Theoretical Performance of a Novel Wide-Slit Infrared Spectrometer. MARTIN HARWIT, *Cornell University*.—A new type of grating instrument is described. Radiation enters this spectrometer through a wide slit where a rotating disk pattern labels the location at which any given photon passes through the slit. The same pattern is also used to sort out photons at the exit slit. Phase-sensitive demodulation at different frequencies can then be used to recover spectral information about the incident radiation. The method allows the simultaneous use of large slits and wide acceptance angles without loss of resolving power. We derive the relation between resolving power, slit size, acceptance angle, and wavelength. The over-all performance of the instrument is compared to the Fabri-Perot and Michelson interferometers. In fact, the wide slit spectrometer can be made to simulate the properties of either of these instruments if proper demodulation techniques are devised. We point out some of the advantages and disadvantages of the spectrometer and compare preliminary performance figures with theory.

An X-Ray Observation of the Crab Nebula. ROBERT C. HAYMES (INTRODUCED BY DONALD D. CLAYTON), *Rice University*.—We have conducted a balloon measurement of the spectrum of the hard x rays from the Crab Nebula. The instrument is a well-type scintillation counter arranged to reject charged particles and to respond only to photons with energies between 23 and 455 keV. A 128-channel pulse height analysis is performed on such photons. The energy resolution is 27%, full width half-maximum, at 50 keV. The sensitive area is 75 cm², and the opening half-angle of the instrument is 3 degrees. It was aimed at the Crab for 320 min, and it was also pointed away to measure the background spectrum. The pressure-altitude of the balloon varied between 4.35 and 6.0 mbar. A correction for absorption of the difference spectrum to the top of the atmosphere results in a spectrum that is in good agreement with other measurements where they overlap. We find that the differential photon flux between 30 and 75 keV may be approximated by a single exponential, $1.1 \exp(-.119E)$ photons cm⁻² sec⁻¹ keV⁻¹, where E is expressed in keV. This expression is valid over two orders of magnitude in flux. Power law spectra may only be fitted over narrower energy intervals. Synchrotron radiation results in a power-law dependence. Thermal bremsstrahlung, however, produces an exponential spectrum. The slope of the observed exponential corresponds to a temperature of 1×10^8 °K.

The research was supported in part by the Air Force Office of Scientific Research, Office of Aero-

space Research, United States Air Force, under Grant Number AF-AFOSR-858-65.

Absolute Transition Probabilities of Ultraviolet Molecular Transitions. JAMES E. HESSER, *Princeton University Observatory*.—The radiative lifetimes of a number of molecular excited states of astrophysical interest which radiate in the 950–4600 Å region have been determined using the electron-excitation phase-shift apparatus of Lawrence (*J. Quant. Spectry. Radiative Transfer* **5**, 359, 1965).

Lifetimes of 0.8 and 0.6 nsec were found for the B and C states of H_2 ; each state showed a small amount of cascading from states with much longer lifetimes. The N_2 p' state gave a cascade free lifetime of 0.9 nsec. The A state of CO yielded lifetimes near 11 nsec. With respect to an exponential decay, an excess phase shift was observed at high modulation frequencies. This may either be an experimental error associated with the measurement of large phase shifts at high frequencies, where the signal to noise is poor, or may be short lived cascading (about 1.5 nsec). A lifetime of 1.4 nsec was obtained for the C state of CO, but spectra failed to show evidence of the C – A cascade transition. The lifetime of the $v'=2$ level of the A state is 11.5 nsec if the extra phase shift is experimental error or is 10.8 nsec if radiative cascading is assumed. We have been unable to account for the factor of two discrepancy between these measurements and those of Meyer, Skerbele, and Lassetre (*J. Chem. Phys.* **43**, 805, 1965).

In addition, lifetimes have been measured for the following states: N_2 , C ; N_2^+ , B ; CO^+ , B ; NO , A , C , D ; NO^+ , A ; SiF , B ; CO_2^+ , two excited states. Measurements of electronic and vibrational branching ratios, which will allow these data to be unambiguously interpreted in terms of absorption oscillator strengths, are planned for the future. This work is supported by NASA grant number NsG-414.

Observations of the Solar Eclipse of 20 July 1963 with the Horn Antenna at Andover, Maine. JOHN H. HETT, (formerly) *Bell Telephone Laboratories*.—The sun was observed during the eclipse of 20 July 1963 with the large horn at Andover. Simultaneous observations were obtained at 4170 Mc/sec in left-handed circular polarization (maser channel) and with right-handed circular polarization (parametric amplifier channel). A graphical solution of the solar temperature integral equation for both polarizations for 57 discrete points across the solar disk was used. Quiet zones of the sun measured between 20 000° and 25 000°K. The hot zone on the east limb measured 55 000°K, indicating a local spot tempera-