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## The End of the Beginning

Voyager 2 journeyed 4 years from the warm sands of Florida to the icy environs of Saturn. Scientific specialists have been awed by the intricate and unexpected natural phenomena which characterize the Saturnian system, just as they were earlier bedazzled by Jupiter. Millions of others around the world have been carried along via instant global communications on this fantastic journey of the mind.

But a funny thing happened on the way to the outer planets. While the Voyagers functioned relatively smoothly in space, circumstances in their terrestrial birthplace were not so harmonious. Double-digit inflation combined with unprecedented interest rates painfully exacerbated the growing disparity between expectations and reality for middle-class Americans. NASA plans for a smooth transition to the reusable space shuttle were dashed by schedule delays and burgeoning costs. All planetary launches following the Pioneer/Venus Mission in 1978 became dependent upon timely development of the shuttle and upper stages.

Voyager 2 began its ambitious four-planet journey in August 1977. At that time Galileo, a long-duration Jupiter orbiter also carrying a sophisticated entry probe for direct atmospheric sampling, was firmly scheduled for launch this very month aboard shuttle flight 16. Two International Solar Polar Mission (ISPM) spacecraft, one American and one European, were planned to depart by shuttle in February 1983 on exploratory passages over opposite poles of the sun. By 1984, the Venus Orbiting Imaging Radar (VOIR) spacecraft was expected to map by radar the permanently cloud-shrouded surface of Earth's closest planetary relative. And even a daring rendezvous with the nucleus of Halley's comet in 1986 was contemplated.

What is the situation now? Galileo is the only remaining U.S. planetary project under development, its launch delayed until 1985. The U.S. ISPM spacecraft has been canceled outright and the launch of its European counterpart delayed until 1986. VOIR, deferred again last year until at least 1988, has come to resemble more the fading grin of a Cheshire cat than a serious national objective. Halley's comet will be investigated by spacecraft of the Soviet Union, Western Europe, and Japan—but not the United States. By these actions the United States unilaterally abandoned world leadership in planetary exploration, one of the 20th century's most uplifting and challenging technological and scientific enterprises. A brilliant burst of American imagination and energy, catalyzed by the Apollo decision, carried our senses and intellect inward to Mercury as well as outward beyond Saturn—but now has nearly run its course.

Our new challenge is to maximize the scientific and exploratory significance of the much more modest U.S. deep space activities projected for the 1980's. The Deep Space Net, which so skillfully captured Voyager's faint video signals from a distance of over 1 billion miles, steadily improves. New deep space missions still can materialize as long as they do not require increased launch-vehicle capability or strain the NASA budget. Opportunities for truly collaborative international deep space efforts may arise to replace symbolic and sometimes paternalistic arrangements of the past.

On a longer time scale, ambitious new missions to the moon and Mars can and should come about in response to the expanding capabilities and aspirations of many more peoples than just those of the United States and the Soviet Union.

During the next century, humankind's growing comprehension and utilization of our solar neighborhood are likely to make the events of the last two decades seem tiny in magnitude but large in historical import. While forgoing dominance, the United States can still make crucial contributions in a more internationalized era of space exploration. The readership of *Science*, especially, can help this uncertain nation once again look outward in space and forward in time. Perhaps our national expectations will again be rising 4 years hence when Voyager 2 reaches Uranus.—BRUCE MURRAY, *Jet Propulsion Laboratory, Pasadena, California 91109*

# Science

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BRUCE MURRAY

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