minating section of the work is the treatment of the sterile character of Cambridge University, from which Newton insulated himself well; the way he responded at an advanced age to administrative challenges he faced as Warden and Master of the Mint and to the new foreign social environment in the capital; and the masterly way he brought the pieces of his celestial and terrestrial dynamics together when called upon to write the *Principia*. Here, as elsewhere, Westfall knows how to use the writings and analyses of other scholars to fashion a brilliant synthesis. Significantly, the least satisfying section is the discussion of the *Opticks*, a topic that is not well treated by others and is in need of more study. I was left puzzled by the way Newton was able to juxtapose his color theory with several periodic optical phenomena discussed on the basis of his excellent observations. That is just one of many subjects that have not been exhausted. But Westfall will surely have brought its discussion to a new and higher plane with this magnificent biography.

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## Particle Physics

**Proceedings of the Fifteenth Rencontre de Moriond**. Les Arcs-Sovoie, France, March 1980. J. TRAN THANH VAN, Ed. Editions Frontières, Dreux, France, 1980. In two volumes. Vol. 1, Elementary Constituents and Hadronic Structure. 706 pp., illus. $65. Vol. 2, Electroweak Interactions and Unified Theories. 606 pp., illus. $65.

Over the past five years experimental evidence has steadily mounted in support of what are now the standard descriptions of three fundamental forces in nature: the strong, short-range interactions between hadrons (for example, protons and neutrons); the weak, short-range interactions common to hadrons and leptons (for example, electrons); and the familiar long-range electromagnetic interactions between charged particles. The implications of these three theories are often best tested in very high energy collisions. One of the numerous conferences at which new results are reported is the Rencontre de Moriond, held in the French Alps each March for two weeks. The papers presented at these meetings are less formal than those published in the research journals but not as pedagogical as the lectures at summer schools. The two volumes of 1980 proceedings contain 95 research papers of varying lengths.

Volume 1 is devoted to the structure of hadrons. Roughly half the papers treat hadronic collisions. Particularly impressive here are the data on massive muon pair production presented by D. Decamp, which fit the Drell-Yan model and yield structure functions that agree with those measured in completely different types of experiments. The one puzzle is that the experimental cross sections are twice as large as the simple model predictions. E. L. Berger gives a theoretical overview of dilepton experiments. Several papers discuss high momentum leptons as signals for charm or other new quarks, and P. Charpentier puts rather strong limits on the production of B mesons from trimuon and like-sign dimuon events. There is a rather standard assortment of papers on hadronically induced jets and on photoproduction.

New data are presented on deep inelastic muon scattering by J.-M. Thenard, K. Rith, Y. Sacquin, and R. Johnson and on deep inelastic neutrino scattering by D. Schlatter and P. Fritze. At momentum transfers as large as 200 $GeV^2$ the scaling violations at large $x$ are as expected but are slightly ambiguous at small $x$. Unfortunately, the data presented are preliminary.

A. Petersen, D. Schmidt, G. Mikenberg, and H. B. Newman, each representing one of the four major groups at PETRA, display very beautiful results on hadronic jets produced in $e^+e^-$ collisions. Each of the four reports is quite thorough and presents solid evidence for the existence of three-jet events at energies of 30 GeV (center of mass). The significance of these events and theoretical expectations for the future are thoroughly discussed in a 40-page report by S. Wolfram.

Volume 2 deals with the electroweak interactions and unified theories. B. Gittelman, P. Skubic, and S. Herb from CESR as well as J. K. Bienlein and K. R. Schubert from DORIS report on the first measurements of the $b\bar{b}$ bound state system. The masses and leptonic widths of three very narrow states and one broad one are measured and agree with theoretical models as described by A. Martin. M. Oreglia, D. Aschman, and G. J. Feldman from SPEAR each present very precise results on radiative transitions between states of the lighter mass $c\bar{c}$ system. They see evidence for only one pseudoscalar state that does not decay into two photons and are able to measure the angular momentum of the $\chi$ states from the angular distribution of the photons associated with their production and decay. R. Marshall, W. Bartel, H. Spitzer, F. Vannucci, and D. H. Saxon from PETRA each report on the search up to 35 GeV for $t\bar{t}$ states, heavy leptons, weak electromagnetic interference, and free quarks. From 2-GeV measurements at Orsay, A. Cordier presents evidence for the $\phi'$ resonance partner of the $\rho'$. In a section on muon and neutrino physics there are several papers on beam dump experiments and dimuon events and a nice review by M. Strovink of multilepton production. J. Trischuk presents the results of several emulsion experiments that measure charmed meson lifetimes.

The small collection of theoretical papers on grand unification provides a useful review. K. Kang introduces the SU(5) model and then follow two papers of more than 40 pages each—a lucid and practical discussion by D. V. Nanopoulos of the SU(5), SO(10), and $E_6$ grand unified models and a pedagogical gem by K. D. Lane and M. E. Peskin on dynamical symmetry breaking.

These volumes are not intended to provide an overview of the field. They are extremely topical and in many instances the reports may already be superseded by journal articles.

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## Developmental Biology

**The Development of the Vertebrate Limb**. An Approach through Experiment, Genetics, and Evolution. J. R. HINCHLIFFE and D. R. JOHNSON. Clarendon (Oxford University Press), New York, 1980. xvi, 268 pp., illus., + plates. $59.

This excellent book is the first to attempt a comprehensive review of vertebrate limb development. It draws together information and ideas from the fields of evolutionary biology, genetics, and experimental embryology. In many ways the book is inconclusive, and it raises as many questions as it answers. But it is just this kind of bold statement that will contribute to the process of getting some of the loose ends tied up.

The book has a pleasing symmetry in that it both begins and ends with evolutionary considerations. In between are chapters on adaptation and diversity, embryology, regeneration, and pattern formation. Throughout the book the authors attempt to discuss as many different vertebrates as possible, although the experimental sections concentrate on the chick wing. This is not a criticism of the