sideration should be given to the methodology employed in economic investigations and to the potential contributions which natural scientists might make to economic analysis.

In the fourth conference we turn from the field of private enterprise to discuss "Government in Relation to Scientific Progress." The introductory paper should survey the changing rôle of government in economic enterprise from the Middle Ages to the present time. It should outline the manifold ways in which government to-day attempts to assist, regulate or participate in economic activities. A second session would undertake a critical appraisal of the patent system, by means of which government seeks to encourage and reward invention. Attention must be given to the bearing both of present laws and of business policies on the utilization of inventions. An underlying concept of democracy is that all its members are entitled to the fruits of new knowledge, which should be permitted and encouraged to flow quickly through the channels of productive enterprise in the service of society. Are there factors and tendencies which impede this process and, if so, by what means may the situation be remedied?

The continuous expansion of the functions of government in recent times has involved a vast increase in public indebtedness in nearly every country in the world. Some government enterprises yield revenues adequate to cover their costs, while others are not self-supporting. Our discussions should include an appraisal of these developments, with the central purpose of determining the growth of tax requirements in relation to the growth of the taxable income of nations. Unbalanced fiscal systems increase the burdens of taxation, lessen the funds available for the advance of science and technology, and also ultimately undermine the stability of both fiscal and monetary systems, which in turn impedes business enterprise and retards economic progress. If we are to continue the forward road to higher standards of living we must obviously preserve the financial and credit foundations.

We must also give consideration to the scientific approach in government. In what ways does our political organization promote and in what ways does it impede the scientific outlook with respect to problems which vitally concern the welfare of the people? What changes in organization and in procedures might be suggested with a view to facilitating the development of the scientific point of view with respect to governmental issues? Similarly, our attention must be given to the future rôle of government in fostering scientific research. Must we, as many apparently believe, henceforth look increasingly to government to provide financial support for, and also to give stimulus and direction to, scientific research? Or, as others apparently believe, must we continue to rely primarily upon endowed institutions and industrial organizations as the best means of preserving freedom and flexibility in the conduct of research? Is there a middle ground or a division of labor with respect to this great problem; and, if so, what are the principles or conditions necessary to effective cooperation? This would seem to be one of the fundamental issues to which this association should give attention if it is to advance science.

Since our ultimate goal is the development of the individuals who compose society, we make "Science and Human Beings" the theme of our final conference —to be held two years from this date. Are the changes in modes of life and in human attitudes which have been, or may be, wrought by scientific discoveries and their applications to productive processes beyond our frail human powers of effective assimilation? What of the alleged advantages accruing as a result of our escape from unremitting toil and the acquisition of leisure in which to study and improve the mind, to contemplate the beauties of nature, to enjoy and profit from broader human associations?

We do not need, or wish, oratorical effusion on this primary issue of contemporary civilization. What is required is a pooling of our scientific resources in studying the effects of science upon human beings. To this end we need the cooperation of the medical scientists, of biologists and geneticists, of psychologists and psychiatrists, of sociologists and philosophers, and also of those who devote their lives directly to the service of individuals through educational institutions, the churches and welfare and character-building and life-adjustment agencies. Our purpose is to take stock of current tendencies by bringing to bear upon them as wide a range of scientific knowledge and human experience as is possible. We express the hope that this conference may be the forerunner of others to be held under the auspices of this association for the purpose of clarifying, and perhaps gradually solving, some of the problems which now confuse—but challenge—our thinking.

OBITUARY

WILLIAM HENRY PICKERING
1858–1938

WILLIAM H. PICKERING was born in Boston on February 15, 1858. After graduating from the Massachusetts Institute of Technology in 1879, he was instructor in physics there until about 1883, when he became engaged in astronomical research at the Harvard Observatory, where his brother, Edward C. Pickering, nearly twelve years his senior, had been appointed director.

One of his first experiments resulted in an excellent photograph of the constellation Orion, obtained by using a dry plate in a small camera attached to the tube of a telescope. The success of this experiment caused him to suggest to his brother the feasibility of a systematic photographic survey of the sky. Thus was started the Harvard collection, now containing about 400,000 stellar photographs.

The lure of astronomical phenomena led him on frequent journeys: for observing total eclipses of the sun, to Colorado in 1878; to Grenada, W. I., in 1886; to California in 1889; to Chile in 1893 and to Georgia in 1900. For comparing earthly craters with those of the moon, he went to Hawaii and to the Azores.

He discovered the great nebula of spiral structure encircling the whole constellation of Orion, and as early as 1899 he suggested the rocking mirror method to determine the velocity of meteors.

When the Boyden fund of $240,000 for establishing an observing station at a high altitude was granted to Harvard Observatory, the first step was to secure the best location. Little was known in those days as to the geographic and meteorological conditions leading to good seeing, and Mr. Pickering was apparently the first astronomer to devise a well-planned scale of seeing. This he did from observations in Colorado and later in Peru. Professor S. I. Bailey had already selected Arequipa, Peru, as the most suitable location for the Boyden station, and thither Mr. Pickering went in 1891 to superintend the construction of the spacious living quarters and housings for the various telescopes.

When the Bruce 24-inch doublet was set up there by Professor Bailey, Professor Pickering planned that a series of photographs of Saturn be taken, as he wished to make an intensive search for a ninth satellite, for which his examination of plates taken with the 13-inch Boyden telescope had been unsuccessful. Soon after the Bruce plates were received in Cambridge, in March, 1899, he discovered a faint object, about magnitude 15.5, which was moving with the planet. This satellite was christened Phoebe after one of Saturn's sisters. As it was found to be impossible to fit into any computed orbit the observed positions of this faint object, Mr. Pickering thought perhaps there might be two satellites of the same magnitude which happened to be near each other at that time. The "improbable idea" then occurred to him that Phoebe might revolve in a retrograde direction. The computation of such an orbit proved to his astonishment that here was a body in the solar system revolving in an opposite direction from all the others then known.

The moon was for many years an object of great interest to Professor Pickering. For the photography of the moon a telescope having an aperture of twelve inches and a focal length of 135 feet was set up at Mandeville on the island of Jamaica where the atmospheric conditions had been found to be extremely favorable to astronomical work. The "Photographic Atlas of the Moon" was published in 1903 and contains eighty plates, made from the Jamaica negatives, forming the most complete study of our satellite then known. His photography and study of the crater Eratosthenes proved to him that marked changes occur in the spots and in the appearance of a system of canals, which he attributed to a low form of vegetation, believing that a "slight local atmosphere and a considerable bulk of water may exist around an active volcanic vent."

Ever since the discovery of Neptune the existence of a trans-Neptunian planet had been a fascinating subject of speculation. Professor Pickering set himself the problem of determining whether such a planet existed, and, if so, to locate it. By graphical processes, he theorized concerning various perturbations, especially those of Uranus by Neptune. As late as 1919, he sent the position for the hypothetical planet to the Mount Wilson Observatory asking them to secure photographs of the region. They did so, but failed to locate the object. When, in 1930, the planet was tracked down on a Flagstaff photograph, these Mount Wilson plates were examined more carefully, and "Pluto" was actually found near Pickering's position, but somewhat fainter than his estimate. Little wonder is it, that when he saw the symbol combining P and L for Pluto he remarked, "That's a good name, Pickering-Lowell."

For many years Professor Pickering was recognized as the leading American observer of Mars. His results were published in forty-four Monthly Reports from 1914 to 1930 in *Popular Astronomy*.

Since 1911 Professor and Mrs. Pickering have lived at Mandeville, Jamaica. Until his retirement in 1925, the Mandeville station was a branch of the Harvard College Observatory. After that it was continued as his private observatory where almost to the end he carried on regular visual observations of the moon and planets. A young student-astronomer who spent several months at Mandeville in the spring of 1936 found him at work on a composite map of Mars from all the drawings of the "Associate Observers of Mars" and keenly interested in such problems as the changing disc forms and markings on Jupiter's Third Satellite, Ganymede.

Professor Pickering died at Mandeville on January 17, 1938. He is survived by his widow, who was Anne Atwood Butts, of Boston, and by their two children, William T. Pickering, of San Marino, California, and Esther, Mrs. Merton S. Harland, of Alberta, Canada.

ANNIE J. CANNON