flakes. Production rates are given for H_2 , CH, OH, NH, CN, CO, and N_2 as functions of temperature and pressure. Destruction of the molecules is due to photodissociation by starlight and other chemical exchange reactions. The varying conditions in the interstellar medium are considered. No molecules are formed when the gas is quiescent. With the higher temperatures of cloud-cloud collisions H_2 is formed, and it is shown that a minimum of $\frac{3}{4}$ of all interstellar hydrogen atoms are in H_2 molecules. CH + CH^+ , OH, and CN are produced by chemical exchange in the observed amounts when graphite grains are driven at supersonic speeds through the gas by radiation pressure. The process predicts the formation of H_2 , CO, NH, N_2 from graphite flakes and possibly Platt particles.

Variable Stars in the Nearby Galaxy NGC 2403. G. A. TAMMANN AND A. SANDAGE, *Mount Wilson and Palomar Observatories*.—The Sc galaxy NGC 2403 is a member of the nearby M81 group. Fifty-six variables have been found by blinking on 131 plates (115 blue, 16 yellow) taken between 1949 and 1963 with the Palomar 200-in. reflector. Of these variables, 17 are Cepheids ranging in period from 20.230 to 87.48 days; 8 are very bright, bluish, irregular variables; 9 are bright, very red, irregular variables, 1 is a blue eclipsing binary of period 6.06702 days, and the remainder are fainter variables of unknown type but among which Cepheids of shorter period are suspected. There are no confirmed novae.

Light curves in two colors were constructed by reference to a photoelectric sequence of 73 stars ranging from $B=9.15$, $V=8.39$ mag to $B=23.0$, $V=22.5$ mag, 13 of which are fainter than $B=21.0$ mag. The Cepheids at maximum light range from $B=21.24$, $V=20.64$ mag to $B=22.70$, $V=21.8$ mag; all fall below the sequence at minimum light.

The period-luminosity relation, using magnitudes at maximum light, shows scatter due presumably to internal absorption within the galaxy. Attempts to correct each variable according to its color index at maximum light are not yet complete. A preliminary distance determination, based on an upper envelope line of the P-L relation and calibrated relative to M31 and the Large Magellanic Cloud gives an apparent modulus of $(m-M)_{app}=27.4\pm0.5$ mag. Corrected for $E(B-V)=0.06$ due to reddening in our galaxy, as determined by UBV values of the brighter photoelectric sequence stars, gives a preliminary true modulus of $(m-M)_0=27.2\pm0.5$ mag.

The distance to NGC 2403 will eventually be used to determine linear dimensions of its many H II regions. Once calibrated from members of the Local

Group, the M81 group, and the M101 group, the emission nebulosities in more distant galaxies may yield an improved value for the Hubble constant.

Determination of the Optical Brightness Distribution of Antares by the Method of Lunar Occultations. J. H. TAYLOR, JR., *Harvard College Observatory*.—Photoelectric observations of the lunar occultations of a star can provide the information required to derive the angular diameter and brightness distribution of the star. Five occultations of Antares observed in South Africa during 1950–53 have been analyzed by convolving the photoelectric data with a suitable restoring function. The analysis gives an effective angular resolution of 0.0084 arcsec. The results indicate that the star consists of a bright central component about 0.018 ± 0.003 arcsec in radius, surrounded by an outer shell extending to at least 0.028 arcsec.

It is further shown that the diameters of a surprisingly large number of stars could be measured by the same method. For example, an observer with a 50-in. or larger telescope in the southwest United States should be able to measure the diameters of at least 10 different stars during the latter half of 1966.

The New Ritter Astrophysical Research Center at the University of Toledo and Some of its Proposed Programs. JOHN J. TURIN, *Department of Physics and Astronomy, University of Toledo*.—The design and construction of the new Ritter Astrophysical Center presently being completed at the University of Toledo is described. The Center will include a 40-in. reflector with a 2-pier cross-axis design having an $f/8$ and $f/13.5$ Cassegrain system as well as an $f/26.4$ coude focus. The coude configuration can be folded into a vertical temperature controlled room directly below the telescope. The design is uniquely versatile with the telescope mounted on a hollow hexagonal pier 60 ft above the ground. Surrounding the pier in hexagonal geometry there are about 7 000 sq ft of laboratory, office, and instrument areas with mechanical foundations completely insulated from the telescope support. The system will be equipped with a variety of spectrographs including high-dispersion coude systems. The optics will be of Ritchey-Chretien design fabricated from Owens-Illinois low expansion CER-VIT material and figured by the Fecker Division of the American Optical Company.

The Ritter Center is now substantially completed. The observatory dome and foundation are complete, and the Warner-Swasey telescope is scheduled for installation in December of the present year. Slides