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THE NATIONAL ACADEMY OF SCIENCES

Addresses given on the occasion of the dedication of the building for the National Academy of Sciences and the National Research Council, Washington, April 28, 1924

THE PRESIDENT OF THE UNITED STATES:

IF there be one thing in which America is pre-eminent, it is a disposition to follow the truth. It is this sentiment which characterized the voyage of Columbus. It was the moving impulse of those who were the leaders in the early settlement of our country, and has been followed in the great decisions of the nation through all its history. Sometimes this has been represented by political action, sometimes by scientific achievements. On this occasion, the emphasis is on the side of science.

By science I mean the careful assembling of facts, their comparison and interpretation. Of those who are entitled to high rank in both our political and scientific life, perhaps Benjamin Franklin was the earliest and one of the most conspicuous examples. But it is the same spirit that has moved through all our life, which makes it particularly appropriate that our national government should be active in its encouragement of the searching out of the truth in the physical world, and applying it to the wellbeing of the people, as it is interested in the searching out of the truth in the political world with the same object in view.

President Washington, in his farewell address to the American people said: "Promote, then, as an object of primary importance, institutions for the general diffusion of knowledge. In proportion as the structure of a government gives force to public opinions it should be enlightened." It was the first President of the United States who saw the necessity of research in this country. Jefferson, our third President, was himself a research worker by natural gift, and loved the problems which gave him a broader knowledge of our natural surroundings. The beginning of our government, therefore, had to do with the inception of scientific research in the United States.

American science may be divided into five periods —the Jefferson period, that of Silliman, the Agassiz period, the present period of cooperative research when no one dominates, and the future for which definite foundations are being laid.

The Jefferson period began even before Jefferson's term as President. Paleontology in the United States had its beginning in the publication in 1797 of Jefferson's paper on the Megalonyx or great claw. The first large paleontological laboratory in this country was in the East Room of the White House, where Jefferson arranged his fossils for study.

The Silliman period covers largely the first half of the last century. During this time the National Institution for the Promotion of Science and Art was established in the nation's capital, which promised to be a rival to the American Philosophical Society in Philadelphia. Meanwhile the American Association was started. Also, in this period, an ex-President of the United States was concerned in the founding of an institution for research. John Quincy Adams in his own handwriting amended the bill to establish the Smithsonian Institution, giving it the broad scope which it has to-day.

The third period, that of Agassiz, again brings a President forward in the promotion of science. Abraham Lincoln, deeply interested in the welfare of the American people, confessed that up to the time when he became President and talked with Joseph Henry, then head of the Smithsonian Institution, he was inclined to view the institution as a rather useless government luxury, but, he said, "It must be a grand school, if it produces such thinkers as he." Later on in 1864, when the very foundations of the nation were shaken with Civil War, the same President looked from the Executive Mansion on the Smithsonian Building which was burning, and remarked to some military gentleman present: "Gentlemen, beyond is a national calamity. We have no time to think about it now; we must attend to other things." It was in these days of strife that a senator from Massachusetts, Henry Wilson, later vice-president, put through the two houses of Congress a bill incorporating the National Academy of Sciences in the United States of America. President Lincoln signed this bill. Just how much the war influenced the recognition of necessity for such a body is not known, but war problems were assigned to the academy and acted on. Since then many government scientific questions have been referred to it by the President, members of the cabinet, and committees of Congress, and the academy members have lent themselves to the work of solving these problems, knowing that their only compensation would be the knowledge that they had served the government of the United States to the best of their ability.

The period of individual work in science continued in America up to the time of the world war. Then a change came over the established methods of warfare. Instead of individual fighting individual, it was masses against masses. Scientific problems in research for the solution of war matters could not, therefore, be solved by one man, but must be worked out by those interested in the same field. Realizing this fact, and knowing of the many experts in the various fields of science covered by the academy, a request was made to President Wilson by the academy to call the leading scientific men of America for service under the guidance of the National Academy of Sciences and to organize a body to solve problems which required cooperative research. Thus began the National Research Council, and later the Council of National Defense requested it to act as the department of research of that body. After the armistice was signed the President of the United States, appreciating the value of what had been done, requested the National Academy of Sciences to reorganize the National Research Council under its charter on a permanent peace basis, and with this request cooperation in scientific research was given a firm foundation. Upon the assumption of this added responsibility, it was found that the old quarters of the academy at the Smithsonian Institution were not adequate. A number of philanthropists who recognized what splendid work could be done if ample space and facilities were available, contributed a sum sufficient to secure the lot on B Street, between 21st and 22d, and C Streets. The Carnegie Corporation of New York then donated the building, which may be termed the Temple of Science in America. It is not a place of mystery, but one to lead the public in thinking deeply and seeing how research can explain fundamental problems.

Nothing with more promise than the fifth period, that of the future of American science, could come to the American people. The scientific man is rending the earth to reveal its secrets. Truth must prevail for the betterment of mankind, and with the energy that the men of science are putting into the problems of research, Diogenes would certainly have a chance to lay down his quarter-staff and lantern and rest, if he would turn his search in their direction.

This magnificent building now being dedicated to science predicts a new day in scientific research. A new sun is rising. It is destined to illuminate the scientific world by illuminating this hall.

One of the most important possibilities for service of the National Academy of Sciences in the future lies in its opportunity for inspiring the people of America to insistence upon having the truth, and nothing but the truth, regarding everything that touches our life as a nation. It is always to be borne in mind that while the peculiar relation of the academy to the government of the United States may concern the conduct of specific researches, the ex-

ample of dignified emphasis upon the truth as reached by correct thinking in every department of research, and in its practical applications, may be a contribution of inestimable value to the whole people.

It is for this purpose that the government sets its stamp of approval upon this effort, and joins in dedicating this building to the betterment of the human race by achieving a clearer knowledge of the truth.

DR. JOHN C. MERRIAM, VICE-PRESIDENT OF THE NATIONAL ACADEMY OF SCIENCES, PRESIDENT OF THE CARNEGIE INSTITUTION, WASHINGTON:

IN the midst of distractions incident to the great national struggle in progress in 1863, the Thirty-seventh Congress of the United States gave evidence of its vision in many exceptional ways. It opened the great west to settlement by homestead, and authorized construction of a railway to connect the Atlantic with the Pacific. It was through the unanimous approval of this congress and the approval of President Lincoln that the National Academy of Sciences received its charter. Though the founding of the academy was in a measure planned with the idea of strengthening the national defense, it was clearly the purpose to reach beyond necessities of the moment and to consider the importance of advancing knowledge and its application for future benefit to the nation.

When the incorporators of the academy were called together, Senator Wilson, of Massachusetts, in transmitting the commission from the government, stated that while some had thought the time not well chosen for such action by Congress, he wished to have the world realize that "the statesmen and the people of the United States in calm confidence . . . are fostering the elevating, and purifying and consolidating institutions of religion, benevolence, literature, art and science."

It soon became clear that if the academy was to serve the government fully in the rôle planned, there must be opportunity for better organization and better contacts, first among its members, then with other organizations, with the public, directly with the agencies of our own government, and with scientific bodies of other countries. It was evident that this must come through developing machinery which could be set up only if permanent quarters were available in the Capital City and in close relation to the agencies of the Federal Government.

The ceremonies in which we participate to-day bring to us, in what seems like sudden fruition, the results of the vision, the plans and the hopes of many years. Knowing as we do that the joy in recognizing advance is itself essential to progress, this would seem the natural time to halt for a moment of pure pleasure in contemplating the attainment. But more important to us than mere apreciation of accomplishment is the realization that this is also a time at which we should consider with utmost care what these newly established conditions mean in terms of further opportunity. We must not fail to realize that these pleasures of possession have intimate relation to responsibility for that which we have helped create, as also for the new and great possibilities of service now opened.

So while this is first a day of rejoicing that possessions have been secured and ideals have been realized, it is most of all a time for earnest consideration of the gerat things this advance may mean for the academy and for the people of to-morrow.

In viewing the future responsibilities of the academy to the government, we may not interpret this relation to mean merely the possibility of assistance in specific problems or researches as they may happen to arise, either in relation to national defense or in other connections. There can be no doubt that this body was chartered with the understanding that it would have always in mind the interests of the people in whatever ways science can contribute to meet their needs or support their ideals. Though it is clear that the academy represents expert knowledge in the sciences only, it is important that its vision of ultimate service reach over all phases of the nation's life and thought, ranging from defense to assistance in securing those guarantees of comfort and health in body and spirit which make good citizenship and happiness possible.

Now, for the first time, we are to have a home, with all that this means as a place to live and work. It seems clear that as one of its responsibilities the academy with its relatively small membership, comprising all the sciences, should look forward to its general and special meetings here as exceptional opportunities for bringing the whole range of scientific inquiry to bear upon new discoveries or upon great investigations in progress. Even more important than the general meetings will be the possibilities of those frequent intimate conferences of small groups brought together for discussion of special topics, in which, with a minimum of formality, the more fundamental discussion is made possible.

The bringing of the National Research Council into being on the foundation of the academy charter has extended greatly the possibilities for stimulation and organization of research. In occupying its quarters in the new building, the academy will come into a relation to the council which will bring out more clearly than at any earlier time the significance of the organization which it has brought into existence. The invitation to a large group of the national scientific societies of this country to participate in the work done through the Research Council has developed a

wide range of relationships of the greatest importance. The responsibilties and opportunities which present themselves to the academy in connection with future problems of the Research Council must be reckoned as among the most important which will now come closely to our vision.

In the future development of our foreign relations in scientific work appears also one of the very great opportunities for national service. There is good reason for believing that the possibility of some of the surest ties to be formed between the nations lies in the discussion of scientific and intellectual questions in which international cooperation is directed specifically toward search for the truth without reference to its immediate economic or political bearing.

Along with those relationships of the academy which have been considered, there is also open to this body, as to other scientific agencies, an exceptional opportunity and a responsibility for aiding to steady the thought of the people by interpreting in some measure the meaning of the rapid advances now being made in scientific understanding of man and his environment. With the continuing growth of knowledge we see the universe increase in complexity and extend itself vastly in space and time. It is to be expected that adjustments in our scientific data will bring into continuous review much that pertains also to the fundamental philosophic and religious thought forming so important a part of the world's thinking. We should never blind ourselves to the fact that the people have philosophies, and always will have them, and that consciously or subconsciously they have religious beliefs also. Abundant national disasters, some of which we have seen in recent decades, have demonstrated fully that there is nothing more deadly than bad national philosophy, especially if it translate itself into terms of economic or political policy. Such beliefs never arise from attainment of the truth, but always from the lack of it.

The academy will always be conservative in holding fast such knowledge as may seem securely founded, but it will never look with favor on the defense of any view merely because it has been held. The attitude of the academy as representing truth-seeking and truth-accepting should have a continuous influence in stabilizing thought. Though we may never be advocates of philosophic or religious systems, we should assist in that interpretation of the shifting panorama which the world seems to present when viewed through the eyes of science. And we should help to keep false assumptions from serving in the place of truth.

DR. VERNON KELLOGG, PERMANENT SECRETARY OF NATIONAL RESEARCH COUNCIL:

IN the presence of the mother, the child lifts only a modest head. The National Research Council was born of the National Academy of Sciences in strenuous days of war, even as the academy itself was born during the throes of an earlier great conflict. Both came into existence for a first purpose of bringing science effectively to the aid of the nation in a time of terrible emergency. Science, which has been said to know no political boundaries, yet has its nationalistic phase. Scientific men may also be patriots.

The academy and the Research Council did so well aid the nation in this war emergency that the President of the United States asked the academy, in 1918, to perpetuate the council as a permanent peace-time organization for the encouragement and support of scientific research in America. This perpetuation was effected, and the council has been steadily and expandingly at work as such an organization ever since the close of the great war.

I shall not weary you with any list of the council's present activities or methods of work. They are many and various, but all follow the lines indicated in the President's order. Nor shall I make any boast of the council's achievements. Boasting will not add to them nor will absence of boasting take anything away from them. I may say simply that we believe that the council has already made achievements helpful to the advancement of science and useful to the nation.

Because of the rôle played by science during the great war, and the even more important rôle that it will inevitably play in the next great war—if such war must come—various philosophers and humanitarians have lifted their voices to decry science as an agent of evil and a promoter of human capacity to do grievous things. They charge against it not only its rôle in war, but its rôle in the industrial revolution which has made too many men slaves of machines.

It is true that science has been used to do sad work. It is true that science can be used to make of the next war an earthly horror almost beyond conception. But is science to be held responsible if we choose to have war rather than peace? Let us put the responsibility where it justly falls: on governments and on ourselves. Because science can convert, in a day or two, a factory for the production of beautiful dyes, pleasant perfumes and disease-destroying drugs into a factory for the production of high explosives and poisonous gases, is science to be judged an enemy of humanity? Scientific men will never make this conversion unless you ask them to. They hope from their hearts that they will never again have to do this.

It is the other side of the picture that science prefers to have shown. It asks to have recognized the many contributions it has made to the well-being

and happiness of mankind. It calls attention to its steady endeavor to satisfy the insistent demand of man to know the world he lives in, that he may more comfortably and confidently live in it; to know the wide reaches of the universe that his mind and soul may understand humility and yet know exaltation. Science moves with constant acceleration in its work of increasing human knowledge, adding to human capacity and expanding human existence. By the very cumulation of knowledge more knowledge is made more rapidly possible. In the early days of prehistoric man before picture-making and writing, man could not cumulate knowledge or, at best, but slightly and slowly. But with the perfecting of means to communicate knowledge from one group to another and from one generation to another the advance and cumulation of knowledge can and do proceed rapidly and ever more rapidly. In the present quarter century more knowledge of the order of nature has been gained than in any quarter century before. One can not dream too widely of the possibilities of the future.

Let science, then, with all encouragement, play undisturbed its glorious rôle of bettering the lot of individuals, adding to the resources of nations, and widening man's understanding of nature and of himself. Let it go on in its great beneficences: conquering disease; ameliorating the wearing struggle for food and the cruel rigors of cold and heat; annihilating distance; reaping benefits from the oceans and forests, and bringing plants and animals to the service of man's sustenance and comfort. Let it continue to convert astrology into astronomy, alchemy into chemistry, guesswork into exact knowing. Let it use imagination to the limit—imagination is no less necessary to science than to the seven arts—but let its dreams be tested by the light of day. Let it prove all things, discover truth, and teach truth and the way of its discovery. Let it attend, undistractedly and unwearyingly, to its great effort to make our land a better land for our children and our children's children to live in, and the human future broader and better than the human present.

To try to help do these things is the avowed purpose of the National Research Council. On this epochal day in its mere youth it rededicates itself to this purpose. For the increase of science and the better understanding and use of science it is now working and will ever work. May the beauty of this new house of science be a symbol of the splendor of scientific achievement yet to come. May America bless itself and the world by the devotion and the genius of its searchers for the truth.

DR. GANO DUNN, CHAIRMAN OF THE BUILDING COMMITTEE:

ON behalf of a devoted Building Committee, Paul Brockett, secretary, which for two years has endeavored to interpret the needs of the National Academy of Sciences and the National Research Council to an architect of the power and genius of Bertram Grosvenor Goodhue, and his associated artists, to a building contractor of the honesty and effectiveness of Charles T. Wills & Company and his subcontractors, and to the building authorities of the District of Columbia, in an atmosphere, here in Washington pregnant with the scientific traditions surrounding the Smithsonian Institution, Abraham Lincoln, Joseph Henry, Dallas Bache, Louis Agassiz, Samuel Langley, I have now in the presence of Abraham Lincoln's successor, the honor to turn over to you as their creation this ineffably beautiful building.

The land on which it stands was purchased by the National Academy of Sciences for $185,000 raised by subscription. The building has cost about $1,450,000. This cost together with the income from the building's maintenance and for the operations of that daughter of the National Academy of Sciences, the National Research Council, come from the generous gift to the National Academy of Sciences of $5,000,000 by the Carnegie Corporation, to aid in the realization of one of the ideals of the life of Andrew Carnegie—the harnessing of science to lift the burdens and improve the conditions of all the people of the United States.

Ever since the time when as Albert Herter has so beautifully painted before your eyes, Prometheus as Science guided by Minerva as Wisdom stole the Divine Fire from the Chariot of the Sun, that Divine Fire has been burning in the minds of men.

This building is one of its altars. The Sun, by a faithful heliostat which daily follows his career across the sky, himself comes down through the eye of the great dome above us, and on a circular table registers in the exact center of this auditorium an image of his flaming personality, revealing to multitudes which prophecy sees entering these doors, his spots and other mysteries not seen by men until Galileo's eyes discovered them to a startled church and an incredulous world.

His rays sifted into a six-foot rainbow below the floor after passing through a slit in the table, reveal to public inspection, through a downward pointing telescope, those secrets of the solar physics and chemistry which modern spectroscopy so proudly displays.

The heavy pendulum which you see suspended from the dome makes languid oscillations in any given plane; but almost while we look, the plane begins to change. It is not really the plane which changes but the position of the earth under it. Our building and the earth itself have squirmed around, thereby proving, as Foucault demonstrated, the earth's diurnal rotation.

These vaulted walls so beautiful do not resound as would a medieval church with voice confusing re-

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