particularly attractive for those interested in observations to be made in the infrared spectrum. Astrophysical results obtained with satellite- or rocket-substitute vehicles, together with the means developed to obtain them, not only have intrinsic merit, but they have ancillary merit as precursor programs for more ambitious studies.

The observations from high altitudes that have been made with Johns Hopkins equipment, using a balloon platform to look at the earth and Venus, and using high-altitude aircraft to look at the sun, will be reviewed. The latter observations bear on the problem of water-vapor content in the upper air at high latitudes. Programs that are being planned for such vehicles, and their potential significance, will be discussed.

The B8 Component of β Lyrae. OTTO STRUVE, *National Radio Astronomy Observatory, Green Bank, West Virginia*.—1. In a recent paper Struve and Zebergs have determined the wavelengths of 299 absorption lines between wavelengths 3679 Å and 4584 Å. The following elements and stages of ionization are either definitely or probably present: *H*, *HeI*, *CII*, *NI*, *NII*, *MgI*, *MgII*, *AlI*, *AlII*, *SiII*, *SiIII*, *SII*, *CaII*, *ScII*, *TiII*, *VII*, *CrI*, *CrII*, *MnI*, *FeI*, *FeII*, *FeIII*, *NiII*, *SrII*, *ZrII*; the presence of *OII*, *AlIII*, *SeI*, *MnII*, and *YII* is uncertain. The presence of strong *HeI* lines and of fairly strong lines of *FeII* indicates an anomaly in the atmospheric composition of this star. Similarly, the presence in the same spectrum of *FeI*, *FeII*, and *FeIII* is indicative of an unusual state of ionization and excitation that may imply the existence of a stratified atmosphere. However, there is no evidence of differential motions.

2. Measurements of the equivalent widths of many absorption lines belonging to the B8 star were made near secondary minimum at which phase the B8 lines are relatively little affected by the lines of the shell or by the emitting layer. A comparison with measurements by A. A. Boyarchuk suggests that the abundance of *HeI* is less pronounced than was found at the Crimean Observatory. With the exception of some systematic errors depending upon the wavelength, the new equivalent widths tend to be somewhat larger than Boyarchuk's. Otherwise the agreement is satisfactory.

3. Observations made during the partial primary eclipse immediately following principal minimum indicated in 1958 that the so-called rotational disturbance was strikingly different in two successive cycles. A similar difference was found in the 1955 observations, also after mid-eclipse, in two cycles separated by about 26 days. At these phases the line of sight passes through the dense ionized gas of the approaching stream and it is reasonable to believe that the observed effect is caused by differences in the

electron scattering of the starlight within the approaching stream.

4. The Stark broadening of *HeI* lines that are not noticeably distorted by emission or shell absorption indicates an absolute magnitude for the B8 component of the order of possibly -3 or at most -4 . Hence, if the B8 star obeys the mass-luminosity relation the mass ratio of the system must be quite different from the one used previously and all the geometrical parameters of the system will have to be recomputed.

The National Radio Astronomy Observatory is operated by Associated Universities, Inc., under contract with NSF.

Numerical Integrations for Nonlinear Compression Waves and Line Profiles in Cepheid Atmospheres. R. G. TESKE, *The McMath-Hulbert Observatory of the University of Michigan*.—Numerical integration of the nonlinear equations for one-dimensional adiabatic flow has been carried out for a "real" Cepheid atmosphere, and line profiles predicted for several phases during a quarter cycle. This work is part of a program aimed at providing a basis for more critical interpretation of observed Cepheid line spectra, with particular emphasis on W Virginis and related objects. Calculations were done with Smithsonian Astrophysical Observatory's IBM 704 computer.

The model selected for the calculations consisted of a plane-parallel atmosphere initially in hydrostatic and radiative equilibrium, described by $\log g=1.0$, $T_{\text{boundary}}=4300^\circ$, with an opacity directly proportional to gas pressure; $\log g$, T_{boundary} and the constant of proportionality between opacity and gas pressure were kept constant during the gas-dynamic integrations. The equations for nonlinear flow were integrated assuming this initial configuration to be driven by a rigid, infinite piston (which lay initially at $\tau=10.0$) whose velocity was taken to be a sine function of time. The piston was given a period of 5.9 days and a small velocity amplitude of 5.5 km/sec. A shock front formed at optical depth $\tau=0.7$ about one day (8×10^4 sec) after the piston began to move upward; the integration was stopped when the advancing shock reached the depth $\tau=0.08$, after about one-quarter cycle of the piston.

Distributions of pressure and velocity in the wave were obtained as functions of time. Optical depths were computed on the basis of the assumption that as a volume element relaxes radiatively its pressure remains at the adiabatic value, and distributions of velocity in optical depth were derived for various times. These show that $(d/d\tau)|v|$, where v is outward velocity, can be quite large at the wave front prior to shock formation. After the shock discontinuity formed, velocity at "accessible" levels ($\tau \lesssim 1.0$)