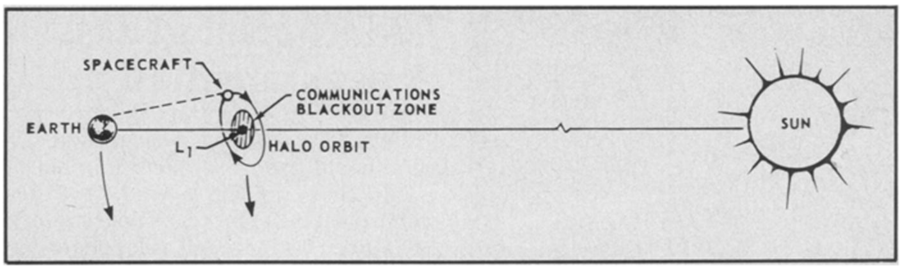
V. Yu. Petrumcin and V. A. Podlevskiy (Soviet Technical Physics Letters, Vol. 2, p. 296). Sixty meters is a conceivable length over which one might want to transport an electron beam for fusion purposes, but still maybe the Soviet government knows what it is being nervous about. The whole subject of particle beam weapons (SN: 7/23/77, p. 60; SN: 10/29/77, p. 281) is fraught with noninformation, deliberate misstatement, horror tales and spy-spook mystification. Still, it seems evident that the United States and the Soviet governments and possible others are thinking about them.

The idea of a particle-beam weapon is to produce a copious burst of energetic particles, be they electrons, protons, ions (or, as the Soviets now seem to be suggesting, neutral [?] particles), send them X kilometers through the atmosphere and zap! there goes your capital city ("biological target") or, more likely, zap! there goes your incoming cruise missile. Those in authority who call the idea a fairy tale usually stress the difficulties of inventing an engine to produce the particles in sufficient density and with sufficient energy and the difficulties of propagating the beam (some voices with the unassailable assurance that comes from years of giving commands have said "impossibility"). Yet there is ongoing research that can be brought to bear on these questions. Incidentally, the background gas through which the laser makes the path in the NRL experiments is air. ☐

Unusual orbit for sun-earth satellite

Around an invisible point, on an imaginary line, there is "the halo." It is not a definition in abstract topology, but the calculated path for a satellite whose planned orbit, according to the National Aeronautics and Space Administration, is "the most unusual ever proposed for a NASA space mission." The probe that on August 12 was launched toward the halo, furthermore, has an unusual job to go with its unique location: early warning system for two other satellites. Their paths too, in fact, are hardly conventional.

The goal of all this complexity is the coordinated study of the earth's complex responses to the equally complex outpourings of the sun. With emphasis on the "coordinated." Numerous satellites over the years have monitored various aspects of the sun-earth system, but they have done so for the most part "independently." How does the tail region of the earth's magnetic field, for example, respond to a burst of charged particles from the sun, compared with the response at the "bow shock" where the burst is striking the geomagnetic field head-on? To get data from their desired locations, researchers have often had to combine measurements from completely different solar outbursts, perhaps months or years apart.



NASA

One attempt to deal with this problem is a series of satellites known as the International Sun-Earth Explorers. Last October 22, NASA launched ISEE 1 and 2 aboard a single rocket that placed them in what amounts to a common orbit, chasing each other around the planet. Because the orbit is a radically stretched ellipse, varying from about 480 to 144,800 kilometers above the planet, the distance between the satellites changes—sometimes hundreds, sometimes thousands of kilometers. In addition, flight controllers at the NASA Goddard Space Flight Center in Maryland sometimes raise or lower the orbit a bit, so that the whole pattern of catching up and dropping back changes. A single solar burst reaching the earth can thus be monitored at two known — and adjustable — locations.

In order to best take advantage of such a system, it would be useful to have data on what is actually coming from the sun, before it is affected by the earth's presence at all. And so, last Saturday, NASA launched ISEE 3, bound for "the halo."

About one percent of the way along a line from the earth toward the sun is a so-called "libration point," where the gravitational influences of the two bodies (with slight corrections for other factors) are balanced. It is about 1.5 million km from earth, well sunward of the geomagnetic bow shock, and it is where ISEE 3 is heading for its sunwatch. The probe will arrive around Thanksgiving, but it will not settle right at the libration point, since that would put the probe in line with solar interference that would drown out the data being radioed to earth. Instead, ISEE 3 will be placed in the "halo" orbit *around* the line, so that it clears the line by about 120,000 km to the (ecliptic) north and south and about 640,000 km to either side. The halo orbit's inertia would normally cause the plane of the orbit to drift so that it was no longer perpendicular to the sun-earth line, so thrusters on the satellite will be used to make periodic corrections. There is fuel for about three years. Once on station, ISEE 3 will provide data to "calibrate" the responses reported by ISEE 1 and 2, and in some cases will even give scientists time to modify certain experiments aboard the earth-orbiting probes in preparation for whatever is coming from the sun.

The ISEE probes are part of the large, multi-year project known as the International Magnetospheric Study, which also includes other satellites and ground-based sensors. In addition, says U.S. IMS coordinator Robert Manka of NOAA, data from NASA Goddard are being used to alert IMS scientists in advance of useful alignments of as many as a dozen satellites (as if several will be strung out down the geomagnetic tail on a given date), enabling widely spaced, "timed" looks at the earth-sun system. ☐

Sherman to Austin: Pass the bananas

It has been clearly demonstrated that Washoe and other chimpanzees can use sign language to communicate with human beings (SN: 7/29/78, p. 72). Now psychologists at the Yerkes Regional Primate Research Center and Georgia State University report "the first instance of … symbolic communication between nonhuman primates."

"This simply shows that these [symbolic communication] processes are accessible to their intelligence," E. Sue Savage-Rumbaugh of Yerkes told Sience News. Prior to the experiments, "I didn't know whether they would pay any attention to one another's behavior," she said. But the results—reported with colleagues Duane M. Rumbaugh and Sally Boysen in the August 18 Science — illustrate that chimps can indeed communicate symbolically with each other.

The chimps — four-and-a-half-year-old Sherman and three-and-a-half-year-old Austin — first learned to identify symbols for individual foods. Each geometric symbol was embossed on individual keys of a keyboard. Depressing a key caused that symbol to appear on a screen above the keyboard.

Austin and Sherman then learned to ask for certain foods by pressing the corresponding keys. This was achieved by one of the researchers symbolically asking a chimp which food was in a certain container, and then giving him that food after correct identification was mastered. The second chimp learned the process from watching the first.

In a final progression of steps, Sherman and Austin learned to ask for, give and receive food from each other by using the keyboard system. In the last phase, the

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