

the papers themselves, which might be added as foot-notes, or incorporated in the text; and perhaps more distinction might be drawn between the longer researches, or more valuable memoirs of the year, and mere passing scientific observations. However, it is easier to criticise than to compile a work like the one before us. Our readers will form some idea of the comprehensive nature of this "annual record" by the following summary of its table of contents:—Astronomy, together with reports of the American observatories, contributed by Mr. Holden, of the United States Naval Observatory, Washington. Physics of the globe, followed by general physics, written by Prof. Barber, who also contributes the next section on chemistry. Mineralogy by Dr. Dana, and geology by Dr. Sterry Hunt. Hydrography and geography follow, the geography of North America being specially full. Microscopy, anthropology, zoology, and botany are contributed by able men in each department. Agriculture, engineering, technology, and industrial statistics are less full, and some of the abstracts given in technology would, we think, have found a better place under the head of physics, such, for example, as the telephone, phonograph, &c.

The observatory reports are a feature of the present volume, information being given concerning the *personnel* of each observatory, its principal instruments, the subjects of special observation during the past year, and those to be taken up during the coming year, and lastly the principal publications emanating from each observatory during the past year.

The bibliography at the end of the annual, giving the list of works on science published during 1877, seems most thoroughly and ably done, and so also is the index to the whole volume, and the concise and useful necrology of scientific workers. W. F. B.

Choice and Chance. An Elementary Treatise on Permutations, Combinations, and Probability. With 300 exercises. By W. A. Whitworth, M.A. Third edition, revised and enlarged. (Deighton, Bell and Co., Cambridge.)

WE have all three editions before us, and so are able to mark the growth of this work, which has been very considerable. The number of pages in the last edition is ten less than that of the second edition, but the volume is much thicker, and much of the matter is in smaller type. The work had already attained the position of a standard one on the subjects of which it treats, and it maintains and even improves its position in the present edition. Here, even in the elementary parts are to be found many propositions of great utility which are not to be met with, so far as we know, in any form elsewhere. We do not mean to say that they are not known to mathematicians, but writers have not introduced them into the text-books. Besides chapters on Permutations and Combinations, we have a chapter on *Distribution*, that is the separation of a series of elements into a series of classes, and one on *Derangements* (if a series of elements have been arranged, or if they have a proper order of their own, and we place them in some other order, we *derange* them). Under the head of *chance* we have a full treatment of that part of Probability which usually finds a place in algebraical treatises. Remarks "On the Disadvantages of Gambling," which formed an appendix to the last edition, here forms part of a chapter which also has a few paragraphs to show that insurance is the reverse of gambling, and discusses the effect of the repetition first of a fair wager, secondly of a wager at odds, thirdly of a fair wager on a scale proportioned to the speculator's means, the general case of a lottery with prizes of different value, and closes with a fairly exhaustive account of the Petersburg Problem. The novelty of this edition is a chapter on the geometrical representation of chances. We shall hope to see this chapter considerably enlarged

in a future edition. The whole treatment may be said to assume nothing but what a well-primed algebraical student should be able to master. What is much wanted is a general treatise on the subject of Probability for English students. Mr. Todhunter's history of the theory down to the time of Laplace is a most interesting and able one, but it does not fill up the gap. In this branch, as in many others, we are dependent upon French writers, and still must have recourse to the works of Laplace, Poisson, and Liagre.

Pine Plantations on the Sand-Wastes of France. Compiled by John Croumbie Brown, LL.D., &c., &c. (Edinburgh: Oliver and Boyd. London: Simpkin Marshall and Co., 1878.)

THE subject of the reclamation of sand-wastes by the planting of coniferous trees or of grasses, shrubs, or other plants is one always of much importance. The extension of pine plantations has a two-fold interest over and above the primary cause of planting, namely, that arising from the general improvement in the appearance of the country, as the plants make growth and develop themselves into goodly forms, and that which is more utilitarian, but withal equally important—in the production of timber. Anything that can be done towards reducing the desolation of these French sand-wastes is a point gained not only, as Dr. Brown points out, for the benefit of France herself, but as indicating that what has been accomplished there may also legitimately be expected elsewhere, "not necessarily by the same means, but by means as appropriate, if they can be discovered." As will be seen from the title, the book does not claim originality, it professes to be a compilation, and the copious extracts, with the usual inverted commas, extending often over continuous pages makes this announcement unnecessary. Nevertheless a good work has been done in bringing together in a convenient form a great deal of valuable matter, scattered about in various books inaccessible for the most part to readers for whom the present work is intended, and amongst whom it will, no doubt, chiefly circulate; containing as it does detailed information on every branch of coniferous culture, from a consideration of the soils most suitable to satisfactory culture, to the collecting of the resin, and other economic products, and the diseases and injurious influences to which the plants are subject.

From the range of country under consideration, it will be understood that the pines treated of are limited to very few species, such as *Pinus sylvestris*, *P. maritima*, and *P. pinaster*. J. R. J.

La Morfologia vegetale. Esposta da T. Caruel. (Pisa, 1878.)

A NEW text-book of vegetable morphology, characterised by freshness both in the mode of treatment and in the illustrations, is an acquisition to botanical literature, even though written in a language which is unfortunately not familiar to most English readers. Prof. Caruel starts with the primary classification of all vegetable structures into the thallus, which displays no external differentiation, and the cormus, consisting of a central stipes (caulome), to which are attached appendages (phyllomes) more or less differing from the stipes. Under the head of the thallus he then discusses propaguli (of Muscineæ), conidia, sporidia (including zoospores), sporules (or spores, properly so-called), the pollen, and phytozoa (or spermatozooids). The general description of the cormus leads to an account of the various special forms which it assumes, viz., to the morphology of flowering plants and vascular cryptogams; and to the various modes of the reproduction of cormophytes by a process of impregnation, that is, the union of the contents of two dissimilar cells. Finally, Prof. Caruel discusses the various subjects connected with the genesis of species, and concludes with the

system of classification of the vegetable kingdom, an outline of which we have already given to our readers (vol. xviii. p. 646). The author brings to his work a mind trained to great accuracy in the use of terms and in the perception of morphological homologies. Great advantage would ensue by the introduction into vegetable morphology in this country of a similar scientific terminology.

A. W. B.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

American Exploration¹

North-western Wyoming and Yellowstone Park

DURING a portion of the period 1870-4, the writer was engaged in service as military engineer of the staff of the troops serving in the geographical department of the Platte, U.S.A. This business involved the accumulation of local geographical information for the use of the troops who were constantly in contact with hostile Indians. The most troublesome of these were the Sioux, whose prowess in battle has since been shown to the world in the story of the battle of the Little Big Horn—the Custer massacre.

Within the limits of this department were several dark spots on the map marked “unexplored.” One of these was the north-western corner of Wyoming territory—a region of vital interest to geographers, comprising, as it did, the crown of the North American continent. There lay, wrapped in impenetrable mystery, the trackless forest country where, in native lore, the Great Spirit evidenced his eternal anger by spouting great columns of water and smoke into the air far above the highest tree-tops, by filling the air with strange rumbling sounds, and Bad Medicine smells; and by flinging the waters of the great river into the bottomless depths of the Cañon of the Yellow Stone. There lay the Lake Beautiful high on the mountain side, from whose borders the Great Spirit puffed great clouds of smoke. There were the strange mountains that no man had ever entered, and whose existence was only indicated on the best maps by a hazy line of feeble *hachures*. Somewhere in that black and forbidding mass of the Unknown Mountains were hidden the secrets of the sources of the Yellowstone, the largest feeder of the Missouri, as well as those of the Columbia and the Snake. They were literally the “Unknown” Mountains. They had been looked at in awe from a few spots on the west and north, and from the south-east by a few travellers whom they had turned back from the glittering prize just as it seemed within their grasp. They were unknown to the Indians who lived on their border, with the exception of a handful of outcasts from the Crows and Shoshonees, who, driven from all intercourse with their fellows, were obliged to live in the mountains, of which even they had acquired but a limited and uncertain knowledge. Along their eastern border spread out the hunting-grounds beyond compare of the Sioux, Arapahoes, Cheyennes, and Crows, from whence no white man or peaceful Indian could ever hope to return unless prepared to cope with fearful odds. The mildest geologist on the planet could not have entered that happy hunting-ground without finding his own—without leaving his bones to whiten in a lonely vale and his scalp to decorate the evening entertainment of some untutored child of nature.

In the winter of 1872-73 General Ord, commanding the department, informed me of his desire that what remained of this dark spot in his field of operations should be cleared up, and, if possible, that a passage-way be discovered between the sources of Yellowstone and Wind Rivers. This would give easy access to the recently-discovered Yellowstone Park region, and very much simplify the question of the shipment

of supplies to some of the posts in Montana. This was the sole origin and animus of the expedition.

At that time there had been published concerning the Yellowstone Park region the following:—Hayden's “Geological Report of 1871,” Barlow and Heap's “Reconnaissance,” and Doane's “Narrative.” Of these, Hayden's work was a rapid geological reconnaissance not based upon any topographical work worthy of mention; Barlow and Heap were two officers of engineers who made a military reconnaissance, in which astronomical and topographical instruments were used by trained observers; while Doane, also an officer of the army, simply recounted what he saw. It was also known that Hayden had spent the season of 1872 in the immediate Park region, but that he had not examined the country to the southward and eastward of it. Acting upon this information, and such as had come to me through considerable hard service in the neighbouring country, I decided to carry what explorers call a preliminary triangulation from the surveyed region of the Union Pacific Railroad northward into the Yellowstone Park, there connecting with the work of previous explorers. This route would take me through the region infested by hostile Sioux, thence through the unknown mountains from the eastward into the Park, and thence recrossing somewhere in the neighbourhood of the sources of the Yellowstone. I felt satisfied that, with a thoroughly efficient pack-train, this could be accomplished before the early snows rendered the mountains impassable.

The event proved that if those pack mules had not been handled with the utmost skill by the men in charge of them, and had they not had the agility of squirrels, we should have been turned back into a hornet's nest of redskins.

I had no particular intention of reduplicating anybody's work, but if such happened I am very glad of it. In the cause of science a little duplication and reduplication are things not to be sneered at. Dr. Hayden has been at work this very season reduplicating his own work in the Park and mine too, and I do hope and pray, if there be anything erroneous or incomplete in my work, that he may find and point it out. I am not afraid of truth and right, even though it lay me prone in the dust. It would be a pity indeed if, with the sum of \$75,000 and upwards at his disposal, with an outfit that has been the growth of so many years of his own and other people's experience, and with the only dangerous Indians in the whole region completely quiescent and humbled to the dust—it would be a pity indeed if the sum of our knowledge of that wonderful region were not very largely increased and many former errors discovered.

Exploring is at best imperfect work, so far as the survey, which is its foundation feature, is concerned. Observations for longitude with any known portable instruments are painfully erratic unless there be abundant time; angles taken with a light shaky transit in a gale of wind from the summit of one mountain to the most pointed aspects of the summits of others in sight must make some very “holey” triangles; and yet this is the best that has been done or can be done unless there be time and money for a regular survey.

With such an expedition as mine it would have been a sad pity not to give trained scientists an opportunity to gather some of the treasures in our path, and so after careful selection and the advice of one of the most competent scientists in the country (Prof. O. C. Marsh), I took with me some specialist observers. They were excellent hard-working men, and have every reason for being proud of their work. The sum of money placed at my disposal for the work was \$8,000.

Prof. Geikie has, I fear, been misled by the one-sided Report of a Congressional Committee.¹ This Report does not afford a fair idea of the issues with which it deals. It conveys the impression that the Engineer Department of the army had been making efforts to absorb the Hayden survey. I was at that time in a position to know that such was not the case.

It may be well to add that both by law and long-continued practice, a portion of the duties of the engineers of the American army comprises public explorations and surveys, and they have always given the greatest possible assistance to specialist observers, who can always do very much more and better work when they have no cares other than those of observation and reflection.

Of Dr. Hayden I would like to say that few men deserve more commendation for successful labour than he. Where others had always failed, he had succeeded in securing from Congress

¹ See NATURE, vol. xviii. p. 315.

¹ House Doc. Report 612, 43rd Cong. 1st Session.