Physical Sciences Notes

ASTRONOMY

Quasars Found Smaller Than Believed

Quasars are even smaller than has previously been believed, measurements made in England using a radio antenna with an effective diameter of 80 miles have shown.

Scientists at Jodrell Bank and the Royal Radar Establishment, Great Malvern, measured the angular size of radio sources characterized by small size and exceptionally high brightness temperature. Most of them are either known quasars, suspected quasars or Seyfert variable galaxies. The interferometric observations were made at a wavelength of 21 centimeters.

"Perhaps the most surprising result of the observations is the discovery that such a large number of sources have these small dimensions," and the small size may be a general feature of most quasars, the eight scientists report in the Feb. 25 Nature.

The new, directly measured upper limits on size showed that most were less than 0.05 seconds of arc in diameter, which is less than one percent of the size of a normal galaxy, such as the Milky Way.

Dr. H. Gent and Dr. H. P. Palmer, respectively, led the Malvern and Jodrell Bank teams.

PLANETARY ASTRONOMY

Cement Simulates Lunar Surface

A readily available material for simulating the optical properties of the moon's surface is ordinary dry commercial portland cement powder, Dr. Bruce Hapke of Cornell University's Center for Radiophysics and Space Research, Ithaca, N.Y., has found.

It is frequently desirable, he reports in the current Icarus (February), to have a material with light scattering and polarizing properties similar to those of the moon, one that is widely available in large quantities.

Such a material is necessary to test television systems or cameras designed for use near or on the lunar surface. It may also be helpful to science teachers for demonstrating characteristic properties of the lunar surface.

The mixture Dr. Hapke uses is cement powder, black coloring powder and maroon coloring powder in the ration of 20 to one to one, stirred in a mortar and pestle or dry blender.

METEORITIC ASTRONOMY

Hexagonal Diamonds in Meteorites

The discovery of hexagonal diamonds in two meteorites provides strong evidence that the diamonds were produced from graphite by the intense shock generated when the parent body slammed into earth's surface.

Hexagonal diamonds have also been produced in the laboratory using shock-pressure techniques on graphite particles, although none are known to have been formed naturally.

The origin of diamonds in meteorites has been the source of considerably controversy among experts, who are divided in supporting two divergent theories.

One is that the diamonds were made at high gravitational pressures inside planet-like objects of lunar size or larger. The other theory is that they were formed from graphite already present in a much smaller original object, with the diamond-producing shock occurring from either impact with earth or collision in space.

The presence of hexagonal diamonds in the Goalpara and Canyon Diablo meteorites rules out the theory that they were formed from larger parent diamonds existing in the meteorite before impact. Cubic diamonds, the kind occurring naturally on earth, cannot be transformed, even partially, into hexagonal diamonds either by static or shock pressure combined with temperature.

Since the moon suffers many highly energetic impacts, without any slowing down due to atmospheric friction, it is likely that shock-formed hexagonal and cubic diamonds will be found on the lunar surface. This implication of the discovery of hexagonal diamonds in meteorites was reported in the Feb. 24 Science by Drs. R. E. Hanneman, H. M. Strong and F. P. Bundy of General Electric Company, Schenectady, N.Y.

HOLOGRAPHY

Holograms Easily Copied

A technique for producing holograms of solid objects having a low spatial frequency and which can not only be reconstructed in white light but are easy to copy on inexpensive materials is reported in the current Applied Physics Letters (Jan. 15). Low spatial frequency (under 200 lines per millimeter) for holograms is the equivalent of a coarse engraving having only 60 dots per square inch compared to a fine engraving having 130 per square inch.

Some of the white light sources that work best for reconstructing the hologram are common penlights, birthday candles, street lights, the sun or even the moon. A 60-watt light bulb placed 15 to 20 feet away also works quite well, Drs. Richard Vandewarker and Kenneth Snow of Bauch & Lomb, Inc., Rochester, N.Y., have found.

They report that copies "with no noticeable loss of detail" have been made through the fourth generation, that is, a copy of a copy of a copy.

OPTICS

Size of Point Source Reexamined

Space scientists planning a rendezvous maneuver need to know in advance the range at which the crew of one spacecraft is able to sight the other vehicle. Therefore, Dr. Arthur C. Hardy of Wellesley, Mass., has reexamined the problem of how large a light source has to be before it can no longer be treated as a point.

A telescope increases the apparent brightness of a star, but it does not increase the apparent brightness of an extended surface. The question Dr. Hardy has answered is, "If another spacecraft is approaching from afar, at what distance does a telescope no longer increase the apparent brightness of the approaching craft?"

His answer is presented in the current Journal of the Optical Society of America (Jan.) in two tables that astronauts could use easily. Dr. Hardy found that the inverse square law (the brightness of a source varies inversely as the square of the distance away from it) "can usually be employed without significant error when the source of light is a space vehicle."