astronomy

COSMOLOGY

Numerical relations relevant to quasars

Some numerical relationships relevant to quasars appear to support the theory that these extremely energetic objects are extremely far away, not relatively nearby as has been proposed (SN: 11/30, p. 554).

Dr. Freeman J. Dyson of the Institute for Advanced Study in Princeton, N.J., finds that four quantities—electron density, emission temperature, rise time of light fluctuations and peak luminosity—are within the range of observed values. The numerical relationships hold, provided that the luminosities of quasars are based on an expanding universe in which the red shift of light from an object is a measure of its distance (SN: 12/7, p. 575).

He stresses that his report in the November ASTROPHYSICAL JOURNAL Letters is not to propose a new theory of quasar stoking but to delineate some numerical relationships that may be valid for a wide variety of theories. Dr. Dyson assumes that quasars are powered by a random succession of objects undergoing gravitational collapse, and that the collapse occurs locally and sporadically, rather than centrally and symmetrically.

Dr. Dyson concludes that there is no conflict between rapid light fluctuations in quasars and cosmological distances, but that the agreement of this and the other three numerical relations are spoiled if quasars are local, astronomically speaking.

SELENOGRAPHY

A feature of the far side

The existence of a new mare, or flat area, in the center of the far side of the moon has been inferred from gravimetric studies. Drs. Brian T. O'Leary, Malcolm J. Campbell and Carl Sagan of Cornell University told the American Geophysical Union meeting at San Francisco that the new mare is about 600 miles in diameter. They suggest calling it Mare Occultum, the Hidden Sea.

The Cornell scientists decided the mare was there because the motion of circumlunar probes indicated there was a large concentration of mass at the location. Such concentrations have been found to underlie maria on the near side of the moon (SN: 8/31, p. 205).

There is as yet no "completely satisfactory" photographic coverage of this region of the moon, but the Cornell scientists say they have found some photographic evidence for a large, heavily eroded mare in the position of the mass concentration.

SATELLITES

Surface temperatures of Jupiter's moons

Successful predictions of the surface temperature of the moon have been made using theoretical mathematical models, and these calculations have permitted significant physical interpretations of the lunar surface composition. The Surveyor vehicles have shown these interpretations are realistic.

Two scientists at Brown University in Rhode Island have now used theoretical models to calculate the surface temperatures of the four Galilean satellites of Jupiter. For their calculations, Drs. P. D. Richardson and Y. -M. Shum assumed that the satellites are synchronous in their orbital rotation with respect to Jupiter.

For two of the satellites, Ganymede and Callisto, the calculated temperatures agreed identically with the values measured with the 200-inch telescope on Mt. Palomar, 156 degrees and 168 degrees K., respectively.

For the other two Galilean satellites, Io and Europa, 145 and 148 degrees, respectively, were calculated; the measured values are 135 and 140 degrees. The discrepancy, they report in the Nov. 30 NATURE, is most probably due to atmospheres on each.

PLANETARY GEOLOGY

Martian core iron

Mars has an iron core, says Dr. Alan B. Binder of the Illinois Institute of Technology Research Institute. Work he has done with the aid of a computer shows this, he told the American Geophysical Union meeting in San Francisco.

Unlike the earth's iron core, that of Mars is not molten but solid.

Dr. Binder's technique is known as mathematical modeling and has previously been applied to the structure of the earth (SN: 6/8, p. 551). It consists of setting up and solving a series of mathematical equations that contain both known physical facts about the planet and trial values for unknowns.

The equations that best agree with known conditions are considered to have the best values of the unknowns.

Dr. Binder finds a series of acceptable equations that give Mars an iron core between 980 and 1,180 miles in diameter and an internal temperature between 800 and 1,500 degrees C.

These temperatures would rule out present volcanic activity if Martian minerals are composed of the same main elements as terrestrial ones: iron, silicon, magnesium and oxygen. Such minerals would not melt at such low temperatures, and volcanism depends on molten minerals.

RADIO ASTRONOMY

Upper limit on optical light from pulsars

Three independent measurements of the radio positions of the pulsating sources CP-0950 and CP-1133 have made it possible for Dr. Jerome Kristian of Mt. Wilson and Palomar Observatories to set a very faint upper limit on the optical luminosity of these sources.

He reports in the November ASTROPHYSICAL JOURNAL Letters that the absolute visual magnitudes of these two pulsars would be higher than 19.3 and 18, respectively. The former would be about 3.5 magnitudes fainter than the faintest white dwarf yet discovered.

This implies an extreme age for these sources and an interior composition much heavier than helium if pulsating radio sources are white dwarfs, which is one theory. A more accepted explanation is that pulsars are neutron stars (SN: 12/14, p. 592).