

In 1971, the *Mariner 9* space-probe began orbiting Mars and transmitted to Earth photographs of a planet enveloped in the dust of a Martian storm. Astronomers, planetologists and geologists studying this phenomenon recorded that the surface temperature of the planet was lower than that of the dust in the upper atmosphere.

Drawing on this data, scientists, including the pre-eminent astronomer and author of *Cosmos*, Carl Sagan, determined that there might be similar effects on Earth should vast amounts of dust and smoke be released into the atmosphere as a result of volcanic eruptions, mass forest fires or a major nuclear exchange. Follow-up work, including scientific modelling, furthered the hypothesis that catastrophic cooling could occur on Earth in these circumstances.

In 1982, scientists Paul Crutzen of West Germany, and John Birks of the United States published the first major study of the effects of smoke generated by a nuclear war. They concluded that forest fires caused by a major nuclear exchange would emit hundreds of millions of tonnes of smoke which would severely reduce the amount of sunlight reaching the earth's surface.

Based on this study, a group of U.S. scientists and biologists undertook the first comprehensive analysis of the phenomenon which came to be known as Nuclear Winter. They examined not only the climatic effects of nuclear war but also, for the first time, possible biological effects and the impact on human life itself.

This study, *The Long-Term Atmospheric and Climatic Consequences of a Nuclear Exchange* (known as "TTAPS" after the initials of the names of the authors: Turco, Toon, Ackerman, Pollock and Sagan), became the basis for a major scientific symposium in April 1983 which brought the Nuclear Winter theory to international attention. A group of more than 100 scientists from the United States and other countries, reviewing the findings of the TTAPS study, declared their general agreement with the Nuclear Winter hypothesis.

A number of biological scientists then examined the potential impact of post-nuclear war conditions on the Earth's life-support systems. Discussing the effects on plant life, animal life, marine