tive international position. All of which suggests that science policy per se fails to provide an adequate basis for either explanation or critique of the range of "trans-scientific" issues that animate Dickson, namely, the organization of the U.S. and world political economies and the proper distribution of their goods and services.

Finally, the presentation of the conflict between technocratic and democratic control over science suffers the fate of most dichotomous analytical schemes: perforce, the analysis is oversimplified. The reconciliation of the desire for democratic control with science (a necessarily elite enterprise), with American business (the most powerful political institution in the political economy), and with the American military (a professional hierarchy subject in complex but genuine ways to civilian control) remains an unfinished task. With his lack of attention to the democratic institutions of representative government—political parties, elections, legislatures—or to the elite institution of the federal judiciary and his suggestion that environmentalists, labor unions, the women's movement, and those pressing the demands of less developed nations constitute the potential for an effective political coalition, Dickinson realistically leaves to others, presumably less radical, the task of reconciling these competing values. But he has forcefully raised some of the important issues.

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Feelings about Risk

Workers at Risk. Voices from the Workplace. DOROTHY NELKIN and MICHAEL S. BROWN. University of Chicago Press, Chicago, 1984. xviii, 220 pp. $20.

As the issue of risk is generally framed, it is, What risks are we as a society prepared to bear to achieve economic and social progress? So put, risk becomes a quantifiable problem amenable to sophisticated risk-benefit analysis and discussions about trade-offs between "acceptable" risk and large social gains. *Workers at Risk* turns this technical formulation on its side and asks instead, How do men and women who actually bear the risks of work contributing to the common weal feel about what they do? The book presents extensive interview material, interspersed with brief editorial comments, detailing the perceptions and experiences of workers who deal with toxic chemicals in a wide, indeed disparate, range of occupations—from chemical operators to gardeners, from laboratory technicians to firefighters, and from railroad trackmen to graphic artists. The authors take work with such chemicals, substances at present indispensable to our economy, as a sort of paradigm of daily confrontation with risks.

I can mention only some of the main themes that emerge from the interviews. Workers are deeply anxious about the potential dangers of toxic chemicals to their own health, but especially about how their jobs might affect their families. Their anxiety is exacerbated by the wide gap between what they see as obscure and often conflicting scientific assessments of acceptable risk and their own frequent gut feelings that something is seriously amiss in their work situations. Their distrust of their corporations, of their management, of the scientific and medical professionals that serve both, of the Occupational Safety and Health Administration, and often of their own unions leaves them with no reliable public forum or authority to help them assess information accurately. It also leaves them with no institutionalized channels to translate their surmises, guesses, or actual specific knowledge about problems into practical solutions. Often, when it becomes clear that they have been exposed to hazards, their bosses blame them for negligence; they in turn blame their bosses for shortsightedness and callousness. For all these reasons, they are skeptical about the efficacy of those engineering controls that are in place. At the same time, they frequently resist mandated personal protections like respirators or "bunny suits" because of discomfort or social pressures from their fellows. Above all, with the exception of some activists who work for change and a few whose love for their work makes risk manageable, they feel powerless to alter their situations both because they perceive their institutional contexts to be intransigent and because exit is simply not a realistic alternative. For the most part, then, as do workers in other alienating contexts and other groups who feel powerless, these workers normalize their risks: they resign themselves fatalistically to their lot, or deny that risks exist, or deny that anything will happen to them. Such normalization sometimes breeds carelessness and a disregard for fundamental precautions. For some, dancing with hazards seems more bearable than enduring a twilight of anxious resignation.

In drawing this bleak but largely compelling picture, the book suggests that the real issues about risk are not technical at all but moral and political ones rooted in the problem of distributive justice. What is needed is not more scientific appraisals of hazards by removed experts but a social reorganization of the workplace to give workers greater control over dangerous work situations.

I cannot argue with the principle behind this conclusion, but the ambiguity of the suggestion points to the book's main recurring weakness. One might ask if greater influence in the workplace would help workers actually control the hazards they face or merely foster the illusion of control by altering their perceptions of risk. Despite the richness of the interview material, the book provides no way of answering such questions because the authors center their presentation on workers' responses to generalized dangers in widely variegated occupational settings that differ markedly in structure and rhythm. One cannot discern or appraise the specific organizational structures that mediate and shape workers' experiences in subtle and intricate ways. Without such links, these voices from the workplace are likely to remain just another set of perspectives easily discounted by those with the power to make their opposing views stick.

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Economic Geology

Metal Deposits in Relation to Plate Tectonics. F. J. SAWKINS. Springer-Verlag, New York, 1984. xiv, 325 pp., illus. $38. Minerals and Rocks, 17.

The author of this book was one of the first to realize the potential impact of the theory of plate tectonics on our understanding of how mineral deposits are formed and how we can find more. He has written a book that is clear and terse, linking with ease the characteristics of mineral deposits at all scales. Many of the insights are deceptively simple.

The contents of the book are divided into sections according to the mineral deposits produced in different plate tectonic regimes: Convergent Plate Boundary Environments, Divergent Plate Boundary Environments, and Collisional Environments and Other Matters. Within these regimes, mineral deposits are discussed in the context of more specific

situations; there are chapters on principal arcs, the inner sides of principal arcs, arc-related rifts, oceanic-type crust, intracontinental hotspots, different stages of rifting, and collisional events. Sawkins also recognizes the "gray" areas, with separate discussions of additional aspects of arc-related metallogeny and the metallogeny of different stages of rifting, and he concludes the book with "an attempt at perspective."

As to content, there is something for everyone, whether general reader or specialist. The general reader will learn about how and why many of the well-known mines and mining districts of the world are found where they are. Not only do discussions of such subjects contribute to understanding, they show the elegance with which a vast accumulation of diverse and seemingly disconnected geological and even geographic data integrate into a coherent story.

The specialist will wonder why he or she didn't think of many of the seemingly obvious things. For example, chapter 3, "Metal deposits of arc-related rifts," boldly unites the molybdenum deposits of the climax type, those "potentially" associated with the McDermit district of Nevada and Oregon, the Kuroko deposits of Japan, the analogous but older deposits of Buchans, Newfoundland, and the vein deposits of the Colorado Mineral Belt. These geographically diverse and tectonically related deposits are then related to isotopic and other fundamental data, many of which originate from Sawkins and his students.

In those cases where the applicability of plate tectonics is still in doubt, such as the massive base metal sulfide deposits of ancient Archean greenstone belts, the Sudbury nickel deposits, or the uranium deposits of the unconformity type, sufficient information is given to make possible independent assessment.

Exploration and discovery of new deposits provide the test of any hypotheses concerning mineral deposits, and there is always a temptation among writers and researchers to indicate the applicability of their own concepts. Sawkins has not been immune to this temptation, and he concludes many sections of chapters with "suggestions for exploration." While the pragmatic explorationist may find these to be of limited value on the ground, they may well stimulate new ideas on area selection for large-scale regional exploration programs. Certainly, the explorationist would enjoy and probably benefit from this book, as will the student and professor. Sawkins has avoided what must also have been a temptation to include much more material, so that his book is just a comfortable length. It can be read in a couple of sittings and will reward repeated returns. I recommend it to all who are interested in mineral deposits or plate tectonics.

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Heat Production in Mammals

Mammalian Thermogenesis. LUCIEN GIRARDIER and MICHAEL J. STOCK, Eds. Chapman and Hall, London, 1983 (U.S. distributor, Methuen, New York). viii, 359 pp., illus. $77.

Heat is generated as a by-product of metabolic reactions in all biological systems. In mammals, where this heat contributes to the homeothermy of the animal, cellular thermogenesis is under neuronal and hormonal regulation. This book, in a series of review chapters, discusses such regulation and provides a timely summary of several recent advances that have increased our understanding of the biochemical basis of thermogenesis as well as the significance of its contribution to mammals.

A major concern of seven of the 11 chapters is brown adipose tissue, a tissue whose only known physiological function is that of heat production. The recent demonstration by Foster and Frydman that small amounts of this tissue can generate significant quantities of heat (brown fat can account for 60 to 65 percent of the nonshivering thermogenic response of cold-acclimated rats even though it represents less than 2 percent of their body weight) has focused attention on this tissue as a major effector of nonshivering heat production in mammals.

Although some of the morphological characteristics of brown fat are described briefly in the volume, *Mammalian Thermogenesis* emphasizes the regulation and functional responses of thermogenic effectors. In an early chapter, Nicholls and Locke deal with the biochemical basis of increased thermogenesis in activated brown fat. As was originally described by Nicholls, brown fat mitochondria possess what appears to be a unique proton conductance pathway regulated by a protein in the inner mitochondrial membrane. Nicholls and Locke lucidly summarize evidence supporting the current view that activation of brown adipocytes results in changes in the conformation of this protein, which in turn lead to an opening of the pathway, a loosening of mitochondrial coupling, an increased rate of oxidation of mitochondrial fatty acids, and hence an increased rate of heat generation. Although the cytosolic signal for effecting these mitochondrial changes is still uncertain, Nicholls and Locke argue for a prominent role for fatty acids. The chapter brings the reader to the current edge of the field.

Another subject of intense investigation reviewed in the book is the relationship between thermogenesis, food intake, and obesity. The report of Rothwell and Stock in 1979 that overfeeding enhanced thermogenesis in rats and attenuated their weight gain captured the interest of nutritionists as well as physiologists. Much of the subsequent work on the subject is reviewed in a chapter by Rothwell and Stock and supports the hypothesis that brown fat is an energy-dissipating tissue that, at least in rodents, is responsive to excess caloric intake. In another chapter, Trayhurn and James summarize data indicating that blunted thermogenesis in brown adipose tissue is an important contributor to the maintenance and, most likely, to the onset of obesity in rodents. Although similar mechanisms may be operant in humans, the contributors are careful to emphasize that it is premature to extrapolate and that evaluation of the role of brown fat in the energy balance in humans will be difficult.

The book not only deals with the increased metabolism occurring under physiological (cold, feeding) and pathological (trauma, fever) conditions, it contains chapters that discuss the regulation of thermogenesis by thyroid hormones and the autonomic nervous system. There is also one chapter devoted to the energetics of maintenance and growth that focuses primarily on large mammals.

Overall, *Mammalian Thermogenesis* reflects the multidisciplinary approach currently being used by investigators in this field. Although it is not an exhaustive review of the subject (for example, there is not a chapter on the thermogenic effects of exercise), the book achieves its objective of presenting an updated summary of much of the current work in thermogenesis. Moreover, one attractive feature of the book is the integration of studies on obesity, diet-induced thermogenesis, and cold-induced thermogenesis, which brings to the reader's attention the similarities between the effects of feeding and cold exposure on mammalian heat production. The book should