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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE RESPONSE TO THE ADDRESSES OF WELCOME AT THE OPENING SESSION AT NASHVILLE

(By President A. A. Noyes)

In response to your welcomes I would say at the start we are heartily glad to be here! And this for various reasons: First of all, we look forward to enjoying the famed hospitality of the South in this, one of its leading cities, and to becoming acquainted with its people. But more important still is the hope that our visit here may in some small measure contribute to the already active scientific and educational development of this section of the country. One of your distinguished writers, Professor Mims, has recently described for us "The Advancing South"; and most important among its many advances is, as he rightly emphasizes, that of its intellectual life. The purpose of this association is the advancement of science in its broadest sense; and it is glad to meet again in the South for the reason that conditions are now clearly propitious for a rapid extension of scientific activities here.

I desire especially to reciprocate Dr. Kirkland's greetings from the educational institutions of this state, and to thank them for their cordial welcome. The present success of these institutions affords the best assurance that this state will play its part in the larger development of science which is to take place during the next decades in this country and especially in the South.

It might be desirable on the occasion of this fifty-year anniversary of the former Nashville meeting, to review in broadest outlines the advance of the sciences during the last half-century; but this would be more suitable for the substantial address of a retiring president than for the short responses which I am making to your kind welcomes. I may, however, briefly refer to certain pronounced changes in the viewpoints of scientific investigators.

About forty years ago the physical sciences, physics and chemistry, seemed to have reached a nearly stationary condition, as exemplified by the oft-quoted remark of an eminent physicist that the future advances of physics were to consist in adding another

decimal place to the known values of natural constants—which reminds me of the remark of a distinguished scientist who, when asked why he did such work, replied, "I guess I am like the Irishman that said, 'When I see a head, I hit it,' so when I see an inexact constant I go at it." Moreover, scientists in those fields were becoming over-conservative in the scientific use of the imagination. Thus the philosopher-scientists Mach and Ostwald in Germany urged that the primary aim of science is a representation of natural phenomena without the aid of hypothesis. Then in 1886–87 burst into the realm of chemistry the general theory of solutions of van't Hoff, the ionic hypothesis of Arrhenius, and the development of these theories by Nernst and others; and a new branch of chemistry, physical chemistry, came into being. In physics during the last decade of the nineteenth century the discoveries of X-rays by Roentgen, of radioactivity by Becquerel and the Curies, and of the phenomena of gaseous conduction by J. J. Thomson, opened the way for a most extraordinary development of physical science—that of modern sub-atomic or electronic physics. Physicists became eager, optimistic, imaginative; and volumes of exciting discoveries poured out of the laboratories of the world. Relativity, non-Euclidean geometry, and non-Newtonian mechanics appeared on the scene. The exactness under all conditions of the most fundamental laws of physics was questioned and reexamined. Energy came onto the stage, and matter took a back seat. A less mechanistic conception of natural phenomena arose.

In the meantime in the biological sciences the existence of evolution as a fundamental phenomenon of life was established by converging evidence from paleontology, embryology, genetics, and comparative anatomy, with a certainty comparable with that of the Copernican conception of the solar system. While even less can be said to-day of the processes by which evolution takes place than was thought to be known fifty years ago, the facts that evolution has been going on and that many animal and plant types have gone through definite stages of development can only be doubted by an individual who like an ostrich buries his head in the sand out of a vague dread that he may see something shocking.

These advances in the physical and biological sciences have greatly influenced the philosophic and religious thinking of the scientific man; for it is a great mistake to think the tendency of advancing science is towards materialism. Just the opposite. The repeated discoveries of new and unexpected types of phenomena in the physical world make us realize more than ever the limitations of our understanding, and lead us to feel with Tennyson that "as knowledge grows from more to more, will more of reverence in us dwell." And we like to repeat to ourselves the words of a poet-scientist of England (Whetham):

> We scatter the mists that enclose us
> The seas are ours and the lands,
> The quivering ether knows us
> And carries our quick commands.
> From the blaze of the sun's bright glory
> We sift each ray of light;
> We steal from the stars their story
> Across the dark space of night.
>
> But beyond the bright search-lights of science,
> Out of sight of the windows of sense,
> Old riddles still bid us defiance
> Old questions of why and whence.
> There fail all cure means of trial
> And end all the pathways we've trod
> Where man by belief or denial
> Is weaving the purpose of God.

Moreover, the fuller establishment of evolution as a principle of life, and the implication of that principle that man in his present state may be "the herald of a higher race," give us a system of ethics which makes us charitable to the failings of our fellow men and eager to work for the further development of our race; also a religious viewpoint which leads us, more than any static ready-made universe could do, "to reverently ponder the ways of God." To us the process of evolution becomes the most striking manifestation in all nature of the underlying power "which passeth all understanding"—a view so finely expressed in the well-known words of another poet:

> A first-mist and a planet,
> A crystal and a cell,
> A jelly-fish and a saurian,
> And caves where the cave-men dwell,
> Then, a sense of law and beauty
> And a face turned from the clod;
> Some call it Evolution,
> And others call it God.

We are delighted to receive also the welcome from the civic interests of this state; for science needs the aid of the intelligent men engaged in other professions and in industry and commerce. There are few things more promising for the advancement of science in this country than the whole-hearted way in which leading men of affairs are interesting themselves in the promotion of research. And most significant is the fact that this interest applies not so much to research in its application to their own industries (shown by the establishment of great research laboratories, such as those of General Electric Company, American Telegraph and Telephone Com-

pany, the du Pont Company, and many others), as to fundamental research in pure science.

The last year has afforded a striking instance of this —the only one I have time to mention. The National Academy of Sciences, a sister organization of this association, realizing that America, in proportion to its wealth and population, is not contributing anything like its share to the advancement of science, and believing that this is largely due to very inadequate financial support of the investigators of this country, undertook to secure from our larger corporations a fund of $20,000,000 for the promotion of research in all the varied branches of pure science. It was clearly seen that the first step in such a campaign must be to get the aid of prominent men of affairs, whose support would carry weight with our industrial leaders. The first remarkable thing was that there was no difficulty whatever in securing this support. Herbert Hoover, in spite of his many obligations, accepted the chairmanship of the board of trustees of the fund; and such men as Elihu Root, Charles Hughes, Andrew Mellon, Owen Young, John W. Davis, Edward House, J. J. Carty, and Gano Dunn became members of the board and have for the most part taken an active part in its work. The second remarkable thing was that there was no need of convincing either these men or the leaders of industry consulted that the fund should be used for research in science itself rather than in its industrial applications. They saw that the latter was a field of research that should be prosecuted by the industries themselves within their own establishments—not by universities or endowed research institutions. They realized too, as Professor Tyndall said in substance fifty years ago in his lectures in New York, that "just as the stream dwindles when the fount dries, so surely will technical developments lose all vitality when they cease to be nourished by new scientific discoveries." Scientific discovery "puts not only money into the pockets of individuals, but millions into the exchequers of nations," yet even greater are its intellectual and spiritual contributions to the welfare of mankind.

Well, the campaign was undertaken under these favorable auspices, and is now progressing satisfactorily. Already a considerable sum payable through a period of ten years has been secured, and the prospects are good for more.

But it is not alone on the financial side that science needs the support of the intelligent people of any community. While *science* has through daily experience come to be universally recognized as vitally important, yet it is often not realized that science does not "just grow"—that it arises from *research*, and that research is a sensitive plant which will grow successfully only from carefully selected seeds—the best brains of the nation; and which must be protected against the frost of dogmatic intolerance, against the drought of administrative routine, against the flood of modern mass education, against overforcing through the impatient demands of practical men, and against the blights of poverty and social neglect. Research will come to its own in any community only when its members, in the words of Pasteur, regard their research laboratories as their temples.

THE NEWLY-ELECTED PRESIDENT OF THE AMERICAN ASSOCIATION

ALL who are interested in the advancement of science in America and in the world at large must be deeply gratified by the election of Henry Fairfield Osborn as president of the American Association for the Advancement of Science. This is the highest honor that can come to an American worker in science from his colleagues, and Professor Osborn's work is surely an excellent example of the finest endeavor for which the American Association stands. Primarily a vertebrate paleontologist his influence for advancement has been much broader than that field. His work has been remarkably effective in many lines of scientific thought. He is well known as a research worker, author, educator and administrator.

The president-elect was born at Fairfield, Connecticut, on August 8, 1857, the son of William Henry and Virginia Reed (Sturges) Osborn. On the paternal side he is descended from the Osborns of Salem, Massachusetts, of the colonial period. On the maternal side his descent is from Nathan Gold and Andrew Ward, of the time of the Revolution, and from Rev. Ebenezer Pemberton, one of the three founders of Princeton College. His maternal grandfather was Jonathan Sturges, who was president of the New York Chamber of Commerce. His father was a founder and for many years president of the Illinois Central Railroad.

Educated at the Columbia Grammar School and Lyons Collegiate Institute, of New York City, and at Princeton College, Osborn received the A.B. degree in 1880. He was greatly influenced by President McCosh in philosophy and by Professor Arnold Guyot in geology. His field work in paleontology began immediately after graduation, for he took part in geological expeditions to Colorado and Wyoming in 1877 and 1878. In 1878–79 he took courses in anatomy and histology at the College of Physicians and Surgeons and at Bellevue Medical College, in New York City. In the year 1879–80 he studied embryology at Cambridge University, under Francis Balfour, and comparative anatomy in London, under Thomas Henry Huxley. He also spent some time in Germany. Having held the first E. M. Biological