ment for the ten-hour day that grew up in the 1840's, a time earlier than his thesis allows for a movement in behalf of increased leisure.

Generally, though, Rodgers is forthright in discussing the limitations of his thesis, and the surprising thing is that, despite the range of his examples and subjects, he trips so rarely. The overall result is one of the most refreshing and penetrating analyses of the relation of diverse levels of 19th-century American culture that it has been my pleasure to read in a long time.

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Small Bodies

Comets, Asteroids, Meteorites. Interrelations, Evolution and Origins. Papers from a colloquium, Lyon, France, Aug. 1976. A. H. DELSEMME, Ed. University of Toledo, Toledo, Ohio, 1977 (available from the University of Toledo Bookstore). xxii, 588 pp., illus. $36.50.

This book is a feast. With 75 papers by a total of 107 authors (there is some redundancy, but not much), even the most jaded palate should find something of interest. The metaphor is not altogether inappropriate, for this is a report of a colloquium held in Lyon, a traditional center of great French cuisine.

The papers are organized into nine sections: Physical Nature of Comets, The Orbital Evolution of Comets, Meteors and Meteoroids, Physical Nature of Asteroids, Orbital Evolution and Fragmentation of Asteroids, Primitive Meteorites, Differentiated Meteorites, The Origin of Comets, The Primitive Solar Nebula. The mousseline au chocolat is provided by the editor—a smooth, tactful summary that allows all the participants (and the reader) to feel comfortable about the preceding heroics. Along the way, extra seasonings are provided in the form of transcribed discussions following most of the chapters—an excellent addition to any volume of proceedings and especially interesting for such a wide-ranging and controversy-inviting conference as this one.

There is a remarkable variety in the presentations. We find sober catalogs of basic data, such as Morrison's listing of asteroid diameters and albedos, Holweger's comparison of meteoritic and solar abundances, Zellner and Bowell's discussion of asteroid compositional types, and Scott's classification of iron meteorites, and reports on oxygen isotope ratios in meteorites by Clayton, carbon isotopes in comets by Vanysek, and the discovery of the long-sought evidence for ^{26}Al by Papanastassiou *et al.* There are laboratory experiments attempting to reproduce conditions in comets (Dobrovolsky and Kajmakov) and computer experiments to analyze comet chemistry (Huebner, Delsemme and Rud) and to explore orbital histories of asteroids (Scholl and Froeschle, Carusi and Massaro, and others) and of comets (Marsden, Everhart, and others). There are careful discussions of basic physics underlying the Poynting-Robertson effect (Soter *et al.*) and the reflectance spectra of asteroids (Gaffey and McCord), and there are free-wheeling speculations that satellites may be formed from comets (Singer), that comets may come from volcanoes on Jupiter (Vsekhsvyatsky), and that the asteroids and comets may be the remains of a planet of 90 earth masses that blew up 600 million years ago (van Flandern). It is a tribute to the scientists present that each of these suggestions is received with tact and care—there is no attempt to sweep nontraditional ideas under the rug.

A wide variety of observational papers is also included. Reviews of compositional studies of comets are given by Delsemme and Donn, who conclude, in agreement with Kresak, that there is no fundamental difference between "new" comets (comets approaching the inner solar system for the first time) and "old" or short-period comets. Millman presents a stimulating review of observations of meteoroids, indicating their apparent similarity in composition to the type C-1 and C-2 carbonaceous chondrites. Brownlee *et al.* describe studies of particles collected in the upper atmosphere that are presumably remnants of these meteoroids and discuss possible origins of particles from carbonaceous chondrites or comets. Just as the unwary reader might be inclined to conclude that meteorites come from comets, the many papers on asteroids and on the meteorites themselves provide convincing evidence for an asteroidal origin. Support for this view is nicely summarized by Levin.

What are the sources of the meteorites in our museums? Many of the authors struggle with this question; no unanimously supported picture emerges. We don't really know how comets evolve or whether "dead" comets represent a possible source of stony material. Asteroids are not entirely satisfactory either, since the ordinary chondrites do not seem to be represented among the types of asteroid spectra recorded by ground-based observers. It appears that missions to comets and asteroids—especially missions that return samples—may be required to resolve these issues.

In his introduction, Delsemme suggests that this volume is devoted to a study of footprints—the record that remains of the early history of the solar system as determined by conditions in the primitive solar nebula. It is clear from these papers that this nebula must have been far more heterogeneous in structure and composition than most students of the subject have thought. Did it already contain comet nuclei? Are some interstellar grains therefore trapped in comets? And what events caused the isotope anomalies found in the meteorites and generated the short-lived radioactivities that played such a crucial role in the formation of planets and satellites? Where *do* the meteorites come from? These proceedings demonstrate that there is a vigorous and intelligent community of scientists hard at work trying to answer these questions and generating new ones as the inquiry proceeds. One can scarcely fail to share their interest and enthusiasm as one reads the papers and discussions in this stimulating book.

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Audition and Behavior

Recognition of Complex Acoustic Signals. Papers from a workshop, Berlin, Sept. 1976. THEODORE H. BULLOCK, Ed. Dahlem Konferenzen, Berlin, 1977 (U.S. distributor, Heyden, Bellmawr, N.J.). 404 pp., illus. Paper, $25. Life Sciences Research Reports, 5.

The general strategy of science is to turn magic into ordered explanations. The focus of ethology is on that ultimate bit of magic, behavior. Pioneering ethologists imposed on behavior a controversial conceptual order that invoked several smaller bits of magic—releasers, fixed-action patterns, imprinting, and so on. It was left to physiologists to show that these orderly concepts reflected real, underlying processes. Neither group, however, found the work of the other particularly useful. When physiologists uncovered unitary feature detectors in the visual system for lines, spots, moving edges, binocular disparity, and so on, traditional ethologists, looking for the holistic patterns required by their treasured Gestalt psychology, saw no connection with releasers. More recent work demonstrating that many detectors