King, Ivan. The concept of effective wave length, and the use of wide-band photometric systems.

In the interpretation of measured stellar magnitudes it is often useful to characterize a magnitude system by some "effective wave length." An analysis of the basic nature of magnitude systems leads, according to arguments advanced by Strömgren¹ and Wesselink,² to a natural definition of effective wave length which is independent of the colors of the stars. A conflicting definition which is often used depends on the colors of the stars but has little relation to the basic nature of the magnitude system. The frequently heard criticism that the effective wave length of the international photographic system varies strongly with spectral type is a consequence of this improper definition and cannot be considered as an argument against the international system.

Along lines developed by Strömgren a second-order formula has been derived which gives photometric corrections dependent on the width of the wave-length band to which the light receiver is sensitive. One term predicts a color equation which is a non-linear function of color index, another gives the dependence of atmospheric extinction on the color of a star, and a third is a quadratic correction to the extinction. The terms relating to atmospheric extinction apply also to interstellar extinction.

1. *Handbuch der Experimentalphysik* 26, 392, 1937.

2. *Trans. I.A.U.* 7, 269, 1950.

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Lampland, Carl O. Astronomy's debt to U. S. government institutions.

This paper gives a brief report on some of the current research programs and cooperative projects carried on at the Lowell Observatory. It is also our purpose to call attention to the important labors and contributions by our capable and devoted Government scientists in advancing the frontiers of basic knowledge as well as carrying on the continuous heavy, tedious labor of long-term programs of established fields of research. So much of the work of Government institutions is often taken for granted.

For some time work has been in progress on determining the most accurate orbit of Pluto from the observed positions in the arc passed over since the discovery of the planet in 1930.

The U. S. Naval Observatory and the Nautical Almanac Office are providing the primary reference star positions, with Yale University taking an important part in carrying through the mathematical work of calculating the positions of the five outer planets for an interval of more than 400 years, in which the powerful selective sequence electronic calculator of the Watson Scientific Computing Laboratory is used. Important information on the mass of Pluto is involved in the calculations. The difficult and extensive mathematical investigation is a cooperative undertaking by the directors of the Nautical Almanac Office and the Yale University Observatory. The observational cooperative project is participated in by the U. S. Naval Observatory and Nautical Almanac Office, the Yale, Lick, and Lowell Observatories.

Planetary problems at the Lowell Observatory began with the founding of the institution and are in active progress at the present time. It is not possible in this place to give adequate recognition of credit due Government institutions extending back to the turn of the century. The Astrophysical Observatory of the Smithsonian Institution was the source of essential data for some of the investigations and involved such basic information as the solar constant, the spectral distribution of the solar energy and the transmission of the earth's atmosphere. The National Bureau of Standards later contributed greatly to the advancement of planetary researches in the many years of Dr. W. W. Coblentz's participation in the observational programs at Flagstaff in designing and constructing the highly sensitive radiometric equipment, as well as outlining the observational procedures and carrying through much of the reduction of the data. The fundamental constants of radiation are the work of the same scientist, as was his important pioneer radiation measurements on stars and planets at the Lick Observatory in 1914. In 1921 at Lowell Observatory he measured with his new spectral radiometer the energy distribution in the radiation from many stars and some of the planets. His collaboration was continued in 1922, 1924, and 1926. From these measurements the temperatures of stars and the planets Venus, Mars, and Jupiter were determined. The work on Mars, extended at later oppositions, clearly brought out the important facts that the climatology and temperatures over the surface were more earthlike than formerly supposed. The results on Jupiter brought a great