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**THE EARTHQUAKE HANDBOOK**—Peter Verney—Paddington, 1979, 224 p., illus., \$10.95. Explains in nontechnical language how earthquakes happen, where they occur and why. Traces the development of seismology, describes and illustrates many famous earthquakes and makes suggestions for safety for those in earthquake-prone areas.

**HANDBOOK OF NOISE CONTROL**—Cyril M. Harris, Ed.—McGraw, 2nd ed, 1979, 720 p., illus., \$39.50. Today there are many people in widely diverse fields whose work requires some knowledge of noise control. This edition is written so as to make technical information on noise control accessible to these nonspecialists without diminishing its value to the acoustical engineer. Contributions from 53 experts in the field.

**THE HIDDEN COSTS OF REWARD: New Perspectives on the Psychology of Human Motivation**—Mark R. Lepper and David Greene, Eds.—LEA (Wiley), 1978, 262 p., charts & graphs, \$16.50. These papers are intended to acquaint the reader with the most recent theory and research concerning the conditions under which rewards may have detrimental, as well as beneficial, effects, and the processes that may underlie such effects.

## ... PETRA

cally charged particles. It would have been a terrible shock if they hadn't.

Another general point reported by Zech from PLUTO is that the total cross section, the over-all probability of producing things, in these collisions, remains at a constant level up to  $2 \times 17$  GeV. In the past when a new variety ("flavor") of quark has entered the picture, the total cross section has taken a stepwise upward move, reached a threshold as they say. The quarks are supposed to be the basic pieces out of which all but a few of the known subatomic particles are built. So it is interesting to know how many they are and how they interact with each other. At the moment theory envisions six varieties or flavors, and there is experimental evidence for five of these.

Zech offers the expectation that at PETRA they will soon find a new flavor threshold, that is, the domain of a sixth quark. Meanwhile, experiments at both PETRA and DORIS are working on the fifth one, called the bottom quark, which appears in the upilon particles, the heaviest yet discovered. The basic upilon weighs in at 9.46 GeV, the slightly more energetic (excited) state, upilon-prime, at 10.02 GeV. DORIS at its top energy can just about make them.

Systematic study by the DASP experiment at DORIS leads to a confirmation that the upilons are indeed bound states of

## HOW TO PATENT WITHOUT A LAWYER

—Albert Thumann—Fairmont Pr (Van Nos Reinhold), 1978, 163 p., illus., \$14.95. Provides answers to patent law problems using actual case studies. The book does not advocate that everyone with a patentable product should patent without a lawyer, but rather that by understanding the principles of self-patenting the best course of action can be chosen.

**LAUGH AFTER LAUGH: The Healing Power of Humor**—Raymond A. Moody, Jr.—Headwaters Pr (Lippincott), 1978, 128 p., \$7.95. An M.D. writes about the medical implications and uses of laughter and the sense of humor.

**MAKING MEDICAL CHOICES: Who is Responsible?**—Jane J. Stein—HM, 1978, 270 p., \$10.95. Technological advances in medicine have created a multitude of choices for each individual—choices that can influence how we live and how we die.

**MALNUTRITION, ENVIRONMENT, AND BEHAVIOR: New Perspectives**—David A. Levitsky—Cornell U Pr, 1979, 295 p., illus., \$15. Papers concerned with the effects of malnutrition on behavior and brain development that were presented at the Cornell Conference on Malnutrition and Behavior, November 1975.

**MURMURS OF EARTH: The Voyager Interstellar Record**—Carl Sagan et al—Random, 1978, 273 p., color and b&w illus., \$15. Written by those chiefly responsible for the content of the Voyager Record that is affixed to each Voyager spacecraft as a message about earth to possible extraterrestrial civilizations. An account of why the Record was done, how the material was selected and what it contains.

the fifth or bottom quark and its antiquark, J. K. Bienlein reports. The force that binds them together is a basic concern of the newly developed theory of quantum chromodynamics (QCD). QCD predicts that this force will be materialized or carried by intermediate particles called gluons. A force between two quarks is equivalent to a continual exchange of gluons between them. Are gluons real?

Theory says that when upilon particles decay, the gluons should manifest their existence by making the decay products come out in three narrow, separated jets. Such jets should be especially distinguishable at high energy. In the general character, nature and distribution of the upilon decay products, the PLUTO group has found a good agreement with theoretical prediction. That is indirect evidence for gluons since they are a key part of the theory, but the three jets that would be a more direct evidence of the gluons themselves have not yet appeared. They hope to find them in PETRA.

Another aspect of the QCD force is how it operates among different flavors of quark. Electric forces, for example, follow the same law whether the charged particle is an electron, a proton or a pion. Bienlein reports that DASP studies comparing the behavior of upilons and of psi particles (which are made of a different flavor of quark, the charm quark), indicate that the "interaction is flavor independent." This is

**POLLUTION: The Neglected Dimensions**—Denis Hayes—Worldwatch Inst, 1979, 32 p., paper, \$2. Long-lived pollutants, such as CO<sub>2</sub>, toxic substances and nuclear wastes, are examined. These pollutants, the author feels, can pose dangers for thousands of years, or even forever.

**POSITIONAL ASTRONOMY AND ASTRO-NAVIGATION MADE EASY: A New Approach Using the Pocket Calculator**—H. R. Mills—Wiley, 1978, 267 p., illus., \$22.50. Makes the basic methods of positional astronomy easily accessible with a hand-held scientific calculator and some simple apparatus that is inexpensive to build.

**PRACTICAL GEMOLOGY: A Study of the Identification of Gemstones, Pearls, and Ornamental Minerals**—Robert Webster—Arco, 6th ed., 1978, 209 p., illus., \$7.95. An introduction to the study of gems. Essential methods of gem testing are explained, apparatus is described and gem species are given in semitabular form.

**THE PSYCHOPATH: A Comprehensive Study of Antisocial Disorders and Behaviors**—William H. Reid, Ed.—Brunner-Mazel, 1978, 349 p., \$17.50. Contributors examine the antisocial syndrome, focusing on characteristics that are associated with it and on treatment approaches that have had some degree of success with these most difficult patients.

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as the theory expects. A contradiction would have seriously complicated quark dynamics.

These beginnings can lead to a very full program. Already Voss is talking of adding polarized electrons to PETRA. Polarized electrons would permit experiments that make very sharp distinctions in the study of the newly unified domains of electromagnetism and the weak interaction, another kind of force in the subatomic world (SN: 7/8/78, p. 20).

By 1981 it may be possible to have two more detectors using polarized beams. There could be more transmitters, raising the energy to 23 GeV per beam. Another energy jump (to  $2 \times 30$  GeV) could come in 198X, that is, as soon as superconducting accelerating cavities are tested out. There is a joint DESY-CERN-Karlsruhe project to build one and install it in DORIS by the fall of this year. In 198X it might also be possible to put in superconducting proton rings of about 300 GeV energy in order to study electron-proton collisions. And finally, though he admits that PETRA is as big a ring as can be built on the present DESY site, Voss's plan for 19YZ talks of an electron-positron ring of 100 GeV or so. At this point, if not sooner, he is likely to run into competition from other European laboratories, especially the older and international CERN laboratory—to some extent he already has—but he doesn't act as if it bothers him. □