

## BOOK REVIEW

Klaus Dose and Horst Rauchfuss, *Chemische Evolution und der Ursprung lebender Systeme* (Chemical Evolution and the Origin of Living Systems), Wissenschaftliche Verlagsgesellschaft mbH, Stuttgart 1975, 217 pp., illus., in German, DM 56.-

Klaus Dose and Horst Rauchfuss must take great credit for writing the only recent comprehensive monograph in the German language on the intriguing subject of chemical evolution and the origin of living systems. An older and more limited text is the German edition of Oparin's original on the origin of life, while R. W. Kaplan's book *Ursprung des Lebens* deals with the problem from a more biochemical standpoint. It is somewhat surprising that this interesting research field has so far received little attention within the German-speaking scientific community in spite of the fact that quite a few fundamental ideas in the field were developed in German schools, for example, M. Eigen's or H. Kuhn's brilliant theories on evolution and Groth's and Suess' early experiments on simulation of chemical reactions occurring on the primordial Earth. To my knowledge there is not one specific course taught on chemical evolution, origin of life, or a related topic in German universities up to now; this again is hard to understand in the light of the fact that more and more material is being accumulated in the search for traces of chemical or biological evolution outside the Earth through new techniques in radiocommunications and direct space explorations.

The subject matter of the book is logically displayed for the reader in six chapters: (1) Historical aspects, (2) Cosmological aspects, (3) Geological-paleontological aspects, (4) Laboratory experiments on chemical evolution, (5) Laboratory experiments on the self-organisation of organic matter into prebiotic systems, (6) Recent ideas on the self-organisation and evolution of living systems. The book is not written for a general audience (it requires some basic scientific understanding, e.g. in organic chemistry, biochemistry, nuclear chemistry, radiation physics, etc.), but for the interested student and scientist, it may provide a stimulating introduction into an unconventional field of research, or for the initiated, an indispensable literature source. Without being an 'overperfectionist' (non-Germans claim this is a typical Teutonic character) a critical look at the chapters of the book raises a number of points worthy of comment.

The first chapter treating the history of the search for the origin of life is very amusing and should be read carefully because it links the philosophy with the 'dry science'. The chapter on 'cosmological aspects' is well written; this is to be appreciated particularly since the material is very complex and presents a number of questions which challenge and will challenge the skill and phantasy of astronomers and astrophysicists. Concerning our Sun, one should be aware of the latest results obtained with the help of the largest radio-telescope, which show quite different data on surface temperatures and dynamics of the Sun (Hachenberg *et al.*). Discussing possible biotic structures outside Earth Mars merits a little more attention, since recent measurements suggest the (previously unexpected) existence of large amounts of solid water associated with frozen CO<sub>2</sub> at the polar caps. If the poles have ever been melted, even for only short geological periods, liquid water (a prerequisite for chemical evolution) would have been available. At this moment Viking space probes are on their way to Mars for sampling biotic-like material. While Jupiter has no surface in the usual sense of a *solid* lithosphere and Venus' atmosphere seems to contain large amounts of sulfuric acid, many scientists agree that Earthlike evolutionary processes could have taken place on the Outer Planets. Discussing the possibility of chemical/biological evolution outside Earth one wonders why the volume entitled *Exobiology* edited by C. Ponnampuruma has not been cited. Sagan describes there a mathematical formula estimating the probability of ever discovering living matter in the universe, which must be relevant to the discussion. On p. 97, Bahadur's work is referred to without any comment: how could Bahadur succeed in synthesising aminoacids from formaldehyde and FeCl<sub>3</sub> with the help of natural sunlight and without N-source? A few more critical comments to some experiments would have been appreciated in other places of the book, too. It is deeply regretted that the problem of optical activity in nature has been treated on 1½ pages only! Since I believe this to be a key point in the whole subject of chemical evolution, it can hardly be justified to review only very few selected papers dealing with this topic. The impressive increase of articles in recent years concerning the phenomenon of chirality may prove this point. The above criticism applies again for the citation of the work of Degens *et al.* reporting an asymmetric polymerisation of aspartic acid. Although it seems at first sight quite logical that evolution started with the synthesis of small molecules and proceeded then to larger and larger entities, C. Matthews presents quite startling arguments that the sequence of events could have been reversed: he claims that the polymers were formed first and thereafter released the monomers through secondary hydrolytic reactions. In the chapter on the self-organisation of organic matter the work of P. Decker has been completely ignored, although he contributed some beautiful ideas to the field.

The care with which the book of Dose and Rauchfuss is made up is documented clearly in tables like the one entitled 'model experiments in prebiotic synthesis of micromolecules' which is of great help for the reader interested in the original literature. I think the review of Eigen's and H. Kuhn's theories on evolution in the last chapter of the book is excellent.

I wish the book the widest distribution in order to make many readers familiar with the intellectually attractive search for the 'origin of life', an extremely relevant question from a pure philosophical as well as scientific-technical standpoint. Futurists may want to obtain information from this field about general trends for extrapolating evolution into the future. It is a pity that the publisher chose such high quality glazed paper and expensive covers such that the price will probably be an obstacle for many students in German universities. I would like to ask the publisher why he did not prepare an inexpensive paper-bound edition: I am convinced his object was not merely to line the shelves of distinguished professors, but rather that the book be read and used by a readership as diverse in interest and income as possible.

*Jülich*

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