and finally resulted in the establishment of instruction in vocational agriculture in the high school, insured the success of these institutions. The agricultural college was slow in developing. Definite information relative to agriculture was meager when these institutions were started. This deficiency was to a large degree remedied by the establishment of the agricultural experiment stations, whose function it was to secure facts relating to agricultural problems. With these facts available, the colleges grew in importance and began to influence agricultural practice. It was, however, only after the creation of the extension service which carried the results of the scientific investigations of the agricultural experiment stations and the teachings of the agricultural colleges to the people that the influence of agricultural instruction upon the efficiency of production was markedly manifest.

The extent to which the extension service is influencing production practices was indicated in a recent report by C. W. Warburton, director of extension of the U. S. Department of Agriculture.[7]

This report states that during 1928, as a result of extension influence, over 4,100,000 instances were recorded of the adoption of improved practices on the farms and in the farm homes of the United States. Among the instances reported were 57,000 farmers who adopted improved practices in the production of alfalfa; nearly 30,000 who planted certified potato seed; 38,000 who treated seed wheat for smut; 418,000 who adopted improved dairy practices; and 424,000 who improved their marketing methods. These are but a few examples of the many ways in which adult education by the extension service contributed directly in a single season to a more efficient agriculture.

There should also be mentioned the educational work of the boys and girls through the 4-H clubs and vocational schools. Over 586,000 farm boys and girls were enrolled for instruction in 41,000 local 4-H clubs in 1926. These club members cultivated and owned 80,306 acres of field, truck and orchard crops; had 87,207 head of high quality live stock, and 1,329,200 standard bred fowls. Over 13,000 teams of club members were trained to give public demonstrations as a means of influencing more people to adopt improved agricultural practices. Formal agricultural instruction was also given to over 85,000 boys in the vocational agriculture classes in the high school. Thus in a single year these agencies trained an army of more than 600,000 young people in modern, advanced methods of farming. It is the influence of educational work of this character, started with the establishment of the Land-Grant Colleges in 1862, expanded as the vision of industrial education developed until it reached the magnitude described above, that has made possible the application of the results of scientific investigation and led to the present efficient state of agricultural production. In no other section of the world has agricultural education been made as easily available to the producing classes, and in no other country has agricultural production reached so high a state of efficiency.

The job of educating the agricultural producers of this country has just begun. The establishment of the first agricultural college is within the memory of men still living. The agricultural experiment stations are less than fifty years of age. Extension work in its modern conception was not started until 1914. Junior extension work has reached large numbers of boys and girls only within the past few years. Few who have received vocational agriculture instruction in the high schools have as yet become farm managers and operators. When all these agencies have had an opportunity to exert their full influence upon agricultural practices and rural life, a still further marked improvement in the efficiency of American agriculture can be confidently expected.

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[7] Report of the director of the extension service, U. S. Department of Agriculture, for the fiscal year ending June 30, 1927.

THE WORLD'S TWO GREATEST PETRIFIED FORESTS

"LEAVING this island," said Sinbad—(for Scheherazade, it must be understood, took no notice of her husband's ill-mannered ejaculation)—"leaving this island, we came to another where the forests were of solid stone, and so hard that they shivered to pieces the finest tempered axes with which we attempted to cut them down." Thus, Edgar Allan Poe in the "Thousand and Second Tale"; and then he says in lucid footnotes, adding a strange literary touch, that an account at first discredited has since been corroborated, to the effect that "there is a completely petrified forest near the headwaters of the Chayenne, or Chienne river, which has its source in the Black Hills of the Rocky chain."

Told with the prescience of unapproachable genius, there was in all the known world no other forest turned to stone, the equal of this of the "Chayenne." There were stems, crowns of fronds, flowers by the tens of thousands, ripened fruits, all stained in stone by nature, in faultless perfection. Those unimpeachable records had awaited throughout the ages the processes of erosion that should again bring them to

the surface of the earth. There was needed but the art of the lapidary to bring into view a life as remote as the light of the stars.

It is no exaggeration to say that within the limits of the area in the southern Black Hills "Rim" between the forks of the Cheyenne, now segregated as the "Cycad National Monument," there is a far richer representation of the petrified cycadeoids than has ever been indicated by field observation or discovery elsewhere. This has seemed to be the world's finest actually petrified forest. While in the like sense of completeness of record, in that rich and fadeless reality, one of the few ancient forests of the globe, fairly vying with the Cycad Monument forest, is surely the fossil Araucarian forest recently discovered in Patagonia.

The first word of this new and likewise "completely petrified forest" appears to have come through Dr. A. Windhausen, of the Argentine Geological Survey. When in the territory of Santa Cruz in the year 1919 he saw certain finely petrified cones in the hands of various persons. Reaching the general locality in the neighborhood of several volcanic outliers called the Cerro de Madre y Hija and Cerro Alto (S. L. 48°) some three years later, he then sent several of the cones to Dr. Gothan, of Berlin, described in 1925 as *"Araucaria Windhauseni."* But a rather more graphic account is given by Dr. Riggs, of the Field Museum of Natural History, Chicago, fairly a co-discoverer of the forest. While engaged in the Patagonian explorations of the years 1923–24, he also presently encountered the cones, so fascinating to the eye, literate or not. The first indication of the great forest came in the form of a cone brought out by the keeper of a "boliche" (country store) midway between Lakes Colue Huapi and Musters, said to come from "forty leagues southward." A month later, two similar cones were displayed in a roadhouse at Station Mazarado on the southern coast of the Gulf of St. George. These were from "twenty leagues to westward." Again the cones were seen at Station Jaramillo, at the crossing of the River Deseado.

As Dr. Riggs further relates:

> Employing the owner of these last specimens as a guide, after four days' travel by auto and search, we came upon the locality some fifteen miles westward and a little south of the volcanic peak, Cerro de Madre y Hija, and near that of Cerro Cuadrado. Here, three months after the first of the cones were seen, we found a considerable number of the fossil trees, some with stumps standing, others lying prone with broken branches and cones scattered about them, revealing a forest of fossil Araucaria, or Brazil pines, preserved on the site where it had grown. A large collection of these specimens was made.

Further picturing the nature of the forest floor, there are present a few finely petrified second year Araucarian seedling stems with their roots merely broken away during erosion—just such seedlings as are now seen freely growing in the Chilean pure stands of the Bio Bio, where there are in winter heavy falls of protecting snow.

Occurrence is in sandy volcanic ash. In accord, though not specifically proven, it is usual to believe that the broad leaf Araucaria type of foliage occurs in the older Mesozoic strata. In my own collections made in the Rhaetic of the Minas de Portrerillos, West Argentina, there are leaves of the size and cut of *Araucaria imbricata,* easily to be confused with those of the older Otozamitans, except for the much more distinct and closer venation of the latter.

With this splendid addition to the collections of the Field Museum, as successive interests have turned, especial attention is being given to ancient types of cones and flowers. Amongst other subjects, following the restoration of the *Cycadeoidea ingens* flower in glass after the manner of the "glass flowers," recently carried out by Dr. Dahlgren, study of the Araucarian series has been taken up, for both museum exhibition and comparative purposes. This elaboration, through the kindness of Professor Noé, of the University of Chicago, and the interest of the director, Dr. Davies, has been entrusted in part to me. It is thus one of the varied series of investigations resulting from five years of Field Museum activity in southern South America, recently noted in SCIENCE.

Sawing and polishing of a splendid group of nearly forty of the cones, large and small, from the great petrified forests of the Cerro de Cuadrado is already done, with also some thin sectioning; and the results are of such unexpected scientific value that the present preliminary account is given.

Most of the cones sectioned may be referred to the larger type studied by Gothan, *"Araucaria Windhauseni,"* the size and form closely recalling the present *Araucaria Cunninghamii.* Gothan's name appears, however, to be a synonym of *"Araucarites mirabilis"* of Spegazzini, who gave an account in the latter part of 1924 without geologic data. But with the advantage of such an extended series of cut cones, more perhaps than have ever been well cut in any single instance of study of an ancient petrified conifer, direct reference to the genus Araucaria seems slightly misleading—or to *Araucarites,* as the other alternative, inexact. Firstly, although Dr. Riggs is inclined to assign a later age to these cones, the opinion of Dr. Windhausen that they are of Triassic and probably mid-Triassic age is also that of a competent geologist, and in view of the features of the collections may prove more nearly correct. Secondly,

there is to be seen between the bract and ligular areas a deep sulcus. Whence a new generic name, *Proaraucaria,* is suggested for these larger cones. Also, as there is a tendency amongst them to run into two types, the one robust with a very large woody cylinder, and the other a more elongate type, two species may be present. If so, the elongate type might be singled out as *Proaraucaria elongata.* The name at least is one of convenience, emphasizing the presence of variation in the many specimens of the larger cone series.

Striking as are these larger cones of clear to jaspery and vari-colored quartz, beautiful as objects of museum display, and even distinct because of a certain primitiveness of feature, their evolutionary significance is but slight compared with that of a closely associated series of lesser cones of several types. These latter are fewer in number, although over a dozen have been cut and studied. Firstly, there is an approximately mature staminate form, certainly referable to the larger cone series, *Proaraucaria* (hence *P. patagonica* ♂). Secondly, there is also present a quite young growth stage of the larger ovulate cones. While preservation does not here extend to finer details of histologic structure, there is no mistaking this identification (likely with the robust cone type *P. mirabilis*). Moreover, as the sulcus between the bract and ligule is well defined, even before the position of the seed is outlined, this feature is not a deceptive generic character. And thirdly, there is a further new and well-represented generic type amongst the lesser cones, easily the most unique feature of the Cerro Cuadrado forest.

At first sight these latter cones appear to be those of pines about the size of the young highly colored cones of an Alcock's spruce three to five centimeters in length, with presence of a broad bract. But the sections at once show the structure to be intermediate between pines and Araucarians. Although the bract is more prominent than in any existing Abietinean, the seed scale makes up the main bulk of the cone, quite as in a pine, while the seed is single, pendent and enclosed, as in Araucaria. Minor structural details are not so well preserved as in some cycadeoid cones, though the larger features are distinct enough. The palisaded outer stone layer is clearly seen, with the nucellus rather free from the integuments; and in one of these cones embryos seem present, indicating an approximately mature condition.

In the case of cones so well represented and freely seen as these, a dozen of them having been cut, and with features so determinate and readily described, even without the illustration and comparison of the entire series of the Cerro Cuadrado yet to follow, descriptive names are fairly needed. Accordingly, it is suggested that on the basis of the distinct bract feature the new generic name *Pararaucaria* may be used. Also, as there is here, too, a more robust, fewer seeded and a more elongate form, the specific names *P. patagonica* and *P. elongata* suggest themselves. In both these forms the woody cylinder is relatively heavy, with the medulla small as in pines, and thus the reverse of the more typical Araucarian structure in these respects. No such types are known to me to be mentioned anywhere in paleobotanic records; but it would be very strange if further examples from elsewhere on the globe fail entirely in extant collections. If a cone-type from Neuquen, called by Spegazzini, *"Romeroites,"* is not rather to be referred to the *Pseudo-Araucaria* of Fliche, these stand as two related distinct genera, showing the presence within the Araucarian alliance of scale types with two or more seeds.

There, therefore, at last appear fossil types which go far to bring together the apposed branches of the Coniferales, and make of that stock a homogeneous unit. The long-debated question whether Araucarians or Pines are the precedent form becomes merely academic. Both are of much the same geologic age, and alike descendants of a well-defined Carboniferous stock with lax cones, various persistent relatives of which are recognizable in strata of Permian to Rhaetic age—*Palissya, Stachytaxus, Voltzia, Cycadocarpidium,* etc. By Permian time, the modern conifers are already defined, as more or less certainly proven by Florin. In Araucarians the bract is the main cone component, in pines the seed scale. In *Pararaucaria,* nature produced the intermediate form, made up of both bract and scale, which became extinct.

From these new points of view, Pines and Araucarians appear alike specialized. Either vegetatively, or in the cones, first one then the other shows that tendency to limited type and numbers after long ages have passed, that restriction to narrowed environments, that sharpness of feature called "specialization." Furthermore, let bract and scale be regarded as they may, the relatively little changed coniferalean stock must best be exemplified by the Podocarps, especially such a cone type as *Podocarpus andina.* Doubtless, a universal homology now runs through the entire group Coniferales taken as a true homogeneous stock. The older lax cone is then in some extremely simple sense antecedent to an inflorescence in which the fertile members merely arise in the successive bract axils. Or the cone is just a spiral succession of scale and fertile leaves, borne on an axis of limited growth. Much more could be said, but discussion better accompanies full illustration.

It is noteworthy that this world's second greatest of petrified forests occurs scarcely 10° south of the

present *Araucaria imbricata* forest of Argentina and Chile, testifying to extreme persistence of type. The counterpart in the northern hemisphere disappeared with the last of the dinosaurs. Two of the final well-marked species are the fine petrified cone *Araucaria hespera,* and the equally distinctive foliage type *Araucaria hatcheri* from the Ceratops beds of Wyoming and Dakota. Of the two great forests, the one yields the first clear glimpses of the Mesozoic flowering gymnosperms, the first readable evidence for the nature and place in geologic time of the course of change leading into the modern world of flowering plants; the other proves the Coniferales to be a homogeneous group, in all their later history at least.

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SAMUEL BONSALL PARISH

LIKE many other amateur naturalists before him who have done things well, Samuel B. Parish carried on his botanical explorations of the native vegetation in Southern California because of the intellectual pleasures derived from field studies and because of his love of the high mountains and the stark deserts. Upon this area, Southern California, he has published no less than sixty-three papers ranging from problems of plant geography and taxonomic detail to topographic description, local lists, studies of immigrant plants and analyses of abnormal structures.

Born at Paterson, New Jersey, on January 13, 1838, he graduated from New York University in 1858, with the degree of B.A., taught school, served four years during the Civil War, pursued prospecting and mining in the western states and finally settled as a fruit-grower in the San Bernardino Valley of Southern California in 1872. This new home was centrally located and well situated for exploration by means of a camp wagon and horses of the varied topographic and climatic areas which make up the eight counties of Southern California, an area somewhat larger than the state of Pennsylvania. Botanically the region is highly interesting but was at that time an almost unexplored land. The fruitful results of expeditions made in days or weeks of leisure brought about between Mr. Parish and Dr. C. C. Parry, formerly botanist of the Mexican Boundary Survey, an intimate friendship, and through Parry there was established what were to prove relations, prolonged and cordial, with Asa Gray, George Engelmann, Edward Lee Greene, M. S. Bebb and many others. For a period of forty-eight years Mr. Parish continued to explore this region of his choice, his last expedition, a trip to the Campo region on the Mexican border, being made when he was eighty-one years of age.

On account of library and herbarium advantages he removed to Berkeley in 1920 and was soon appointed honorary curator in the herbarium at the University of California and a little later lecturer in botany at Stanford University. His library was purchased by Pomona College and his invaluable herbarium by Stanford University. He passed away at Berkeley on June 5, 1928, in his ninety-first year, having been active botanically until within a year of his death.

In 1915 Mr. Parish and Ellsworth Huntington joined forces for an expedition into the arid wastes of Death Valley. Both men had had much field experience and neither was in need of homilies on the thesis laid down by H. G. Wells in one of his books that a camping trip is the most severe test of human nature ever invented. On the return journey Dr. Huntington expressed a desire to meet Mrs. Parish. It was arranged. Said Dr. Huntington: "I have been curious, Mrs. Parish, to meet the woman who had the penetration to select so remarkable a man as Mr. Parish. I have in three weeks enjoyed him to the full."

The well-worn path that led to the door of the rose-covered Parish cottage in the San Bernardino Valley has been trod by scores of botanists, beginning with the early visits of Asa Gray and George Engelmann and coming on down to the later ones of Hugo de Vries and J. N. Rose. All these men and others who knew this quiet earnest worker had feelings akin to those of Dr. Huntington. Wise in foresight, thoughtful and considerate, generous of his store of botanical knowledge, unfailing in his dry and emollient humor, men were warmed by the wholesome personality of Samuel Bonsall Parish. In him the Wise Mother seemed in an unusual degree to have mixed harmoniously the ingredients of human nature.

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SCIENTIFIC EVENTS

THE INTERNATIONAL CONGRESS OF TROPICAL MEDICINE

THE International Congress of Tropical Medicine and Hygiene had its final meeting at Cairo on the morning of December 22 and the official proceedings ended in the evening with a *soirée* given by the organization committee in the Heliopolis Palace Hotel.

According to a report in the London *Times* the meeting was preceded by the ceremony, over which the Minister of Education, Ahmed Bey Lutfy es Seyyid, presided, of conferring honorary degrees of the Egyptian Faculty of Medicine on some of the foreign delegates. Professor Nuthall, Sir Robert Philip and