BOOK REVIEWS

Mars and the Development of Life, Anders Hansson, Second Edition, John Wiley and Sons. xx+208 pp., £19.95 paperback, £45.00 hardcover.

This book is a 1997 update of information about the planet Mars, exploration of Mars, possible life on the neighboring planet and a number of other topics about the solar system, and the origin of life. Packing all of this into 218 generously illustrated pages, of necessity, makes this a collection of essays and mini reviews of relevant material. Chapter 1 includes a chronology of past Mars missions and a discussion of the Viking results. This is followed in Chapter 2 by a somewhat conventional discussion of biogenesis. Chapters 3 and 4 deal with a series of biophysical perspectives. Chapters 5 and 6 are a somewhat speculative discussion of clay and water. The remaining chapters then move to Martian life, real and virtual, past and future. The book concludes with a discussion of policy and politics of Martian exploration and future uses of the planet.

This is an evenhanded review as the author weaves his way through often very divergent views. Since much of the science is, of necessity, uncertain it is well to have all views represented. The subject material is in a state of rapid flux so that this work stands as a current report. One might think of it as a Mars Almanac, a function which its serves well. Hansson is an advocate for the future of the study of Mars, and his enthusiasm shows through in every chapter. For anyone wanting to know, what's new on Mars, this book is a good place to begin.

HAROLD J. MOROWITZ
George Mason University

Chemical Evolution: Physics of the Origins and Evolution of Life, Proceedings of the 4th Trieste Conference on Chemical Evolution, Trieste, Italy, 4–8 September 1995. Kluwer Academic Publishers, 1996, $190.00 (US)
Edited by Julian Chela-Flores and François Raulin.

The 4th Trieste Conference on Chemical Evolution which took place in September 1995 was dedicated to the memory of Cyril Ponnamperuma. It was really a nice gesture to dedicate the symposium to a scientist who showed so many captivating

qualities. He was a preeminent member of the first generation of pioneers who opened the experimental approach of the origin of life and exobiology. Originally from a country lacking in strong scientific traditions, he spent much time and energy promoting science within the Third World. He initiated the Trieste Conferences on Chemical Evolution and the Origin of Life and co-organized the first three events. Excerpts from letters read at the conference and addresses from scientific academies and foundations of which Cyril was a member are presented in the last chapter and testify the worldwide influence of Cyril Ponnamperuma.

The scientific contributions to this volume are assembled into ten sections. The physical aspects of the origin of life was chosen as a general guideline. This is not an obvious way to arrange the papers since the real continuity is given through the chemical nature of organic compounds. In Section 1, two pioneers in the field, Juan Oro and Sidney Fox, have been honored. Juan Oro retraces the whole story from the Big Bang to life in the Universe with his usual talent. Sidney Fox gives the history of the thermal copolyamino acids. Everybody in our scientific community will mentally temper Sid's enthusiasm when reading the chapter. However, for readers not very well up on the subject, claims that thermal polymers can carry out the crucial act of self-organization to cells having the essential properties of protoneurons could be misleading , if taken literally.

In Section 2, entitled 'Origins', George Coyne brings arguments for a Universe in evolution, including Big Bang cosmologies. Mayo Greenberg and Aigen Li present interesting IR absorption features analogies between the diffuse cloud interstellar dust and laboratory photoprocessed low temperature ices exposed to long term solar ultraviolet radiation in Earth orbit. The model core-mantle particles proposed for interstellar dust along with the possible presence of chiral organic molecules and the fluffy structure, may provide an adequate environment for prebiotic chemical evolution within the comet dust particles. The paper by Jean Schneider on strategies for the search of life in the Universe closes this broad section of the book. The author enumerates requirements to help define what could be recognized as life and describes tools to detect habitable planets.

Section 3, 'From geophysics to prebiotic chemistry', contains a diversity of contributions including the description of the West Greenland oldest fragmentary record of terrestrial surface environments (S. Moorbath and M. Whitehouse), a review on clays as natural catalysts in prebiotic processes (A. Negron-Mendoza, G. Albarran and S. Ramos-Bernal), an inventory of transient and stable molecules in chemical evolution (Mohindra Chadha) and the role of lightning associated to Archean volcanic ash-gas clouds in prebiotic synthesis (R. Navarro-Gonzales, V. Basiuk and M. Rosenbaum).

Section 4 presents physicochemical aspects of the origins of life. The bioenergetics of inorganic pyrophosphate and of adenosine triphosphate in biological energy conversion and in prebiotic evolution are outlined by Herrick and Margareta Baltscheffsky. According to M. S. Kritsky, M.G. Vladimirov, V.A. Otroshchenko and V.A. Bogdanovskaya, pyrite minerals could have participated in the synthesis

and evolution of organic matter via electrochemical processes. In a paper entitled 'Thermal peptides as the initial genetic system', Aristotel Pappelis and Sidney Fox argue that self-ordering of amino acids during the thermal protein synthesis resulted in the first genetic system when thermal proteins self-organized to form protocells. According to Benoît Prieur, the formation of RNA occurred by chelation of the sugars with heavy cations. In the following paper, the author gives a possible synthesis of fatty acids from sulfur ylides.

Section 5 contains general biophysical aspects of the origins of life. In 'Oxygen and the rapid evolution of life on Mars', Chris McKay speculates that Mars may have been more readily oxidized than the primitive Earth, thus accelerating oxygenic photosynthesis, endosymbiosis and multicellularity. In 'First steps in eukaryogenesis', Julian Chela-Flores discusses the origin and evolution of chromosome structure with a special attention devoted to chromosome inactivation. Joseph Seckbach presents open questions in eukaryogenesis and proposes that some unicellular primitive algae may have been among the nucleated pioneers. The three following papers concerns the thermodynamic approach of the origin of life. Georgi Gladyshev presents a macrothermodynamic model describing the evolution of supermolecular structures and chemical composition of living objects in the course of ontogenesis and at long periods of biological evolution. Koichiro Matsuno suggests that a process enhancing energy concentration locally in addition to that of synthesizing prebiotic molecules could have constituted an evolutionary significant event on the primitive Earth. Finally, L. Moiseeva elaborates on open catalytic systems to understand the early stages of the emergence of life.

Section 6 is devoted to the very important problem of biomolecular chirality. David Cline discusses possible physical origins of homochirality (one handedness) in life including fundamental interactions, amplification through bifurcation processes and the possible influence of these effects in presolar dense molecular clouds. Curiously, the two following papers have no direct connection with chirality. J. Wu, H. Jin and W. Wenqing describe the two excited states obtained when tributylphosphate is subjected to photolysis, gamma-radiolysis and pulse radiolysis and their possible role in chemical evolution. For Yu-Fen Zhao and Pei-Sheng Cao, the co-evolution of nucleic acids and proteins was achieved through the self-assembly of N-phosphoamino acids in the presence of nucleosides. Chirality reappears in the last paper by A. Bakasov, T.-K. Ha and M. Quack who propose an improved ab initio calculation of the parity violating interaction energy in chiral molecules. They obtain energies 1-2 orders of magnitude larger than those obtained with the previous calculations.

Evolutionary aspects are presented in Section 7. In a paper entitled 'Prebiotic chemical evolution and Darwinian revolution', Frederick Eirich proposes a model scenario reconstructing a plausible sequence of events supposed to have begun in the prebiotic era and led to the development of cells capable of Darwinian evolution. Model scenarios are always a little bit frustrating for a bench chemist because their authors just added what they need, when needed. In the

second paper, Florence Cerceau-Raulin presents 'la Grande Galerie de l'Evolution' in Paris. Wonderful example of science popularization, its description is refreshing. Two papers deal with information theory in Section 8. In 'New approaches in mathematical biology: information theory and molecular machines', Thomas Schneider uses classical information theory to study genetic systems. K. Tahir Shah, in 'Information-processing genes: Molecular biology in the computational paradigm', reviews various models of information processing by macromolecules and presents progress in the model of information processing genes. After several attempts to understand these two papers, the reviewer must confess that he is unable to judge their pertinence.

Some relaxation after the two preceding papers is provided in Section 9 which offers two straight forward papers on 'Communications'. Frank Drake recommends important technological improvements of SETI systems including the Project Phoenix. Jean Heidmann proposes that crater Saha on the farside of the Moon be protected as dedicated implementation zone for SETI.

Section 10 is devoted to instrumentation in exobiology and Mars exploration. Francois Raulin and 8 co-authors present the Cassini-Huygens mission to Titan and the Rosetta mission to a comet aimed to study large-scale organic chemical processes which take place in their natural environment. The search for homochirality is documented by Alexandra MacDermott and 19 co-authors. The chemical exploration of Mars is studied by three Japanese laboratories. A strategy for the detection of bioorganic compounds on Mars is proposed by Kensei Kobayashi and 4 co-authors while the Martian soil analysis is described by Y. Ishikawa, K. Kobayashi and T. Saito.

In summary, the book has both scientific interest as well as a sentimental character because of Cyril Ponnamperuma. The scientific interest is not always topical and the referees should have been more critical in some occasions. The book cannot be read straight forward as one would a mystery thriller because of its organization, several topics being often mixed together. Nevertheless, it constitutes a helpful vehicle for the broad scope of scientific information contained in most of the papers.

ANDRE BRACK
CNRS, Orléans, France

Read an article about life on Mars to practise and improve your reading skills. Do the preparation task first. Then read the text and do the exercises. Preparation. Reading text. A new study published in the journal Science shows definitive evidence of organic matter on the surface of Mars. The data was collected by NASA's nuclear-powered rover Curiosity. It confirms earlier findings that the Red Planet once contained carbon-based compounds. These compounds â€“ also called organic molecules â€“ are essential ingredients for life as scientists understand it. The organic molecules were found in Tough Place for Life. At this time, Mars' surface cannot support life as we know it. Current missions are determining Mars' past and future potential for life. 10. Rusty Planet. Mars is known as the Red Planet because iron minerals in the Martian soil oxidize, or rust, causing the soil and atmosphere to look red. Humans to Mars. Robots Blaze the Trail for Humans on Mars.Â And in the 2014 novel and its 2015 movie adaptation, "The Martian," botanist Mark Watney is stranded alone on the planet and struggles to survive until a rescue mission can retrieve him. Kid-Friendly Mars. Kid-Friendly Mars. Mars is a cold desert world. It is half the size of Earth. Mars is sometimes called the Red Planet. It's red because of rusty iron in the ground. Why travel to Mars? More habitable worlds than Mars have been discovered outside our solar system. TRAPPIST-1, the system boasting seven planets which can all potentially support life, is 39 light years away.Â Mars has always been the destination of choice in pop culture, and the same is true in real life. A journey to the planet would take approximately six months using current spacecraft, if both planets are aligned properly for the shortest possible journey.Â Lee adds that a number of other highly popular crops and plants canâ€™t be grown fast enough for demand, and we are going to need to turn to synthetic foods to make up the difference. The final option to ensure there is food on the planet is probably the most ambitious: to change Mars from a red planet to a green one. The scientific exploration of Mars might yield results of extraordinary importance for our own planet, particularly the search for extant or fossil Martian life, which would make it possible to understand terrestrial life in a more profound way. This potential scientific treasure places on us an ethical obligation to minimize the disruption of the Martian environment until our scientific exploration has been greatly advanced. We also have ethical obligations to the human scientific explorers of Mars, ethical obligations that require a series of scientific investigations, e.g., about how the lo Facts about Mars. Mars is the fourth planet from the Sun and last of the terrestrial planets and is around 227,940,000 km from the Sun. The planet is named after Mars, the Roman god of war. It was known to the ancient Greeks as Ares, their god of war.Â Mars experiences huge dust storms â€“ the largest in our solar system. This is due to the elliptical shape of the planetâ€™s orbit path around the Sun.Â With the exception of Earth, Mars is the most hospitable to life â€“ a number of space missions are planning for the next decade the further increase our understanding of Mars and when it has the potential for extraterrestrial life, as well as whether it may be a viable planet for a colony. Martians, also known as extraterrestrials from Mars, are a common character in science fiction books and movies.