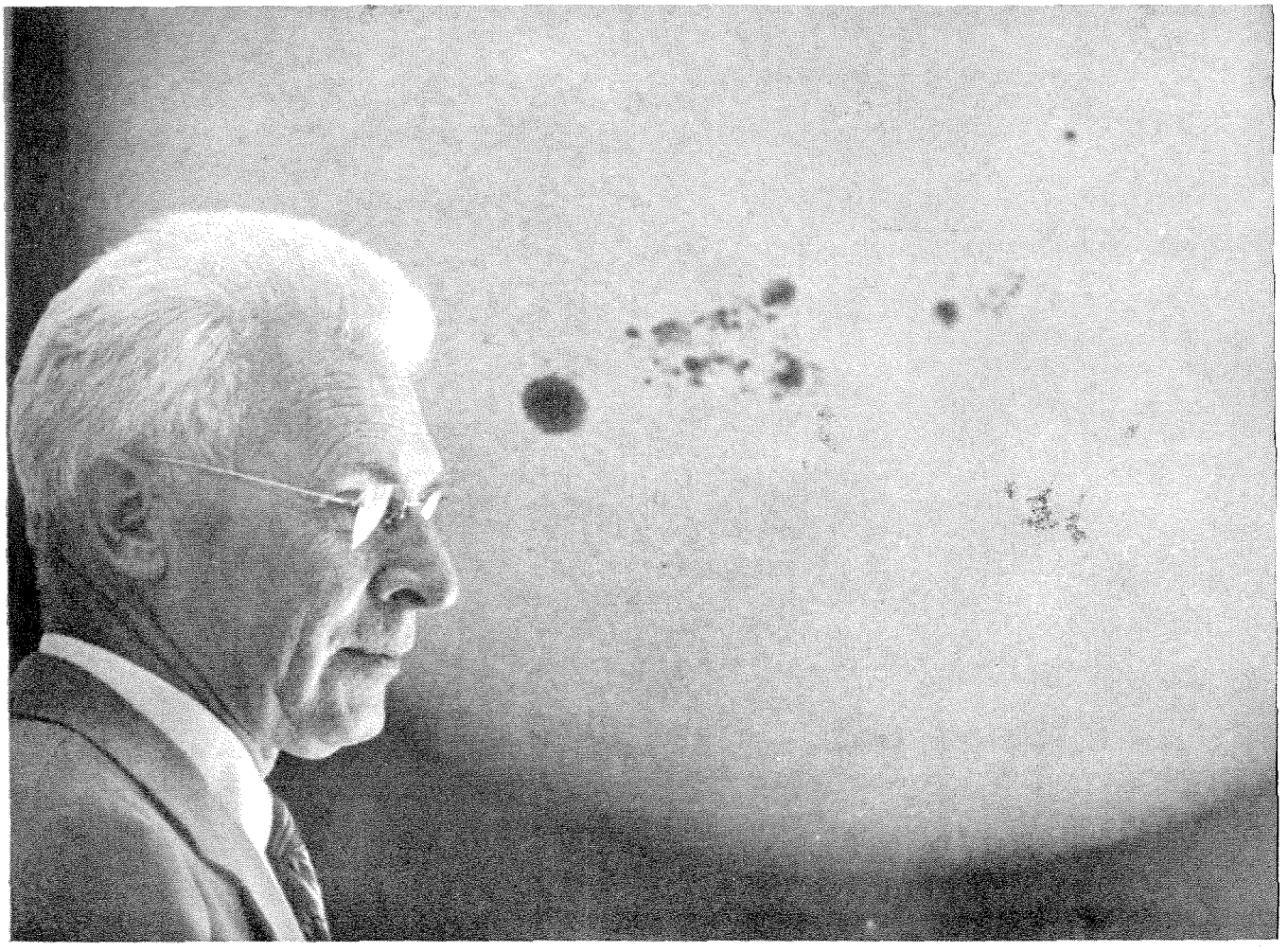


Seth B. Nicholson, staff member, Mount Wilson and Palomar Observatories, is on Technical Panel on Solar Activity.

CALTECH AND THE IGY

SOLAR OBSERVATIONS

by SETH B. NICHOLSON

DAILY SOLAR observations have been made at the Mount Wilson Observatory for the last 50 years. This daily record of activity on the sun has been improved as better instruments became available, and has been made more complete as it became evident what solar features were the important ones to watch.

The daily solar observations, which supplement specific research programs, constitute a volume of data about the sun that can often be used to check new theories without waiting for the accumulation of future data. These records consist of various kinds of solar photographs and visual observations of the intensity and polarity of the magnetic fields in sunspots.

The daily photographic program begins with photographs of the solar surface made with a 6½-inch image at the 60-foot focus of a tower telescope. The photographs, of very short exposure, are taken through yellow color filters to minimize the blurring of the image due to the unsteadiness of the earth's atmosphere.

In addition to the photograph made for ourselves, a second one is taken for the U.S. Naval Observatory to supplement the daily photographs made by them in Washington, D.C. Next, spectroheliograms using the red light of hydrogen are made of each sunspot group, with the 6½-inch image. These are made in the early morning,

before heat waves from the earth cause blurring of the image. Later, spectroheliograms of the whole disk are made with a 2-inch image in the light of hydrogen and calcium. Three negatives of each kind are taken, one of them being exposed simultaneously with an image made by monochromatic light from the continuous spectrum near these lines. The 2-inch image of the sun is then blacked out by a metal disk and spectroheliograms are exposed long enough to record the high hydrogen clouds all around the sun.

Photographic flare patrol

When this program is completed, an automatic photographic flare patrol is begun. This consists of somewhat underexposed spectroheliograms taken every 80 seconds. These are just dense enough to outline the sun and the ordinary bright flocculi but they show the brighter flares conspicuously. The flare patrol uses a 1-inch solar image on 35-mm film.

While the flare patrol is operating, the magnetic fields in the sunspots are observed at the 150-foot focus of the other tower telescope. Here the solar image is 17 inches (430 mm) in diameter and even small spots can be observed individually on the slit of the spectrograph. To make certain the right data about sunspots is recorded, the observations are written on a drawing—the spots being traced directly from the solar image projected on white paper. The heliographic latitudes and longitudes of the spot groups are read from a card on which the projected meridians and parallels of latitude have been drawn, and are recorded on the drawing of the spot groups, along with the magnetic data.

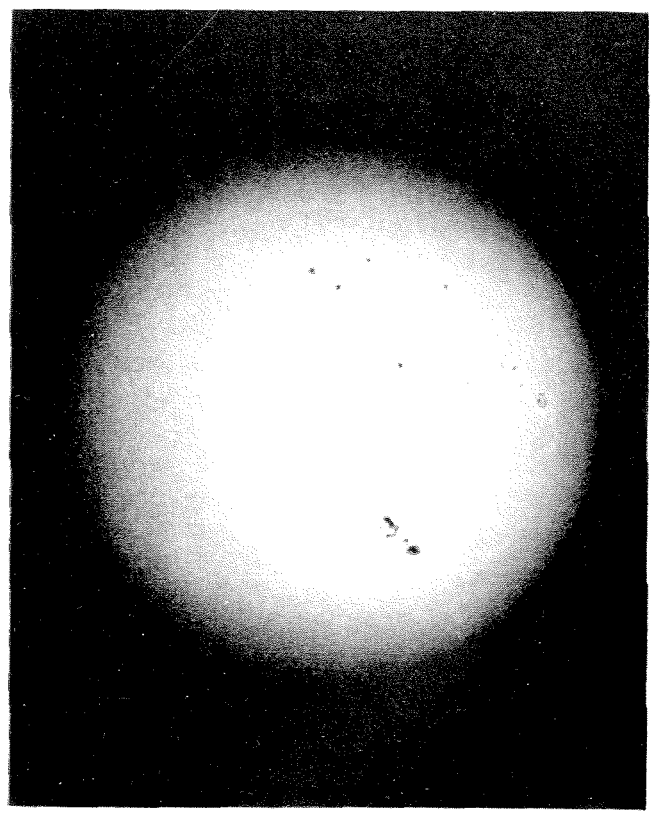
With remote controls, the mirrors at the top of the tower are turned to move the solar image so that each spot is centered in turn on the slit of the spectrograph. The observer notes the displacement and sign of the polarization of the components of a spectral line affected by the magnetic field in each spot and records the polarity and field strength of the sunspot on the drawing. Since this program was started, 12,000 such records have been made.

This observing program will be continued much as in the past during the International Geophysical Year, and will become a part of its intensified cooperative solar observing program. The routine program using the large solar images is now usually made just after sunrise, because that part of the day is most likely to have a good observing condition on Mount Wilson. During the IGY this program will be repeated in the late afternoon to check the continuity of changes in solar activity, and to supply data at a time of the day when solar observations are not possible at more eastern stations. The last photographs of the sun will be made here just as observing is starting in Japan, Australia, and India.

A new magnetograph is now installed in the 150-foot tower on Mount Wilson and will be in daily operation soon. This instrument will record the minute magnetic fields over the sun's surface, and around sunspots, that are too weak to be detected by the usual visual method. It is essentially a duplicate of the one that has been used by Drs. Harold and Horace Babcock at the Hale Observatory in Pasadena for the past four years. Many improvements have been incorporated in the new equipment on Mount Wilson and it will be ready for daily recording during the IGY. The results obtained with it will also be reported to the IGY communications centers.

Except for the emphasis on additional observing in the late afternoon, the program on Mount Wilson during the IGY will be changed very little. The principal change will be in the reporting of results. Now, except for a daily telegram to the Radio Warning Service of the National Bureau of Standards, the results are reported bi-monthly and quarterly in the standard publications. The film for the photographic flare patrol is now developed only after 100 feet has been completed. During the IGY this film will be processed daily, in short lengths, so that it can be scanned and the results from it reported daily. A spectrohelioscope is also available for visually detecting flares when a special spectrographic or photometric program for observing them is in progress.

The daily processing of the negatives and the preparation of more complete daily reports for the IGY will require the services of additional personnel. Arrangements are being made with the University of California at Berkeley to have one of their graduates, William Livingston, be in residence on Mount Wilson as a guest investigator to supply the additional help necessary to carry out the IGY program.



IGY comes at 11-year peak of solar activity, like that shown in this typical sunspot photograph taken March 28.