NGC 205. The situation with respect to the optical nucleus is not clear, since one source precedes it closely. This source (OA35.3) might also be associated with the supernova of 1885 in M31. No radiation is apparent from M32 but this result is not conclusive. The contours outlining the emission from the galaxy show marked asymmetry. In both directions from the nucleus along the major axis the emission conforms to the axis to a distance of about 40 min of arc but beyond swings away sharply to the north on the north-following side and to the south on the south-preceding side forming narrow spurs.

The clusters of sources 30 min before and after M31 reported a year ago (Kraus, J. D., *Nature*, **202**, 269, 1964) have been studied in more detail. The possibility that these are associated with material ejected from M31 in an earlier epoch is considered.

Correlation of the Longitudes of the Galilean Satellites with Jupiter's Decametric Radiation.

G. R. LEBE, ALEX G. SMITH, AND T. D. CARR, *University of Florida*.—A recent publication by Bigg (*Nature* **203**, 1008, 1964) calls attention to an apparent correlation between the longitude of the Jovian satellite Io and the occurrence of decametric emission during the years 1961 and 1962. Computer techniques have been used to search the extensive multifrequency data of the University of Florida Radio Observatory, which go back to 1957. An Io influence seems to appear strongly in 1961 and 1962, but the effect is less marked during the interval 1958–1960. The correlation is also much weaker at the lower frequencies, from 5 to 15 Mc/sec. It is interesting to note that the Io influence is far stronger for analyses that include intensity rather than simple probability of occurrence—i.e., the satellite appears to produce an amplitude modulation. Analyses are also being carried out for possible effects of the second and third satellites. Preliminary results for the 1962 apparition indicate that these bodies may also produce a detectable amplitude modulation.

Supported by the National Science Foundation, the Army Research Office (Durham), the Office of Naval Research, and the National Aeronautics and Space Administration.

Structure of the Martian Upper Atmosphere.

JEAN L'ECUYER, *Yerkes Observatory*, MICHAEL B. McELROY, AND JOSEPH W. CHAMBERLAIN, *Kitt Peak National Observatory*.—We have computed a number of models of the Martian thermosphere with various constants and boundary values in the hydrostatic and heat-flux equations. The investigation is divided into two main parts. First, we have varied

the basic parameters, one or two at a time, to find to what extent an uncertainty in one of these fundamental parameters affects the derived exospheric temperature and other characteristics of the upper atmosphere. These models are physically oversimplified, but mathematically serve their purpose. Second, with selected specific chemical compositions, we have integrated the equations with allowance for diffusive separation and absorption of sunlight in different spectral regions. A rather detailed and general discussion is included of the efficiency with which photon energy is converted into the kinetic energy of heat in the neutral atmosphere. The computed models are thought to be fairly representative of an actual atmosphere with the assumed compositions.

It appears that CO vibrational excitation is not so important as a thermostat as was previously suggested, but the rotational levels of CO, and to a smaller extent the fine-structure levels of the ground term of O, may cause appreciable radiation loss. Direct observation of the Martian corona in the $\lambda 1302$ resonance radiation of O I should be possible and would allow the main present uncertainties to be removed.

On a Test of Randomness of Lunar Craters.

ALLAN H. MARCUS, *Case Institute of Technology*.—

The apparent randomness in the distribution of centers of lunar craters is an important argument in favor of the meteoroidal impact hypothesis for the origin of craters. The usual test of randomness is based on goodness of fit of the Poisson distribution to the numbers of crater centers in equi-area subregions of a region of the lunar surface. It is shown that even if the underlying distribution of crater centers is completely random, the distribution of centers of *observable* craters is not. In particular, in finite regions in which a very large crater is found we would expect to find a dearth of small craters, since the large crater would have obliterated older small craters in its neighborhood. The distribution of the number of crater centers is therefore a mixture of Poisson distributions, with the density of craters in a region being treated as a random variable. It is possible to determine the mixing distribution of crater density from a model of the formation and survival of lunar craters. Under the meteoroidal impact hypothesis, the coefficient of variation of the crater density is less than 4%. Large variations in crater density may then be due to differences in the amount of crater-filling activity among various regions of the lunar surface.

Empirical counts of continental craters show these effects clearly. Simulated plots of randomly formed craters are used to study the probability levels to be expected on applying the test of goodness of fit of