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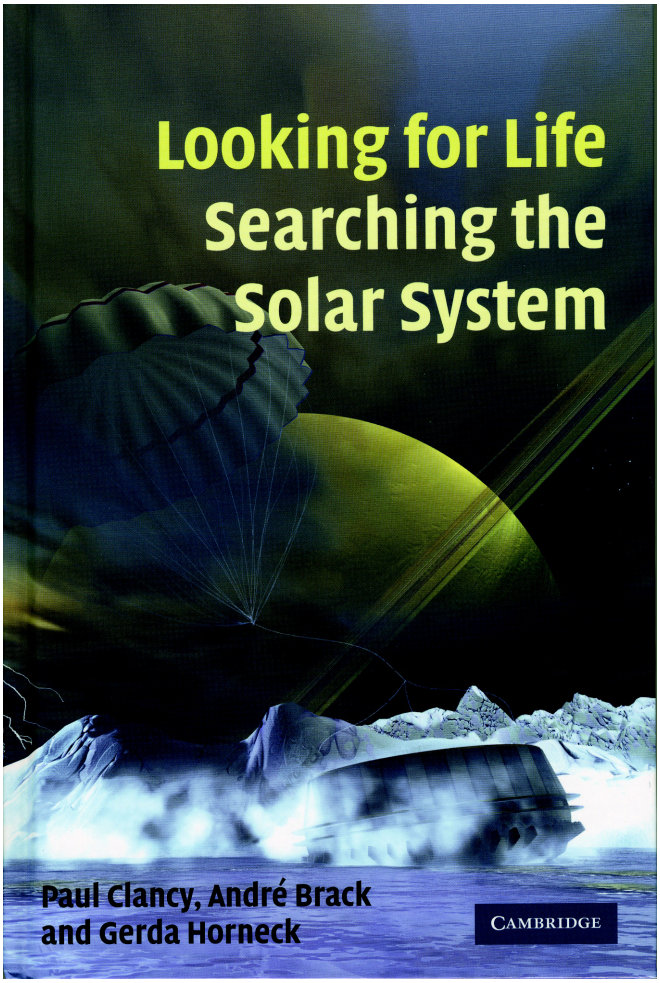
# Book Review

**Looking for life, searching the solar system** by Paul Clancy, André Brack, and Gerda Horneck. Cambridge: Cambridge University Press, 2005, 364 p., $40.00, hardcover (ISBN 0-52182-450-8).




In this book by a former strategic planner for the European Space Agency and two distinguished exobiologists, the authors share a passionate belief that the destiny of humanity is strongly linked to space exploration. In a free-ranging romp, the book is divided into five parts, encompassing exploration as metaphor, how to detect life, the roles of humans in the search for life, the cosmic biological imperative to explore, and "our cosmic destiny." Within these five parts are fourteen chapters, which appear in places to have been written independently by the three authors.

This book champions human exploration while downplaying colonization and embracing the ethical considerations for exploration "in a spirit of respect." However, they are also curiously ambivalent about the concept of terraforming Mars, which they claim is technically feasible (perhaps, but in the same sense that it is also technically feasible to move Mars closer to the Sun; it is hopelessly impractical because of the scale of the enterprise), yet seem unable to pass judgment on it. Here, the populist approach to this book comes out with apparently little input from the geological or atmospheric science disciplines that should acknowledge that terraforming Mars would be not only the ultimate abandonment of biological planetary protection but could also rapidly wipe out tell-tale clues in the geological record (geomorphological, geochemical, and mineralogical) that are our only hope for answering crucial questions about global climate evolution, conditions conducive to life, and biomarker evidence for extinct life.

In the opening chapter, Shackleton is lionized for his famous self-rescue after the failed attempt to cross Antarctica as "one of the greatest feats in the annals of exploration." Perhaps if "survival" were substituted for "exploration," this assertion might ring true. No mention is made of the superior planning and designs of Nansen, some two decades earlier, whose ship, the *Fram*, survived polar ice—unlike Shackleton's *Endurance*, which sank. The lesson learned, says Chapter one, is that the commander must provide outstanding leadership "far away from the ability of Earth-based Mission Control to influence events." Yet, the approach that NASA and ESA have repeatedly embraced is teamwork among the crew, meticulous pre-planning, and leadership and assistance by experts who remain on Earth. After all, it was Mission Control that saved Apollo 13. These approaches are intended to minimize the daring and risk-taking that characterized the valiant early explorers of our own planet. Of course, those explorations predated modern technical capabilities for long-distance communications, much less to launch an orbiter for reconnaissance. Exploration by robotic spacecraft has proven itself in recent decades to be safe and spectacularly effective. One has to agree with the authors that when we do place humans on Mars, the geologists and biologists in the crew should be able to conduct much more rapid and thorough exploration than possible today with remote-controlled robots.

To their credit, the authors come down on the side of sample return occurring before humans go to Mars, although they provide little to explain to the public the rationale that is

so obvious to most scientists. Also missing is the viewpoint of the "Safe on Mars" report (2002) by a National Research Council (NRC) study group, which discussed the quandary any future Mars explorers will face: even though human exploration may be the best hope for discovering life on Mars, astronauts may need to avoid areas with biological potential in order to prevent themselves from becoming carriers of alien organisms which conceivably could create a risk—albeit a most likely vanishingly small one—to the health or vigor of the terrestrial biosphere. The authors are worried for the astronauts themselves, without clearly acknowledging the perceptions of risk to the population back home.

This book became available in mid-2005, but a scan of the convenient reference lists reveals a concentration in many chapters on the literature of the 1990s. This may explain why the otherwise comprehensive overview of extremophiles cites an upper temperature limit for hyperthermophiles of 113 °C, whereas for several years now there have been reports of organisms at 120 °C. Even so, the quoted temperature is in conflict with a later statement that returned samples may have to be heat sterilized at only 105 °C, which is also far below the 135–160 °C values adopted for Apollo samples, Viking on-board sterilization, or by the most recent NRC survey on the subject.

Surprisingly, there is nary a quotation or reference to Carl Sagan, who almost single-handedly legitimized the search for life on Mars in the early days of exploration. Quoting instead predictions of bases around Jupiter within the next half century, utilization of helium-3 from the moon to cover the energy needs of the Earth, and biotechnology breakthroughs gleaned from martian extremophiles, there seems a penchant for the ideas of science popularizers who are non-expert in these fields, such as P. Davies, J. H. Holland, and R. Zubrin. The so-called Mars Direct concept of the latter (incorrectly attributed in part to me) is touted throughout the book, but paradoxically, the human Mars mission described is actually a more reasonable NASA mission concept, which stages the system from Mars orbit. Zubrin claims to save money by eschewing orbital operations, which necessitates launching a colossal rocket from the surface of Mars directly back to Earth, rather than a much smaller rocket with only a small capsule (think Gemini) to carry the surface crew safely back up to Mars orbit, thereby avoiding the huge mass penalty of needlessly transporting the food and life support systems for the long voyage back home down into and then up out of the deep gravity well of Mars. The assertion by the book that Mars Direct has "no serious contenders" overlooks dozens of studies during the past several decades that have considered numerous options for humans to explore the red planet.

Several chapters and appendices address the characteristics of life, approaches to its detection, and even an overview of some instruments. The second longest chapter provides a thorough discussion of interplanetary transport of organisms by meteoroid impact. Another chapter comprehensively discusses radiation hazards for human travel in deep space (later on, there is a vision of humans conducting drilling operations on Europa with no mention of its impracticality due to the horrendous bremsstrahlung doses from trapped energetic electrons in Jupiter's radiation belt).

This book avoids excessive complexity and has a reasonably comprehensive index, an appealing layout and typeface, and a non-imposing size. The color plates are a shotgun potpourri of past and future, although they could have benefited from more informative captions. If one is not so concerned about starry-eyed viewpoints on the approaches, timing, affordability, and practicality of human missions into deep space, this book provides a wide-ranging overview of a number of the issues. It may be difficult to find a survey that is more kaleidoscopic in its breadth yet includes some degree of technical detail, especially on selected topics relevant to the continuing search for past or present life in our solar system.

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