

IT'S SCIENCE FAIR TIME

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Each title represents a project completed by at least one student. Some projects are so basic that they have been done by thousands of young people. Some are largely original.

The titles have been classified by subject matter using the Library of Congress classification system so you can more easily find out what you want.

A ready source of ideas for students at all age levels.

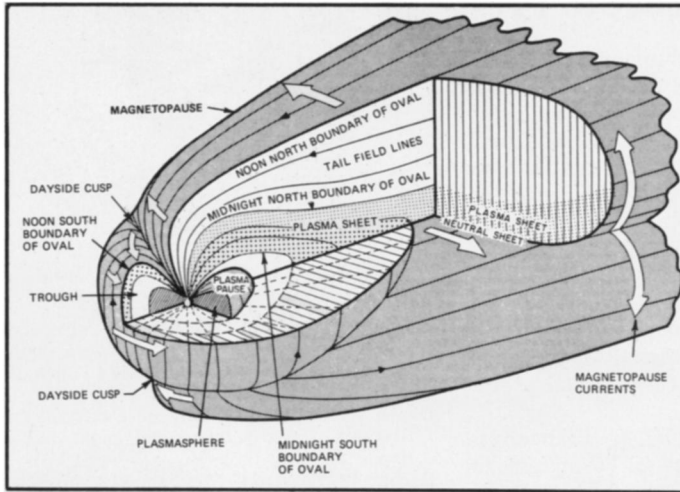
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Ten years of monitoring earth's magnetosphere



The ten-year program of IMP satellites has contributed greatly to the present picture of the earth's magnetosphere.

National Academy of Sciences

One of the United States' largest and most important scientific satellite programs begins its final leg next week with the launch, set for Oct. 25, of the tenth and last in the Interplanetary Monitoring Platform series, IMP-J. (The satellite will be renamed Explorer 50 upon achieving orbit.)

The IMP program was planned to study the patterns and changes in the radiation and magnetic fields surrounding the earth, throughout an entire 11-year cycle of solar activity. The particles and radiations that stream outward from the sun, some of them approaching the speed of light, cause major changes in the earth's space environment, many of them because of the ways in which the solar outpourings interact with the earth's magnetic field.

The first IMP was launched on Nov. 27, 1963, less than six years after the first U.S. satellite went into orbit and just before the beginning of the International Years of the Quiet Sun, a cooperative program to study the sun during the least active part of its cycle. It was an unimposing little octagon—at 138 pounds it included only 43 pounds of experiments and trickled data back to earth at a miserly 25 bits per second. By comparison, IMP-J is one of the heaviest science-oriented satellites in the sky, an 877-pound behemoth with 181 pounds of experiments and 64 times the data-sending capacity of its early ancestor.

One of the most important contributions of the IMP's has been the discovery and mapping of a growing list of complexities in the magnetic field of the earth. The field is not a simple sphere around the planet, since the solar wind pushes it into a shape more like a boat's wake, streaming outward from the sun. The numerous currents, counter-currents and repelling and attracting fields introduce additional subtleties, creating a confusing picture

that scientists are still struggling to understand.

The IMP satellites have revealed, for example, that magnetic lines of force moving in opposite directions have created a magnetically neutral area, called the neutral sheet, in the tail of the wake, and that in this neutral sheet are highly energized electrons which could be the source of radiation that contributes to auroras and also may replenish the Van Allen radiation belts.

Eight of the nine IMP's launched so far have been in orbits around the earth. The exception, IMP-E, was put in an orbit around the moon, where it revealed that the moon has a small but detectable magnetic field of its own. IMP-D was also supposed to have gone into a lunar orbit, but problems with the second stage of its launch vehicle gave it an extra kick that pushed it into a gigantic orbit more than 280,000 miles across and took in both the moon and the earth. Yet that misguided IMP turned out to be one of the most successful of the series; designed to operate for a year, it worked for more than five and provided the first mapping of the earth's magnetic tail outside the orbit of the moon.

The newcomer, IMP-J, will be aimed at a nearly circular earth orbit with a mean radius of about half the distance to the moon. A bonus is the fact that its predecessor, IMP-H, launched Sept. 22, 1972, into a similar orbit and still operating, will often be 180 degrees around the earth from IMP-J. This will enable, for example, the study of the effects of a single solar flare on both the day and the night sides of the earth.

An extension of the IMP program, with cooperation from the European Space Research Organization, is planned to begin in 1977. Called the International Magnetosphere Project, it will involve two earth-orbiting probes plus one on a path circling the sun. □

