# astronomy notes

**Gathered at the American Astronomical Society meeting in Philadelphia**

## SATELLITE

### A Predictable Meteor

Next July 5, there will be fireworks over the Indian Ocean. The celestial display will result from the plunge through the atmosphere of IMP-3, launched into a highly elliptical orbit May 29, 1963.

Normally the decay of a satellite in a nearly circular, near-earth orbit cannot be predicted more than a few hours in advance because its path depends entirely on earth's high atmosphere, the density of which is not known well enough for such forecasts. Because IMP-3 has an orbit that is entirely above earth's atmosphere, its decay is determined solely by gravitational factors and can therefore be predicted.

Dr. Barbara E. Lowrey of the National Aeronautics and Space Administration's Goddard Space Flight Center, Greenbelt, Md., calculates that IMP-3 will re-enter earth's atmosphere on July 5, 1968 in the early morning over the Indian Ocean near Ceylon.

## SOLAR SYSTEM

### Moon Distorts Interplanetary Field

The moon, unlike the earth, is not protected from the solar wind—it has no magnetic field and, therefore, no shielding magnetosphere. Both the earth and the moon, however, do leave a wake in space in the solar wind in the direction away from the sun.

The moon's wake is estimated to be at least 100,000 miles long, Kenneth W. Behannon of the National Aeronautics and Space Administration's Goddard Space Flight Center, Greenbelt, Md., reports, compared to several million miles for earth's wake.

The void in the solar wind carved in space by the moon has a central dark cone surrounded by an outer shell, just as its shadow has an umbra and penumbra in visible light. The outer shell distorts the interplanetary magnetic field slightly; the inner cone twists it considerably, measurements from the Explorer 55 satellite have shown.

The Anchored Interplanetary Monitoring Platform, launched into lunar orbit last July, has also returned information showing no ionosphere for the moon, no radiation belts and a low average electrical conductivity, indicating an internal temperature of less than 1,800 degrees F.

The work Behannon reports was directed by Dr. Norman F. Ness, also of the Goddard Center. H. E. Taylor and Y. C. Whang were co-workers.

## LUNAR ASTRONOMY

### Laser to Locate Moon in Space

A laser experiment to measure the distance between the earth and the moon to an accuracy of five feet will be undertaken when one of the early Apollo astronauts visits the moon. The distance is now known within a few hundred yards.

Instrumentation for the lunar laser experiment is now being developed by the Air Force Cambridge Research Laboratories, in a cooperative research effort with the National Aeronautics and Space Administration. Dr. Mahlon S. Hunt of AFCRL says laser light would be bounced from an array of corner reflectors that can be used both for ranging and photographic experiments.

For the ranging experiment, pulsed light from a ruby laser will be transmitted through a special purpose telescope with a five-foot aperature, then returned through the same telescope to a photomultiplier. Since the speed of light is known, the moon's distance can be calculated from the time it takes the light beam to make the round trip. Each laser pulse will last 100-millionths of a second.

For the photography experiment, a pair of telescopes spaced about a mile apart will be used, one to send and a like one to receive the laser beam. The displacement is necessary to compensate for the aberration of light over the distance, an average of 480,000 miles.

From both sets of measurements, the very accurate lunar distances will yield a much improved yardstick for determining how far away from earth other planets are and, therefrom, more information about their motions and the mutually interacting gravitational forces.

## X-RAY STARS

### Double-radiation Stars Found

Two new optical objects have been identified with X-ray sources, bringing the total now known by their radiation in both light and X-rays to six.

These first results from the 60-inch telescope at the Cerro-Tololo Inter-American Observatory in Chile are reported by its director, Dr. Victor M. Blanco. One of the sources is known as Centaurus XR-2; the second, unnamed, shines in Sagittarius. The tentative identifications were made with Dr. William R. Kunkel.

## PLANETARY

### Windblown Dust on Mars

Windblown dust transported across the Martian surface accounts for seasonal changes in its features, such as springtime brightening of bright areas, as well as the dark and bright areas themselves, Dr. Carl Sagan of Harvard University reports.

The late Dr. Dean B. McLaughlin of the University of Michigan in the early 1950s suggested dust as the cause of changes in Martian surface features. The model computed by Dr. Sagan with Dr. James B. Pollack of Harvard, however, gives the theory its first quantitative basis. They calculated mathematically how grains could be moved across the planet's surface.

Saltation (the bounce to a slight distance away given to a dust particle by the Martian wind), suspension and creep are responsible. The smallest particles are moved by suspension, larger ones by saltation and the largest onces by creep.

Over a period of time saltating particles will become concentrated in the dark highland areas, suspended particles in the bright lowlands. The size of the particles that can be carried by winds of different velocities are calculated by Drs. Sagan and Pollack based on the fact that wind speed would be higher in winter.

They find that the changes in size with wind speed are "just the amounts implied by photometric and polarimetric observations of the wave of darkening, as well as the springtime brightening."