Dreams Are Maps: Exploration and Human Purpose
An Essay by Carl Sagan

Editor's Note: Former Planetary Society President Carl Sagan died on December 20, 1996 of pneumonia after a prolonged illness. This essay is reprinted from the September/October 1992 issue of The Planetary Report.

I know where I was when the Space Age began. In early October 1957, I was a graduate student at the University of Chicago, working toward a doctorate in planetary astronomy. The previous year, when Mars was the closest it ever gets to Earth, I had been at the McDonald Observatory in Texas, peering through the telescope and trying to understand something of what our neighboring world is like. But there had been dust storms on both planets, and Mars was 40 million miles away. When you're stuck on the surface of Earth, those other worlds, however tantalizing, are inaccessible.

I was sure that someday spaceflight would be possible. I knew something about the American rocket pioneer, Robert Goddard, and V-2 rockets, Project Vanguard and even Soviet pronouncements earlier in the 1950s about their ultimate intentions to explore the planets. But despite all that, Sputnik 1 caught me by surprise. I hadn't imagined that the Soviets would beat the United States to Earth orbit, and I was startled by the large payload (which, US commentators claimed, must have been reported with a misplaced decimal point). Here the satellite was, beeping away, effortlessly circling the Earth every 90 minutes, and my heart soared--because it meant that we would be going to the planets in my lifetime. The dreams of visionary engineers and writers--Konstantin Tsiolkovsky, Goddard, Wernher von Braun, H.G. Wells, Edgar Rice Burroughs--were about to be fulfilled.

Sputnik 1, in 1957, was the first artifact of the human species to orbit Earth. Mariner 2, in 1962, was the first spacecraft to explore another planet, Venus. These two achievements--one Soviet, the other American--mark a new age of exploration, a new direction for our species: the extension of the human presence to other worlds.

We have always been explorers. It is part of our nature. Since we first evolved a million years or so ago in Africa, we have wandered and explored our way across the planet. There are now humans on every continent--from pole to pole, from Mount Everest to the Dead Sea--on the ocean bottoms and in residence 200 miles up in the sky.

The first large-scale migration from the Old World to the New happened during the last ice age, around 11,500 years ago, when the growing polar ice caps shallowed the oceans and made it possible to walk on dry land from Siberia to Alaska. A thousand years later, we were in Tierra del Fuego, the southern tip of South America. Long before Columbus, people from

Borneo settled Madagascar, off the African coast; Indonesians in outrigger canoes explored the western Pacific; and a great fleet of oceangoing junks from Ming Dynasty China crisscrossed the Indian Ocean, established a base in Zanzibar, rounded the southern tip of Africa and entered the Atlantic Ocean. In the 18th and 19th centuries, American and Russian explorers, traders and settlers were racing west and east across two vast continents to the Pacific. This exploratory urge has clear survival value. It is not restricted to any one nation or ethnic group. It is an endowment that the human species holds in common.

At just the time when Earth has become almost entirely explored, other worlds beckon. The nations that have pioneered this new age of exploration are the former Soviet Union and the US--motivated nationalistically, of course, but serving as well as the vanguard of our species in space. Their combined achievements are the stuff of legend. We humans have sent robots, then animals and then ourselves above the blue skies of Earth into the black interplanetary void. The footprints of 12 of us are scattered across the lunar surface, where they will last a million years. We have flown by some 60 new worlds, many of them discovered in the process. Our ships have set gently down on scorching Venus and chilly Mars, returning images of their surfaces and searching for life. Once above our blanket of air, we have turned our telescopes into the depths of space and back on our small planet to see it all as one interconnected and interdependent whole. We have launched artificial moons and artificial planets, and we have sent four spacecraft on their way to the stars.

From the standpoint of a century ago, these accomplishments are breathtaking. From a longer perspective, they are mythic. If we manage to avoid self-destruction, so that there are future historians, our time will be remembered in part because this was when we first set sail for other worlds. In the long run, as we straighten things out down here, there will be more of us up there. There will be robot emissaries and human outposts throughout the solar system. We will become a multiplanet species.

We are not motivated by gold or spices or slaves or a passion to convert the heathen to the One True Faith, as were the European explorers of the 15th and 16th centuries. Our goals include exploration, science and technology, education, national prestige and a recognition that the future is calling. There is a very practical reason as well: We can take better care of Earth (and its inhabitants) by studying it from space and by comparing it with other worlds.

But whatever our reasons, we are on our way. We advance by fits and starts; there are detours and failures of nerve. In the long run, it's getting cheaper and easier to go into space, and there is progressively more for us to do there.

Only a handful of nations have access to space at the moment, but their number is increasing. France and China are now lifting commercial payloads for a profit. Japan and the European Space Agency, in 1986, mustered their first, extremely successful missions into interplanetary

space. There will be other spacefaring nations in the next few decades. Others may lose their determination and their vision, as did Portugal, which trailblazed the great sailing-ship voyages of discovery and then gradually sank into obscurity.

With the competitive impetus of the Cold War over, the Soviet Union having nearly disintegrated and the US facing grave fiscal and other domestic problems, it is conceivable that those nations that pioneered the early exploration of space will not be engaged in the enterprise when its real fruits begin to be harvested. But this need not be the case, and with a real dedication to international cooperation--trimming costs and pooling resources--I believe that the human species will be fully able to continue its exploring.

It has been my good fortune to have participated, from the beginning, in this new age of exploration; to have worked with those glistening Mariners, Apollos, Pioneers, Vikings and Voyagers in their journeys between the worlds, a technology that harmed no one, that even America's adversaries admired and respected; to have played some part in the preliminary reconnaissance of the solar system in which we live. I feel the same joy today in these exploratory triumphs that I did when Sputnik 1 first circumnavigated Earth, when our expectations of what technology could do for us were nearly boundless.

But since that time, something has soured. The anticipation of progress has been supplanted by a foreboding of technological ruin. I look into my children's eyes and ask myself what kind of future we are preparing for them. We have offered them visions of a future in which--unable to read, to think, to invent, to compete, to make things work, to anticipate events--our nation sinks into lethargy and economic decay; in which ignorance and greed conspire to destroy the air, the water, the soil and the climate; in which, with over 50,000 nuclear warheads still in existence, we permit a nuclear holocaust. The visions we present to our children shape the future. It matters what those visions are. Often they become self-fulfilling prophecies. Dreams are maps.

I do not think it irresponsible to portray even the direst futures; if we are to avoid them, we must understand that they are possible. But where are the alternatives? Where are the dreams that motivate and inspire? Where are the visions of hopeful futures, of times when technology is a tool for human well-being and not a gun on hair trigger pointed at our heads? Our children long for realistic maps of a future they (and we) can be proud of. Where are the cartographers of human purpose?

Continuing, cooperative planetary exploration cannot solve all our problems. It is merely one component of a solution. But it is practical, readily understood, cost-effective, peaceful and stirring. Like Tom Paine, I believe it is our responsibility to create a future worthy of our children, to fulfill the promise made decades ago by Sputnik 1 and Mariner 2, to open up the universe to those intrepid explorers from planet Earth.

Carl Sagan, the David Duncan Professor of Astronomy and Space Sciences and Director of the Laboratory for Planetary Studies at Cornell University, is a recipient of the Explorers Club 75th Anniversary Award "for achievements in furthering the spirit of exploration."