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AFRICA AND SCIENCE[1]

By JAN H. HOFMEYR

PRESIDENT OF THE SOUTH AFRICAN ASSOCIATION

TO-NIGHT I enter upon the consummation of what is at once the highest and the least merited distinction which it has been my privilege to receive. To those who called me to the office of president of the South African Association for the Advancement of Science I tender my sincere thanks. I make myself no illusions in respect of the adequacy of my claims to that honor on the ground either of scientific attainment or of services rendered to the cause of science, nor would I have our visitors remain for a moment without the knowledge that my scientific qualifications for this presidential chair are of the slightest. They are far less indeed than those of that distinguished statesman to whom when he had remarked to the great Faraday in relation to an important new discovery in science, "But after all, what is the use of it?" the scientist replied, "Why, sir, there is every probability that you will soon be able to tax it." The presidency of this association is an honor the conferment of which upon myself has never seemed to fall properly within the scope of my ambitions; it imposes responsibilities for the discharge of which I am all too scantily equipped; and I can only seek to justify my election in a manner similar to that which Mr. Stanley Baldwin followed when he was chosen to be president of the Classical Association in England. I can but say that, while it is to the scientist that we look for the advancement and the progress of science, the effectiveness with which his work is brought to fruition does depend in some measure on the interest, the sympathy and the enthusiasm with which his achieve-

[1] Address at the inaugural meeting of the British Association for the Advancement of Science, Cape Town, South Africa, July 22, 1929.

ments are followed up by that army of plain, ordinary men, in which I gladly count myself a musket bearer. In no other capacity dare I venture to address you. It was once said by a literary man of some distinction that the man of science appears to be the only man in the world who has something to say, and he is the only man who does not know how to say it. There is an obvious rejoinder, that the man of letters frequently has nothing to say, but says it at great length. I dare not claim to be a man of science. I can only hope that I shall not be deemed to-night to have qualified for consideration as a man of letters in the sense of that retort.

The honor which has been conferred upon me is the greater because of the special significance which attaches to my year of office. It is the year of the keenly anticipated second visit of the British Association for the Advancement of Science to South Africa, and for that reason my first words to-night are, happily, words of welcome. Not merely the association for which I speak, but all South Africa, rejoices in the presence of the British Association and its distinguished members. To its parent body, which can look back upon all but a century of glorious achievement, this stripling association brings its tribute of respectful admiration and good-will. To the great organization of scientific men, the history of which is the history of the advancement of science in Britain, which has a presidential roll adorned by names such as Brewster and Tyndall, Huxley and Kelvin, Rayleigh and Lister, this land of ours, mindful of its debt to science, conscious of the gifts that science can yet bring to it, extends the hand of friendship, in gratitude for the honor of this visit, and in appreciation of the stimulus to its progress and development which must needs attend it.

We have reason, indeed, to be grateful to the British Association for its achievement and its significance. If I might select three distinctive features in its record, they would be these. First, its contribution, direct and indirect, to those great triumphs of British science in the nineteenth century which are the possession not of an age, nor of a nation, but of all time and of every land. Directly it has initiated, correlated and contributed towards work of great scientific value; indirectly it has inspired much constructive activity, while its meetings year after year have done more than any other single factor to stimulate and hasten the onward march of science.

Next I would dwell on its maintenance of a broad view of the scope and function of science, and, coupled with that, the emphasis laid by it on the essential homogeneity of science conceived thus broadly, and the interdependence of its several branches. The association had no lack of opposition to encounter at its coming to birth. Those who interpreted science primarily in the medieval sense as being limited to the sciences of introspection had still but scant respect for the claims of the sciences of observation. When in the second year of its existence the association visited Oxford, Keble protested vigorously against the university's reception of what he called a hodge-podge of philosophers. This hodge-podge, be it noted, included Brewster and Dalton and Faraday. But the association did not react into narrowness. It remained true to the broad conception of *scientia* which was held by its founders, one of whom affirmed in striking language at the first meeting that "The chief interpreters of nature have always been those who have grasped the widest fields of inquiry, who have listened with the most universal curiosity to all information, and felt an interest in every question which the one great system of nature represents." The association has imposed no narrow restrictions on the extension of the sphere of its activity; within that ever-widening sphere it has maintained a spirit of cooperation between workers in diverse fields which has been worthy of the best traditions of Francis Bacon. It has had its reward—in greater effectiveness of work in its own sphere, and in the permeation of the kingdom of learning with the atmosphere of good-will. By way of illustration of this last point, may I, as one whose first allegiance is to the classics, mention the fact that the roll of twenty-six presidents of the Classical Association of England includes five fellows of the Royal Society, names such as Geikie, Osler and D'Arcy Thomson, and if it is not too presumptuously personal to refer to it, I would add, that when the South African Association elected me as its president, it chose one who was then president of the Classical Association of South Africa.

Lastly, I would select as characteristic of the British Association its success in maintaining the contacts of science with the public on the one hand and the state on the other. One of the aims which its founders set forth was "to obtain more general attention for the objects of science"; they sought to create a body which would make its appeal to the educated public as a whole, to fashion an instrument for the interpretation of the sometimes highly technical results of scientific investigation to the man in the street. They realized that the scientist received much from the public, that to the public he must freely give, and that the giving would not be without its due reward of new inspiration and renewed enthusiasms. There were some who opposed the nascent association in the fear that science might degrade itself by making too popular an appeal. That fear has been belied in the passing of the years. The association has kept

touch with the public, it has "demonstrated to all men that science is thinking with them and for them," it has secured their interest and their sympathy, but it has never paid for that achievement the price of a lowering of its aims or of its standards. It is its success in this respect that has secured for it the prestige which has enabled it time and again to stand forth as the ambassador of science to the state, and so to play an important part in initiating and furthering enterprises of great national and scientific significance.

For these reasons and for much else South Africa is proud and happy to be able to welcome and do honor to the British Association for the Advancement of Science. We welcome it the more heartily because of our consciousness of the greatness of our indebtedness to the first visit of the association twenty-four years ago. To that visit, with which there will always be linked a name honored in the history of South Africa, as it is in the annals of science—I refer to Sir David Gill—this country still looks back with grateful recollection. It marked the commencement of an epoch in our scientific history, the epoch of the consolidation of the position of science in South Africa.

Let us view the position of science in our country as it was in 1905. On the academic side it is the nakedness of the land that chiefly impresses us. South Africa then had but one university, and it was in reality only a board of examiners for the candidates presented by various colleges, which were all, without exception, inadequately staffed and poorly equipped. In the subjects which fell within the scope of the association, as it was defined in 1905, there were in all the colleges taken together in that year only forty-nine workers, thirty-three professors and sixteen others. When it is remembered that this was the total number of teachers of all branches of science spread over seven different institutions, all purporting to do university work, it is painfully obvious how little time was available for scientific research and investigation. Nor was the work done, measured in terms of the number of graduates, very impressive. The number of those who in 1905 qualified for degrees in pure and applied science was only twenty-seven. Outside of the colleges scientific workers were to be found mainly in government departments, then still small and inadequately staffed, and working in isolation in the four South African colonies. In most branches the state's scientific activities were still in their earliest infancy. The organization was only just commencing to be built up. As part of these activities there fall to be mentioned the two astronomical observatories at that time in operation: the Royal Observatory at Cape Town, then already full of years and of honor, and the Johannesburg Observatory which, thanks largely to the representations made by this association of ours, had been established a few months before the 1905 meeting. In regard to scientific societies there is but little to record. There were in existence in 1905 a small South African Philosophical Society (now known as the Royal Society of South Africa), the Geological Society of South Africa, the Cape Society of Engineers, the Chemical Metallurgical and Mining Society and also this Association for the Advancement of Science, which had come into existence a bare three years previously. It was, indeed, the day of small things, and small also was the achievement which science in South Africa at that date had to its credit. If one leaves out of account the work of Sir David Gill and the scientific endeavor which had been put into the development of the gold-mining industry of the Witwatersrand, there is little indeed of permanent significance that remains.

Against this picture it is appropriate to set the picture of South African science as it will unfold itself to our visitors to-day. They will find three vigorous single-college teaching universities, which have in recent years made remarkable progress in the attainment of the standards of similar institutions in older lands, and also a federal university with six constituent colleges, which, like the single-college universities, are, in human and material equipment and in the output of the results of scientific investigation, very far ahead of their predecessors of 1905. Against the forty-nine workers of 1905 we can now set 429—134 professors and 295 others—within the range at present covered by the activities of this association. The twenty-seven graduates of 1905 have increased to 275 in 1928. To the scientific societies of 1905 there have been added, since the last visit of the British Association, the South African Institute of Electrical Engineers, the South African Institution of Engineers, the Cape Chemical Society, the South African Chemical Institute, the Botanical Society of South Africa, the South African Biological Society, the Astronomical Society of South Africa, the South African Geographical Society and the South African Economic Society, and this association of ours has become an active, vigorous and powerful body, proud of the achievements which it already has to its credit, challenging eagerly the tasks that await it in the future. The two observatories of 1905, our visitors will find, have increased to six, including the Smithsonian Solar Observatory in South-West Africa, and the equipment of these institutions includes four great telescopes, with objectives of twenty-seven inches, twenty-six and one half inches, twenty-six inches and twenty-four inches, respectively, to which

will shortly be added a twenty-four-inch refractor and a sixty-inch reflecting telescope—surely a remarkable astronomical equipment for so young a country. The stimulus of the 1905 visit, in which so many prominent European astronomers participated, has indeed borne rich fruit in the advancement of astronomical work in South Africa.

But perhaps our visitors will be impressed not least by the development and consolidation of the scientific departments of our Civil Service, by the magnificent Institute of Veterinary Research which the state has created at Onderstepoort and the effective work which through its scientific officers it is doing for the development of South Africa, and by the remarkably efficient and well-equipped Institute for Medical Research at Johannesburg, the credit of the establishment and maintenance of which falls jointly to the government and the mining industry. Significant also of the attitude of the state to science, and full of promise for the future, has been the establishment of a Research Grant Board, which advises the government on the practical measures necessary for the encouragement of scientific research in the union, and acts as its agent in the distribution of grants in aid of individual investigations.

Nor have we reason to be ashamed of the positive achievements of science in South Africa during the past quarter of a century. Most impressive, perhaps, regarded cumulatively, have been the advances made in our knowledge of the diseases of plants, animals and men, and of the methods of preventing them. In 1905 we knew practically nothing of the plant diseases of South Africa. In that year the first steps were taken towards their scientific investigation. To-day a general survey has been completed, most of the important diseases have been worked out, and a highly efficient service for combating them is in operation. In 1905 also the Transvaal Crown Colony government voted £1,500 as a first instalment towards the establishment of a laboratory for the investigation of stock diseases. From that has sprung the magnificent body of work in veterinary science, which has won world-wide recognition for the Onderstepoort Institution which I mentioned a moment ago. More recently there has been founded the South African Institute for Medical Research, to which is allied the Miners Phthisis Medical Bureau. The researches conducted there in the control of pneumonic infection, and the advances made in industrial hygiene in the fight against silicosis, have brought great luster to these two institutions and to South Africa. But in other fields also South African scientific workers have won recognition. In geology, marine biology, the mathematical theory of determinants, the economics of gold production and along several other lines of investigation, important scientific work has been done in South Africa; a succession of discoveries has been made throwing light on the origins of the human race; and applied science has by means of the conquest of distance in this far-flung land of ours, and of the construction of important irrigation and other engineering works, contributed generously to South Africa's progress. It may, perhaps, be taken as a measure of the achievement of science in South Africa in one of its aspects that, while in 1906 the value of products of the land exported from South Africa amounted to £5,928,000, the corresponding figure for 1927 was £27,815,000.

But if I were asked to select the most broadly significant feature in the development of science in South Africa since 1905, I think I would pick out what one might describe as its South Africanization. In 1905 science in South Africa was in large measure exotic. The workers had come almost exclusively from other lands. They were only beginning to apply themselves to our South African problems. In many cases they had not yet acquired a South African background, or a South African outlook. In the years that have passed South Africa has claimed those workers for her own, and they have given themselves to her service. They to whom this is the land of their adoption, no less than those to whom it is the land of their birth, and whom they have taught and inspired, have made it the land of their vigorous and devoted service. In its personnel science in South Africa has become essentially South African. And science has given itself with enthusiasm to the problems of South Africa. It has emphasized the specific contributions of South Africa to the wider problems of science; it has applied itself to the removal of those obstacles which hamper the material development of South Africa; it has taken up vigorously the study of South African economics and sociology and anthropology. Perhaps also one may claim that it has brought to bear on scientific investigation what we regard as the distinctive features of the South African outlook —freshness and breadth of view, receptivity to new illuminations and readiness to see old truths in new settings and in the light of their wider bearings. Is it not South Africa that has given to science and the world the conception of holism? And there is surely no gift more worthily representative of the South African outlook at its best that we could have offered. It may indeed be that that very South Africanization of our South African science of which I have been speaking is but another instance of the holistic principle at work. As I speak of the South African outlook in science, I can not but refer you with that deep appreciation which I know we all feel to the masterly address which four years ago General Smuts

delivered from this chair, when he demonstrated in so compelling a manner (I quote his own description of the task he set himself) "that there is something valuable and fruitful for science in the South African point of view, that our particular angle of vision supplies a real vantage-point of attack on some of the great problems of science; and that, so far from the South African view-point being parochial in science, it may prove helpful and fruitful in many ways to workers in the fields of scientific research and investigation."

Science in South Africa, then, has made itself truly South African, and in doing so it has established itself in the admiration and affection of the people of this land. As a nation we are grateful to our scientists for their contributions to our intellectual and material progress. The liberal policy of the state in supporting scientific effort we heartily endorse, the increase in the mental stature and the prestige of the nation which science brings to us we sincerely welcome. We are proud of our South African science, not least because we know that we can regard it as distinctively ours. But while our science has been South Africanized, we can rejoice that there is nothing narrow about its South Africanism. Were it otherwise, it would have been false to the spirit of science. In applying itself to the problems of South Africa, it has succeeded in attracting the attention of the scientific world to South Africa. In that address to which I have already referred, General Smuts emphasized the fact that recent events had drawn the eyes of the world to this land of ours as a rich field for scientific investigation. "The scope for scientific work," he said, "in this department of knowledge" (he was referring more especially to human paleontology, but his words are of wider applicability) "is therefore immense; the ground lies literally cumbered with the possibilities of great discoveries. . . . Science has in South Africa a splendid field of labor; other nations may well envy us the rich ores of this great 'scientific divide' which is our heritage." Those words are well worth remembering. We speak sometimes of our wealth in South Africa—mineral wealth, agricultural wealth, potential industrial wealth—but great also is our scientific wealth, and great is the debt we owe to South African science for what it has done to reveal that wealth to ourselves and to the world.

There, then, in brief outlines, all too imperfectly drawn, is a picture of South African science in 1929. Contrast it with the picture of 1905, and you have the measure of the achievement of a great epoch. Science consolidated, science South Africanized, science recognized as of great national value, both in the spiritual and in the material spheres, science drawing to our country the eyes of the world—surely that is no unworthy achievement. And as to-night, once again after the lapse of many days, our association makes its report to the parent body, to which it gladly pays the tribute of filial reverence, it does so with pride and satisfaction in the work of the intervening period, but also with grateful recognition of the inspiration which that visit of 1905 brought to South Africa as one of the constitutive factors in the progress of the last quarter of a century.

And now it has been our privilege to welcome this second visit of the British Association. Is it strange if we ask ourselves, as we gratefully remember the stimulus of 1905, what will be the stimulus of 1929? That visit had abiding results. What will be the results of this one? That visit inaugurated a new epoch. Are we not justified in believing that once again we stand on the threshold of a great advance? If that be so, what are to be the characteristics of the period on which we are now entering, what will be its achievement? In the period that followed the first visit of the British Association we South Africanized science in South Africa. Is it too much to hope that in the next we shall Africanize it? Will not this visit perhaps give us the impulse and the inspiration to a bigger and a bolder enterprise? One of the most significant tendencies evidenced in South Africa in the last few years has been the growing consciousness of our obligations in relation to the continent of Africa. We have come to realize that the position of this European civilization of ours set upon the verge of this great continent is a position of unique strategic importance, that it presents us with at once an opportunity and a challenge. While in the past we thought, as a nation, almost exclusively of our own problems and difficulties, we are now ceasing to limit our horizon by the Limpopo, we are beginning to envisage the task that awaits us beyond our own borders. And in the mind of the nation there is being developed a new conception of South Africa, of a South Africa that consciously and deliberately seeks to play its part on the African continent, not aiming at conquest or domination, but never failing in its readiness to give its intellectual and material resources to aid all who are engaged in the task of developing this great undeveloped area of the earth's surface, which is so full of potentialities for the future welfare of the world. If, then, South Africa aspires to leadership in Africa in other branches of activity, why not also in science? If the outlook of the nation is broadening, why should not its scientists also begin to think in continents? If as a people we are anxious to make our contribution to Africa,

eager to give it of our best, rather than to get from it that which will be to our material advantage, why should not our science also become consciously and deliberately African in its outlook, its ideals, and the tasks to which it applies itself? If science has consolidated its position in South Africa, as we believe it has, is it not fitting that, with South Africa as its base, it should enter now into the new sphere of opportunity and achievement which stretches mightily outwards from its borders?

To you, our visitors, I look to give us the stimulus and the encouragement to that enterprise. You have come to Africa. This great land-mass which has reared itself against time's passage, almost since time's beginning, and holds inviolate so many of the records of that passage, has challenged your attention. You have come to Africa to seek new inspiration for the study of the problems that interest you, by seeing them against a different background which has for many of you an unaccustomed vastness. But while Africa was your goal, you did not think fit to enter it at the point nearest to your homes. You steamed down, day after day, skirting the long coast-line of this vast expanse of veld and forest, and have entered it by its southern gateway. For a great body of scientists, it is the only point of effective entry into Africa. It is by way of this southern gateway that science itself can most effectively be made to permeate Africa. And to you, having so come, to you, the ambassadors of science, I present—Africa. It is Africa and science, which, I would like to think, are to-day met together. Happy indeed should be the fruits of the mating.

It is to that theme—Africa and science—that I propose now to invite your attention. What can Africa give to science? What can science give to Africa? Those are the questions to which I would address myself. But as I speak, I would ask you all to remember that it is for the South African scientist that the answers to these questions have primary significance. It is for him that they have significance, because for the solution of many of the problems of South Africa a greater knowledge of Africa as a whole than is at present available is essential, and the extension of that knowledge is his personal responsibility. It is for him that they have significance because he dwells in a land which is strategically placed for attacking the problems of Africa and for drawing forth its hidden resources of scientific discovery for the enrichment of science throughout the world.

(To be concluded)

OBITUARY

GEORGE PERKINS MERRILL

GEORGE PERKINS MERRILL, head curator of geology in the U. S. National Museum, died suddenly of a heart attack in Auburn, Maine, on August 15, 1929.

Merrill was born in Auburn on May 31, 1854, and was graduated at the University of Maine with the degree of B.S. in 1879. In the autumn of that year he was called to the chemical department of Wesleyan University, where in addition to teaching he pursued advanced studies which gained for him in 1883 the degree of M.S. from his alma mater.

The greater opportunities for scientific advancement led him to Washington, where in 1880 he became connected with the Census Bureau. A year later he transferred his allegiance to the U. S. National Museum, then in the making under the gifted G. Brown Goode with whom he worked congenially and successfully, becoming curator of mineralogy in 1881 and in 1897 head curator of the department of geology. Whatever Merrill undertook to do he did well, and in the organization of the National Museum his contributions stand out as conspicuously great, marking him as one of the foremost museum experts of his time.

Meanwhile he spent the winter of 1886–87 at the Johns Hopkins University in following higher studies which resulted in his receipt of the coveted Ph.D. from Maine in 1889. Also it must be mentioned that in 1893 he became professor of geology and mineralogy at George Washington, with which university he continued his lectures until 1916 when he was made emeritus and a year later was given the honorary degree of Sc.D. in recognition of his valuable services.

In 1900 he was called by the authorities of the twelfth census to become special agent of stone-quarry statistics, and to this work he gave his usual careful attention, preparing an important report for the bureau, enriching the collections of the museum with many valuable specimens and finally, as the result of his painstaking efforts, giving to the public his matured studies on the subject in the popular treatise, "Stones for Building and Decoration,"[1] of which two revised editions, largely rewritten, were published. His researches on this subject led to his book entitled "Rocks, Rock-weathering and Soils,"[2] of which Dr. H. W. Wiley has said: "The greatest work on the genesis of soils we owe to Merrill." He

[1] 1891, 1897 and 1903.
[2] 1897, second edition 1907.