

Fleischer R L, Price P B & Walker R M. *Nuclear tracks in solids: principles and applications.* Berkeley, CA: University of California Press, 1975. 605 p. [General Electric Res. Lab., Schenectady, NY; Dept. Phys., Univ. California, Berkeley, CA; and Dept. Phys., Washington Univ., St. Louis, MO]

Heavily ionizing particles produce radiation damage tracks in a wide variety of dielectric solids. Chemical etching renders the tracks easily visible and can be used quantitatively to measure the properties of the nuclear particles. This book presents the principles and techniques of track etching and describes the diverse uses of etched tracks in science and technology. [The SC[®] indicates that this book has been cited over 310 times since 1975.]

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"Our original primary motivation for studying nuclear particle tracks in solids was the idea that lunar rocks might contain records of the energetic radiation to which they had been exposed. A decade later the Apollo program enabled the idea to reach fruition. In the early-1960s, when we were all working at the General Electric Research Laboratory, we became aware of the pioneering work of Silk and Barnes,¹ who had imaged fission fragment tracks in mica using transmission electron microscopy. Their work stimulated us to seek other methods of observing tracks—a search that quickly led to the development of track etching. We later learned of earlier work by Young,² who had etched tracks in LiF.

"Track etching proved to be a very general phenomenon, applying equally well to natural minerals and to man-made materials such as plastics and glasses. Much of the

excitement of the early days arose from the recognition of the many opportunities to apply track etching to diverse areas of science and technology. Extraterrestrial research first focused on meteorites, in which ancient nuclear tracks led to the discovery of rare cosmic rays heavier than iron. In addition, the discovery of large concentrations of fission tracks confirmed the prior existence of a now-extinct nuclide, ²⁴⁴Pu, at the beginning of the solar system. Lunar samples permitted the study of the energy spectra and abundances of solar flare particles as well as of heavy cosmic rays.

"Plastic track detectors flown in balloons, rockets, and spacecraft have given precise measurements of the properties of energetic extraterrestrial particles at our present epoch. At various accelerators, track detectors, mainly plastic, have led to discoveries in the physics of fission and of heavy ion reactions at both low and high energies. Natural tracks from the spontaneous fission of uranium in minerals make it possible to date geological and archaeological events.

"Track etching has also had a number of practical consequences including improvements in dosimetry and the fabrication of unique materials. General Electric created two new businesses, now independent firms, to exploit certain applications. Nuclepore Corporation manufactures filters made from irradiated, etched plastics and Teradex Corporation provides a service for monitoring ²²²Rn emission to guide in drilling for uranium, to measure indoor radiation in homes, and to aid in earthquake prediction.

"Other workers were quick to utilize track etching, and several thousand track articles have now appeared. A specialty journal (*Nuclear Tracks*) has been established, and international conferences on diverse aspects of tracks are periodically held.³ Recent reviews on particle track etching have been published.^{4,5}

"Our book, *Nuclear Tracks in Solids*, was designed to summarize the science and technology of etched tracks. Its high citation rate is undoubtedly due to the fact that it is the only source book that covers all aspects of the still expanding field."

1. Silk E C H & Barnes R S. Examination of fission fragment tracks with an electron microscope. *Phil. Mag.* 4:970-1, 1959.
2. Young D A. Etching of radiation damage in lithium fluoride. *Nature* 182:375-7, 1958.
3. Francois H, Kurtz N, Massue J P, Moynin M, Schmitt R & Durani S A, eds. *Solid state nuclear track detectors. Proceedings of the 10th International Conference.* Lyon, 2-6 July 1979. Oxford: Pergamon Press, 1980. 1082 p.
4. Fleischer R L. Where do nuclear tracks lead? *Amer. Sci.* 67:194-203, 1979.
5. Ahlen S P, Price P B & Tarié G. Track-recording solids. *Phys. Today* 34:32-9, 1981.