Frank Drake, Harry van der Laan, John Findlay and many, many others told fascinating stories, but John Broderick's talk on the "buffalo syndrome" is a classic and deserving of special mention. It pictures the plight of the scientist who can't get support to do an unpopular experiment because the buffalo herd is going the other way. But when someone demonstrates that his idea has merit, the herd turns and tramples him in its stampede.

Controversial issues were freely discussed. The charges that "no major discoveries have been made at a national center" and that "by building big instruments, by determining the total means of doing research . . . [everyone goes] down the same road in lockstep" elicited spirited discussion. The talks brought out that essentially all of radioastronomy was pioneered by persons who came in from the outside—many trained as physicists—and were not regarded by optical people as real astronomers. Not only was Jansky trained as a physicist—he obtained a BS and MS in physics from the University of Wisconsin—but he was even named after a famous University of Michigan physicist, Karl Guthe.

Of serendipity and discovery, R. Hanbury Brown commented that you need the right man in the right place at the right time, but he must be a man who doesn't know too much. This explains how physicists and engineers came into radioastronomy and made discoveries. "Many of them didn't know the Sun from the Moon or a planet from the stars. But that was all right; they were self-reliant people who got on with their job."

Profusely illustrated with photographs and drawings, *Serendipitous Discoveries in Radio Astronomy* is a unique contribution to the literature of science and discovery, focusing on how pioneers succeed in spite of the odds. It can be read with benefit by students, amateurs and professionals of all disciplines.

As one of the participants, I found the workshop to be a thrilling and unforgettable experience. The editors are to be commended for making the full proceedings available in book form.

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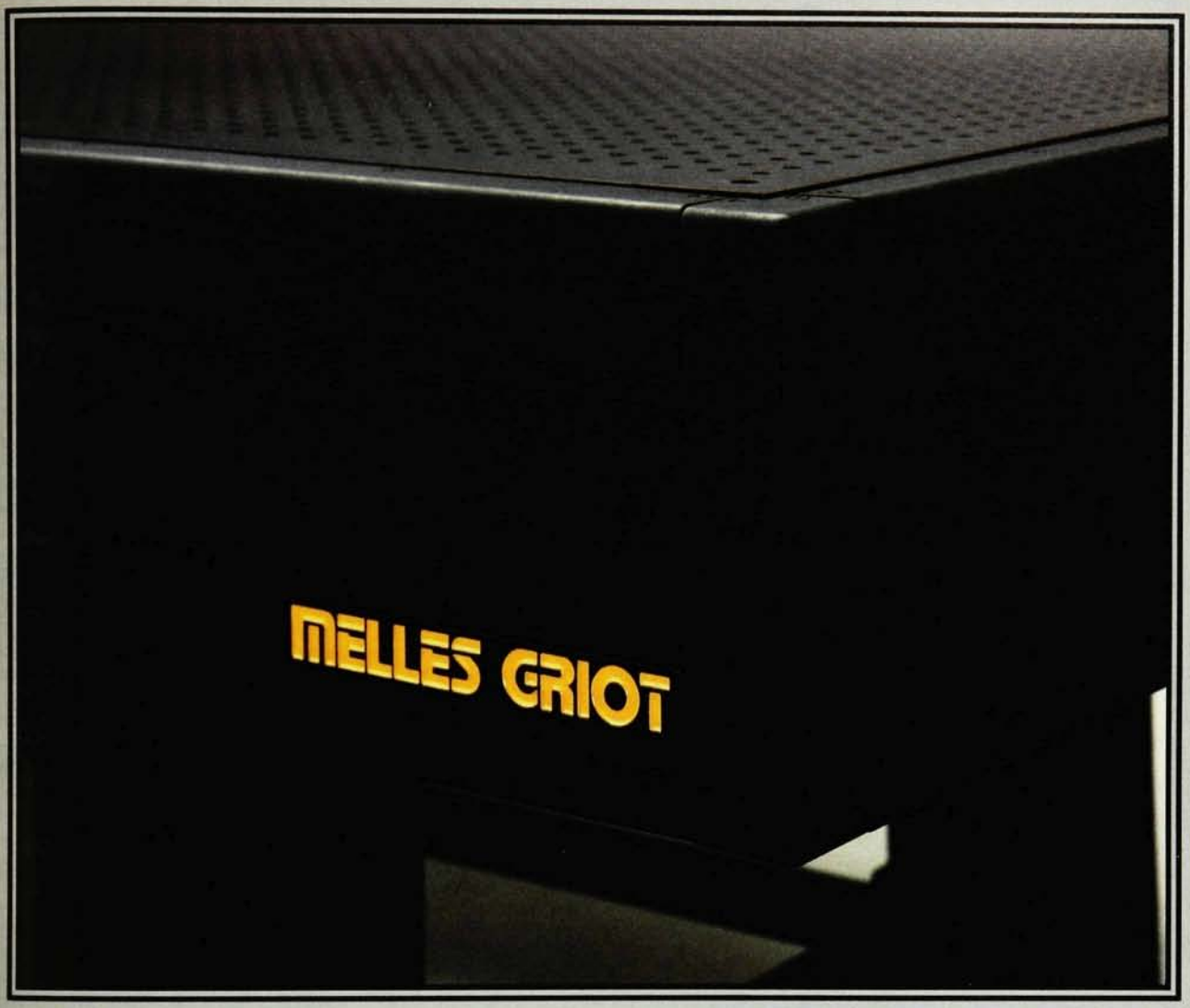
Vibrational Spectroscopy at High External Pressures: The Diamond Anvil Cell

John R. Ferraro
264 pp. Academic, New York, 1984. $59.00

The diamond-anvil cell has evolved since its creation in the late 1950s to one of the most powerful research tools in high-pressure science. This text deals with the cell and its application to infrared and Raman spectroscopy. The eight chapters may be divided roughly into two parts: The introductory sections discuss designs and pressure calibration, and the remainder of the book is concerned with spectroscopic studies of a wide variety of materials. It does provide a concise review of the diamond-anvil cell and of the effects of pressure on various vibrational modes in a number of classes of solids.

Unfortunately, at times Ferraro's references to historical or scientific detail are inaccurate. For example, in the preface he tells us that "the diamond anvil cell (DAC) was discovered by workers at the National Bureau of Standards. . . ." To be sure, Alvin Van Valkenberg and Charles Weir (to whom the book is dedicated) were instrumental in the development of the cell at NBS and most of the design improvements occurred there over the following 15 years, but the idea of using opposed diamonds for the generation of pressure was also employed indepen-

THE COMPETITIVE EDGE



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dently and almost simultaneously by workers at the University of Chicago led by the late John Jamieson. Also in the preface we are told that one reason for writing this book was that "no extensive synopsis of the DAC and its achievements has previously been published." However, an early review by Stanley Block and Gasper Piermarini, "The diamond cell stimulates high-pressure research," appeared in the September 1976 issue of PHYSICS TODAY (page 44), which is incorrectly referenced by Ferraro on page 37. More recently, A. Jayaraman published two review articles, one "Diamond anvil cell and high-pressure physical applications" (*Reviews of Modern Physics* **55**, 65, 1983—which is incorrectly referenced by Ferraro on page 38) and another, "The diamond-anvil high-pressure cell," that appeared in the April 1984 issue of *Scientific American* (page 54). In addition, in their book *Comparative Crystal Chemistry*, Robert Hazen and Larry Finger devote two chapters to a very thorough review of the development, designs and applications of the diamond-anvil cell.

Another misleading statement is found in the chapter dealing with the elements. Here Ferraro states about nitrogen (page 65), "A fourth phase (epsilon) has been reported to exist at a pressure >49 kbar (Kobashi *et al.*, [*Phys Rev B* **26**, 5996] 1982)." The work by Koji Kobashi and his colleagues is a theoretical calculation predicting a new phase of nitrogen. The correct citation for the discovery of a new phase of nitrogen above 49 kbar is to a 1979 paper by Richard LeSar and his collaborators at Los Alamos; this reference is found in the first sentence of the Kobashi article. The work of LeSar's group is not referenced by Ferraro in this chapter.

In the central chapters Ferraro presents an abundance of data from the literature on the pressure dependence of vibrational frequencies in a variety of inorganic materials. He gives data on space group symmetries, active vibrational modes and known phase transformations, and, where possible, makes comparisons. At times, however, the selection of materials appears to be somewhat arbitrary. For example, Ferraro includes a section on nitrogen but makes no mention of oxygen, even though oxygen undergoes a number of dramatic color changes around 100 kbar (M. Nicol, K. R. Hirsch, W. B. Holtzapfel, *Chemical Physics Letters* **68**, 49, 1979). Even more curious is that there are lengthy discussions dealing with the possible metallic phases of hydrogen and xenon, but nothing is said about the well-studied metallic phase of iodine (K. Takemura *et al.*, *Physical Review Letters* **45**, 1881, 1980).

There is a good section on coordination compounds. Here Ferraro reviews a set of rules developed by R. G. Perason and Richard F. Bader using group theory and perturbation theory to examine the vibrational distortion of ground-state molecular configurations. From these analyses one can forecast stable molecular structures, rigidities and modes of reaction. Ferraro applies these selection rules to a variety of four-, five-, six-, seven- and eight-coordinate complexes. In this same section he provides good reviews of the effects of pressure on spin states, on oxidation–reduction reactions, on ligand isomerism and on internal vibrational transitions.

The book has many figures, most of which come from the literature. The need for some of these is unclear; for example, Chapter 7 presents several pages of spectra from a variety of materials—bearing fluid, automobile paint, a taillight lens, water-based enamel paint, polyester fiber, acrylic rug yarn, hair from women and men, and the explosive material HMX. Presumably these are included to establish the obvious point that spectra obtained from different materials are themselves different; no discussion of the various differences is given in the text.

The book does include useful and interesting summaries of a variety of areas in which pressure is used as a tool, such as geoscience, investigations of one-dimensional conductors, studies of prospective superconducting materials and forensic science. It also serves as a good source of references, which are grouped into their respective fields. Unfortunately, some of the citations contain misprints.

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new books

Solid-State Physics and Electronics

Advances in Circuits and Systems. Proc. Int. Conf., Beijing, China, June 1985. Institute of Electronics, Academia Sinica, Beijing, eds. 549 pp. Science Press, Beijing, and World Scientific, Singapore (US dist. Taylor and Francis, Philadelphia), 1985. $77.00

Electronic Structure, Dynamics, and Quantum Structural Properties of Condensed Matter. *NATO ASI Series.* Proc. NATO Adv. Study Inst., Antwerp, July 1984. J. T. Devreese, P. Van Camp, eds. 591 pp. Plenum, New York, 1985. $89.50

Nonequilibrium Phonon Dynamics. *NATO ASI Series.* Proc. Nato Adv. Study Inst., Les Arcs, September 1984. W. E. Bron, ed. 679 pp. Plenum, New York, 1985. $97.50

Noise and the Solid State. D. A. Bell. 175 pp. Wiley, New York, 1985. $32.95. *Monograph* □