verberations. They are an artificial stone contributing to optimum acoustics and are so calculated that they absorb enough and yet reflect enough to render clear over all this auditorium a speaker's every word.

Perhaps the larger part of this assemblage can even hear a pin drop when from uplifted hand I release one, as I now do.

Surrounding rooms have been provided in which to exhibit in working actuality with constantly changing program, not what science has done in the past, but currently is doing always the latest wonders about which the public seeks to learn.

The difficult foundations in an ancient stream bed and other triumphs of construction might be enumerated but the occasion does not permit.

Here at their best, lighting, heating, ventilation, intercommunication and other cunning arts of to-day's Prometheus, have effected their compromise with beauty—perhaps it might be better said, have given her a background on which she stands uncompromised.

Upon the classics too have we called in many ways and under the scholar's guidance of Dean West, have symbolized the debt of science by carving high and clear across our marble front immortal words of Aristotle.

The landscape architecture of Charles Downing Lay has framed our picture. Rarely if ever have decorators' fingers so adorned and emphasized result as have Miss Hildreth Meiere's our soaring dome.

Rarely if ever have sculptor's hands wrought marble, bronze and copper with such historical insight and compelling genius, as have Lee Lawrie's in his doors and panels and other masterpieces here.

We feel with deep emotion that rarely if ever has master architect contrived so ravishing a whole as Bertram Grosvenor Goodhue; such assembly rooms, great scientific library, office, exhibit and board rooms and practical appurtenances, all so effectively and conveniently, with such power and fascinating beauty, and lovely charm carved out of space in a way to make life through beauty happier for us all—happier but for his sad loss three days ago. His thing of beauty is indeed a joy forever. It will live on, its loveliness increasing.

But I must pay one further tribute. If there should be removed from our fair project, from its scientific ideals and beneficent usefulness to the American people, the part it owes to the gifted vision and tireless devotion of George Ellery Hale, our temple could not stand.

Mr. President, this building is more than a building. It is a great instrument, firing the ideals of science as well as feeding its resources, a great organ for the taking of that divine fire which Prometheus first stole, preserving its sacred continuity and transmitting its infectious blaze throughout the land for the benefit of the people.

It is a temple indeed, a temple—as written above us—forever conscious of "ages and cycles of nature in ceaseless sequence moving"—a temple dedicated to our passion—to "Science, Pilot of Industry, Conqueror of Disease, Multiplier of the Harvest, Explorer of the Universe, Revealer of Nature's Laws, Eternal Guide to Truth."

APRIL 28, 1924

THE HISTORY OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

III

MEMBERSHIP

To the year 1915 the statistics of membership and registration have been published in the Proceedings. In 1848, the number of members was 461. Of this roll 21 were designated as from 1840, including three deceased. Of the total list less than 30 can now be recognized as geologists, although most naturalists of that time knew their geology. In 1876 only 43 names of the original 461 remained on the list, and James Hall was the only one with continuous membership from 1840.

The membership had risen to 1,004 at the first Washington meeting, in 1854. Then it fell away during the civil war period, dropping to 415 in 1867. Rising slowly, the number reached 1,030 in 1879, and 2,033 in 1883, and remained near that figure to 1900. Then the membership increased steadily to 4,000 in 1903, 8,000 in 1910, and over 11,000 in 1920.

The rapid increase during the last decade has been coincident with the publication of the Proceedings in SCIENCE as the official medium of the association; and since 1902 with the meetings in winter instead of in summer. Other and less apparent influences are the affiliation of practically all the national scientific societies; the constant watchfulness and supervision of the policy committee (now executive committee); and especially the keen and active interest of the editor of SCIENCE.

The "objects and rules of the association" recognized in the early years two classes of members: first, those who had participated in the meetings 1840–1848, along with persons of certain scientific professions who should subscribe to the rules; and second, persons who might be nominated and elected. This distinction between professional and non-professional members has continued to the present time, the workers in science being classed as "fellows" since the revision of the rules in 1874 (23: 167).

In 1857 a class of "associate members" was established, to be admitted for one, two or three years by election, the same as regular members, and to pay the

same dues, but with no participation in the business of the meetings. This complicated rule and arbitrary distinction was not lasting; but associates for a single meeting have always been recognized (by-laws, II, 2).

In 1891 the class of "corresponding members" was created (40: 442), but has been dropped. And the former class of "patrons" is now known as "sustaining members." Our democratic régime makes only a very slight distinction in privilege between fellows and ordinary members, only the former being eligible to the council.

Some careful details in the old volumes of Proceedings are now curious for published records. Several volumes contain lists of persons who "paid the assessments but were not formally elected, and did not sign the constitution," and of those who "signed the constitution but were not elected, and did not pay the assessment." Perhaps this was the secretary's method of notifying delinquents.

We do not know when the signing of the constitution was waived or forgotten. Such evidence of adhesion was the general custom of ancient societies, but, of course, impractical with large membership.

At the first meeting, 1848, a resolution was voted that members might introduce ladies at the sessions. After this gracious concession to feminine curiosity women are not recognized in the records until 1858. At the 12th meeting, in Baltimore, the standing committee proposed some changes in the rules, one of which was to admit ladies as associate members. The only subsequent mention of the proposed amendments is a sentence in volume 13, page 364, which reads, "Resolved, that no action is necessary in regard to the motion to admit ladies as members, inasmuch as two ladies have already been admitted." Examining the former lists of members it is found that in 1850 two women were elected, or at least named on the roll, Maria Mitchell, Nantucket, Massachusetts, and Margaretta Morris, Germantown, Pennsylvania. Either the two women had been very quiet for eight years or else the standing committee was not alert. In Professor Chester Dewey's personal copy of volume 12 is found a memorandum in his writing stating that the proposals of the committee had been rejected as result of opposition led by himself. The first women members in the British association were in 1843, the twelfth meeting.

An interesting list of members who had joined previous to 1877, and were then living, is printed in SCIENCE, Vol. 42, pp. 791–2, 870.

Dues.—The geologists' association had no fixed fees or dues, but assessments and voluntary subscriptions from the members present at the meetings. During the first two years of the association the rules called for an "annual subscription" of one dollar, which entitled the member to a copy of the Proceedings, and an amount on registration that was left blank in the printed rules.

In 1850 an assessment of three dollars was levied on each member in attendance; in addition to the annual dues of one dollar. We would suppose that this should have penalized attendance. But in 1851 the annual dues were two dollars, and they remained at that figure down to the revision of the rules in 1873, when the dues were made three dollars and remained at that rate until 1920. A proposition in 1891 to increase the dues to five dollars was rejected, and unwisely. Such increase was made in 1920, with practically no objection, but with increased respect for the association and greatly increased resources.

The fellowship fee of two dollars was dropped in 1904.

OFFICERS

The lists of all past officers, including those of the parent society, have been repeated in the Proceedings volumes.

The first elected president was William C. Redfield. The last presiding officer of the geologists and naturalists was W. B. Rogers, who acted in place of Amos Binney, deceased. Rogers presided on the first day of the 1848 meeting until the rules were adopted and the present association formally organized, and by action of the association his name is coupled with that of Redfield as the first presidents.

The office of permanent secretary was established in 1850, for term of three years, with a salary of $300, and Spencer F. Baird elected to office. The records show that the association immediately found a great variety of duties for the new officer with the princely salary. The office was not named in the printed rules until 1856. The previous secretaries had been E. N. Horsford and Lewis R. Gibbes. The successors to Baird have been Joseph Lovering, 1854–1868, 1870–1873; F. W. Putnam, 1869, 1873–1898; L. O. Howard, 1898–1920, and Professor B. E. Livingston since 1920.

For many years the salary of the permanent secretary was $500. During the years it was slowly raised, until in 1903 it was $1,500, with $1,000 for assistance. Honor should be paid to Miss C. A. Watson, who was Professor Putnam's efficient assistant, and to whom the association owes a debt for the many years of devoted and intelligent service.

The office of general secretary came into the rules with the changes of 1856. The chairman of the sections have always been vice-presidents of the association.

The only woman official of the association was Mrs. Erminnie A. Smith, who was secretary of the section of anthropology in 1885, the thirty-fourth meeting. This conservatism does not equal that of the British

association, which did not have a woman in office until the eighty-third meeting, 1913, as the sectional president in botany, and a woman in the council in 1914.

The list of 69 presidents of the association is the roll of honor in American science. This roll is called in each volume of the Proceedings. The titles of the presidential addresses, with volume reference, should be published ni the record of the seventy-fifth anniversary.

Brief biographical sketches, with portraits, of the earlier presidents was given by Marcus Benjamin as his address to Section I in 1889 (48: 397–459). A complete collection of portraits of the presidents to 1920, collected by him, is now the property of the association, and should some time decorate the association's hall of fame.

PUBLICATIONS

The record of 73 meetings, to 1921, is found in 62 volumes of Proceedings. A volume was published for each meeting to 1905, making 55 volumes to that date. Since then, under contract with SCIENCE as the official journal of the association, three volumes of Summarized Proceedings have been published (1912, 1915, 1921), bearing the serial numbers of the meetings, with references to SCIENCE for all administrative and scientific proceedings.

The volume published in 1843 by the parent society might properly be regarded as the initial volume of the Proceedings, but is not so listed. That "report" of the first three meetings of the geologists' association has 544 pages, 68 being "Proceedings" and 448 being "Transactions," the latter including 24 scientific papers with 21 plates. This volume was printed through the liberality of the men of Boston, and was dedicated to Nathan Appleton. The committee of publication was H. D. Rogers, L. C. Beck, B. Silliman, Jr., Amos Binney and A. A. Gould.

The early Proceedings were published in the *American Journal,* and only there do we find the record for the five later meetings of the parent society (see above in first chapter).

Volume one of the Proceedings was reprinted in 1874; and volume two in 1885. In 1882 there was a fund raised by subscription for reprinting, with a report that the Nashville and St. Louis volumes had been reprinted. The names of subscribers to the fund of $2,113.46, were given (31: 641). Evidently the officers in the early years did not anticipate the future growth of the association and the demand for its Proceedings; a common failing.

Some of the early volumes were financed by the cities which entertained the meetings. This example was set by Charleston, South Carolina, in 1850, for volume three; and followed by Cincinnati, 1851, and Albany, the same year. Cleveland undertook the publication of volume seven, for 1853, but the product was unfortunate, and was discarded, and the volume was printed by the association in 1856. An appendix to that volume tells the story in very sharp and amusing correspondence.

Judged by modern standards the early volumes were not good examples of book-making. The first six volumes have no table of contents; and numbers one and three have no index. Later volumes have sufficient, and sometimes very full contents, but the indexes are scanty.

In 1872 there was a proposition to publish a general index, which, unfortunately, was never done. The record of American science to 1903 is largely contained in the 52 volumes of Proceedings, but the lack of general indexes makes the record inconvenient and practically unavailable, and in consequence the association has not received its due credit.

In volume five we read that efforts were made to obtain abstracts of papers; repeated at times, and even made a requirement. That difficulty was not limited to those years. The trouble in obtaining reviews or summaries of scientific progress was illustrated in 1852 (7: 273), when twelve men were made as many special committees on the progress in that number of branches of science. The list was carried in several volumes, but no reports are recorded.

The only publication of the association beside the volumes of Proceedings is the Memoir on Fossil Butterflies, by S. H. Scudder, a handsomely printed quarto of 99 pages and 3 plates. The expense was borne by the first gift, of $1,000, from Mrs. Elizabeth Thompson.

During the early years the addresses by the presidents apparently were informal, and not supplied for publication. The first published address was by A. D. Bache, in 1851 (6: XLI–LX), in which he discussed the progress of the sciences. He found that 338 communications had been presented to the first five meetings; 107 in physics and mathematics; 93 in geology and mineralogy; 83 in natural history (especially zoology); 32 in chemistry, and 23 unclassified. He also made the comparison that at Cambridge and New Haven physico-mathematics predominated; natural history at Charleston; and geology at Cincinnati. Regarding the function of the association he claimed "that the association was for the advancement or increase of science, not for its diffusion or promotion." This was an overemphasis on research, and was overruled by the first article (objects) in the constitution. Diffusion of knowledge certainly is an important means of advancing it.

In 1854 President Benjamin Peirce, at Washing-

ton, made a poetic and literary address (8: 1–17). J. D. Dana's address, in 1855, was an essay on geology. (9: 1–36). At the eleventh meeting, Montreal, 1857, James Hall, as president, made an important address on the geology of the American continent, which was so far in advance of the thought of his contemporaries that it aroused strong opposition and failed of its proper influence by delay in publication, not appearing until 1882, in volume 31. Volume 13 contains the address on astronomy by Alexis Caswell. Since 1867 the address of the retiring president has been a regular feature of the meetings and a valuable part of the Proceedings volumes. They often have been of a philosophic character, and sometimes in the nature of a preachment.

Probably the more valuable element in the association literature is the many addresses by vice-presidents, as chairmen of sections, being more largely scientific reviews and technical reports by experts in their respective fields.

In 1900 a contract (49: 382) was made with the journal SCIENCE, for publishing the notices and Proceedings of the association, beginning January, 1901: and that relation has continued to the present time. In consequence the volumes of Proceedings have been abridged and united. Volumes 50–54 contain the addresses and titles of papers presented to the sections, beside the usual historical and personal matter; but since 1907 the volumes contain no scientific matter, but refer to SCIENCE. Volume 58 is the first of the greatly abbreviated volumes.

To Dr. J. McKeen Cattell, as editor of SCIENCE, and for his keen, untiring and vigilant interest in the association affairs, joined with his intimate knowledge of scientific men and forces, the association is very greatly indebted.

The publications of the great technical societies now carry most of the literary product of research and discovery. In the former years, to about 1888, the association shared with the *American Journal of Science* the responsibility of setting forth the new truth. With the vastly increased output of scientific literature it certainly is to the advantage of the student to have the literature in his field collected in the journal of the special society.

Library.—Until 1896 the literature received in exchange for the association Proceedings was held at Salem, Massachusetts, at the office of the permanent secretary. In 1895 it included 638 bound volumes, 1,628 unbound, and 6,443 pamphlets. At that time the "exchanges" numbered 248. In that year the council decided to deposit its library with the University of Cincinnati (44: 399), under a contract retaining ownership and with power to recover under conditions. At the present time data are not obtainable regarding the increase and size of the library, which is especially valuable in its series of publications by many foreign societies.

The British association has a similar disposition of its library; the foreign material being in the University College, London, and the transactions of the local societies in the British Museum.

SCIENTIFIC WORK

The scientific record may properly, if not technically, include the volume of 1843, described above under publications. The 24 papers, with 21 plates, printed in that report of the first three meetings of the geologists' association, cover a variety of subjects and are highly creditable to the earth-science of that time. They read quite up-to-date and might be examined to-day with some profit, especially for appreciation of the pioneers. There has been repetition in scientific literature, due either to ignorance or to disregard of previous work. Professor J. J. Stevenson has said, not wholly facetiously, that it is safe to republish, as original, anything 20 years old.

To 1905 the scientific activities of the association are on record in the 57 volumes of Proceedings. Subsequently they are in SCIENCE.

The first meeting is of particular interest. During the five days of the meeting the papers were presented in several general sessions and in two sections. Louis Agassiz was the first chairman of the Natural History section, and Joseph Henry of the General Physics. The record in Volume 1 is not clear, but the 56 titles listed in the *American Journal of Science* (6: 393–5) classify as follows: geology and paleontology, 12; chemistry, 11; zoology, 11; mathematics and astronomy, 8; meteorology, 3; archeology, 2; and one each in nine branches. All the men who at that time were eminent in American science attended that initial meeting. Agassiz is credited with 11 papers. At the third meeting he presented four, and at the fourth meeting 15.

Some of these papers of 1848 are interesting now. The longer were: "The sediment of the Mississippi River," by Andrew Brown and M. W. Dickeson; "Organization of the Smithsonian Institution," by Joseph Henry; and a long report on geographical explorations and researches in 1847 and 1848. An "extended and spirited discourse" by W. B. Rogers was not printed.

That old friend of the paleontologist, *Triarthrus Beckii,* was introduced and vouched for by Ebeneezer Emmons. The "Locke Level" in common use by engineers and geologists was described and figured by its inventor, Professor John Locke.

The function of the association as the watchman and spokesman for American science was properly exercised, and the young society assumed its author-

ity as representing organized science and boldly addressed communications advising national officials and state legislatures. One memorial was sent to the President, the heads of departments and to Congress requesting that scientific men be added to the boundary commissions and expeditions. Over this there was a lively debate, Agassiz in opposition. Another communication was addressed to the secretary of the navy, asking for aid to Lieutenant Maury in obtaining information for his charts of winds and currents, and another to the legislature of Pennsylvania urging the publication of the Rogers' Geological Survey report.

At the second meeting several state legislatures were advised in regard to their surveys. A few of the memorials, selected quite at random, will show the activity of the young society.

1851, to the governor and legislature of New York, with reference to a geographical survey.

1858, on the Hayes expedition to the Arctic region; on American ethnology; and to the states on meteorologic observations.

1869, the United States government was asked to intercede with the authorities of Uruguay to recover manuscripts on Indian languages for Porter C. Bliss.

1875, to Congress in support of the international bureau of weights and measures.

1878, to Congress and to state legislatures on forestry.

1881, to create the International Park at Niagara Falls.

1884, for a geodetic and topographic survey of the public domain.

1885, on the scientific work of the U. S. coast survey.

Special Committees.—The character and scope of the scientific work is also exhibited by the titles and reports of the many special committees. Eleven such committees are named in volume 2; 23 in volume 4; and 20 in volume 6. Following are a few examples:

1849, on standards of measurements; and on the prime meridian.

1858, on state surveys; on registration of births and deaths.

1859, a long report on the Coast Survey, by F. A. P. Barnard.

1875, on weights and measures, and coinage.

1876, to arrange for a congress of geologists at Paris. (This action, initiated by Section E, resulted in the organization of the International Geological Congress. The report of the committee was made in 1879, vol. 28: page 555.)

1877, elaborate report on zoological nomenclature (26: 7–56).

1880, on forestry; on science teaching in the public schools.

1881, on standards of stellar magnitude; on standard time; on abuse of the Ph.D. degree (30: 373–377).

Since the eighteenth century there has been change in the accepted view of the function of government. The opinion held by some publicists that the government should be little more than a police force has given way to a more generous conception of the duties of a people's rule. To-day, the government, both national and state, is active in many ways for the common good. The several scientific bureaus, with elaborate organization and ample financial support, are objects of just pride. In 1848 the Coast Survey was the only scientific bureau at Washington. The association must be credited with much of the social progress in America by way of development in the governmental scientific activities. To-day the association must guard against political and local injustice and organized commercial greed, and as the recognized national voice of science it should not hesitate to speak.

Sections.—For many years, down to 1881, the work of the association was carried on in two main sections, with vice-presidents. The papers were grouped in variable sub-sections, under chairmen. The present system of lettered sections went into effect in 1882, with nine sections. The first listing was in volume 30. They were increased to 12 by 1919, and the present rules name 16 sections.

The order in time in which the branches of science were recognized as sections, or sub-sections, is of interest. The nine sections in 1882 were: A, mathematics and astronomy; B, physics; C, chemistry; D, mechanical science; E, geology and geography; F, biology; G, histology and microscopy; H, anthropology; I, economic science and statistics.

In 1885 G was united with F; and in 1893 F was divided into F, zoology; G, botany. In 1901 Section K, physiology and experimental medicine, was added. With some changes in titles this schedule lasted until 1920, with the addition of L, education, in 1908, and M, agriculture, in 1914, the sixty-sixth meeting.

That the broad and fundamental science of agriculture should be the latest one recognized for separate status is a phenomenon in psychology. It was rejected in the British association in 1839, and not listed until 1912, the eighty-second meeting.

The new constitution, 1920, gives a more logical classification or sequence to the sections, and increases the number with some changes in the lettered designation. The new sections are D, astronomy; I, psychology; L, historical and philological sciences; O, agriculture; P, manufactures and commerce.

Financial.—The small income during the early years, derived only from the low membership fees, was used in economical administration and for publication of the Proceedings. Not until 1869 was there any positive action for a permanent fund. There are suggestions in the record that the prevailing policy

might have been opposed to any accumulation of property and money; for one reason that the association was migratory and without fixed habitation.

In 1869 a resolution was adopted that receipts from sales of the Proceedings should be made the nucleus of a research fund. To this small beginning was added later the life-membership fees, subsequent to the death of the life members. In the absence of donations the permanent fund grew slowly. In 1882 it was only $2,062.00; in 1891, $5,254.00; in 1910, $21,300.00. Due partly to the generous bequest of Richard T. Colburn the fund is now nearly $138,000.00.

The first notable gift was in 1873, from Mrs. Elizabeth Thompson, of $1,000.00 (22: 422). From this donation was published the memoir on Fossil Butterflies, by S. H. Scudder (23: 48). In 1884 Mrs. Thompson made a second gift of the same amount, to be used for experimental research on light and heat (33: 691). In 1911 Mrs. Jane M. Smith gave $5,000.00, the income to be used in payment of life membership fees for worthy old members. A donation of $4,381.21 was received in 1920 from W. H. Stephens.

The first grants for research from the permanent fund were made in 1887, of $175.00 to A. A. Michelson and E. W. Morley to aid in establishing a standard of length; and $125.00 to C. S. Minot for biologic study (36: 355). A third grant was made the next year to F. W. Putnam, of $200.00, for exploration of the Serpent Mound in Ohio. For several recent years the annual appropriation for grants has been $4,000.00, which in future years will be increased. However, it will require some time for our total of grants to equal that of the British association, which during the years 1834 to 1921 were an equivalent of nearly $403,000.00.

To-day the British association is suffering, only temporarily, it is hoped, from the monetary and political troubles of Europe. The outlook for the American association is bright, for financial resources and the ability to aid in the search for truth, and in helpfulness in other ways for human betterment. Other strong organizations, beside the technical societies, are now supporting scientific research; but with its honored history, its wide scope, its close relation to all the national societies and with its increasing membership and income, the association should hold its leadership in the field of American science.

In comparison with its sister associations of Great Britain and France, and others in the southern hemisphere, the American association has the peculiar difficulty and the delicate function of being the central and unifying body among a great number of very strong national societies. In further comparison, it may be said that the British association is older, richer and with great social and official prestige. Its home field is small and easily covered. It has been the chief national society, with the support of many strong local societies. The American society, on the contrary, has an immense territory, with cities far-scattered and thousands of miles for travel; no official or governmental relations; and since about 1888 has had to recognize a great number of very strong technical national societies. Our nearest approach to official recognition was the address of welcome at the third Washington meeting by President Taft; and the receipt of a communication on national conservation, in 1907, from President Roosevelt.

The annual "conferences" which the British association holds with the local societies are scarcely to be compared to the "convocations" of the American association in affiliation with (at present) 53 leading technical societies and some 40 associated societies (1921, Vols. 24–26).

The object of the association is to bring forth truth and to set forth the truth—to discover and to proclaim the phenomena of the cosmos. The educational function, the advancement of science by diffusion of knowledge, has not been undertaken in an active and systematic way. And the need is pressing for popular and general scientific education. Not only are many millions of people in this land of education ignorant of elementary science, and being served with sensation instead of fact, but to multitudes the theories and facts of science are repugnant. The truth has great need of fearless champions, and as the spokesman for organized science in America the American association should assume leadership.

HERMAN L. FAIRCHILD
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ERNEST FOX NICHOLS

SURROUNDED by friends and associates and addressing, as one of the leaders in his own field of science, a distinguished audience of fellow scientists, Ernest Fox Nichols died suddenly on April 29, in the auditorium of the building of the National Academy of Sciences at Washington.

Were it possible to be unmindful of the added shock and sorrow to his family which such sudden death brings, his friends could have wished for him no more fitting ending of his life, devoted as it was to the advancement of scientific knowledge, than to die in full mental vigor, in physical health as it seemed, and to the very last instant taking the part of a leader in his profession.

Ernest Nichols was born fifty-four years ago and received his collegiate training in his native state, Kansas. As a graduate student in physics he began his career at Cornell University from which institu-