Altogether, this systematic use of the balloon for the study of special meteorological conditions must be regarded as a new departure; and the signal-service is to be congratulated on its successful initiation.

THE KOWAK RIVER.

THE map opposite shows the explorations made by the U. S. revenue marine on the Kowak or Kūak River during the season of 1884. The asterisk indicates the farthest explored point on the river. The native settlements are shown by small black triangles. The course of the lower part of the Selawik River and part of the Kowak delta, indicated in dotted lines, have not been explored. It will be observed that the new explorations almost exactly join the course of the river as laid down on the coast-survey map of 1884 by Dall, from Woolfe and Jacobsen's sketch-map. The spelling of the names on the above map has not been modified to agree with the Innuit pronunciation as obtained by Lieut. Cantwell, since the different tribes of the region do not pronounce these names uniformly, and the names 'Kowak' and 'Selawik' have been adopted on all charts for many years. According to Lieut. Cantwell, the people of the river call it Kū-ak (or 'big river'). Other names are Shēlāwik (Selawik, or 'fish') lake and river, Imogarik'-choit (lake or 'little sea'). The stream connecting this with Selawik River is Ig'-yăk ('throat') River: that flowing to Selawik Lake is Ki-ăk'-tŭk ('fox') River. Others have been referred to in our report of this exploration. It is probable that the upper part of the Selawik, taken from the Western union explorations of 1866–67, is too far to the westward, and that the course of the river is less irregular than above indicated; but there are not sufficient data to make this certain, or to alter the chart at present.

A GLANCE AT THE HISTORY OF OUR KNOWLEDGE OF FOSSIL PLANTS.[1]

THE ancients, though acquainted with fossil shells and corals, were wholly ignorant of fossil plants; and the first mention of any vegetable substance in a state of petrifaction was made by Albertus Magnus about the middle of the thirteenth century. Agricola, Gesner, and others treated of petrified wood in the sixteenth century; and, during the seventeenth, Major in Germany, and notably Lhwyd in England, called attention to the existence of vegetable impressions in the rocks. By the beginning of the eighteenth century considerable collections of such material existed in the European museums, and this had become the subject of animated discussion. Dendrite had long been known, and was then generally supposed to represent vegetable matter; but in the year 1700 Scheuchzer overthrew that doctrine, and established its purely mineral character.

Prior to this date the prevailing notions of the times ascribed all fossils to some mysterious cause, and denied their reality as the remains of things that had once possessed life. As to their true nature, there was, however, no harmony of opinion. Some looked upon them as divinely created archetypes of living things, others as divine enigmas placed before man to test his faith, others still as merely the varied forms of the subterranean world corresponding to those of the earth's surface, while many regarded such objects as purely accidental, or as mere freaks of nature.

Against these predominant mystic views there had, however, long existed the theory that these forms, so strikingly similar to real things, might be the petrified remains of the life that perished by the Noachian deluge, and which had been stranded on the mountains and highlands of Europe and Asia. This view was countenanced by Martin Luther, and strongly defended by Alexander ab Alexandro in the sixteenth century; while towards the close of the seventeenth it secured many earnest advocates, including Woodward of England, and Scheuchzer of Switzerland. The latter undertook to defend his theory from the evidence furnished by plant-remains; and from this zeal resulted his greatest work, one of the most remarkable of the time, — his 'Herbarium diluvianum.' This appeared in 1709, and in it are enumerated and figured many fossil plants. These impressions were declared to be those of existing and often familiar species; and we find among them the myrrh of Scripture, Galium, Hippuris, and other well-known forms. So confident was Scheuchzer that these were living plants, that in 1718 he ventured to classify all known impressions according to Tournefort's system, as drawn up in his 'Elémens de botanique' in 1694. The new edition of the 'Herbarium diluvianum,' which appeared in 1723, contained this systematic table, in which four hundred and forty-five species are enumerated.

This bold stroke aroused an intense interest in the subject, and immediately led to a closer comparison of the fossil with the living flora. In this work, Leibnitz in 1706, and Antoine de Jussieu in 1718, had already led the way by examining certain well-defined impressions, and expressing strong doubts of their identity with any European species. Further investigations were made; and these disagreements soon gave rise to the belief that they were tropical forms which by some convulsion or vicissitude had been brought to Europe, and buried under its soil. This view prevailed until the close of the eighteenth century.

Thus far the idea of ancient or extinct life had

[1] Read before the American association for the advancement of science, Sept. 8, 1884, by LESTER F. WARD.

scarcely been conceived; but continued failure to correlate fossil with living forms, even after thorough examination of many tropical floras, began to give importance to this question, and in the first year of the present century Baron von Schlotheim commenced to urge for plants, what Blumenbach had for some years insisted upon for animals, that the fossil forms were extinct, and belonged to another age of the world, characterized by a different kind of life. Hard as this doctrine then was for the beliefs of the times, its manifest soundness caused it steadily to gain ground, and soon opened the way for the serious study of paleontology on a true scientific basis.

The reaction against attempting to correlate fossil with living plants went too far, and the former nomenclature was completely abandoned. Judging all by the paleozoic forms, which had been the chief objects of study, all efforts to apply generic names even to those of the most recent formations were suspended, and resort was had to the terminologies of the mineralogists, particularly those of Waller, Walch, and Schröter. All vegetable remains were called phytolithes. Impressions on the rocks were distinguished as phytotypolithes. Fossil leaves were named bibliolithes, and fossil fruits carpolithes. Not until 1818 did any one venture to establish species under any of these heads. The first attempt of this nature was made in that year by the Rev. Henry Steinhauer, whose now celebrated memoir, 'On fossil reliquia of unknown vegetables in the coal strata,' describes and figures ten species of Phytolithus, assigning to each an appropriate specific name. This may be regarded as the true birth of systematic paleobotany, — an example of the humility of true science as contrasted with the arrogant assumptions of Scheuchzer a century before.

It is remarkable that this initial paper by Steinhauer was published in an American serial, the Proceedings of the American philosophical society, at Philadelphia, and was contributed by an American citizen, and member of that society. But that it was founded on any extensive study of the coal-plants of this country, as some have stated, there is no internal evidence. No American localities are mentioned; and the paper seems to deal throughout with British fossils and British coal-mines, with which the author was perfectly familiar.

Schlotheim, who in his 'Flora der vorwelt,' 1804, had not dared to go thus far, took a step in advance, two years later, in his 'Petrefactenkunde.' He greatly enriched the terminology of the science, and described with true binomial designations seventy-eight species belonging to seven genera of fossil plants.

Count Sternberg's 'Flora der vorwelt' commenced to appear in parts at about this time, in which many new genera were created on thoroughly studied grounds; and in 1822 Adolphe Brongniart's elaborate paper on the classification of fossil plants was published in the memoirs of the Paris museum of natural history. But these contributions, though highly systematic, and by far the most important that had been made to the science, did not descend to the question of species, nor indicate the number of distinct forms. The next work, therefore, in which light is thrown upon this problem, was Brongniart's 'Prodrome,' which appeared in 1828. By this time the science of paleontology had been fairly established, and geognostic considerations had come to receive something like their due weight. The ancient floras were distinguished from the later ones, and the approaching analogy of the latter to that of our own time was clearly perceived by Brongniart, who thus early prophetically declared for the successive development of higher types, though this view was strenuously opposed by the English school a decade later.

In this work, and the large treatise published the same year ('Histoire des végétaux fossiles'), to which it forms an introduction, an immense advance was effected in the systematic treatment of fossil plants. Not only was a large number of species recognized, belonging to the extinct genera heretofore established, and many new genera created, but the identity of many of the fossil with living genera was boldly asserted, at least for the more recent formations; and a long step was taken in the direction of correlating the extinct and living floras, and of demonstrating the fact of an uninterrupted series connecting the past with the present plant-life of the globe.

At that date Brongniart enumerates five hundred and one species of fossil plants, nearly half of which belonged to the first, or oldest, of his four periods, corresponding to the paleozoic of modern geologists, and of course chiefly from the coal-measures.

It is interesting to note here how much faster the science of fossil plants has advanced in this numerical respect than that of botany proper; for, while more than a hundred living species were then known to Brongniart for every fossil species, only eighteen living plants are now known to one fossil plant. And yet how rapid has been the growth of our knowledge in both sciences may be realized by contemplating the fact that nearly five times as many living, and sixteen times as many fossil, plants are recognized now as then.

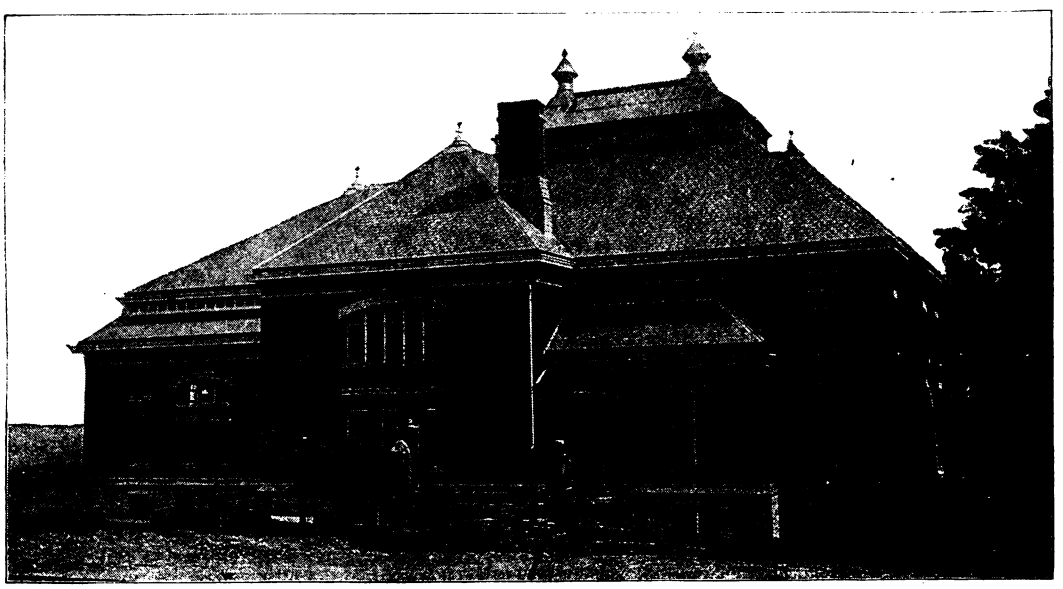
A census of fossil plants was again taken in 1845, by Unger, in his 'Synopsis plantarum fossilium,' in which he enumerates 1,648 species; and in the same year, by Göppert, quite independently of the former work, in a paper published in Leonhard and Bronn's 'Neues jahrbuch für mineralogie,' in which 1,778 species are claimed. Sixty-eight thousand living species were then known to Göppert, or about thirty-eight living to one fossil species.

In 1849 Göppert again reviewed the fossil flora, and published an exhaustive enumeration in Bronn's 'Index palaeontologicus.' He now finds 2,055 fossil species, to be compared with the 69,403 living species named in the same work, or less than thirty-five living to one fossil species.

The third quarter of the present century was one of intense activity for systematic vegetable paleontology. The combined labors of Heer, Saporta, Ettingshausen, and Lesquereux, with a large corps of

co-laborers working upon abundant material from all parts of Europe, from the arctic regions, and from the United States, multiplied several times within a few years the number of fossil plants known to science; so that by the time of the completion of Schimper's 'Traité de paléontologie végétale,' in 1874, he found that he had been able to describe in that work about six thousand good species, after a liberal exclusion of uncertain forms. But a thorough inspection of this important work shows that even then he came far short of gathering in all the data extant at that date, while it is since then that most of the solid work in this line has been done in America and in the polar districts.

A catalogue of all the fossil plants that have been described, down to the present year, is in preparation at the National museum; and, though still far from complete, the work has sufficiently progressed to warrant an approximate estimate of the present number of species, which cannot fall far short of nine thousand, and may considerably exceed that figure.



THE NEW AMHERST GYMNASIUM.

PHYSICAL TRAINING AT AMHERST.

THE recent inauguration of the new health-building at Amherst college is a noteworthy feature in the development of this department of collegiate institutions in general. Amherst college was, it will be remembered, the first institution of the kind in America to awaken to the practical necessity of a competent physical culture proceeding simultaneously with the intellectual development of its students; and effective measures were taken to secure these ends nearly thirty years ago, soon after the accession of the late Dr. Stearns to the presidency of the college, when, in the year 1859, the board of trustees created the department of physical education and hygiene. Prescribed physical training four times weekly was constituted a part of the regular college course, and has been maintained under the immediate personal superintendence of a regularly educated physician, who exercises, in addition, a general oversight of the health of the college. And it is worthy of note here, that, while the experience of similar institutions elsewhere has often been very different, no epidemic has visited this college for the past twenty-five years, nor has any serious or permanent injury ever happened from the gymnastic exercises, either required or voluntary. From the outset the department which had to do with the physical education of the student has been on equal footing with the other departments of collegiate instruction, and the facts of the relative attendance upon the required exercises in light gymnastics show that this position of the department is fully and cheerfully recognized by the students.

While in the conduct of the affairs of the new health-building, or Pratt gymnasium, — the gift of Mr. Charles M. Pratt of Brooklyn, — no radical change is contemplated, there is, with a greatly larger structure, more completely specialized apparatus, and all the conveniences for promoting bodily health as well as fostering physical development, a vast field for amplification of the work of the department which it is now in the strongest position to occupy. The interior arrangements of this structure present much that is new in college gymnasiums; and nothing has been spared to provide the most suitable forms of