women who were not college-educated. Such findings are interpreted in terms of systematic differences between social classes in the degree of similarity (continuity) between adolescent and midlife socialization. Thus, for non–college-educated women, a double-track career was more consistent with their own and societal expectations than for college-educated women.

A final example that illustrates the fertility of this project involves the identification of two personality dimensions that appear to act like central control mechanisms for later development: emotional control and cognitive investment. Emotional control in adolescence proved to be a strong predictor of adult health, marital and occupational career, and IQ. For the dimension cognitive investment, an index category measuring cognitive competence and commitment, a similar pattern is identified. Investment in oneself and one's growth during adolescence appears to be a major driving force in achieving "healthy and effective" adult functioning.

The present volume, like any long-term longitudinal research on human development, has its limitations. The adequacy of design and statistical controls and analyses varies. Despite much effort to avoid it, several authors succumb to the temptation to speak about causal mechanisms and linkages where it would have been more appropriate to limit themselves to reporting correlations. Similarly, one wonders whether the high degree of stability in personality functioning found may in part be a methodological artifact. If a few items in the pool used for rating of personality are stable over time and these items function as "trend setters" (prototypes), they could produce a halo effect based on belief systems about people rather than on people's behavior, with resulting overstatement of the case for developmental continuity. The reader would be aided also if the editors had presented a table summarizing the timing, format, subject composition, measurement battery, and other such features of the various longitudinal studies.

In sum, despite its shortcomings this volume will, in our view, become a classic of the literature on human development. It is a testament to the rewards of cooperation, and the harvest is rich enough to encourage our interest in the next season of the subjects' lives.

PAUL B. BALTES
ELLEN A. SKINNER
Max Planck Institute for Human Development and Education, Berlin, Federal Republic of Germany

Element No. 78

A History of Platinum and Its Allied Metals. DONALD MCDONALD and LESLIE B. HUNT. Johnson Matthey, London, 1982 (distributor, Europa Publications, London). xii, 450 pp., illus. $37.50.

Platinum entered the purview of science in 1750, when recent studies of the "new semi-metal" were made known to the Royal Society of London. But this was rather an identification than a discovery. As is related in this book, platinum was known to visitors to South America in the 16th century and has been found among the objects of pre-Columbian archeology. The metal was virtually unworkable, and the successful resolution of this problem, accomplished by 1782, was a remarkable exemplification of the powers of applied science, involving several scientists and several techniques, including powder metallurgy. The growing sophistication of the chemist was further shown in the discovery of other elements in crude platinum, iridium, osmium, palladium, and rhodium (1802–1804). By 1805 W. H. Wollaston was able to supply small articles of malleable platinum for uses where corrosion resistance was important enough (his price was £16 an ounce). The predominant early uses were for touchholes and pans of flintlock guns and for boilers for concentrating sulfuric acid, of which the first was made in 1805. Other uses of the metal were obvious enough to outrun supply, but its suitability for what was to be its most important use, in catalysis, was not unveiled until 1822, by J. W. Döbreiner. A worldwide search for sources of platinum has since been continuous, and largely successful, the most recent source described here being South Africa.

This is an excellent book, to be recommended not only to scientists and historians interested in the topic (which is, as the book shows, wider than most of us realize) but especially to anyone involved in the history of a science-oriented business. The publisher is a principal producer of platinum and the authors are long-time associates of the firm. Together they have virtually set a new standard for this genre of publication.

In 1960 the senior author published *A History of Platinum*, "from the earliest times to the 1880's," which was well received, being criticized mainly for its early cut-off date and for neglecting the scientific aspects of the subject. The present book is responsive to these criticisms. The former book had 18 chapters in 254 pages; this one has 24 chapters in 450 pages. Chapters on catalysis, the chemical history of the platinum metals, their place in the periodic table, and platinum in the measurement of high temperatures have been added. And the subject is brought up to the 1960's—still not quite the last word; we are told in the preface that the scale of production of the platinum metals has increased fivefold since 1960.

Revision appears to have been principally the work of the junior author, for the understandable reason of McDonald's advanced age—he died at 92 while the book was in press. The writing is straightforward, descriptive rather than analytical; but historical analysis depends on the prior existence of books such as this.

The 1960 volume was praised for its elegance. This one improves on it, the illustrations being even more numerous and some of them in color. The sponsoring firm, and its members who are the authors, have exercised a restraint and modesty that are, to say the least, unusual in historical publications emanating from commercial firms. It is to be hoped that others may take this as a model for how to expend a small fraction of their substantial expenditures for public relations, or "understanding."

ROBERT P. MULTHAUF
Museum of American History, Smithsonian Institution, Washington, D.C. 20560

Particle Physics

Proceedings of the Seventeenth Rencontre de Moriond. Les Arcs, Savoie, France, March 1982. J. TRAN THANH VAN, Ed. Editions Frontières, Gif sur Yvette, France, 1982. In two volumes. Vol. 1, Quarks, Leptons and Supersymmetry. 650 pp., illus. $60. Vol. 2, Elementary Hadronic Processes and Heavy Ion Interactions. 702 pp., illus. $65.

It is useful to view the present volumes from the perspective of the past ten or 15 years in particle physics. Tremendous progress has been made, both theoretically and experimentally, in understanding particles and their interactions. A real unified theory of weak and electromagnetic interactions was written and experimentally tested in many ways. A possibly fundamental theory of strong interactions (called quantum chromodynamics) was found; many of its predictions are, so far, only qualitatively tested, but agreement between theory and experiment is good, and the circumstantial evidence is highly favorable. There exist theories that describe all known

interactions of particles, and there are no known conflicts between theory and experiment. This body of theory has come to be called the standard model.

Particle physicists think that the present description is incomplete, because it does not provide "why" explanations for several basic phenomena, such as the equality of magnitudes of electric charge of the electron and proton, the origin of particle masses, and the apparent existence of several families of particles that have identical interactions but differ in mass. The standard model also requires another particle, the "Higgs boson," to exist; its properties, and whether it must be fundamental or can be dynamical, are not well understood.

The contributions to the proceedings can be divided into three sets. In each set there are some that review the field or provide introductory material (suitable for a particle physicist who has not worked on the specific subject), some that present recent developments, and some that provide a current perspective.

One set of contributions refers to further tests of the standard model. Before one can be confident of the validity of the model, many important tests must be done. Even if confidence can be achieved, small deviations from standard model predictions may be a clue to the answers to some of the questions that go beyond the model. A number of detailed tests are reported from neutrino reactions. Some of the first results from the new e^+e^- collider at Stanford (PEP) are prsesented, as are a number of results from the older e^+e^- collider at Hamburg (PETRA). Important results on decays of b-quarks from the e^+e^- collider at Cornell (CESR) are given by Kass and Sadoff and by Franzini and Bohringer. Tests of quantum chromodynamics in photon-photon collisions and large transverse momentum collisions (where quarks will appear as "jets" of conventional particles, mainly pions) are described.

The most important tests of the standard model will come in the near future. The electroweak theory requires the existence of fundamental bosons, like the photon, to mediate the interactions. A proton-antiproton collider at CERN, Geneva, is the first accelerator in the world with enough energy to produce these bosons—although they are like the photon, they should be heavy, about 90 proton masses. Quantum chromodynamics also has a major prediction that requires the CERN collider, that there should be collisions that produce a pair of quarks (which would appear as narrow jets of mainly pions) carrying 20 to 30 percent of the total energy of the collision. Some of the papers in the proceedings review the predictions and some describe the first events from the CERN machine, which had been turned on only shortly before the meeting. (Very recently jet events that may have the expected properties have been observed, but further data and quantitative comparisons are needed. It was planned that a week of the 18th Rencontre de Moriond, in March, would be devoted to results from the CERN collider.)

All of the results mentioned so far arise from predictions of the theory where a perturbation series should be valid. Another set of contributions discusses ways to try to learn about quantum chromodynamics in the nonperturbative realm, which is much more difficult. Coherent phenomena such as elastic scattering or collisions of heavy ions where a plasma of quarks and gluons might be formed are discussed. Work on this subject is very difficult and is consequently in a primitive state.

The third set of contributions is concerned with the effort to go beyond the standard model to answer some of the "why" questions and to further unify the known forces. The main activity of many workers in this direction is on supersymmetry, which introduces a symmetry between the bosons of the theory (like the photon) and the fermions of which matter is composed. Supersymmetric theories have many nice properties and could address some of the open questions, though so far they have not improved the situation. They also have many experimental implications but none have been observed; although many workers consider supersymmetry the most promising approach to questions beyond the standard model, there is not yet one item of experimental evidence in its favor. Several papers, particularly a review by P. Fayet, describe the activity on this subject. Other contributions cover motivation and searches for axions (there is a nice review by G. Girardi), neutrino masses, and proton decay.

There is an increasing overlap of particle physics with astrophysics and cosmology, mainly in the realm beyond the standard model. The Rencontre de Moriond has recognized this by holding a week of simultaneous meetings in these fields, with some overlapping sessions. Some of the contributions by particle physicists are in the present volumes, though there is a separate volume of proceedings for the astrophysics week (called *The Birth of the Universe*).

As is consistently the case, particle physicists will find the Rencontre de Moriond proceedings to be timely and useful. Although they are for active workers, they contain enough of a pedagogical and review nature that others may find them to be helpful in gaining some insight into what is going on in particle physics (and why) at a given time.

GORDON KANE
Randall Laboratory of Physics,
University of Michigan,
Ann Arbor 48109

A Small Peptide

Substance P in the Nervous System. Papers from a symposium, London, Dec. 1981. Pitman, London, 1982 (U.S. distributor, CIBA Pharmaceutical Company, West Caldwell, N.J.). x, 350 pp., illus. $35. Ciba Foundation Symposium 91.

The history of substance P, a small peptide of 11 amino acids, is almost as old as the history of acetylcholine in biology. A few years after the discovery that it is acetylcholine that transmits signals from motor neurons to muscles in vertebrates, Von Euler and Gaddum found a substance in intestine that was different from acetylcholine but very potent in causing smooth muscle contraction. Because this substance was present in the powder fraction of the tissue extract, they referred to it as P in their first paper on the subject, in 1931. Subsequently substance P was found to be concentrated in nervous tissue such as the brain and the spinal cord.

Each segment of the spinal cord is connected to the peripheral tissues such as skin and muscles by two nerves, the dorsal root containing sensory nerve fibers and the ventral root containing motor nerve fibers. The finding that substance P was much more abundant in dorsal roots than in ventral roots led Lembeck to suggest in 1953 that substance P might be a transmitter that is released by certain sensory neurons. Since then much attention has been directed toward understanding the function of substance P in the nervous system. Research on the subject has gained tremendous momentum since Chang and Leeman purified and sequenced substance P in 1970, using its ability to stimulate salivation in the rat as a bioassay during purification. With the chemical structure of substance P known, large quantities of synthetic peptides became available, allowing study of the biological activity of pure peptides. Also, antibodies against substance P were generat-