Publicizing Mathematics

Mathematics Today. Twelve Informal Essays. LYNN ARTHUR STEEN, Ed. Springer-Verlag, New York, 1978. viii, 368 pp., illus. $12.

Mathematics has the worst public relations of any of the sciences. Usually remote, it seldom offers the journalist a handle for a story. Worse yet, its most effective publicists, elementary school teachers, frequently dislike science in general and mathematics in particular. In the last few years the leaders of the mathematical community, alarmed by cuts in support for basic research, a decline in the numbers of undergraduate and graduate math majors, and a shortfall in academic slots for new Ph.D.'s (a fate previously reserved for doctorates in the humanities), have tried to compensate for the lack of favorable publicity.

Mathematics Today, a collection of essays by well-known mathematicians, is an effort in this direction. As set out in the preface, the object of the book is "to convey to the intelligent nonmathematician something of the nature, development, and use of mathematical concepts, particularly those that have found application in current scientific research." Now the phrase "intelligent nonmathematician" is ambiguous; I am sure that each essayist held in his mind a different image of that beast. Thus, while any high school student could grasp the two opening essays, "Mathematics today" and "Mathematics—our invisible culture," and the concluding one, "The relevance of mathematics," the audience for others is, to varying degrees, less broad.

The more motley the group of readers, the more effort the authors must put into their exposition. As they compose each sentence they must think not only of its substance but of the persons who will read it. It is hard to maintain such a schizophrenic vigilance. But Ronald Graham, in his contribution to this volume, "Combinatorial scheduling theory," has not let his eye stray far from a plausible image of an "intelligent nonmathematician." Any reader of the *New York Times* could follow most of his essay, and anyone with four years of high school math could master every step.

Graham's choice offers a paradigm of good public relations. It opens with a practical problem (how to schedule the ten tasks of assembling a bicycle), quickly encounters counter-intuitive paradoxes, includes an (optional) mathematical proof, generalizes the problem, illustrates the mutual dependence of pure and applied mathematics, reports on the latest research, and presents unanswered questions. In parting it offers an astonishing morsel that even a child could relish: It is possible to place far more than 100,000 times 100,000 nonoverlapping 1-inch squares in a square of side 100,000.1 inches. Moreover, Graham chose a topic that invites the reader's participation.

In "What is a computation?" Martin Davis matches Graham's triumph. Not only does he describe the most general computer and computation, he spends time with a particular example, showing how to program an archetypal computer to double the number of 1's on a tape of 1's and blanks. He then goes to theoretical questions, discussing the unsolvability of the halting problem, an unsolvable word problem, and undecidable statements. While an "intelligent nonmathematician" could follow the gist throughout, it would take some sophistication to follow a few of the head-breaking steps. An undergraduate who knew a little abstract algebra or set theory could understand the whole essay.

A subject like statistics, which ordinary mortals breathe daily, is easier to expose to a heterogeneous audience. David S. Moore, in "Statistical design of experimental data," also has managed, by judicious choice of topic and example, to show that fascinating mathematical questions lie strewn about us—if we only would look.

Other essays are devoted to number theory, algebra, geometry of the universe, meteorology, the four-color problem, economics, and population biology. While each is of merit, they are not as successful as the three mentioned.

Any scientist, engineer, or mathematician could read the whole collection with profit, but I suggest that the "intelligent nonmathematician" begin with the essays by Graham, Moore, and Davis in that order, then browse as fancy dictates.

The authors have evidently been persuaded to descend at least partway toward that nebulous reader. I suggest, however, that, in case of a sequel, each essay, when still in manuscript, be judged by a jury of its author's nonpeers. Such a jury might consist of three bright high school students, three lay readers of the *Times*, three junior math majors, and three scientists who apply mathematics. Simply impaneling this jury would define the phrase "intelligent nonmathematician" precisely. Moreover, such a jury would have the clout to compel each author to go all the way, not just partway, toward the reader. In short, I am urging the use of a little of the market research techniques usually squandered on less noble goals, such as the development of sugared breakfast cereals.

All things considered, however, I feel that this attempt has been surprisingly successful. The first printing is already sold out (permitting the swift correction of several errata). Perhaps some publisher may venture to produce the next volume in what should be an endless series.

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A Geologic Puzzle

Ice Ages. Solving the Mystery. JOHN IMBRIE and KATHERINE PALMER IMBRIE. Enslow, Short Hills, N.J., 1979. 224 pp., illus. $12.95.

This little book is an absorbing account of one of the great quests of geologic science—the quest for the cause of climatic change during the ice age. The book starts with the story behind the struggle of Louis Agassiz to demonstrate that continental glaciers once covered much of Europe and North America. It then considers the theories that have been proposed to explain the ice age. After dismissing all other theories as implausible or untestable, the book focuses on the astronomic theory of the Serbian mathematician Milutin Milankovitch, which is based on the geometric perturbations of the earth in relation to the sun—the eccentricity of the orbit, the inclination of the axis, and the precession of the equinoxes. The book comes to a climax with an account of the ocean-core studies that support the Milankovitch chronology of climatic change.

The pace quickens as the account approaches the present, for here John Imbrie himself is one of the central figures, and the account is augmented by anecdotes about conversations in Parisian cafes, professional rivalries among the