This work was supported by the National Science Foundation.

Novel Interferometer for Studies of Discrete Radio Sources. JAMES N. DOUGLAS AND CLINTON C. BROOKS, *Yale University Observatory*.—A 250-Mc interferometer nearing completion at the Bethany Observing Station of the Yale University Observatory will measure the declination of 500 radio sources to an accuracy of 20". Obtaining its *N-S* directivity by virtue of a broad operating bandwidth, the instrument will utilize 10 simultaneous beams to compress observing time and to increase effective sensitivity and degree of redundancy. The potentialities of this technique as applied to much larger instruments are described.

This work has been supported by the National Science Foundation.

Performance of Multistage Image Amplifying Tubes; Astronomical Applications; and Proposed Use with Fabry-Perot Etalons for Stellar Spectroscopy. T. DUNHAM, JR., *Mount Stromlo Observatory*.—Three properties of multistage image tubes (Wilcox, W. L., Emberson, D. L., and Weekly, B., *Nature* **185**, 370, 1960) offer advantages for photometry at low flux levels: (1) high-speed recording; (2) background electrons are focused at the output, thereby reducing the number per resolution band to approximately 10^{-4} of the contribution encountered with photomultipliers; and (3) scintillations, corresponding to individual photoelectrons, are bright enough to permit recording a considerable fraction on moving film. Information storage is greater on moving film and scintillations in individual spectral resolution bands can be counted, so that the tubes can be used as multichannel pulse counters [Dunham, T., Jr., *J. Opt. Soc. Am.* **50**, 1129(A), 1960].

The factor of merit of an image tube for spectrophotometry may be expressed as G^2r^2/N , where G is the over-all light gain, r the linear resolution, and N the background.

For direct stellar photometry, an image tube offers the possibility of recording flux from a number of star images (and sky) simultaneously, using fiber light guides to transfer images to a linear array on the photocathode, so that scintillations can be recorded and counted on moving film.

Speed, resolution, and background have been investigated, using test spectra and coudé spectra with Baum's microprojector (Baum, W. A., *Advances in Electronics and Electron. Phys.* **16**, 391, 1962). The percentage of incident photons that can be recorded on film has been determined by using a low-intensity

scattering source of approximately monochromatic light.

For high-resolution spectroscopy, the use of an image tube and moving film, with a scanning Fabry-Perot etalon (Jacquinot, P., and Dufour, C., *J. Rech., Cent. Nat. Rech. Sci.* **2**, 19, 1948) and rotating grating, appears to offer an efficient system that permits pulse counting of many fringes simultaneously. For space spectroscopy, direct electrical pickup at the output, on narrow conducting strips corresponding to the fringes, and connected to individual pulse-counting circuits, would have advantages.

The experimental part of this study was carried out at Imperial College, thanks to the kindness of Dr. J. D. McGee.

High-Luminosity, Fully Convective Contracting Sun. I. D. EZER AND A. G. W. CAMERON, *NASA Institute for Space Studies, New York*.—Last year Hayashi predicted that the sun would be fully convective in its early contracting phases and would have a high luminosity. This follows from the consideration that the photosphere must occur at about an optical depth of unity, which requires that the photospheric density and temperature must both be high in order to provide the necessary opacity. High temperature means high luminosity in the red-giant stage of contraction; high density and high luminosity both require deep outer convection zones. New models of the contracting sun have been constructed in which particular care has been taken to treat the outer convection zone and transition layer to the photosphere realistically. Opacities were calculated from the Los Alamos code and crude line corrections were added. For purposes of general exploration the models were not calculated in strict evolutionary sequences, but rather subject to the restriction that dr/dt is constant throughout the model. We find that Hayashi's predictions are fully correct. For all models with $R/R_\odot \geq 3$, convection is complete to the center. It is possible to construct models out to several hundred solar radii (but see accompanying Cameron-Ezer paper, p. 572); their surface temperatures lie in the range 2600°–4600°K. One can roughly say that these models descend nearly vertically in the color-magnitude diagram. The luminosity reaches a minimum near $R/R_\odot = 1.7$ and then increases slightly as further contraction proceeds towards the main sequence.

Atmosphere of Mercury. GEORGE B. FIELD, *Princeton University Observatory*.—Kuiper pointed out that radiogenic argon might be retained by Mercury. The critical temperature for escape in 4.5 billion years is 1800°K, close to the actual daytime temperature of the exosphere of the earth. The at-