opacity source will not be evident in the light from the system. Continuous absorption by hydrogen would be an adequate opacity source if there is a temperature of the order of 10 000 °K and a density of 10^{11} hydrogen atoms per cm^3 in the inner region of the invisible component.

The Far-Ultraviolet Spectra of δ and π Scorpii. DONALD C. MORTON, *Princeton University Observatory*.—On the night of 1 June 1965 two ultraviolet objective spectrographs were carried to 113 miles by a NASA Aerobee Hi rocket at the White Sands Missile Range. The spectrographs were directed towards δ Sco within 1° by the Aerobee attitude control system. Limit-cycle jitter parallel to the dispersion was reduced to about $\pm 20''$ by pivoting the spectrographs in this direction and attaching to them a large gyro rotor gimballed about a perpendicular direction. Thus fine stabilization in one coordinate was achieved by a purely mechanical system.

The parachute failed on re-entry so that the impact damaged the payload beyond repair and admitted light into the film cassettes. Most of the films were totally fogged, but underdeveloping one from the Schmidt camera with a calcium fluoride corrector showed wide spectra of the early B-type stars δ and π Scorpii with a resolution of the order of 1 Å. The spectra extend from 1265 to 1720 Å for δ and from 1265 to 2180 Å for π . Several absorption lines have been identified in both spectra, including C II at 1335 Å, Si IV at 1393 and 1402 Å, Si II at 1527 and 1533 Å, C IV at 1550 Å, and He II at 1640 Å. The strongest lines are those expected in early B-type stars according to calculations based on the best atmospheric models (Mihalas and Morton, *Astrophys. J.* 142, 253).

Further Photometry of Nova-like Variables. GEORGE S. MUMFORD, *Tufts University*.—Since the fall of 1964, various telescopes at Kitt Peak National Observatory have been used to obtain further one- or three-color observations of U Geminorum, EM Cygni, EX Hydrae, all known eclipsing binaries, and AB Draconis, DI Lacertae, X Leonis, SS Aurigae, and AH Herculis, which are not known to eclipse.

About 3400 cycles of EM Cygni have elapsed since its discovery as an eclipsing variable. The best value for the period is near 0.2909105 day.

Contrary to a previous report (Mumford, *Astron. J.* 69, 553, 1964) the period of EX Hydrae, after almost 17 000 cycles, appears to be remarkably stable at 0.06823385 day.

This work is being continued under a grant from the National Science Foundation.

An Analogue for Solar Hydrodynamics. STEVEN MUSMAN, *High Altitude Observatory*.—A highly simplified analogue for the solar convective zone and the overlying stable region is furnished by a novel convective experiment which uses the density anomaly of ice water. Malkus suggested cooling a layer of water from below so that the density maximum of water at 4°C divides the layer into a lower unstable portion and an upper stable portion.

Finite amplitude solutions have been obtained for the mean convective motions in the ice water problem. The finite solutions differ substantially from the infinitesimal solutions to the linearized problem given by Veronis (*Astrophys. J.* 137, 641, 1963). The onset of convection occurs with a finite amplitude for a Rayleigh number considerably below that of the critical Rayleigh number of the linear problem. In some cases shallow counter cells in the stable region are formed above convective cells in the unstable region. These may resemble the supergranulation cells on the sun. Furumoto and Rooth (Woods Hole Summer Study, 1961) found both the finite onset of convection and the counter cells in the laboratory.

Theoretical Line Profiles for Three Model Solar Atmospheres. J. P. MUTSCHLECHNER, *Los Alamos Scientific Laboratory*.—Theoretical line profiles have been computed under the condition of pure absorption for three lines in the solar spectrum: Fe I $\lambda 6105.2$ Å, Fe II $\lambda 6113.3$ Å and Ti I $\lambda 6126.2$ Å. For each line the calculations were carried out at six positions on the solar disk. Three model atmospheres were used: (1) a semiempirical model used previously by Müller and Mutschlechner (*Astrophys. J. Suppl.* 9, No. 85, 1964), (2) a theoretical model developed by Swihart and Fischel and used by Schmalberger (*Astrophys. J.* 138, 693, 1963) and (3) a three-stream model proposed by deJager, Heintze, and Hubenet (*Bull. Astron. Inst. Neth.* 17, 422, 1964). These models have, respectively, constant isotropic microturbulence, anisotropic depth-dependent microturbulence, and isotropic depth-dependent microturbulence.

The calculations for the $\lambda 6105$ Å line at three strengths (12, 68, and 109 mÅ) were used to study the effects on the profile parameters of line broadening constants, model temperature, and electron pressure distribution, three-stream versus one-stream models, and microturbulence distributions. It is found that the equivalent width is primarily influenced by the model for all three line strengths but the microturbulence tends to become equal in importance for the strongest lines. The line depth is also mainly influenced by the model except for the weakest line, for which the microturbulence is the chief factor. The linewidth at half-depth is dominated by the