Carl Sagan’s Universe

Carl Sagan’s many contributions to science and society have been profound and far-reaching, influencing millions of people around the world. He carried out significant research in planetary science, was closely associated with the U.S. space program, created the highly acclaimed television series, *Cosmos*, and was the Pulitzer Prize-winning author of many best-selling popular science books. *Carl Sagan’s Universe* is a fascinating and beautifully illustrated collection of articles by a distinguished team of authors and covers the many fields of science, education, policy making, and related areas in which Sagan worked.

The book is divided into four sections, the first two of which provide an absorbing overview of the U.S. space program (as well as a complementary account of the Russian program) and of the history and current status of the search for extraterrestrial life. The final two sections deal with the importance of science education in the successful development of a technological society and of the shaping of science policy in tackling the problems facing us today. Also included is a separate chapter by Sagan himself, discussing the place and role of our planet and mankind in the universe.

Written in honor of Carl Sagan’s many achievements, this book will fascinate and reward anyone interested in planetary science and exploration, the search for extraterrestrial life, or the role of science in the modern world.
Carl Sagan’s Universe

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Preface

When Carl Sagan came to Cornell in 1968 he was young, brilliant, and ambitious; in this respect not so different from other new faculty members. But Sagan had an uncommon vision and well-defined purpose. He was fascinated by science and by astronomy in particular, and he believed that key questions concerning the origins of life and the existence of life elsewhere in the universe could be confronted by rational thinking combined with astute research and observation. He was further convinced that what he knew and believed, and what he hoped to discover, had to be effectively communicated to the public policy makers and indeed to the general public at large. He recognized that in a technological society (or in any advanced society, for that matter) science is critical for informed decision making.

For nearly three decades we watched Carl Sagan pursue his vision with great dedication and spectacular success. He played a leading role in the American space program since its inception. He briefed the Apollo astronauts before their flights to the Moon and was an experimenter on the Mariner, Viking, Voyager, and Galileo expeditions to the planets. He helped solve the mysteries of the high temperature of Venus in terms of a massive greenhouse effect; he explained that the seasonal changes on Mars were caused by windblown dust; and he showed that the reddish haze of Titan was due to organic molecules in its atmosphere. He was a consultant and adviser as well as an important spokesperson for the National Aeronautics and Space Administration (NASA) and the entire scientific community at congressional hearings and in the press. He brought public attention to extremely important environmental and other issues, such as the Nuclear Winter. He was one of the key scientists who organized and inspired programs in the search of extraterrestrial intelligence.

Sagan became a best-selling author the world over of books that popularize science and its significance for mankind. In 1978 he
received the Pulitzer Prize for *The Dragons of Eden*. In 1980 he presented the Public Television Series *Cosmos*, which was seen by 500 million viewers in sixty countries. This thirteen-part series broke all previous records in terms of viewers and had a great impact on people everywhere. It was a magnificent perusal of the birth and development of life, civilization, and science on Earth. The ensuing book, *Cosmos*, was on *The New York Times* bestseller list for seventy weeks and had forty-two printings in the American edition, plus thirty-one foreign editions.

Sagan was the best-known and most popular science writer and educator in this century. At Cornell a Sagan lecture filled any auditorium to capacity; there was fierce competition among students to register in his limited-enrollment classes. Many of the most productive planetary scientists working today were his former students and associates. He was a much sought after lecturer around the globe, not only because there was such interest in the subjects he discussed but also because of his extraordinary talents as a public speaker who could reach, educate, and indeed entertain any audience on Earth.

In 1980, Sagan and Bruce Murray formed The Planetary Society, dedicated to the exploration of our Solar System, the search for planets around other stars, and the quest for extraterrestrial life and intelligence in the universe; the Society, with Sagan as its first President, presently counts more than 100,000 members worldwide. What Sagan wrote about its goals best expresses his aspirations and personal philosophy: “to discover and explore new worlds, and to seek our counterparts in the depths of space – these are objectives of mythic proportions. They are now in the realm of sober scientific reality because of the enormous technological strides made in the last two decades. Pursuing these endeavors for the benefit of the human species is a mark of our dedication to a hopeful future.”

At sixty, Carl Sagan still remained the same relentless worker and dreamer he was as a young scientist. His books followed one another in rapid succession, and he was getting ready to produce a motion picture based on his novel *Contact*. In his laboratories experiments were being conducted, simulating the atmosphere of Jupiter, the conditions on Titan, and still others to learn more about the origin of life on our own planet.

To celebrate Carl Sagan’s sixtieth birthday, Cornell University organized a symposium dedicated to his work. This meeting took place in October 1994 at the Cornell campus and was attended by more than 300 scientists, educators, friends, and family from around the world. The papers presented in this volume were delivered in his honor during the symposium. The four general subjects, I. Planetary Exploration; II. Life in the Cosmos; III. Science Education; and IV. Science, Environment, and Public Policy, were discussed by an array
of distinguished speakers and demonstrate Carl Sagan’s interests and involvement during the last few decades.

Carl Sagan’s work has inspired and motivated countless young people around the whole Earth to pursue the sciences. During the symposium banquet, a young student from Niamey, Niger, Hamadou Seini, related how Sagan’s influence made him organize the “Carl Sagan Astronomy Club” in Niamey, and a young Cornell freshman, Baquera Haldri, expressed her attraction to science and Cornell due to Sagan’s work, Contact, with the words, “…In her hand, clenched tightly, was a tattered old paperback, yet within its pages was the most valuable story she had ever read – a tale of adventurers called scientists, of struggles and victories, of life, and of an unimaginable wonderful journey to a place not only without us all, but within us as well. And it was as if suddenly this young girl, longing all her life to touch those pinpricks of infinity, had made Contact.”

The Sagan symposium, whose proceedings appear in this volume, was sponsored by the Department of Astronomy at Cornell University, the New Millennium Committee of The Planetary Society, and PARADE magazine. We would like to thank Andrea Barnett, Sharon Falletta, and Laurel Parker for their cooperation and assistance, and Ann Druyan, Peter Giersch, and Ed Salpeter for their invaluable advice. We are grateful to Mary Roth for her expert transcription of the proceedings and her valuable help in editing.

Several months after Sagan’s sixtieth birthday, he was diagnosed with a rare disease, myelodysplasia. He fought the illness with never waning courage and optimism for nearly two years. On December 20, 1996 he died of pneumonia at the Fred Hutchinson Cancer Research Center in Seattle, where he had received a bone marrow transplant and a number of follow-up treatments.

Carl Sagan was buried in Ithaca on December 23, 1996. He was remembered and mourned around the entire globe. His family, friends, colleagues and all those he touched by his writings, lectures, speeches and television programs will deeply miss him for a long time to come.

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