

## COMMENTARY

### Comets and the Origins and Evolution of Life

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There is considerable debate concerning the role that extraterrestrial objects such as comets and asteroids (and associated dust) may have played during the early history of the Earth's biosphere. Such debate is founded primarily in our incomplete knowledge of such fundamental issues as the nature of organic chemical processes in space, the chemistry of comets and asteroids and the early terrestrial environment. In addition, however, it also reflects conflict over the dual nature of these bodies, as deliverers of organic and volatile inventories (Oró, 1961; Chyba *et al.*, 1990) and as destroyers, by impact erosion of terrestrial volatiles (McKinnon, 1989; Melosh and Vickery, 1989).

To examine current developments in this dynamic field, a conference titled 'Comets and the Origins and Evolution of Life' was held on September 30 – October 2, 1991, at the University of Wisconsin, Eau Claire. 55 scientists from 13 countries attended, presenting 37 papers.

The scope of the conference was to consider the role of comets in the origins and evolution of life, in light of new findings about the chemical nature of Comet Halley (Delsemme, 1988), the study of interplanetary dust particles (IDPs) (Anders, 1989), an improved understanding of plausible mechanisms of organic synthesis in meteorites and comets (Cronin *et al.*, 1988), progress in numerical simulations of cometary orbital evolution (Weissman, 1991), and models of comet impacts on the Earth (Chyba *et al.*, 1990). In addition, given the prospect of future close-up studies of comets such as NASA's Comet Rendezvous Asteroid Flyby mission (now canceled) and ESA's *Rosetta* mission, it seemed timely to discuss the contribution that spacecraft observations could make to this topic. A report on the meeting was published in a recent edition of *Science* (Marcus, 1991).

This special edition of *Origins of Life and Evolution of the Biosphere* contains eleven articles developed from presentations at that meeting that address a wide range of issues associated with the focus of the conference. Contributions include both theoretical and laboratory work on such topics as:

The origins of extraterrestrial organic molecules (and biomolecular chirality) in the interstellar medium.

Radiation processing of cometary interiors and hydrothermal concentration of organic material within asteroids.

Constraints on cometary organic molecules as candidates for terrestrial prebiotic chemistry from *Giotto* and *Vega -2* data for Halley.

A review of the importance of comets as deliverers of the terrestrial volatile and organic inventories.

Estimates of the survivability of organics during planetary accretion processes by experimental shocking of samples from the Murchison carbonaceous chondrite.

Examination of contemporary time scales for survival of interplanetary dust grains in the inner solar system with a view to discussing the deposition of organic dust on the early Earth.

A detailed discussion of sources and sinks for amino acids on the early Earth during the terminal stages of the Heavy Bombardment.

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