I strongly suspect that in this he was influenced by his contacts with Dr. Conklin. I know that he would have derived great satisfaction in this award to his friend.

FRANK B. JEWETT

PRESENTATION OF THE HENRY DRAPER MEDAL FOR 1942 TO IRA SPRAGUE BOWEN[3]

MORE than three quarters of a century ago, Huggins, a former Draper medalist, found that the spectra of certain nebulae were composed of sharp isolated bright lines, thus proving that their luminous material is a glowing rarefied gas. Some of the lines were recognized as those of hydrogen, and later others were identified as due to helium and ionized carbon, oxygen and nitrogen, but nearly half of the nebular radiations, including the two strong green lines, could not be matched in any terrestrial source. These mysterious radiations were believed to indicate the presence in the gaseous nebulae of an unknown element "nebulium" and for more than sixty years the nature of "nebulium" remained one of the outstanding problems of physical astronomy with which the ablest spectroscopist had struggled and had failed. It was solved not by an astronomer but by a physicist, Professor Ira Sprague Bowen, of the California Institute of Technology.

Dr. Bowen's dramatic discovery of the nature of "nebulium" was the result of his brilliant analysis based as modern atomic theory, in which two factors contributed to his success. The first of these was the recognition by him that under the condition of extremely low density obtaining in the gaseous nebulae, radiation of energy could take place through transitions between metastable states. For these the mean life of the excited state is so long that even in the most rarefied laboratory sources, the energy is transferred to another atom by collision and no radiation occurs. The second contributing factor was that his laboratory investigations in spectroscopy carried on in collaboration with Millikan furnished the data which enabled him to determine the energy states for certain of the lighter elements known to be present in the nebulae. He found that the two strong green radiations and one in the blue could be accounted for by transitions between metastable states in doubly ionized oxygen. The familiar pair in the ultraviolet and a line in the red had a like origin in ionized oxygen while the strong red pair was due to similar transitions in ionized nitrogen. Thus "nebulium," the mystery of half a century, turned out to be the two elements forming the chief constituents of the air we breathe.

This initial success with the origin of the chief nebular lines was followed immediately by his identification of a number of fainter ones which had been recorded in the spectra of these objects. Later when opportunity offered, Dr. Bowen went to the Lick Observatory as Morrison research associate where he undertook a search for still fainter radiations emitted by the nebulae. Largely as the results of ingenious methods introduced by him in the observing technique, he was able to record the faintest lines obtainable with the very efficient equipment selected for this problem. The investigation was signally successful and not only revealed the presence in the nebulae of several elements, in particular iron, magnesium, potassium and calcium, which had not been known to exist in them, but indicated that the chemical composition of the gaseous nebulae does not differ greatly from that of the sun and the stars, a result of great cosmological importance.

The researches of Professor Bowen have not only greatly enriched our knowledge of the chemical constitution of the nebulae, but they have provided the answers to many enigmas concerning the physical processes involved in the emission of their light. He has given us most conclusive explanations of the presence or absence of certain radiations in their spectra and in particular the behavior of different lines emitted in the gaseous envelopes of very high temperature stars, bringing to these problems that brilliant and logical analysis characteristic of all his work. His spectroscopic investigations in the laboratory, moreover, have furnished the data not alone for his own researches on the nebulae but have been utilized by others in the solution of the many spectroscopic problems in the broader field of astrophysics. We are, therefore, indebted to him for some of the most important contributions to astronomical physics in recent times.

In recognition of these remarkable achievements your committee has unanimously recommended the award of the Draper Medal for 1942 to Professor Ira Sprague Bowen. The academy may justly be proud to count him among its members and to honor him by the bestowal of this award.

J. H. MOORE

[3] Read by Dr. S. A. Mitchell, in the absence of Dr. Moore.

PRESENTATION OF THE AGASSIZ MEDAL FOR THE YEAR 1942, WITH ACCOMPANYING HONORARIUM OF $300, TO COLUMBUS O'DONNELL ISELIN, II.

I AM going to be a bit reminiscent this evening and recall that over forty years ago when I went up the steps of the Agassiz Museum for the first time, a tall stooped figure had just preceded me, the smart brougham from which he had emerged was in the act of driving off. I followed that figure up the stairway and saw it enter a door marked "A. Agassiz" in bold