



# comment

## a microbiologist's view of astrobiology

A prescient 1964 essay by George G. Simpson discussed the possibility of life beyond the Earth and noted the “increasing recognition of a new science of extraterrestrial life, sometimes called *exobiology* – a curious development in view of the fact that this ‘science’ has yet to demonstrate that its subject matter exists!” It is now almost a decade since NASA scientists McKay *et al.* dramatically announced the discovery of ‘past life’ on Mars, evidenced partly by supposed fossils of micro-organisms in a Martian meteorite collected on Earth. The announcement unleashed an unprecedented media frenzy, but within 2 years, careful examination of the meteorite by expert scientists showed that the claims of McKay *et al.* could not be substantiated.

As the Mars microbe story deflated, NASA established a virtual ‘Astrobiology Institute’, which describes astrobiology as ‘study of the origin, evolution, distribution and destiny of life in the universe. Astrobiology represents a synthesis of disciplines – from astronomy to zoology, from ecology to molecular biology, and from geology to genomics’. This description, which has boundless dimensions, is obviously not the definition of a science.

Words beginning with ‘astro’ define subjects dealing with stars and celestial bodies. Since there is no biology of any kind known other than that on Earth, ‘astrobiology’ is an oxymoron. The word is designed to generate public excitement and interest, but conveys the false idea that life has actually been discovered in places other than Earth.

The subtitle of Simpson’s remarkable essay is ‘We can learn more about life from terrestrial forms than we can from hypothetical extraterrestrial forms’. Simpson stressed the need for experimental facts, not ‘improbability piled on improbability’. The NASA Astrobiology Institute now awards grants promoting studies on terrestrial micro-organisms that can grow under unusual physical and chemical conditions. The existence of such bacteria is exploited to fuel the tacit hope that there may have been organisms that once lived under the hostile conditions on Mars. Publicity from the Astrobiology Institute strongly implies that terrestrial extremophiles were discovered only recently. In fact, many such bacteria were isolated and characterized by microbiologists long before the Space Age. For example, the discovery, by Benjamin Volcani, of extreme halophiles (e.g. *Halobacterium*) in the Dead Sea in the 1940s. During the 1970s, Thomas Brock and others isolated and described several kinds of extremophiles, including a variety of thermophilic micro-organisms (see his important 1978 book).

References to the older literature on the extraordinary range of environmental conditions under which bacterial species can grow can be found in the classic book *Bacterial Metabolism* by pioneering British microbiologist Marjory Stephenson. The final paragraph of her book, published in 1949, notes ‘It is impossible to exaggerate the importance of the variability of the bacterial cell or

Is astrobiology really a science? Does it have anything to do with micro-organisms? **Howard Gest** gives his opinion.

*the desirability of studying the laws regulating it. Biochemically, bacterial cells are the most plastic of living material, even as compared with other micro-organisms. The bacterial cell, by reason of its small size and consequently relatively large surface, cannot develop by maintaining a constant chemical environment, but reacts by adapting its enzyme systems so as to survive and grow in changing conditions. It is immensely tolerant of experimental meddling and offers material for the study of processes of growth, variation and development of enzymes without parallel in any other experimental material.’*

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### Further reading

**Brock, T.D. (1978).** *Thermophilic Micro-organisms and Life at High Temperatures*. New York: Springer-Verlag.

**Kerr, R.A. (1998).** Requiem for life on Mars? Support for microbes fades. *Science* **282**, 1398.

**McKay, D.S. & others (1996).** Search for past life on Mars: possible relic biogenic activity in Martian meteorite ALH84001. *Science* **273**, 924.

**Simpson, G.G. (1964).** The non-prevalence of humanoids. *Science* **143**, 769.

**Stephenson, M. (1949).** *Bacterial Metabolism*, 3rd edn. London: Longmans Green.

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