needs of the dying patient (or colleague) and their families. Beyond "greater awareness," however, the solution to this problem is not found in this book. It simply reminds us to consult with social work or psychiatry in order to mask our own deficiencies. Such consultation will not substantially improve the effectiveness of the physician in handling these issues.

For readers who are already interested in these topics, Safe Passage will be disappointing. It does not offer any sense that things can be better; it only reminds us that things are bad. This book will be most useful as a focus for discussion. Judicious selection of articles (e.g., "Compounding the Ordeal of ALS," "Doctors and Cancer Patients," and specific-issue essays) could provide physicians with a first step in the struggle toward meaningful change.

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The Mystery of Life’s Origin: Reassessing Current Theories. By Charles B. Thaxton, Walter L. Bradley, and Roger L. Olsen. New York, Philosophical Library, Inc., 1984, $14.95.

Most non-scientists who read the popular press, and probably even most scientists, believe that recent work demonstrating the production of essential amino acids by the action of energy on gases assumed to be in the primordial atmosphere has solved most of the problems of abiogenesis, the idea that living organisms arose from non-living chemicals by the action of natural laws that can be observed today. In particular, the work of Miller and Urey, using electric spark, and that of Harada and Fox, using thermal synthesis, are well known. Others have used ultraviolet light alone or in combination with heat as the energy sources.

To all who share the comfortable assumption that the scientific problems of abiogenesis are mostly resolved, this book will come as a real surprise. The authors have developed a critique of current hypotheses that is a synthesis of the concerns of many working in the field, combined with their own additional contributions. The essence of their critique is that

... in the atmosphere and in the ocean, dilution processes would dominate, making concentrations of essential ingredients too small for chemical evolution to be significant [p. 42].

The dilution processes referred to here include both the diffusion of small created quantities into the vastness of primordial seas and the action of destructive processes on those amino acids that are created.

The special problems leading to the conclusion of dilution include: (1) evidence that life appeared very early in the earth's history, providing only a relatively short time for chemical evolution; (2) the fact that destructive processes would tend to dominate over creative processes; (3) the possibility of thermal decay in the oceans, and (4) the presence of various chemical decay processes. The latter include: the hydrolysis of hydrogen cyanide to formic acid, the reaction of carbonyl groups with amino acids, various reactions with the many non-proteinaceous amino acids that would also have been formed, and the termination of growing polypeptides and polynucleotides by reactions with a variety of chemicals or by hydrolysis. The authors say, "... survival of
proteins in the soup would have been difficult, indeed” (p. 55) and “As with proteins, it is difficult to conceive of a viable nucleic acid existing in the primordial soup for more than a very brief period of time” (pp. 55–56).

One of the most striking concepts to this reviewer was the emphasis that most of the proposed creative mechanisms would, in fact, be both creative and destructive to abiogenesis and that the destructive actions would tend to dominate. For example, some theories postulate that ultraviolet light would also have been destructive to many of the early chemicals. If one postulates a different energy source (problematic in itself) and enough oxygen-ozone to prevent ultraviolet-induced chemical decay, there would have been enough oxygen to be destructive to many primordial chemicals through oxidation processes.

As a proposed solution to dilution-destruction problems, various concentration mechanisms are proposed, such as small concentrating ponds in areas protected from ultraviolet light with a heat source to speed up evaporation. However, such unlikely settings have problems of their own, and there is, apparently, no geological evidence for an organic prebiotic soup, either generally or locally (although evidence for such localized areas could easily have escaped detection to date).

Some of the most fascinating chapters are those on the thermodynamics of abiogenesis, which is probably not surprising, given the fact that the first author’s doctorate is in physical chemistry (the other two authors have doctorates in materials science and geochemistry). They state the results of the estimates of the required energy input per mole and conclude, “This trivial yield emphasizes the futility of protein formation under equilibrium conditions” (p. 142). They conclude that open system energy sources might be sufficient “...for doing the chemical and thermal entropy work, but clearly inadequate to account for the configurational entropy work of coding (not to mention the sorting and selecting work)” (p. 165). They believe there is a need to postulate some sort of a coupling mechanism, or the thermodynamic laws alone would probably rule out abiogenesis along the lines of any of the current theories.

The volume as a whole is devastating to a relaxed acceptance of current theories of abiogenesis. It is well written, and, though technical, much of the book is within the reach of the informed non-scientist. The book apparently has been well received by many who are working in the field of abiogenesis, such as Dean Kenyon and Robert Shapiro. The volume, however, has still another surprise for the reader, a philosophical epilogue in which several general theories of origins are considered: new natural laws, panspermia, directed panspermia, special creation by a creator within the cosmos, and special creation by a creator beyond the cosmos. This section was interesting, and provided information new to this reviewer, such as the strong position of Hoyle that “...Darwinism has failed to account for the origin of life and the development of terrestrial biology” (p. 196). Whether such a philosophical epilogue is appropriate or not must be left to the reader to decide, but, in any case, the philosophical questions are not introduced into the science portion of the text (which is 187 out of 217 pages). This book is reasonably priced and is strongly recommended to anyone interested in the problem of chemical and biological origins.

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