perfect plant, and therefore, in the examination of each root for the production of seed, the quality of it had to be ascertained. For this purpose, Vilmorin had a set of most delicate instruments made for the determination of specific gravity, and he found that the specific gravity was indicative of the sugar contained. The cups he used were no larger than a lady's thimble, and the saccharometer or measure of specific gravity equally small. The roots were first selected according to the best ordinary rules, then a small portion of each root was punched out of it in such a part as to injure as little as possible its future growth; the pieces were reduced to pulp, and the juice was extracted. All the roots which did not yield juice up to a certain standard were rejected, whilst those which reached the standard were planted for seed; the roots produced from this seed *were found to be constantly increasing in richness*, and a few years of the process produced the great percentage of sugar which is now attained." I may here mention in reference to the foregoing that I had, so long ago as 1860, come to the conclusion that vigour of vegetable growth was identical with the power of supporting animal life, and that specific gravity was the measure of both. The difficulty of determining the specific gravity of a grain of wheat without impairing its vital vigour was, however, found insurmountable.

I will now refer to results obtained in cereals by selection, taking wheat as the illustration. The chief points to attain are vigour of growth, hardiness, productiveness, and quality, and these have become as permanent characteristics of the pedigree cereals as are the good points of a thoroughbred animal, and reproduce themselves as surely. I begin with a report from near Perth, Western Australia, in 1862, nineteen years ago. "The English wheat (Hallett's) sown before I came, produced when drilled 29 bushels per acre; and when dibbled, 35 bushels per acre. The average crops about here are under ten; ours were six; and our neighbours' opposite 4½ bushels per acre. The

[1] Paper read by Major Hallett at the Brighton Health Congress.

largest ear produced 113 grains. The greatest number of ears on one 'stool' was 72." And next I give the *last* report received *of the same wheat*, from New Zealand, published in the Otago *Daily Times* of June 3, 1881 :—"We have been shown two samples of wheat grown by Mr. M. C. Orbell, at Waikouaitai, and we do not remember to have seen any to compare with them in this country. They are known as Hallett's Pedigree wheat, Hunter's White, and Original Red. The yield exceeded anything ever grown in the district before. Mr. Orbell sowed 1¼ bushels upon one acre, and the yield was 72 bushels (or nine quarters) of good marketable wheat. Many of the plants consisted of over 90 ears, some of which contained as many as 132 grains each. Hallett's Pedigree white Canadian oats, introduced by the same importers, have, we understand, been cultivated by Mr. Shannan, of Conical Hills Station, with the same success as the wheat grown by Mr. Orbell." Thus, after 18 years (not without further selection, but the selection, having been continued annually at Brighton throughout the interval), the *same wheat* is found not only to have maintained, but to have further developed its vigour of growth, producing over "90" ears (instead of 72 ears) upon a plant, with 132 grains (instead of 113) in an ear. In England, 1876, 105 ears on a plant contained more than 8000 grains. (The average number of grains in an ordinary ear is 22 only.) From Essex in the same year as the date of the report first given, a crop of the *same wheat* was reported of 27 quarters on three acres, or nine quarters per acre, exactly the same quantity as that just given as obtained eighteen years later in New Zealand! Can illustration further go that there is no deterioration if only the selection be continued? Here is another exp rience in another year and country :—M. Tiéhonnais, editor of *La Revue Agricole de l'Angleterre*, writes October 9, 1865, from Brussiéres, France—"I am now staying here, a large farm where your wheat is extensively cultivated. The average this last harvest was at the rate of seven quarters to the English acre; the average of the other sorts in the same district did not exceed three quarters per acre."

Thus far as to vigour of growth and productiveness. I will now give examples of the other two points named, hardiness and quality. Report of the Minister of the Interior, Belgium: "I continue to sow the varieties of wheat improved by Hallett, above all the 'Red,' and 'Victoria' white. These varieties are very hardy. During the winter 1875 and 1876 many of our varieties of wheat have been destroyed by frost. The Hallett Red has successfully withstood the frost. It has been the same with the Victoria. On the other hand, the variety 'Galand' has been completely destroyed, not a single plant of it left. We have seen many fields of even our 'little red' variety, very hardy, which have greatly suffered." Lastly, as an example of sustained quality, a report from Linlithgow, Scotland, dated November 23, 1878: "I have again, making now ten years in succession, had the honour of topping the Edinburgh market with your Hunter's white wheat. I sent some of your barley to Australia, and in a few years it spread and gave immense satisfaction." The pedigree cereals having been grown in upwards of forty different countries in Europe, Asia, Africa, America, and Australasia, it is, of course, impossible to give, in such a paper as this, any idea of how widely *extended* has been the success of selection as exemplified in them, but I may mention that, in acknowledgement of that success, the Minister of Agriculture at St. Petersburg placed at my disposal the collection of all the agricultural colleges of Russia; and the Minister for Hungary sent through the Austrian Embassy at Vienna, and published, a most flattering communication showing results obtained by his Government by adopting my system. From Italy, Holland, Denmark, and Sweden, I have received similar acknowledgments. The Government of the United States published my system *in extenso* in the report for 1874 of the Department of Agriculture. The English Government, too, as will presently be seen, did me the honour to appropriate and apply my system in India.

A very practical acknowledgement has been made by less distinguished persons at home. When I commenced my system, now nearly twenty-five years ago, nothing had been done or attempted in the matter of the systematic improvement of food plants. One searches the advertising columns of the newspapers of that day without finding any of those announcements with which they now positively bristle, of seeds of all kinds, "of repeated selection," of "the latest selection," &c. But now many persons and firms, supposed to be of the highest respectability, and among them, as is always the case, some who ridiculed my work at the outset unblushingly try to identify their productions with my own, a sure and certain evidence that the reputation resulting from my system of selection has a very practical value.

In the case of the potato, next to the cereals in importance as a food plant, I have also applied my system, starting every year with a single tuber, the best of the year (proved to have been so by its having been found to produce the best plant), for now fourteen years. My main object here has been absolute freedom from disease, and these potatoes are now descended from a line of single tubers, each the best plant of the year, and absolutely healthy; and concurrently with the endeavour to wipe out all hereditary tendency to disease, I have always kept in full view the point of increasing productiveness. The result may be thus shortly stated. Dividing the first twelve years into three periods, the average number of tubers upon the annual best plant selected was, for the first period of four years, 16; for the second period of four years, 19; for the last period of four years, 27, or nearly double the number produced during the first series of four years. And if, as I might very fairly have done, I had confined the first period to the first three years (instead of four), the last period would have shown an average of 27 tubers against 13 in the first period, or more than double. Here, exactly as with the number of grains in the ear of the cereals, we reach in the last period of a long series of years a standard altogether higher than in the first years of the series, *and this no matter how we divide it into "periods."* In the latter "periods" of a series of years the results vary according to season and circumstances; but (except in a case of disaster) in no year of the last year of a series *do they drop back to the standard of the earliest years!* Can it possibly be conceived that all this is mere chance or accident? Is it not the fair conclusion, rather, that nature offers to us—nay, tempts us with—on every side rewards for intelligent observation, if we will only learn the lessons and avail ourselves of the variations which she presents to us?

I have hitherto spoken of food plants only, of vines, beetroot, cereals, and potatoes, but in a Health Congress such as this, I may be permitted also to refer to plants destined for clothing; of little, if of any, less importance than food to the health of mankind. I will take the cotton plant as an illustration. In the *Times of India*, November 6, 1869, an article headed "Cotton Report" says: "The Cotton Administration Report for the past year concluded with an interesting notice of the experiments made last season and of others which are now in progress in different parts of the Presidency, for growing cotton of an improved quality. To those who remember the conclusions recorded by Mr. Walter Cassels, in 1862, in his work prepared and printed on account of Government, it may seem strange that such experiments are now undertaken at all. These conclusions, drawn from the past history of cotton cultivation in Bombay, were (1) that 'exotic cotton cannot be successfully cultivated on a large scale in Bombay Presidency, except in a limited portion of its southern districts'; (2) that 'Indian cotton may be improved in cleanliness and somewhat reduced in cost, but the general characteristics of the staple will not be materially altered.' Because lacs of rupees had been in a long course of years expended in cotton experiments, and these had resulted in a long list of failures, it seems to have been supposed that the utmost had been tried in vain, and that the question had been finally set at rest." The article, having referred to Mr. Cassel's opinion that the failure of exotic cotton when cultivated on a large scale was due to the violence of the Indian season, continues thus:—"The climate of Hindostan is, we admit, in nearly all that relates to cotton, very different to that of any but the most arid districts in our Northern Deccan collectorates. But it is plainly a fallacy to attribute to climatic influence results for which other causes can be found independent of the climate, and, unlike the climate, quite within our control. One of these causes is indicated in a Minute by the Governor of Bombay, dated January 10, 1869, in which his Excellency, who attaches great importance to the subject as one 'of vital interest to this Presidency,' remarks that 'the experiments that have hitherto been made by the order of Government with a view to improvements in the cultivation of cotton, do not appear to have been hitherto carried out with sufficient persistence or sufficient method. So that, in fact, as remarked in the report before us in the matter of Indian cotton improvement, we are yet but on the threshhold of our experience, but let us hope that the course will now be distinctly mapped, and that we may be saved from the task of beginning our experience again and again. What is still wanted, not

only in the North-West Provinces and Upper India, but in the far more favoured cotton fields of our Presidency, is an adequate testing and full authentication of some inexpensive method of treatment or cultivation, which shall be equally applicable to the exotic, hybridi-ed, and good indigenous varieties, and which the ryots themselves will be able to appreciate alike under their present simple methods of tillage, or under any improved system they may eventually be induced to adopt. There is at last, we think, some prospect of this *desideratum* being attained. The minute of his Excellency suggests more than simply a systematic method of operation in future experiments. It describes what is known at home as *Hallett's pedigree system*, which consists in the selection by hand of the finest seed from each successive year's crop, and the annual reproduction of the plant only from such seed; and it enjoins the adoption of this plan in experiments both with exotic and indigenous cotton, as the best means of acclimatising the one and improving the other. The advantage of this system appears so very manifest that the wonder seems to be that it has never yet been tried. A cultivator selecting the finest bolls in his field of cotton, and putting them aside, extracting from them at leisure the seed for his next sowing, is a thing that has never yet been heard of; but the matter is so simple, so reasonable, that we have little doubt that the system will be generally adopted when the ryots come to be acquainted with it, and its advantages are explained to them." The same article then goes on to say: "The pedigree system was begun last year in different parts of the Presidency, but cannot be said to have yet had to any appreciable extent a trial, as it is obvious that the effect of it can only be judged by the character of the produce of successive years. In the experiments now being conducted in accordance with the plan suggested by His Excellency, there is yet another element of success in the efficient character of the agency employed. The Cotton Departments are assisted in the work by four practical horticulturists, Messrs. Shearer, Stormont, Strachan, and Milne, who have been sent out to this country for the purpose by the Secretary of State, who, we believe, selected them from a number of applicants on the recommendation of Dr. Hooker, of the Botanical Gardens at Kew." I wrote to my friend Sir Joseph Hooker, who, in reply, says the men were sent out from Kew in 1869, but that he has no statement of the results beyond a newspaper cutting, stating that their services were highly approved of, adding, "cotton is coming down from the country much better in quality and in much larger quantities." I therefore wrote to the India Office requesting to be furnished with a copy of the Minute above referred to, and with information as to the exact plan adopted and the results obtained. I can only suppose that there is some difficulty in doing this, as, although I stated that these particulars were required for the Congress this day, they have not yet reached me.

Had the Government, when thus appropriating and applying my system, done me the honour to consult me upon it, I should have pointed out that mere horticulturists, however skilful, would not (unaided) be likely to accomplish very much. It appears that in India there are thirty different kinds of cotton grown, in as many separated districts, for the Liverpool market. In each district the kind of cotton grown there is said to be that most suitable, and indeed the only kind that can be cultivated there with advantage. If this be so, then there must be thirty selectors—one in each district—in order to improve to the utmost the cotton most suitable to it. I do not profess any special knowledge of the growth of cotton, but I know something of the growth of wool, and I apprehend that fineness, and length and strength of fibre are qualities equally desirable in both. I have seen a buyer of wool, when blindfolded, tell by the touch the age and sex of the animal from which the fleece in his hand came, and I have tested beyond all possibility of doubt his ability to do this. I am told there are men in Liverpool who have an equal gift in judging cotton, but that such men soon make their fortunes there. But these are exactly the men who are wanted for cotton selectors in India. The available differences of plants are slight, and when out of a number the selection has reduced the competing plants to two or three, the difference is very slight indeed, but still very real. With many different points to take into account, I have occupied weeks in studying the final best two plants. It is evident that if there is anything at all in selection, a selector, ignorant of the one thing needful, may pedigree in the wrong direction, as the first Napoleon did unconsciously when his conscriptions left only those men who were quite impossible for soldiers to be progenitors of the future Frenchmen with the result of the standard in the army having to be lowered by five inches. I must not, I suppose, be surprised if the Government has imperfectly understood my system when such a man as Mr. Darwin, in his "Cross and Self-fertilisation of Plants," can thus write of it:—"Loiseleur-Deslongchamp (Les Céréales) was led by his observations to the extraordinary conclusion that the smaller grains of cereals produced as fine plants as the large. This conclusion is, however, contradicted by Major Hallett's great success in improving wheat by the selection of the finest grains." Here finest evidently means largest; but size of grain is not even an element in my system of selection.

If then we can seize upon these variations in plants, and by means of the principle of inheritance, perpetuate, increase, and accumulate year by year the original variation in the desired direction, what a field does it open to us for increasing this world's plant food! And how vast is this field compared with that presented by the food-producing animals, in mere number probably not equal to the food-plants upon a single English farm; for while these animals supply food for man alone, and for him only in part, plants may be said to almost wholly support both them and man. Vast, indeed, may this field be called, for it includes not only the plants destined for food and clothing, but also every kind of plant which contributes to the welfare and happiness of mankind; surely a field, then, worthy of any man's labour!

Since this paper was read a Minute by His Excellency, Sir Seymour Fitzgerald, the Governor of Bombay, dated January 10, 1868, has been sent to Major Hallett by the direction of the Secretary of State for India, together with reports extending to 1870 only.

"In England I have had opportunities of seeing on my own land, and on the properties of other gentlemen, how much can be effected in the improvement of cereals by a continued attention during successive years to the selection of the best seed only from crops of a common variety. The pedigree wheat, which bears the name of Mr. Hallett, a Sussex gentleman, is, in fact, a new variety which he has produced by the constant selection each year of the finest ears produced on his farm near Brighton, and by his never permitting any seed from small or inferior ears to be sown. None but the best ears selected by hand were set aside the first year for seed; from the produce of these the best were again in the same manner selected by hand, and this course was continued for several successive years; the final result was the introduction of Hallett's Pedigree Wheat, which I have known in my own experience to produce a crop nearly 50 per cent. more in quantity, and 50 per cent. more valuable in quality, than that produced from the best seed that could be purchased in the market, and this in the same field, under exactly the same circumstances, and with the same care taken in the cultivation.

"I believe the same result may probably be obtained if the same process is adopted with our indigenous cotton. At any rate, I desire the experiment to be carefully made, and will take care that funds are placed at the disposal of the Inspector-in-Chief for this purpose. The experiment should be tried not only in different districts but in several parts of each district, and a sufficient breadth should be sown in each case to ensure a fair and satisfactory trial.

The Inspector-in-Chief is, therefore, authorised to make the same experiments as those I have suggested as to the indigenous cotton—with all the exotic varieties he may receive—in the same manner and on the same scale. Even if they are not successful to the extent and in the manner I anticipate, they will serve to show us, if carefully continued for the next three or four years, what are the exotic varieties of cotton which we can with confidence encourage the cultivators in each district to adopt, as being best suited to the particular circumstances of their lands."

The following extract from Administration Report, Cotton Commissioners' Department, for the year 1870-71, was received by Major Hallett on January 9, 1882. Major A. T. Moore, Acting Cotton Commissioner and Inspector-in-Ckief, writes under date Bombay, October 31, 1871, on the advantages of "Selection":—

"Taking everything into consideration, I think the fact of the heavier yield—by more than double—being in favour of the 'Pedigree,' goes to show that 'selection,' as desired by His Excellency Sir Seymour Fitzgerald, should be carefully carried out; that the cultivators should be supplied from the Government crops with as much seed as possible, and at the same time, that the necessity for selection should be earnestly pressed on

their notice; while the Superintendents themselves, by carefully and steadily pursuing the same plan year by year, by selecting from all their crops, and again selecting from that selection, will be able apparently, if the present results may be relied on, to increase the production and fruitfulness of the plant, and in the course of a few seasons to establish a veritable 'Pedigree Cotton,' as unlike its parent as the 'English thorough-bred,' with his long stride and fine skin, is unlike the stock whence he originally sprang. It remains for me to notice the avidity with which our surplus seed was purchased by the cultivators. Mr. Wilkinson says this seed was sufficient for the requirements of two villages, and that the crop produced was an abundant one. He further adds, 'I was informed by the Patel of one of the villages that this seed had given great satisfaction; yields being reported of 96 lbs. to 150 lbs. cotton per acre, according to the amount of care in cultivation.' This gives an average of 123 lbs., but I will only take 100 lbs. as the *average* product, and even then I find the figures loudly speaking in favour of carefully picked and selected seed.

	Per acre. lbs.
Average yield of our Departmental seed ...	100
Average yield for Kandeish	82⅔
Difference in favour of our seed	17⅓

or about 20 per cent.

If only this 20 per cent. could be established as the increased out-turn, by the efforts of our Department, it would bring wealth to thousands, and unspeakable benefit to the Presidency generally. It would represent an increased produce, valued at last year's rates, of Rs. 26,365,979 = £2,636,597 18*s.* 0*d.*; a result and a prize worth striving for, and, it would appear, possible of attainment!"

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The election to the Professorship of Animal Morphology will take place on May 31.

The Moderators and Examiners for the Mathematical Tripos have announced that logarithmic tables will be provided for each of the candidates during the examination.

The mineralogical laboratory will be open to students during July and August.

The proposed enlargement of the space available at the new museums for Practical Morphology and Histology is to be at once proceeded with.

Mr. W. H. Caldwell, B.A., Scholar of Gonville and Caius College, is approved as a Teacher of Comparative Anatomy with reference to certificates for medical study.

Dr. Anningson has been approved as a teacher of Medical Jurisprudence in the Medical School.

The proposal to continue the opening of the Botanic Garden for three hours on Sundays to Members of the Senate accompanied by their friends during the summer months, has met with warm opposition from some who consider that in this case Sunday labour is imposed on others for the selfish pleasures of a few. It has been pointed out that owing to the value of the contents of the garden it must always be watched, and it could not possibly be said that the proposed regulations will impose additional Sunday labour. The voting on this question takes place to-day (25th).

LONDON.—Prof. Ray Lankester has been re-appointed Professor of Zoology and Comparative Anatomy in University College, London.

SCIENTIFIC SERIALS

American Journal of Science, May.—Photographs of the spectrum of the nebula in Orion, by H. Draper.—Mean annual rainfall for different countries of the globe, by A. Woeikoff.—Physiological optics, by W. L. Stevens.—Flood of the Connecticut River valley, from the quaternary glacier, by J. D. Dana.—Brazilian specimens of Martite, by O. A. Derby.—Method of determining the flexure of a telescopic tube for all positions of the instrument, by J. M. Schæberle.—Dykes of micaceous diabase penetrating the bed of zinc ore at Franklin furnace, by B. K. Emerson.—Occurrence of smaltite in Colorado, by M. W. Iles.—Conditions attending the geological descent of some freshwater gill-bearing molluscs, by C. A. White.—Measures of the rings of Saturn in the years 1879, 1880, 1881, and 1882, by E. S. Holden.—Interference-phenomena in a new form of refractometer, by A. A. Michelson.—New minerals, monatite and monite, with a notice of pyroclasite, by C. U. Shepard.—Marine fauna of New England, by A. E. Verrill.

Journal of the Franklin Institute, May.—On the several efficiencies of the steam-engine, and on the condition of maximum economy, by R. H. Thurston.—Ninety miles in sixty minutes, by W. B. Le Van.—Intonation of chime bells, by J. W. Nystrom.—The Mears chlorination process, by W. U. Greene. Action of charcoal on a solution of gold chloride, by G. E. Kœnig.

Bulletin de l'Academie Royale des Sciences de Belgique, No. 3.—On the sensations the author experiences in his eyes, by M. Plateau.—On a claim of priority, introduced in the Academy by M. E. Dewalque, regarding my note on the origin of Devonian limestones of Belgium, by M. Dupont.—On the respiratory effects of excitation of the pneumogastric, by M. Henrijean.—Various products obtained from fresh stocks of peony; new reaction of salicylic acid, by M. Jorissen.—Reports.

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti, vol xv. fasc. vii.—The geology of the Parman Apennines, by A. Del Prato.—The double quadratic transformation of space, &c. (concluded), by F. F. Archieri.—On rational skew curves, by L. Weyr.—On the transformation of the co-ordinates in space, by F. Borletti.

Fasc. viii.—On a formula of Cauchy, concerning the development of functions in infinite products, by P. Cazzaniga.—Whether cemeteries may have an injurious influence on the public health, by L. Gabba.—Remarks on the subject, by C. Zucchi, and reply by L. Gabba

Atti della R. Accademia dei Lincei, vol. vi., fasc. 10.—On some derivatives of citraconic acid, by Drs. Ciamician and Dennstedt.—Studies on fluoxysalts and fluosalts of molybdenum, by Signors Mauro and Panebianco.—Reports.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, May 4.—"On the Specific Resistance of Mercury." By Lord Rayleigh, F.R.S., Professor of Experimental Physics in the University of Cambridge, and Mrs. H. Sidgwick.

The observations detailed in the paper were made with the view of re-determining the relation between the B.A. unit and the mercury unit of Siemens, *i.e.* the resistance of a column of mercury at 0°, one metre in length, and one square millim. in section.

According to Siemens' experiments

1 mercury unit = 0·9536 B.A. units,

and according to Matthiessen and Hockin,

1 mercury unit = 0·9619 B.A. units.

The value resulting from our observations agrees pretty closely with that of Siemens. We find—

1 mercury unit = 0·95418 B.A. units.

Four tubes were used to contain the mercury, of lengths varying from 87 to 194 centims. The diameter of the three first tubes was about 1 millim., and that of the fourth about 2 millims. The final numbers obtained from the several fillings of the tubes are as follows:—

Tube I.	0·95386 0·95412 0·95424 0·95436 0·95421	... ...	0·95416
Tube II.	0·95389 0·95414 0·95437 0·95436	... ...	0·95419
Tube III.	0·95424 0·95418 0·95399 0·95425	... ...	0·95416
Tube IV.	0·95440 0·95415	... ...	0·95427

Combining the results of the present paper with our determination of the B.A. unit in absolute measure, we get—

1 mercury unit = 0·94130 × 10^9 C.G.S.