

the planets from Venus to Neptune. In our simulation, we found that a few percent of the martian particles struck Earth, having typical transfer times of several million years; ALH84001's measured transfer age of about 15 million years is unusually long.

Although terrestrial bacteria are known to have survived in vacuum for several years (2), transit times of millions of years may preclude safe passage. Our simulations show, however, that a small fraction of martian ejecta launched just marginally faster than the martian escape speed could be found immediately on Earth-crossing orbits. Our simulations show that the rate of Earth deliveries was almost constant for the first 10^7 years, which implies that on the order of 1 in 10^7 of the martian meteorites that reached Earth could have spent less than half of an orbital period in space (less than a year). The dozen recovered martian meteorites, the majority of which have been on Earth for much less than 10^5 years, represent only a tiny fraction of all the pieces of Mars currently on our planet and, when one considers the much higher impact rate early in the solar system's history, an even smaller proportion of those that have arrived throughout Earth's history. Therefore, fast transfers (taking less than a year) from Mars to Earth must have occurred numer-

ous times during Earth's past. We leave to others an appraisal of the likelihood of survival of martian organisms in the rigors of space and their fiery entry through Earth's atmosphere. Because such an entry would hardly affect the center of a meteorite, terrestrial weathering would eventually have exposed the pristine interior. If martian microorganisms can survive a year in space, many may have already arrived.

Large impact events could also have liberated some pieces of Earth at high speeds and simultaneously could have cleared an atmospheric channel through which a few particles might have slipped to Mars. Our simulations show that about 0.1% of these rarely liberated terrene meteoroids could have found their way to Mars, but even fewer than 1 in 10^7 of these would have had rapid transfer times.

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References

1. H. J. Melosh, *Nature* **332**, 687 (1988); M. Moreno, *ibid.* **336**, 209 (1988); P. C. W. Davies, in *Evolution of Hydrothermal Ecosystems on Earth: Proceedings of Ciba Foundation Symposium No. 202*, J. Goode, Ed.

(Ciba Foundation, London, in press).

2. F. J. Mitchell and W. L. Ellis, in *Analysis of Surveyor 3 Material and Photographs Returned by Apollo 12* (National Aeronautics and Space Administration, Washington, DC, 1972), pp. 239-248; G. Horneck, *Nucl. Tracks Radiat. Meas.* **20**, 185 (1992).



Sociobiology's Successes

In a highlighted text box (Random Samples, 19 July, p. 315), the headline "‘Sociobiology’ to history's dustbin?" is placed over a photograph of E. O. Wilson. The "news" is thin: a specialist journal has changed its name.

Sociobiology was originally envisioned as the comparative, evolutionary study of the biological bases of social behavior, integrating traditional ethological approaches with new advances in population biology, behavioral ecology, demography, and life history theory (1). A few politically motivated critics then invented and promoted a caricature of the field, which they criticized as "sexist," "racist," and "determinist." In response, many researchers did indeed shrink from the label "sociobiology," but sociobiological research programs (by whatever name) have prospered.

One easily forgets, after 20 years, how



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profoundly the sociobiological synthesis has transformed the study of animal behavior and large parts of biological anthropology (3). More recently, it has influenced research in many other fields, including botany (4), reproduction and development (5), genetics and molecular biology (6), neurobiology and psychology (7), women's studies and political science (8), art and philosophy (9), and economics and law (10). Oddly, this vigorous interdisciplinary research enterprise remains largely defined in public consciousness by its detractors rather than by its practitioners.

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References

1. E. O. Wilson, *Sociobiology: The New Synthesis* (Harvard Univ. Press, Cambridge, MA, 1975).
2. N. Wade, *Science* **191**, 1151 (1976).
3. J. Alcock, *Animal Behavior: An Evolutionary Approach*, (Sinauer, Sunderland, MA, 1993); E. A. Smith and B. Winterhalder, Eds., *Evolutionary Ecology and Human Behavior* (Aldine/de Gruyter, Hawthorne, NY, 1992); L. Betzig, Ed., *Human Nature: A Critical Reader* (Oxford Univ. Press, New York, 1996).
4. J. Lovett Doust and L. Lovett Doust, Eds., *Plant Reproductive Ecology* (Oxford Univ. Press, New York, 1988); D. C. Queller, *Oxf. Surv. Evol. Biol.* **6**, 73 (1989); C. A. Dominguez, *TREE* **10**, 412 (1995); W. E. Friedman, *Proc. Natl. Acad. Sci. U.S.A.* **92**, 3913 (1995); S. C. H. Barrett and L. D. Harder, *TREE* **11**, 73 (1996).
5. M. E. Lamb, R. A. Thompson, W. Gardner, E. L. Charnov, *Infant-Mother Attachment* (Erlbaum, Hillsdale, NJ, 1985); K. B. MacDonald, Ed., *Sociobiological Perspectives On Human Development* (Springer-Verlag, New York, 1988); M. J. West Eberhard, *Ann. Rev. Ecol. Syst.* **20**, 249 (1989); D. Haig, *Q. Rev. Biol.* **68**, 495 (1993).
6. J. H. Werren, U. Nur, C.-I. Wu, *TREE* **3**, 297 (1988); D. Haig and C. Graham, *Cell* **64**, 1045 (1991); L. D. Hurst and R. F. Hoekstra, *Nature* **368**, 811 (1994); D. A. Shub, *Curr. Biol.* **4**, 555 (1994); T. Moore, L. D. Hurst, W. Reik, *Devel. Genet.* **17**, 206 (1995); M. B. Yarmolinsky, *Science* **267**, 836 (1995); T. Naito, K. Kusano, I. Kobayashi, *ibid.*, p. 897.
7. A. Bass, *Trends Neurosci.* **15**, 139 (1992); L. F. Jacobs, *TREE* **11**, 82 (1996); J. H. Barkow, J. Tooby, L. Cosmides, Eds., *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* (Oxford Univ. Press, New York, 1992); M. Hauser, *The Evolution of Communication* (MIT Press, Cambridge, MA, 1996).
8. P. A. Gowaty, Ed., *Feminism and Evolutionary Biology* (Chapman & Hall, New York, in press); L. Liesen, *Politics Life Sci.* **14**, 145 (1995).
9. E. Dissanayake, *Homo Aestheticus: Where Art Comes From and Why* (Free Press, New York, 1992); D. C. Dennett, *Darwin's Dangerous Idea: Evolution and the Meanings of Life* (Simon & Schuster, New York, 1995).
10. J. Hirshleifer, *J. Law Econ.* **20**, 1 (1977); G. S. Becker, *A Treatise on the Family* (Harvard Univ. Press, Cambridge, MA, 1981); K. Binmore, *Fun and Games: A Text On Game Theory* (Heath, Lexington, MA, 1992); G. M. Hodgson, *Economics and Evolution: Bringing Life Back into Economics* (Polity Press, Blackwell, New York, 1993); P. A. Corning, *J. Soc. Evol. Syst.* **18**, 421 (1995); R. Posner, *Sex and Reason* (Harvard Univ. Press, Cambridge, MA, 1992).

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