aerospace

Options for the second Jupiter spacecraft

Pioneer 10 will arrive at Jupiter in December after a nearly two-year journey (SN: 2/24/73, p. 116). The back-up spacecraft (Pioneer G) will be launched to Jupiter between April 5 and April 26, 1973.

Pioneer G (Pioneer 11 after launch) will have a number of options. If Pioneer 10 is unsuccessful at Jupiter, Pioneer 11 will repeat its mission. If not, Pioneer 11 may fly a different course over the planet's surface, making measurements and taking pictures that will complement those of Pioneer 10. If, for example, Pioneer 10 gets a successful look at Io, one of Jupiter's moons that is about the size of the earth's moon, then Pioneer 11 may fly by another of the moons. Ganymede and Callisto are each the size of Mercury; Europa, like Io, is approximately the same size as the earth's moon. Pioneer 10 will have completed its swing by Jupiter when Pioneer 11 is just emerging from the asteroid belt. This will give engineers about ten months to decide how to change the flight of Pioneer 11 either to repeat or complement the mission of Pioneer 10.

After flying by Jupiter, Pioneer 11 may follow Pioneer 10 out of the solar system, or it may be sent instead into a solar orbit that would take it by Saturn in 1980.

High energy plans revised

The suspension of the High Energy Astronomy Observatory (HEAO) program by NASA for budget reasons (SN: 1/13/73, p. 20) brought a chorus of howls from cosmic-ray, gamma-ray and X-ray physicists. HEAO's A and B were to carry six tons of instruments each into earth orbit in the late 1970's to study emissions from pulsars, black holes, neutron stars and supernovas—the hottest objects in current astronomy. Now NASA has announced a plan to salvage the main objectives of HEAO. Under the scaled-down program, NASA will use smaller launch vehicles (Atlas-Centaurs instead of Titan 3C's) to put smaller payloads in orbit (about 2,800 pounds each) between 1977 and 1979. The first and second observatories will concentrate on X-ray emissions; the third will concentrate on gamma-ray and cosmic-ray emissions. NASA hopes the shuttle will then be able to pick up where the smaller observatories left off. The original HEAO program was estimated to cost $275 million; NASA hopes the little HEAO's can be done for one-half the cost. TRW Systems of Redondo Beach, Calif., is the prime contractor.

B-1 crew-escape module

The B-1 bomber under development by the Air Force and Rockwell International (formerly North American Rockwell) will have a crew-escape module designed to save four men from a crashing plane. The module will work over sea or land. The detachable crew compartment is now being tested at Holloman Air Force Base, N.M.

In case of in-flight emergency, the crew can ignite rocket engines underneath the crew compartment. One engine would blast the compartment free of the bomber. The second rocket would then put the crew compartment in a level attitude. Fins and a spoiler would deploy to stabilize the module until a parachute opened to bring the men down.

The module is being tested on the ground on rocket-powered sleds traveling about 600 miles per hour. Ejection tests of the module will come later as the sled moves down the track at speeds close to the speed of sound.

The first crew will fly the B-1 in April 1974.

physical sciences

Why is the universe isotropic?

The universe, as we see it now, is isotropic (the same in all directions) or almost so. The evidence for this is found in the microwave background radiation. This radiation comes to us from all directions, and appears virtually the same in all directions. As C. B. Collins and S. W. Hawking of Cambridge University point out in the March 1 ASTROPHYSICAL JOURNAL, if there were any large anisotropy or inhomogeneity in the universe it would show in the background radiation.

Collins and Hawking set out to discover whether an isotropic and homogeneous universe could evolve from arbitrary initial conditions in such a way that any anisotropy would die out with time. They find that in general this canunot be. Quite special initial conditions are necessary for a universe to develop toward isotropy as aeons of time go by.

This raises a philosophical question that cosmologists don't like to face: If special initial conditions are necessary, why did just those conditions occur? The question can be sidestepped by proposing that there are an infinite number of universes with all possible combinations of initial conditions, and ours just happens to be one.

The possible universes can be divided into three classes. Those that do not possess the escape velocity necessary to prevent recollapse disappear before galaxies are formed in them. In those that have more than the escape velocity, galaxies never form. Galaxies form only in those that have just the escape velocity, and these are also the only ones that tend toward isotropy.

A possible new interaction

Physics knows four fundamental interactions that give rise to the forces that affect bodies and govern the transmutations of elementary particles: the strong nuclear, the electromagnetic, the weak and the gravitational. An indication of something new in this domain now comes from the cosmic rays.

J. E. F. Baruch, G. Brooke and E. W. Kellermann of the University of Leeds report in the March 5 NATURE PHYSICAL SCIENCE that there is a discontinuity in high-energy ray spectra. The best interpretation, they say, is that there is a change in the parameters of high-energy interactions at 10,000 billion electron-volts. This could be either a new type of interaction or a radical change in one of the known ones.

Where are the Maffei galaxies?

The Maffei galaxies are two recently discovered objects that lie very nearly in the plane of our galaxy (SN: 1/16/71, p. 42). They have aroused interest because they have been suspected of being members of our cluster of galaxies and also of being bound gravitationally to each other in a kind of galactic binary system.

Optical observations of Maffei 2 are reported in the March 1 ASTROPHYSICAL JOURNAL by a group led by Hyron Spinrad of the University of California at Berkeley. The observations show that Maffei 2 is a galaxy of type Sbc II lying about 5 megaparsecs (about 17 million light-years) away, much too far to be a member of the local cluster. Maffei 1 has nearly the same redshift as Maffei 2, which would indicate that they are at the same distance. But putting Maffei 1 at that distance makes its brightness come out wrong for its spectral class. The inconsistency remains to be solved.

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