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Research at Mount Wilson and Palomar

The projects that make up the research program of the Mount Wilson and Palomar observatories can be classified roughly into two main groups: (1) geographic exploration of the sky, and (2) physical and chemical examinations of astronomical bodies.

The first part of the program utilizes the ability of the telescope to reunite rays of light that originated in the same point but have traveled in gradually diverging beams. The second part is built around the ability of the spectroscope to take apart complex beams that have traveled together all the way from the star.

The 200-inch Hale telescope, in systematic use for nearly three years, has demonstrated its power to photograph exceedingly faint objects, thus extending the boundaries of the observable universe, and to photograph finer detail in gaseous nebulae and distant galaxies. In nebulae our meager knowledge of structure and internal motions will be increased, and in certain galaxies stars may be separated from an amorphous luminous background and studied as individual objects. The telescope also measures and analyzes the light of faint objects, revealing their composition, physical condition, and motion. A notable achievement was the photographing by M. L. Humason of the spectrum of a nineteenth magnitude galaxy in the constellation Hydra, about 360,000,000 light years distant. This object was found to be receding at the rate of 61,000 kilometers per second—about one fifth the velocity of light.

Long-standing programs involving detailed spectroscopic analysis of physical and chemical mysteries of the skies have received impetus from the 200-inch telescope. Work on magnetic fields in stellar atmospheres is being extended. New information has been obtained from long-exposure spectrograms with fairly high dispersion of planetary nebulae and of long-period variable stars near their times of minimum brightness. Spectra of the brightest stars in the puzzling globular clusters have been found to differ from those of normal giants. An unexpected discovery was the recent identification of the apparently unstable element technetium in the atmospheres of S-type stars. New facts concerning clouds of gas between the stars are constantly being added.

Observers are trying to determine the distances of objects outside our Milky Way with greater precision—a complicated task that must be approached statistically. In the requisite data, measurements of light intensities of faint objects play a large part, and they are now being obtained with photoelectric photometers more accurately than ever before. The law of red shifts is being re-examined, but it does not appear that the previous formula will require much change.

Beautiful photographs are being obtained with the wide-angle 48-inch Schmidt camera. A systematic survey of the northern sky, with matched pairs of plates taken in blue and in red light, is now proceeding under the joint sponsorship of the observatories and the National Geographic Society.

Systematic observations of the constantly varying features of the sun's surface are obtained daily, special attention being given to flares (small short-lived bright areas). The relationships of flares, ionospheric disturbances, and geomagnetic activity are being eagerly studied. Methods of observing small Zeeman effects in solar absorption lines (caused by magnetic fields where the lines are formed) by placing a narrow slit on the steep portion of the edge of the line have recently been developed, and the results indicate that the general magnetic field of the sun is much weaker than previously believed. It is anticipated that an automatic photoelectric detector that allows rapid scanning of the disk of the sun for small Zeeman effects, due either to general or local fields, will yield significant information.

A new satellite of Jupiter, the twelfth, was discovered in September 1951 by Seth B. Nicholson.

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