

## SPACE

# U.S. Leads in Space

► THE UNITED STATES started late in the race for space with Russia, but it now holds the lead measured both in the number of satellites successfully put in orbit and in benefits to all mankind.

In the five years since Sputnik I, the U.S. has successfully boosted nearly 100 satellites into space while the Soviet Union has orbited less than two dozen.

The U.S. tally includes the first and only weather satellites, the TIROS series (five); the first and only communication satellites, ECHO and TELSTAR; the first orbiting solar observatory; Vanguard and Explorer satellites from which American scientists discovered the earth is pear-shaped and the existence of the Van Allen radiation belt; the first recovery by air of a satellite (Discoverer) reentering the earth's atmosphere; the first international satellite.

Only nine of the more than 60 spacecraft in orbit are Russian. Twenty-four U.S. satellites still are transmitting data. The only Soviet satellites transmitting information are two of the six Cosmos satellites launched since March, 1962.

In orbiting and recovering men and

animals from space, the Russians still hold the lead in time and number of orbits. Cosmonaut Titov was in space nearly 24 hours. An American astronaut is not scheduled to ride a full day in space until next year.

The Russians also hold the lead in lunar exploration. They have impacted the moon, taken pictures of it and put a satellite into orbit around it. In four tries with the Ranger series, the U.S. has achieved one lunar impact.

The Russians have had a partially successful Venus probe. They sent a satellite toward Venus, but the radio conked out before it reached the vicinity of the mystery planet. The U.S. failed in its first attempt at a Venus launch, but another try has been scheduled.

Soviet payloads in space are much larger than those boosted by U.S. rockets, but data from American space efforts plus U.S. success in making more efficient, compact instruments thus far have been more significant.

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## ASTRONOMY

# Universe Standing Still?

► THE UNIVERSE is just standing still. It always has been and always will be, a Boston University astronomer said.

Despite popular theories which hold the universe is expanding at tremendous speeds, Dr. Gerald S. Hawkins of the University observatory, and professor of astronomy, believes it is a "static universe," having no beginning or end and is not moving apart.

One current theory, known as the "big bang" theory, states that the universe began with a violent explosion of a primeval atom. Galaxies were formed from the gaseous debris and continued the same outward motion of the expansion caused by the explosion. In the end galaxies will be separated from one another, the stars will burn out and the universe will finish as a dark, changeless world.

Another theory, the "steady state" theory, also retains the idea of an expanding universe, but has one important difference. It holds that matter is being continually created.

These two theories are based on the red shift, the change in the color spectrum of heavenly bodies toward red when the body is moving away from the observer. This phenomenon, called the Doppler effect, has caused many astronomers to doubt the value of the observations and theories, Dr. Hawkins said. Its interpretation is open to doubt.

The second basis for the popular theories which also might be wrong, according to the astronomer, is the Hubble Law which shows that the expansion speed is directly related to the distance of the galaxy. Since

it is more dependent on the distance squared, a Doppler interpretation is no longer possible, he said.

Dr. Hawkins' "static universe" theory differs from the "steady state" theory by avoiding the concept of continuous creation. Matter, the scientist said, is continually being used and re-used. New stars and galaxies are formed from the decay of previous remnants. The universe is not expanding, there was no violent explosion at any time, the galaxies are not moving, and will not end in isolation, the scientist emphasized.

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## SPACE

## Personal Shielding Best Protection for Astronauts

► PERSONAL shielding closely surrounding each astronaut on a lunar mission will be the only means of providing adequate radiation protection during solar flares while at the same time keeping the weight of the space vehicle at a reasonable level, a General Electric space expert said.

Dr. George R. Arthur, of the company's Missile and Space Vehicle Department, in a paper given at a meeting of the Institute of Aerospace Sciences, presented complete systems designs of an early manned lunar spacecraft.

Included in the paper was an analysis of the radiation problem and the design of a collapsible shielding system employing aluminum, plastic and a water blanket. Solar

flares release clouds of protons which temporarily raise the level of radiation dangerous to man in space.

Dr. Arthur said if adequate radiation shielding were added to the walls of a spacecraft of the size being developed for the Apollo project it would add nearly 3,500 pounds, making it impossible for the rocket booster to perform the desired missions. Personal shielding for three men, he said, would add 1,200 pounds to the basic vehicle weight.

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## ASTROPHYSICS

## Craters of Moon May Have Water Supply

► A WATER SUPPLY locked in ice may be waiting in dark moon craters for the first astronaut landing on the moon.

Huge lakes of ice are believed present in the sunless craters of the moon's polar regions. However, scientists will have to wait for the first lunar landing to see if this is true, Russian scientists seriously noted, because of the present impossibility of peering into the dark craters.

At the lunar poles, the sun barely rises above the horizon, keeping the crater temperatures exceedingly low, Dr. V. D. Davydov, State Astronomical Institute, Moscow, said in reports received in Washington. Under these conditions, it would take billions of years to evaporate even a thimbleful of water.

"The presence of ice on the moon would make it possible to substitute important scientific instruments for water supplies on lunar spacecraft," the scientist concluded.

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## CHEMISTRY

## New Melting Point Found For Uranium Nitride

► NEW TESTS have shown the melting point of uranium nitride is 2,850 degrees centigrade ( $\pm 30$  degrees) instead of the previously accepted 2,630 degree ( $\pm 50$  degrees).

Robert Mulford and Bill Olson of the Los Alamos (N. M.) Scientific Laboratory reported achieving the higher melting point by conducting the experiment under a nitrogen pressure of at least 2.9 atmospheres.

The scientists said lower pressure permits the compound to decompose before it starts to melt. They believe the decomposition has previously been mistaken for melting. Both occur at about the same temperature when unpressurized.

Both uranium nitride and plutonium nitride have attracted interest recently as reactor fuels because they retain their solid state at much higher temperatures than the metals in pure form.

Uranium nitride, though discovered 20 years ago, had long been relatively ignored by most reactor experimenters. It is not difficult to make.

The Los Alamos chemists plan to explore plutonium nitride melting points when their present tests are finished.

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