

Carl Sagan (1934-1996): An appreciation

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Carl Sagan, astronomer, astrophysicist, author and director of the Laboratory for Planetary Studies at Cornell University, died of pneumonia on December 20, 1996 at the age of 62.

An accomplished scientist, he was best known for his ability to write and speak of complex scientific phenomenon in terms that could be understood by nonscientists. He was diagnosed in 1994 as having a disease of the bone marrow known as myelodysplasia. His death followed years of treatment, including three bone marrow transplants from his sister.

Sagan was born in 1934 in New York City. His father was a garment worker and his mother a housewife. In his most recent book, *The Demon-Haunted World*, Sagan attributes his great interest in science to his parents. He relates how his father taught him about the mathematical concepts of zero and infinity. Following what he calls an unremarkable high school education, Sagan attended the University of Chicago, where he studied physics, mathematics, chemistry and biology and, in 1960, received a doctorate in astronomy and astrophysics.

Although Sagan was raised in the Jewish faith, his application of the scientific method of thinking made it impossible for him to accept the existence of God or an afterlife. Even during his illness, Sagan remained true to his materialist conception of nature.

In a recent interview he discussed his illness and made the point that without chemotherapy and the bone marrow transplant from his sister, his illness would have been rapidly fatal. He had been near death numerous times and in each case his life had been saved by science.

Sagan's outlook was clear: medical progress had made bone marrow transplants possible and this development of science and technique was the sole factor enabling him to live as long as he did. This affirmation of a materialist and atheistic world view was a refreshing contrast to the frequent practice of attributing a successful outcome of treatment, resulting from the application of highly advanced medical procedures, to God's divine intervention, miracles or the power of prayer.

In a March 1996 essay in *Parade Magazine*, Sagan spoke of his illness. Referring to friends and supporters who had prayed for his recovery and asked how he could face death without a belief in God or an afterlife, Sagan concluded the essay with the following comment: "Many of them have asked me how it is possible to face death without the certainty of an afterlife. I can only say that it hasn't been a problem. With reservations about 'feeble souls,' I share the view of a hero of mine, Albert Einstein: 'I cannot conceive of a god who rewards and punishes his creatures or has a will of the kind that we experience in ourselves. Neither can I—nor would I want to—conceive of an individual that survives his physical death. Let feeble souls, from fear or absurd egotism, cherish such thoughts. I am satisfied with the mystery of the eternity of life and a glimpse of the marvelous structure of the existing world, together with the devoted striving to

comprehend a portion, be it ever so tiny, of the Reason that manifests itself in nature.'"

The power of human reason

These remarks at the end of his life typify the passionate conviction which Sagan maintained throughout his career in the power of reason, the ability of man to grasp objective truth, and the potential of the human race, through the development of science, to improve itself.

It is to his credit that Sagan defended these views at a time when the fashion within academic circles has been to question the presence of an objective world existing independently of thought, deny the possibility of real knowledge and discount the potential for social progress.

In the first chapter of *The Demon-Haunted World*, Sagan tells of his positive view of science: "Advances in medicine and agriculture have saved vastly more lives than have been lost in all the wars in history. Advances in transportation, communication, and entertainment have transformed and unified the world. In opinion poll after opinion poll science is rated among the most admired and trusted occupations, despite the misgivings. The sword of science is double-edged. Its awesome power forces on all of us, including politicians, but of course especially on scientists, a new responsibility—more attention to the long-term consequences of technology, a global and transgenerational perspective, an incentive to avoid easy appeals to nationalism and chauvinism. Mistakes are becoming too expensive."

Sagan's ability to expound on the wonders of the universe were based on his years of scientific research in the areas of astrophysics and astronomy. Author of over 100 scientific articles, Sagan was an adviser to NASA on the Mariner, Voyager and Viking unmanned space missions. He briefed astronauts on the Apollo missions to the moon.

He also made significant contributions in several areas of planetary science: He proposed that the light and dark areas on Mars were caused by hills and valleys created by windstorms, a view that was confirmed years later by the Mariner 9 Mars orbiter. He also wrote landmark studies of the structure of the lower atmosphere of Venus and the organic haze on Titan, one of Saturn's moons.

Work on the greenhouse effect

His early work on the atmosphere of Venus developed the idea of

the “greenhouse” effect to explain why the temperatures on Venus were so high. This work would later assist him in developing a model to show the effects of a nuclear war on the earth’s atmosphere.

In collaboration with others he proposed the theory of a “nuclear winter,” explaining that a nuclear war would create huge dust clouds that would block the sunlight and halt plant photosynthesis. This would be accompanied by drastic drops in temperature and the extinction of life on earth. Sagan became a leading spokesperson for organizations such as the Union of Concerned Scientists, which used the nuclear winter model to expound on the horrors of nuclear war and oppose the use and development of nuclear weapons.

His best known work and the one which catapulted him to prominence as a science popularizer was the television series “Cosmos.” In this 13-part program, first shown in 1980, Sagan traced the history of the universe from the time of the big bang up to the present. The series, which was viewed by over 500 million people in 60 countries and won an Emmy and a Peabody Award, was complemented by the book *Cosmos*, which he co-authored with his third wife, Ann Druyan.

In the closing narrative, Sagan compared the 15-billion-year duration of the universe to the 365 days of a year. If the big bang happened on New Years Day, dinosaurs would not appear until Christmas Eve and the written history of human civilization would begin only in the final seconds of December 31. Sagan pointed out that the dinosaurs ruled the earth for over 180 million years, but then disappeared. This was a warning to the human species that extinction was a distinct possibility.

While Sagan was not a Marxist, his materialist outlook on nature and his belief in the potential for social justice and human progress had a strong impact on his views on history. These convictions led him to greatly admire Leon Trotsky as a political figure and symbol of the struggle for historical truth.

In the chapter “Science and Witchcraft” in *The Demon-Haunted World*, Sagan discusses the witch trials that swept Europe in the Late Middle Ages and makes an analogy between them and the Stalinist regime in the former USSR. The Soviet witch hunters, he explains, used the same methods of superstition and terror.

Sagan, Trotsky and historical truth

Speaking of the ability of governments to manipulate and coerce public opinion, Sagan writes: “1984 was not just an engaging political fantasy; it was based on the Stalinist Soviet Union, where the rewriting of history was institutionalized. Soon after Stalin took power, pictures of his rival, Leon Trotsky—a monumental figure in the 1905 and 1917 revolutions—began to disappear. Heroic and wholly ahistoric paintings of Stalin and Lenin together directing the Bolshevik Revolution took their place, with Trotsky, the founder of the Red Army, nowhere in evidence. These images became icons of the state. You could see them in every office building, on outdoor advertising signs sometimes ten stories high, in museums, on postage stamps.

“New generations grew up believing that was their history. Older generations began to feel that they remembered something of the sort, a kind of political false-memory syndrome. Those who made the accommodation between their real memories and what the leadership

wished them to believe exercised what Orwell described as ‘doublethink.’ Those who did not, those old Bolsheviks who could recall the peripheral role of Stalin in the Revolution and the central role of Trotsky, were denounced as traitors or unreconstructed bourgeois or ‘Trotskyites’ or ‘Trotsky-fascists,’ and were imprisoned, tortured, made to confess their treason in public, and then executed.”

Further on, Sagan returns to the issue of Stalinist historical falsification and reports on his own efforts to oppose it: “But it’s hard to keep potent historical truths bottled up forever. New data repositories are uncovered. New, less ideological, generations of historians grow up. In the late 1980s and before, Ann Druyan and I would routinely smuggle copies of Trotsky’s *History of the Russian Revolution* into the USSR—so our colleagues could know a little about their own political beginnings.”

Smuggling the works of Trotsky into the Soviet Union was a courageous act that involved considerable personal risk. But Sagan felt it was his duty as a scientist to make known the advances of human reason in all fields, including history. He saw Trotsky’s history of the revolution as a weapon against the falsifications of Stalin and all those who attack reason and progress.

Sagan’s limitations as a thinker are characteristic of even the best representatives of science within capitalist society. Despite his tendency as a scientist to view history objectively, he failed to place human society within the context of his materialist outlook. Within the realms of physics and astronomy, he recognized the law-governed properties of matter, and the fact that man could understand these laws, and thereby predict the behavior of matter and consciously change the world in keeping with his needs.

But he never understood the existence of historical laws governing the development of human society and the central role of the class struggle as the means for achieving the types of changes which he himself professed. His view of society was that reason and logic would prevail. It was purely a matter of making the truth known.

It was here that his materialist view faltered and the common idealist conception crept in that thought is primary over matter. This in no way detracts from the contribution Sagan made as a proponent of a materialist outlook on the universe, but it does illustrate the ideological weight of capitalism on even some of the best scientific thinkers of our time and reinforces the significance of Marxism as the only consistent materialist philosophy.

Ultimately, what made Sagan an important figure was his strong foundation in the natural sciences; his opposition to a narrow, restricted view of science; his defense of the humanistic and democratic traditions stemming from the Enlightenment; his opposition to the reactionary trends of pseudoscience which preach religion, nationalism and chauvinism; his belief in historical truth; and a social conscience which led him to take progressive, often controversial stands in the defense of these beliefs.



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