## A Technical Alliance

**Top Secret Exchange**. The Tizard Mission and the Scientific War. DAVID ZIMMERMAN. McGill-Queen's University Press, Montreal (ISBN 0-7735-1401-5), and Sutton, Phoenix Hill, UK (ISBN 0-7509-1242-1), 1996. xii, 252 pp. + plates. $29.95, C$29.95, or £18.99.

Readers having only a casual acquaintance with the history of radar know about the Tizard Mission, that unparalleled exchange of technical secrets between Britain and America in early fall 1940, 14 months before America became a formal belligerent. In retrospect how obvious and reasonable it was for two great democracies with common roots facing dangerous tyrannies to share secrets vital and useful to both. But it was not obvious then. Americans favored Britain in her struggle with Germany, but they also wanted to stay out, the consequence of serious disillusionment about the origins and outcome of the previous war and the manner in which America had been brought in.

It is from this starting point that Zimmerman tells the story that goes beyond the usual euphoric descriptions of the British Technical Mission that have been recorded by the participants who soon formed the MIT Radiation Laboratory. As the MIT contingent saw matters, each day brought the removal of obstacles that prevented American scientists—interventionist to a high degree—from working with their colleagues across the sea. That such a thing was historically unprecedented just did not matter to them, but when one left the tiny circle of scientists things were not so simple. There had been attempts to exchange technical secrets earlier, but all had foundered because they were attempts to trade: how does one trade something that is secret without first revealing it? Added to this were old hostilities between the two navies, which must seem incomprehensible to modern readers. An opinion widespread in the Admiralty was expressed by Vice Admiral Sir James Somerville: "Anything told to the American Navy went straight to Germany."

The idea that grew in Henry Tizard's mind was to give America Britain's technical secrets with nothing required in return. Britain would gain thereby a stronger potential ally and access to America's electronics industry for production of secret devices. It was a bold idea that met serious opposition, reflected in vacillation by Churchill even after the mission was under way. The agreement by Prime Minister and President called for disclosures by both parties and found American officers as reluctant as most of their British counterparts.

Left at this original intended level the mission probably would have been useful, although Naval Research Laboratory and Signal Corps engineers were favorably impressed with only two British radar designs and decidedly unimpressed by others. What transformed the mission was the presentation to the Americans of the cavity magnetron, a microwave generator that had power undreamed of by Americans working in this field. To exploit this revolutionary device Vannevar Bush's newly formed National Defense Research Committee organized almost overnight the MIT Radiation Laboratory, which not only became an organization of mythical proportion but also provided Bush's organization of civilian scientists with much-needed initial momentum that helped reduce military resistance to both the committee and the mission. As the exchanges spread throughout the research establishments of the two countries they disseminated the spirit of the mission and laid the foundation for an alliance historically unmatched in cooperation.

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## Martian Substances

**Water on Mars.** MICHAEL H. CARR. Oxford University Press, New York, 1996. xii, 229 pp., illus. $65 or £49.50. ISBN 0-19-509938-9.

Decades ago, in a library, I was surprised to find that the U.S. Department of Agriculture yearbook was entitled "Water." On reflection it made perfect sense. So does this book. As budgets for planetary missions get tighter it forces a more focused approach. Exobiology will always be a prime motivation, especially after the recent reports of organic compounds and possible microfossils in a Mars-derived meteorite. However, an important and accessible parallel approach to the "search for life" on Mars is to garner an understanding of the history of martian volatiles and how it has affected the Mars climate. Carr discusses estimates of Mars's original endowment of volatiles, the mechanisms of degassing, mechanisms of their loss to space or incorporation into the soil. This leads to estimates of the past and present state and distribution of $H_2O$, $CO_2$, and other atmospheric components and inferences as to past conditions at the Mars atmosphere-surface interface. Carr is critical of some pet hypotheses but objective in his evaluations. For example, he does not accept rainfall or surface runoff as necessary for formation of the "valley networks" that are ubiquitous in (mostly) the earliest Mars history. He argues against suggestions of a large Mars ocean but accepts morphological evidence suggesting some smaller bodies of water and favors these sites for exploration in the search for past life. He questions the assumption of a weak early sun and points out some difficulties with early $CO_2$ greenhouse models suggested to have produced an early "warm wet" Mars. In estimating the total water inventory he points out difficulties with geochemical models that lead him to a rather simple "what you see is what you get" approach based on estimated discharge volumes of the large outflow channels.

In contrast, Carr's discussion of possible Mars life is quite sanguine. There is an emphasis on the variety of microenvironments that may not have shared entirely the history of the global environment. There is an emphasis on the extreme hardiness and environmental tolerance of Archea, thought to have been the common ancestor of all Earth life. They make methane from $CO_2$, they love hot and highly saline conditions and actually might have happily survived under early and later Mars conditions. Very surprisingly, a plausible and well-documented case is made by Carr for survival during space transport and possible natural contamination of Earth by Mars life as the result of giant impacts on Mars. Did you know that Archea have been cultured from the interior of a salt crystal 200 million years old? I sure didn't.

Finally, after decades sitting on nearly every space exploration planning committee ever convened, Carr is well equipped to discuss the many frustrations of trying to get "new starts" in the planetary program. Although nearly every possible approach to unmanned planetary missions is discussed here, a careful distinction is made between those that are "on the books" and those that are scuttlebutt. One of the frustrations is that there are so many excellent reasons for planetary exploration that even enthusiasts spend a great deal of effort trying to select some one that appeals to every special interest sector. Carr has *got* the right one: "The drive to explore is mostly spiritual, not practical. Exploration lifts us above the humdrum concerns of food and shelter and provides us with feelings of awe, wonderment and pride. It is this aspect . . . that I think will ultimately drive us to Mars."

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