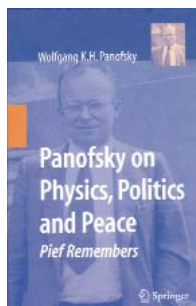


project. However, I would have liked more discussion of what motivated the important choice of linac energy, which set the scale of the SLAC construction project. As history later proved, that choice, like most of Pief's other decisions, was remarkably wise.

Moving beyond approval of the SLAC construction, Pief details its organization and the many challenges—mostly technical, but also political and administrative—that were encountered in the building of the accelerator and the large spectrometers needed for the research. He managed to attract an outstanding staff of not only accelerator builders but also research scientists. He clearly took a highly active role in solving some of the technical problems. In later chapters, Pief discusses some important results of SLAC research, which led to several scientists receiving Nobel Prizes. Topics include a detailed recollection of the electron-positron collider SPEAR and the exciting observations of the charm quark and the tau lepton. The book also contains recollections of the higher-energy SLAC colliders—the Positron-Electron Project (PEP) and the Stanford Linear Collider (SLC). Going beyond



the SLAC experiences, Pief also briefly recalls the rise and fall of the Superconducting Super Collider project in which he participated as chair of the SSC Board of Overseers. His reflections on all those topics are illuminating.

Interspersed among the chapters on the science and organization of SLAC are chapters detailing Pief's work advising government over the course of his career. He evaluated high-energy physics programs for government funding agencies and, more significantly, played a major role on national committees, including the now-defunct President's Science Advisory Committee, advising the government on policies related to the control of nuclear weapons. He discusses a list of potential problems in the advisory process, such as conflict of interest, accountability, access, and so forth. After his retirement as SLAC's director, Pief chaired the Committee on International Security and Arms Control of the National Academy of Sciences for eight years. The final chapter recounts in some detail many of the issues he encountered in his efforts toward a sensible nuclear weapons policy.

A few minor errors appear in Pief's

account, but that is not surprising, given all the detail he supplies. For example, on pages 125 and 138 Pief refers to the "tau meson," even though it should be the "tau lepton." Also, some of the discussions of experiments and their results are probably too technical for general readers. Such slight limitations do not detract significantly from the overall story. Pief gives us a truly panoramic narrative of both the history of US electron-accelerator-based, high-energy physics and the development of the country's nuclear weapons control policy. He contributed enormously to both endeavors and has a remarkable, fascinating tale to recount.

George Trilling

*Lawrence Berkeley National Laboratory
Berkeley, California*

Volcanism on Io A Comparison with Earth

Ashley Davies
Cambridge U. Press, New York,
2007. \$133.00 (355 pp.).
ISBN 978-0-521-85003-2

Io, the innermost Galilean satellite of Jupiter, is an enigma. A little larger than the Moon, it has a richly colored surface of sulfur compounds and silicates

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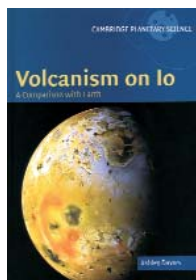
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produced by the hyperactive volcanism that results from tidal heating. It is the most volcanically active body in the solar system and a wonderful natural laboratory to study volcanic processes. For those of us who were privileged to study Io's volcanism as members of NASA's Galileo mission at Jupiter (1995–2003), the tasks of planning for the encounters with Io, acquiring the data, and then analyzing it remains a highlight of our careers. Now, in his *Volcanism on Io: A Comparison with Earth*, Ashley Davies, a former team member of Galileo's near-IR mapping spectrometer (NIMS), compares volcanism on Io to that on Earth through his lens as a specialist in modeling volcanic thermal emission.



Despite being billed by the publisher as the first text dedicated to volcanism on Io, Davies' book was actually preceded by *Io After Galileo: A New View of Jupiter's Volcanic Moon* (Springer/Praxis, 2007), edited by Rosaly Lopes and John Spencer. With Robert Howell, I coauthored the compilation's chapter on effusive volcanism.

Nevertheless, I found *Volcanism on Io* to be useful and informative, with a different focus from *Io After Galileo*; the two books complement one another. Lopes and Spencer's edited volume contains a detailed overview of Io, from pre-Voyager to post-Galileo, and it includes the perspectives of many authors. Davies' book, on the other hand, focuses much more on comparing Io's volcanic eruptions with terrestrial eruptions and showing how different eruption styles can be recognized through their thermal emission signatures.

Davies' writing style is clear and concise, and he includes considerable background material on terrestrial volcanism, remote sensing techniques, thermal and physical properties of the types of lavas found on Earth and on Io, and parameters used for modeling volcanic processes on both worlds. I particularly liked the table and figures in chapter 8, and elsewhere in the text, that show comparisons of thermal emission signatures from terrestrial insulated and tube-fed flows, lava fountains, open-channel lava flows, and several types of lava lakes. The author also shows how researchers can recognize the Ionian counterparts of those eruptions through analysis and modeling of the terrestrial thermal signatures.

The book contains considerable discussion of the limitations and uncertainties of existing Voyager, Galileo, and telescopic observations of Io's ther-

mal emission. Such challenges are due to the geometry of the flybys near Io and the corresponding limitations on the data's spatial resolution and the capabilities of the instruments themselves—NIMS and Galileo's solid-state imager (SSI) were almost 20 years old by the time the mission began. Davies makes the case for the types of thermal emission data that should be acquired on future missions and argues, in particular, for higher temporal resolution at a variety of scales. Those constraints are now being used in the development of concepts for NASA's new Outer Planets Flagship Mission and other missions that could study Io.

Background information, fundamental equations, and plenty of examples make this book ideal as the primary text for a college introductory class on volcanic remote sensing or as a supplemental text for a class on terrestrial or planetary volcanism. The book offers a chronological overview of the procedures and results for estimating temperatures of Io's volcanic eruptions. The chronology includes the confirmation, obtained early in the Galileo mission, of pre-Galileo, mafic-silicate eruption temperatures; evidence presented by Alfred McEwen and colleagues in 1998 suggesting very high, ultramafic-silicate eruption temperatures; and the 2007 work by Laszlo Keszthelyi and colleagues, whose improved thermal models indicated that the temperature of Io's hottest eruptions should be revised downward, perhaps to superheated-mafic or slightly ultramafic temperatures.

Volcanism on Io, derived from research that Davies has conducted throughout his career, focuses on the analysis and modeling of terrestrial and Ionian thermal emission. Because of its emphasis on thermal remote sensing, the book's broad overview of Io based on data from Galileo is not as detailed as that given in *Io After Galileo*. The author, though, does dedicate chapters to the Io volcanoes that were a focus of Galileo close flybys: Amirani, Loki, Pele, Pillan, Prometheus, and Tvashtar. The book also contains chapters discussing the geomorphology of surface units, plumes, and hot spots. The treatment of other aspects of Io science, such as the formation and early evolution of Io, Io's atmosphere, neutral clouds, the plasma torus, and magnetospheric interactions, either is not included or is given short shrift. But chapters 18 and 19 summarize very well our current un-

derstanding of volcanism on Io, and they provide a list of key questions that should motivate future observations and missions.

Volcanism on Io is a great contribution to the field of volcanic remote sensing and to Io science. It is geared toward advanced undergraduates, graduate students, and professionals. I will use the text as a reference in my planetary volcanology lectures, and it will join *Io After Galileo* on my bookshelf.

David Williams

Arizona State University
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