▸ I found an uncharacteristic lapse from efficient pedagogy in the treatment of the quantum ideal gas, which Harris does first in the canonical ensemble, with the inevitable mathematical complications, and then efficiently in the grand canonical ensemble (but, unaccountably, in a way that will suggest to many students that the latter approach relies on the formalism of second quantization).

▸ I suspect that many people nowadays prefer their relativity without $\sqrt{-1}$.

▸ The basic postulate governing time evolution in quantum mechanics is presented in integral rather than differential form for time-dependent Hamiltonians, but the need for time-ordering the exponential is unaccountably overlooked.

▸ Finally, a book as broad in scope and as useful to beginners as this one would benefit greatly from a more extensive index.

I am not sure how many people will feel that Harris's book (or books like it—and I am unaware that any has existed since Joos) is the way to teach physicists their subject. The almost universal current practice, what might be called guided wallowing in half a dozen or so chaotically massive compendia, though undoubtedly a less comfortable way to begin, is in fact much closer to the way in which practicing physicists continually extend their domains of expertise. On the other hand, for those who want to know the rudiments of everything physical—whether they are chemists, biophysicists, or just miserable physics graduate students faced with their orals in a month or two—I would be hard pressed to suggest as efficient a way as reading Harris.

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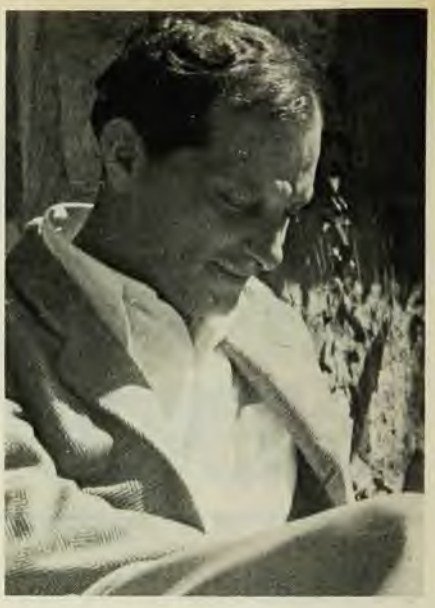
Adventures of a Mathematician

S. M. Ulam
317 pp. Scribner's, New York, 1976. $14.95

Mathematicians are not like ordinary folk, and this autobiography provides an excellent example of the breed. The first chapter, "Childhood," brings Stanislaw Ulam to the age of 18, when he enters the university. His account consists of a series of remembered observations, musings, reflections and accounts of successes in schools, all of which presage the future mathematician. A scion of an upper-crust Polish–Jewish business family, Ulam lived in ease and luxury in the home environment, which appears to have effectively insulated him from the prevailing anti-Semitism and misery experienced by the poorer Polish and Jewish



ULAM

population. Ulam *père* was a successful lawyer, and the mother came from a well-to-do family dealing in steel. There is little account of parental influence, and the mother is not mentioned at all except in an opening paragraph which gives her maiden name and family. The biographer and historian will find very little in this account to fuel speculation on the environmental forces that shaped the interest and direction of this personality.

The second chapter, "Student Years," is of a very different quality. The six years at the university in Warsaw were exciting, stimulating and indeed inspiring. It was in the hey-day of the great Polish school of mathematics, and Ulam made the most of it. He describes how he floated on clouds of wonderful mathematics and mathematical lectures and congresses he attended and long sessions in cafés with other young, inspired students and teachers. It will bring tears of nostalgia and sentimental recollections to those who were fortunate enough to have gone to an exciting university in an exciting time in physics, which was my own good fortune.

In this account one finds, interspersed like a dirge, such names as Schraiar, Sternbach, Auerbach, Ruckziewicz, Stozek and Lomenicki, with the remark as each occurs, "murdered by the Germans"—nothing more.

Ulam lived a charmed life in Poland and later in the United States. Well mannered, easy going, witty—all doors appeared to be open to him. His friendship with John von Neumann, which this narrative in a profound sense is really about, inspired, colored and guided his life. With only brief intervals Ulam's lifeline proceeds from one success to another, both in career and professional achievement.

In Los Alamos, where I first knew Ulam, he was the man who was above the

grubby battle, the aristocrat providing witty and slightly malicious comments on the struggles of the deeply engaged. From time to time, with a pithy remark and a clever piece of calculation presented in a somewhat indifferent manner, he could make—as in the matter of the hydrogen bomb—a contribution of very great significance. All along, one had the feeling that he was a visitor from another world, the world of pure mathematics. Other things—physics, politics, human affairs—although of some interest, were not enough to stir one deeply. This attitude is not a pose, it is the essence of this remarkable personality.

I have not attempted to assay the importance of Ulam's mathematical contributions as they are detailed in this book, because I am not at all equipped to do so. The reader, if he is a mathematician, will find a wealth of topics on which Ulam worked and suggestions and hints of further work. He will also meet briefly some of the great mathematicians of our time as they are refracted in the prism of Ulam's experience.

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Beam and Fiber Optics

J. A. Arnaud
447 pp. Academic, New York, 1976.
$34.00

The announcement in 1970 by F. P. Kapron, D. B. Keck and R. D. Maurer of the Corning Glass Works that they had produced a glass fiber that would transmit light efficiently over long distances made optical communications a practical possibility and led to an increased effort to understand the fine details of light propagation in fibers. (The announcement appeared as "Radiation Losses in Glass Optical Waveguides" in *Appl. Phys. Lett.* 17, 423, 1970.) In large part this book is an outgrowth of that effort, although a good deal of the material is concerned with guiding systems that predate the fiber.

The Corning people demonstrated that 1% of the light introduced at one end of a kilometer-long fiber could be recovered at the other end. At present, the fiber can be 10 km long with a 1% optical-power recovery, which is a plentiful percentage by communications-systems standards. In the pre-1970 days, the 99% figure for optical-power absorption and scattering loss occurred in fibers that barely reached across the room. While lossy fibers of that kind were not of much use for communications, they were fine for other applications. These applications included endoscopy (in which fiber bundles are used for viewing inside the body), image intensification (fiber bundles are em-