Not God's and not the beasts,
God is, they are—
Man partly is and wholly hopes to be.''

It is in this attitude of expectation that we may, I think, look confidently forward to see at no great distance the science and art of medicine meeting more effectually than it ever has done before the challenge of a changing world.

SCIENCE AND CONSERVATION[1]

By Dr. JOHN C. MERRIAM
CARNEGIE INSTITUTION OF WASHINGTON

THE conservation movement in the United States has passed through three principal phases. The first two concern the idea of protection as designed to prevent destructive exploitation and undue concentration in private hands of properties derived from public ownership. The third phase relates to development of the highest use of resources. Exceptional illustration of this third aspect of conservation is given in discovery of new modes of utilization for petroleum. From consumption through burning of oil for light or fuel we attain a stage in which these products find a vast range of application in all manner of chemical compounds valuable for industries as also those having special application for medication.

The relation of science to conservation has been important in all these phases. There has been large contribution in determining the occurrence and nature of natural resources. This has enabled us to harvest or gather the materials in such manner as to limit waste. In consideration of new uses science and engineering have had leading parts. These advances were made possible both by extensive application of available knowledge and by new researches in chemistry, physics, biology and many other fields of science. This program gave a vast number of products which have helped to make life more agreeable and more profitable. It increased the types of employment and extended the range of human interests. It is a responsibility of science to devote itself in the most effective way to fundamental and to applied research which may extend the uses of the vast resources with which this country is blessed.

The term conservation has widened from its original narrow limits to express in a great variety of ways activities which have to do with maintenance and extension of values in many types of human activity. As a second phase of this discussion, I think it important to call attention to certain conservation aspects of the great educational program upon which advance of science depends.

In our educational system we attempt to furnish for youth a concentrated statement of available information and experience and to give a point of view which will make possible the most thoughtful and constructive attitude toward life. With particular reference to science, we present an outline defining in some measure the nature of the materials and the forces which constitute the scene of human life. We are now beginning to realize that this effort depends for its success upon our ability to develop a program which will maintain its value through the period of maturity. To state the problem in another way: we support an educational system which should have continuing and increasing influence upon later life, and we find that unless special means are developed for maintenance of this influence, a large part of the original effort is lost for the period in which it should be most effective. The broad plan for continuing education of the adult to-day is designed in a measure for conservation of the values secured in early education. Along with this influence we seek to open the way for evolution or development of the individual through his whole life.

As a third phase of this statement, it is important to call attention to the fact that we need, just at this time, to protect as fully as possible the exceptional opportunity which has come to science and research for bettering conditions of life in nearly every aspect of human activity. With science in the wider sense, including natural science, social science and governmental science, having won high place in the world, we have reached a stage at which question is raised insistently as to possible disturbing influence of science and research upon the course of civilization. It is stated frequently, and from many directions, that the influence of science is in large part responsible for the difficulties in which the world finds itself to-day. We discuss seriously whether science is an asset or a liability. We consider the possibility that a moratorium be established on research.

From my point of view there is no doubt that the opportunities offered for creative work are essential for maintaining the happiness of mankind. In one aspect of the question research may be considered the hope of a changing world, in that it offers a continuing supply of new materials with which to build and opportunity for adequate adjustment to shifting conditions. Seen from another angle, there is no doubt that the introduction of new ideas, however

[1] Remarks before the National Academy of Sciences, Washington, D. C., April 24, 1934.

valuable they are intrinsically, unless guarded with extreme care, may produce unfortunate situations. What we call unemployment may be a result, not because research necessarily leads to unemployment but because of the difficulty in attaining immediate adjustment to things which may have great basic values for mankind.

The situation which arises through introduction of new ideas in a world which has not been prepared for them is in some respects not unlike that which may occur in bringing a new biological element, or an element from another region, into a part of the world adjusted through millions of years to a particular biological balance. The mongoose was introduced into Jamaica in order to kill rats. The experiment proved that the mongoose also kills all ground birds and destroys nests and may become an intolerable pest. The rabbit, a peaceful and in many ways useful creature, brought into Australia becomes a serious problem. So a new idea brought into use through physics or chemistry or study of social theory may come into a world not yet prepared for its use, and unless carefully guarded may contribute toward development of an unbalanced situation.

With reference to the possibilities of unbalance, it is my feeling that we are faced at this moment with a need for what might be called conservation of opportunity for science. With the way open for enormous contributions, which may well bring blessings to mankind, we must protect or conserve the positive opportunities for advance through warding off dangers which might lead to restriction of constructive science. The situation of science is endangered by failure to set up such relations as will furnish the most careful guidance in the introduction of new elements arising from creative work. This protection, or conservation, of the opportunity for great achievement, which intelligence has gained after fighting its way through tens of thousands of years, is one of the greatest needs of the moment. Development of means for adjustment in this situation depends in part upon those who study mankind from the point of view of social sciences, in part upon economists and in part upon students of government. There is also an unavoidable responsibility resting upon science itself so to fit the contribution which it makes into the general scheme of human life as to give the greatest advantage with the minimum of possible disturbance.

SCIENTIFIC EVENTS

CONVERSAZIONE OF THE ROYAL SOCIETY

THE Royal Society held a *conversazione* at Burlington House, London, on May 9. According to the London *Times*, a large number of exhibits were on view, illustrating the most recent developments in pure and applied science, and lectures and demonstrations were given by the various exhibitors.

Professor G. I. Finch and Imperial Chemical Industries (Alkali), Limited, showed the precision electron-diffraction camera designed by Professor Finch and Dr. Quarrell in conjunction with the research staff and constructed in the workshops of the Winnington Laboratories. Dr. C. D. Ellis and W. J. Henderson conducted an experiment to show the production and decay of the new radioactive elements discovered by Joliot and Curie, while Dr. Oliphant demonstrated the transmutation effects observed when protons and diplons are used to bombard layers of lithium and of heavy hydrogen.

A fractional seconds chronograph, exhibited by the mathematical department of the Imperial College of Science, records on paper tape 1-100ths of a second at 1-10th inch scale up to four events simultaneously, by means of a tuning fork controlling a synchronous motor which, through a three-speed gear, gives motion to a printing train and paper feed. The instrument is portable and worked from a 12-volt accumulator. Part of a new apparatus to determine the length of the meter and the yard in terms of wave-lengths of light was shown by the National Physical Laboratory, with demonstrations of the application of circular interference fringes produced in cadmium radiations measured by an étalon approximately 1-12th of a meter in length, and of the comparison of optical lengths by means of Brewster's fringes produced in white light passing through this étalon and another of one third of a meter.

Studies of coal particles and coal suspensions were provided by the Fuel Research Station, while the Metals Research Association explained the control of structure and soundness of ingot of non-ferrous metals, with particular reference to the effect of casting conditions on brass ingots and the causes and remedies of unsoundness in aluminium alloy castings. A large range of specimens of metallurgical interest, illustrating applications of ferrous metals and alloys, was shown by Sir Robert Hadfield.

Among those present were: The President of the Royal Society (Sir Frederick Gowland Hopkins), Sir Henry Lyons (treasurer), Sir Henry Dale, Sir Frank Smith, Lord Rayleigh. Lord Cecil of Chelwood, the president of the Royal College of Surgeons, Sir Buckston Browne, Sir Hubert Bond, Sir Ernest Benn, Sir William Bragg, Sir Frederick Berryman, Sir Lenthal Cheatle, Sir Patrick Duff, Sir Frank Dyson, Sir Archibald Deury, Sir John Flett, Sir