rising status as connected to changing values, but I think it is unfortunate he does not distinguish among the various systems of values that were being transformed. Moral values, in the strict sense, played almost no role in increasing support for chemistry in the 18th century, but changes in political, epistemic, social, and economic values were of great importance. In the absence of distinctions of this sort it is difficult to see why the rather extravagant claims made for chemistry in the 18th century received a sympathetic hearing.

In the introduction Hufbauer declares that his "entire argument presupposes that the formation of the German chemical community was essentially a social process" and that the views held by this community "were more akin to an ideology than a Kuhnian paradigm" (p. 5). True to this presupposition, he takes no account of the theoretical content of the chemical work actually done within the community during the period of its formation. I am in no position to argue that there was indeed a paradigm that provided a distinctive research program for this community, although I strongly suspect one would find one by examining G. E. Stahl's influence. What is clear is that we are given no reason to believe that the ideological as opposed to the paradigmatic approach uncovers the whole truth in this case.

Hufbauer offers what he calls a "conflict interpretation" to explain the final coming to consciousness of the German chemical community. The relevant conflict was a heated debate over Lavoisier's antiphlogistic theory, an episode Hufbauer characterizes as "a struggle for the German chemical community's allegiance" (pp. 118–119). But his interpretation of the events he describes at length (chapters 7 and 8) is undermined by a simplistic view of how theory change takes place in science. Do scientists choose a new theory because they find the evidence and arguments for it compelling, or do external factors, such as national pride, self-interest, and community allegiance, dominate their choices? Such an either-or approach contradicts Hufbauer's own description of the experimental work involved in the struggle. Moreover, having decided not to give any weight to the conceptual arguments in this debate, Hufbauer is forced to make excessive claims for the influence of social factors. Kuhn is again invoked, this time to substantiate the assertion that social factors play a predominant role in theory choices entailing selection between incommensurable paradigms. Yet the facts in this case provide no evidence to support the dubious notion that, historically, paradigms have ever been truly incommensurable.

The shortcomings of this book should not be overemphasized, for they flow from the author's admirable willingness to reach beyond his evidence and engage the big issues in the history of science. The book's enduring value is the direct result of the author's thorough research and careful analysis of his data.

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Mathematics from Poland

The Scottish Book. Mathematics from the Scottish Café. R. DANIEL MAULDIN, Ed. Birkhäuser Boston, Cambridge, Mass., 1982. xiv, 268 pp., illus. $24.95.

The Scottish Book is a Polish book. A group of Polish mathematicians used to meet Saturday evenings in the Kawiarnia Szkocka (Scottish Coffee House) in Lwów beginning in 1935 and continuing for almost six years. A large notebook (subsequently named after the meeting place) was left in the custody of the headwaiter. It contained problems—challenges to one and all by the brilliant younger members of the group as well as by the established seniors. Almost all the names signed to the problems have become internationally famous. Examples: Banach, Mazur, Ulam, Schreier, Steinhaus, Orlicz, and Schauder; an occasional foreign visitor such as Fréchet and von Neumann; and, after the Russian occupation, a small number of Russians such as Alexandroff and Sobolev.

Sometimes the challenger offered a prize for a solution. In 1936 Steinhaus offered 100 grams of caviar for an explicit computational answer to one of his questions, a small beer for a mere existence proof, and a demitasse for a counterexample; in 1940 Saks offered one kilo of bacon. (The Russians came in 1939.)

The total number of problems is 198 (numbered from 1 to 193, with five afterthoughts such as 10.1 and 188.1), and most of them are about Polish mathematics. (That's not an ethnic slur. An expression such as "Polish space" has become a precise and universally accepted technical term.) Something like 60 of them are about real analysis (sequences of real numbers, derivatives of real functions frequently of several real variables), 35 about general topology, and 30 about functional analysis (mainly Banach spaces). The rest are scattered over measures, groups, sets, convexity, combinatorics, and probability; there are one or two about complex function theory.

In May 1979 in Denton, Texas, a few of the erstwhile participants and visitors, and several other problem enthusiasts, met at a conference dedicated to the Scottish Book; the volume under review grew out of that conference. It consists of five lectures, followed by statements of all the problems (frequently annotated by commentaries, solutions, and references). A commentary is sometimes a brief comment or a statement of a pertinent theorem, and sometimes several pages of serious mathematical discussion.

The lectures are by Ulam, Kac, Zygmund, Erdös, and Granas. Ulam tells a lot about Ulam's views (on, for example, joint papers in mathematics, and concreteness versus abstraction). Kac presents some autobiography, describes part of his own work, and gives some curiously offhand references to the literature ("published around 1940 in the Bulletin of the American Mathematical Society"). [Incidentally, I cannot resist commenting on a terminological observation of Kac about "what Tony Martin called a decimal binary (which is an excellent name for what ordinary mortals call simply a binary)." I object. "Decimal" refers to 10 and "binary" to 2, and I find the phrase "decimal binary" philologically illiterate—it grates on me.] Zygmund is from Warsaw and had only a "loose" contact with Lwów; he talks mainly about the work of Steinhaus. Erdös captures the spirit of the Szkocka beautifully; he discusses several problems and, when possible, their solutions; he emphasizes that some of them are still not solved; and, characteristically, he offers $100.00 for the solution of one of them. The Granas work is a long (17 pages) technical paper ("KKM-maps and their applications to nonlinear problems"), complete with definitions, theorems, and proofs. Its connection with the Scottish problems is tenuous, and its presence in this volume is totally inappropriate.

It is hard to choose "typical" excerpts from a work with a focus as wide as this one has; the best I can do is offer the following four problems. Their main virtue (which makes them not completely representative) is that their statements are not too technical; their main fault is that (with one exception) they do not make contact with "serious" mathematics.

10.1. THEOREM. If $\{K_n\}_{n=1}^{\infty}$ is a sequence of convex bodies, each of diameter $\leq a$ and the sum of their volumes is $\leq b$, then there

exists a cube with the diameter $c = f(a,b)$ such that one can put all the given bodies in it disjointly.

Corollary. One kilogram of potatoes can be put into a finite sack.

PROBLEM. Determine the function $c = f(a,b)$.

59. CAN ONE DECOMPOSE a square into a finite number of squares all different?

The commentary accompanying Problem 59 occupies eight pages. It gives a history of the question, several solutions, and many references to the literature.

123. GIVEN ARE THREE SETS A_1, A_2, A_3 located in the 3-dimensional Euclidean space and with finite Lebesgue measure. Does there exist a plane cutting each of the three sets A_1, A_2, A_3 into two parts of equal measure? The same for n sets in the n-dimensional space.

This is the celebrated "Ham Sandwich Theorem": given two slices of bread and a slice of ham, placed perhaps irregularly in space, can you bisect them all with one straight swing of a knife?

147. SUPPOSE THAT A BILLIARD ball issues at the angle 45° from a corner of the rectangular table with a rational ratio of the sides. After a finite number of reflections from the cushion will it come to one of the remaining three corners?

As an instance of the craft of making books this volume is egregiously bad. Even a casual leafing through it will reveal many typographical errors, some funny, some serious. On at least one occasion Lwów misses its accent and Wrocław is misspelled, "probablistic" is not a word, on p. 124 there is a reference to "pp. 000–000," I have no idea what a "homoie class" means in Problem 58, the long commentary on Problem 59 (mentioned above) is unsigned (all others are signed), in one instance the name of a frequent commentator, Diestel, comes out Dieztel—these, and several others like them, are the errors that jumped to my eye without my making any effort to proofread. The "Contents" lists "The Scottish book problems" as one entry (which covers pp. 63–268), and there is no index. In a book like this one, that lack is maximally inconvenient: a problem, solution, comment, or reference once lost is likely to remain unfound through maddening riffles.

We problem aficionados should and do welcome the book with open arms nevertheless. We can't help feeling that we deserve better, and surely we have grounds for grumbling, but we would rather have the book, faults and all, than not have it.

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American Cactaceae

The Cacti of the United States and Canada. LYMAN BENSON. Line drawings by Lucretia Breazeale Hamilton. Stanford University Press, Stanford, Calif., 1982. xii, 1044 pp., illus. $85.

This large, comprehensive, well-written book is the culmination of a lifetime of study and research on cacti conducted in the field, in gardens, and in herbaria. The numerous excellent illustrations, including photographs both in color and in black and white and line drawings, will make it particularly appealing and useful to amateurs, and the keys to genera and species, distribution maps, descriptions, and documentation should satisfy the most discriminating professional taxonomists.

The first quarter of the book provides background information that enhances the reader's knowledge of cacti and the problems involved in identifying and classifying them. Included are sections that deal with structure, physiology, chemistry, distribution, floristic associations and ecology, uses, endangered species, and conservation. Students wishing to pursue fieldwork on cacti will appreciate the detailed directions given for the preparation of herbarium specimens and the proper documentation of collections. Benson discusses the enormous variability that characterizes many groups of cacti and its relationship to environmental and genetic factors, including hybridization. All of this relates to the establishment of a policy and taxonomic philosophy that will allow species, varieties, and hybrids to be usefully and consistently delimited—no easy task in the Cactaceae. Because few groups and populations have been intensively studied, Benson adopts a conservative approach that may not meet the approval of those who like to erect taxa on the basis of a few simple characters, a procedure that has resulted in a proliferation of cactus genera and species that are poorly documented and of doubtful validity. Instead of accepting many taxa as species, he presents cogent arguments for reducing them to varietal rank and for using lists of characters rather than simple keys to separate the varieties. The number of genera described by Britton and Rose and others for the area under consideration has been reduced. For example,

"Cactus planting in the Huntington Botanical Gardens, San Marino, California." [From *The Cacti of the United States and Canada*]