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Books and Multimedia Reviews

Chemical Dynamics in Extreme Environments, Volume 11 of Advanced Series in Physical Chemistry edited by Rainer A. Dressler. World Scientific Publishing Company, Singapore, 2001, 632 pp., $126.00 hardback (ISBN 9810241771).

Editor Rainer Dressler has collected a diverse ensemble of knowledgeable authors to assemble this new volume in World Scientific's *Advanced Series in Physical Chemistry*. The work is deliberately and successfully interdisciplinary in nature, and will appeal to a wide range of basic and applied researchers, with applications to chemistry, geology, plasma processes, propulsion, atmospheric entry, cryogenics, detonations, advanced materials, lasers, combustion, and the full range of planetary sciences.

The author list includes chemists, physicists, and engineers, with a total of 21 contributors from four countries. They provide the reader with 11 chapters of technical material, a brief glossary, and an extensive list of references (over 1600 total). Chapter content includes cluster impact activation, nonequilibrium chemistry modeling in rarefied hypersonic flows, chemical laser dynamics, complex combustion mechanisms, meteoritic chemical dynamics, hypervelocity gas/surface collisions, surface chemistry in the jovian environment, atomic-oxygen-induced polymer degradation, thermal barrier coatings, and detonation simulation. While it is unlikely that a single reader will access all chapters to equal extents, the selection of material is so broad that any researcher in these fields will find this a valuable reference, and can expect to benefit from the diverse nature of the work and the range of approaches to the scientific issues involved.

Sections devoted to chemical dynamics at high temperatures and pressures includes applications to re-entry vehicles, meteor entry, planetary atmospheres, propulsion, aurorae, and detonations, while low-temperature and pressure topics apply to inverse Arrhenius dependence, zero-point energy, superfluid helium, and solid hydrogen. Non-equilibrium processes and modeling are featured throughout the work. Of course, this diversity makes an extensive expert review somewhat difficult.

This volume could also serve well as an educational text for advanced level courses in the sciences and engineering. While there is great breadth to the subject material covered, there is sufficient depth within each specialized chapter to render the text a valuable reference, even for those readers who already possess significant expertise.

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Storms in Space by John Freeman. Cambridge University Press, New York, New York, USA, 2002, 139 pp., $27.95 hardcover (ISBN 0-521-66038-6).

In the foreword to *Storms in Space*, George Siscoe says that John Freeman has done the impossible—he "has written a book about space weather that's a fun read". Space weather might not be everyone's cup of tea, but a reader might be excused for wondering why a fun book about space weather would be impossible. The problem, according to Freeman, is that the majority of the phenomenon is invisible, so that little progress could be made in understanding it until the space age, which for the first time allowed scientists to probe the upper atmosphere and the region of space around the Earth that is permeated and controlled by Earth's magnetic field. This magnetically controlled region, called the magnetosphere, contains the van Allen radiation belts discovered by James van Allen in 1959 using instruments aboard *Explorers 1* and *3*, the first US orbiting satellites. Subsequent space probes have revealed additional parts of the magnetosphere, including a magnetic "tail" that stretches away from the Sun out to distances far beyond the orbit of the Moon. The magnetosphere itself is immersed within the so-called solar wind, composed of ionized hydrogen and helium streaming hypersonically outward from the Sun. The existence of a solar wind had been inferred even prior to the space age, from theoretical predictions and from the observation that a solar wind would explain why comet tails always point away from the Sun, but it was first measured in 1962 by the interplanetary space probe *Mariner 2*. It is the interactions among these three invisible players—the Earth's upper atmosphere, the magnetosphere, and the solar wind—that drive the phenomena of space weather. The challenge that Freeman has undertaken is to unmask these players and reveal their secrets to the book's intended readers.

These readers are mainly dwellers in the mid-latitudes who rarely have an inkling of storms in space. Most have never witnessed an aurora—eerie dancing glows in the sky, an example of which is illustrated on the cover of the book. These visible signs of the space weather interactions, however, are as familiar to dwellers in the polar regions of the Earth as the stars of the night sky. Auroral displays have puzzled and amazed humans since prehistory. The Inuit and other arctic inhabitants were not only awed but often terrified—was the aurora a pathway for the dead to heaven? Portents of doom? Signs of firelight from the edge of the world? Reflected light from ice crystals in the sky? Nineteenth-century European polar explorers, upon first seeing auroral displays, felt overwhelmed, like Charles Hall who wrote, "Who but God can conceive such infinite scenes of glory?"