The observations were made at the 1962 Harvard Summer Institute in Observational Astronomy sponsored by the National Science Foundation.

A Possible Interpretation of Schröter's Valley and Other Lunar Sinuous Rilles. WINIFRED SAWTELL CAMERON, *Goddard Space Flight Center*.—The hypothesis that acid magma has been generated on the moon, and that many types of lunar features can be interpreted as manifestations of it, has been proposed in another paper (O'Keefe, J. A., and Cameron, W. S. *Icarus* 1, No. 3, 271–285, 1962). That hypothesis is assumed in this paper. One of the most common terrestrial manifestations is the nuée ardente, typified by the famous Peléean eruptions. It is to be expected that similar events have occurred on the moon. The question is, what lunar features exhibit vestiges of this kind of activity?

Descriptions of the eroding actions of some nuées ardentes from Mont Pelée and Asama Yama volcanoes, given by Perret (Perret, F. A., *Carnegie Inst. Wash. Publ.* No. 458, 1935) and Aramaki (Aramaki, S., *Japan. J. Geol.* 27, 189–229, 1956, Part I), respectively, give a clue as to the form of objects to look for on the moon. In both cases, ditches or furrows have been dug and a sinuous course is sometimes found. The dimensions of these ditches or furrows sometimes reach those that could be detected at the distance of the moon.

A class of features, with certain common characteristics was first pointed out by Pickering [Pickering, W. H., *The Moon* (Doubleday, Page, and Company, New York), pp. 42–43]. These common characteristics of the lunar sinuous rilles are similar to the terrestrial ditches produced by nuées ardentes. It is proposed in this paper that Schröter's Valley and the two more conspicuous sinuous rilles in the Apennines in particular, and perhaps all the very rare sinuous rilles described by Pickering, can be interpreted as the product of erosion by nuées ardentes, which is often comparable to that produced by marine turbidity currents that sculpture some of the submarine canyons on earth.

Nebular Spectrograph of a New Type. E. F. CARPENTER, *Steward Observatory*.—A spectrograph of simple configuration has been successfully used for several years for nebular studies with the 36-inch Steward Observatory reflector. The dispersive element consists of a transmission grating mounted on the hypotenuse of a prism and operates as an echelle with very fine steps between the individual grooves of the echelle. The angle of the prism is selected so that the central wavelength of the spectrograph passes through the system undeviated. As a consequence the spectrograph elements line along

a straight line enabling a simple mechanical system to be constructed. For low-dispersion work the limitation of not being able to change centering of the spectral range is not important.

The spectrograph is used at the $f/5$ Newtonian beam and has a speed of $f/0.8$ with a curved-field Schmidt. Well-exposed spectra on galaxies are obtained in two to six hour exposures. A flat-field modification of the camera is currently being made to circumvent the currently acute problem of obtaining emulsions of high speed and low fog on film base, even though the difficulty of cutting small plates is appreciable in comparison to the ease of cutting film pieces with a small die stamp.

Dynamics of RR Lyrae Envelopes. R. F. CHRISTY, *California Institute of Technology*.—A study is underway of dynamical models of stellar envelopes (radial motion only). The coupled nonlinear, one-dimensional partial differential equations of hydrodynamics and heat conduction are integrated numerically. Convection has been ignored in the heat transport because of the low density of the giant envelopes. The core of the star at temperatures above 10^6 ° is treated as an unmoving constant heat source. The surface boundary has zero pressure and is radiative. An initial velocity distribution is imposed on a static equilibrium solution to initiate a motion approximating the fundamental mode. The integration is followed in time for several periods to identify the characteristics of the motion.

In this way, a number of models similar to RR Lyrae envelopes have been studied. The effect of varying the mass, mean radius, luminosity, and hydrogen-to-helium ratio has been explored in a preliminary way. Models ranging from 20% H , 80% He to 100% H (all with $z=0.002$) and with mean T_e ranging from 5500° to 7500° have been tried.

A number of observable characteristics such as period, velocity, amplitude, luminosity amplitude, phase relation of velocity and light curves, temperature amplitude, radius amplitude, and also details of the shapes of these curves can be correlated with the four parameters above which determine the model. It is hoped that more accurate values of these parameters will result from this work. Already, it is clear that the calculated envelopes of appropriately chosen models have the appearance of actual RR Lyrae stars, including the correct shapes of light and velocity curves and the correct phase relation between them. In particular, the phase relation is sensitive to both hydrogen-helium ratio and to mean temperature. Preliminary conclusions are reported.

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