this approach has been largely limited to the so-called external relations of science. In the near future lies the possibility that social relations may be the key to the internal development of science as well.

Dupré and Lakoff are both identified on the cover of this book as assistant professors of government at Harvard. Hence they would doubtless admit themselves accountable for the query as to what political science has to offer in the delineation of the scientific revolution. While most of their account is descriptive narrative, they do in their conclusion venture into a more analytical way of stating the changed relation that is their subject. They see the partnership in research between the federal government, on the one hand, and business and the universities, on the other, as profoundly modifying the definition of the words *public* and *private* in our national life. They also conclude that, in the political sphere, the line between technical advice and policy-making is equally modified and that scientists are inextricably engaged in both. "If science and the nation have become interdependent but not indistinguishable it is because implicitly and explicitly those who have shaped the relationship have recognized that cooperation is essential if free institutions and individual freedom are to continue to function successfully. They have therefore sought to answer a national need but at the same time to promote institutional pluralism and personal responsibility."

Plea for Public Understanding

In their final paragraph, the authors transcend analysis with a fervent plea for better public understanding of the policy structure and politics of science in the nation. "Without public understanding of the new ways of partnership in which science and the nation have been brought together, old ideological dogmas may hinder vital progress. In the last analysis, a democratic nation can cope with the scientific revolution wisely only if thoughtful citizens know what it truly entails." Among the several groups within the public who must exert themselves in this enterprise are both scientists and social scientists, whose aroused efforts might provide the basis of information and theory on which the present authors could thankfully take up anew the task of sketching a portrait of the scientific revolution of our time.

Facets of Achievement

Essays in Pre-Columbian Art and Archaeology. Samuel K. Lothrop and others. Harvard University Press, Cambridge, Mass., 1961. 507 pp. Illus. $12.50.

Most of the 27 papers in this volume deal with American Indian civilizations in Middle and South America, but there is some coverage of less advanced cultures, both ancient and modern. Counting joint authorships, it is clear that 28 students of the American Indians in areas south of the United States have contributed to this volume as a gesture of respect and affection for one of the greatest producers and thinkers in their field. The lead article and one other are by Lothrop himself.

The editorial committee consisted of Doriz Stone, Gordon F. Ekholm, Junius B. Bird, and Gordon R. Willey, who provide a preface. Their effort was to make the collection "representative of the extremely wide range of interests in a distinguished career" and with "a particular eye to those objects that are commonly classified as art." They justly note that no Americanist contemporary of Lothrop has "extracted from the work of art so much information on the past or such insight into the lives of the makers." I steal space to add that no one has been more universally liked as well as respected for his accomplishments.

With one exception all the papers involve recent discoveries or new research. The top-drawer nature of the editorial group assured contributions of high quality only. Most students of the field covered will find required reading among these papers, and they will broaden their knowledge by reading them all. The emphasis on art objects gives the collection a special unity and requires generous illustration. The book is attractively printed and aims at the general reader as well as at the specialist. It should prove an excellent medium for showing the former how archeologists use "art" where written documents are lacking.

The objects discussed range through small and large stone sculpture, products of the lapidary, baked clay figurines, pottery vessels, textiles, paintings on pottery and wood, and work in the precious metals. Without entirely departing from the art category, there are valuable contributions on the design of ancient ball-game courts and equipment for the players. A new "experimental formulation of horizon styles" illustrates the desire of all the authors to rise from well-founded particulars to the level of useful inferences.

The first of the two papers by Lothrop himself breaks the pattern. "Archaeology—then and now" covers the period from 1915 to 1960. A leading theme is the change in a field man's problems wrought by the automobile and the airplane, and there is much delightful reminiscence. A prize photograph, taken at Copan, Honduras, in 1916, shows Lothrop in the background and the already venerable W. H. Holmes watching Sylvanus G. Morley, who is apparently loading his own mule. The final pages outline the history of Middle and South American archeology as Lothrop has seen it develop during the last 35 years.

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Problems and Potentials

Control Mechanisms in Cellular Processes. The seventh annual symposium publication of the Society of General Physiologists. David M. Bonner, Ed. Ronald, New York, 1961. v + 248 pp. Illus. $8.50.

Someone has spoken of modern biology as the "coming science." The designation has certainly been justified by the recent explosive and well-publicized advances in the elucidation of genetic coding, a "breakthrough" of knowledge that has been very properly characterized as one of the great scientific achievements. Lest any biologists think, however, that the opportunities for exploration have been reduced, I hasten to refer them to this timely volume.

The amazing profusion of reactions occurring within the cell is fully appreciated by today's biologists, many of whom have been engaged in discovering and characterizing these reactions. The contributors and the editor of this volume go a step further. They concern themselves with the question, "What regulates this complex system and keeps it functioning in an orderly way?" To be meaningful, they ask the question of parts of the cell, beginning with the nucleus and proceeding outward. Thus, the regulation of the activity of one

gene by another, the genetic control of enzyme synthesis, the interplay control of DNA (deoxyribonucleic acid), RNA (ribonucleic acid), and protein synthesis, and the feedback mechanisms in enzyme systems are examined in a penetrating way. The interdependent regulation of metabolic mechanisms (the Pasteur and Crabtree effects) are reexamined, and the effects of hormones on biochemical reactions and on growth are assessed for possible regulatory function. The effect of light on cell processes and the fascinating subject of built-in biological clocks—that is, temporal regulation of cellular processes—are covered in the final chapters.

The aim of the volume, as implied in the title, is not evenly maintained by the various contributors. This is not so much a fault of the individual authors as it is an indication of the state of knowledge in the areas which they serve. What is more to the point is that the reader is made clearly aware of the important unsolved problems, and that the biology of the future is rich in opportunities for a new generation of scientific giants.

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Well-Translated Tool

Kinematics of Nuclear Reactions. A. M. Baldin, V. I. Goldanskii, and I. L. Rozenthal'. Translated from the Russian by Ronald F. Peierls. Oxford University Press, New York, 1961. xii + 223 pp. + tables (45 pages). $6.10.

When we consider the prodigious rate of accumulation of data relating to nuclear reactions, it is somewhat surprising that more rapid progress has not been made in the fundamental understanding of the nature of the forces between the elementary particles. But the reason is not too hard to discover, if one examines in detail the nature of the data that are available, especially in the high-energy range. The fact is that most of the experimental results reflect, in one form or another, the consequences of one or more of the conservation laws—the conservation of energy, of angular momentum, of parity, of isotopic spin, of "strangeness," of baryons and of leptons, of "isotopic parity," and the like.

In the field of elementary particle physics especially, involving as it does interactions in the relativistic energy range, where the basic kinematical relationships are far from being intuitively obvious, the problem of separating out the inevitable consequences of the conservation laws is especially acute. Most observations, it turns out, yield little more than the confirmation of one of the principles of conservation or symmetry which govern the interactions among the elementary particles. Of course, as long as it is a question of discovering or verifying basic conservation laws, or when it is a matter of the discovery of a new elementary particle or symmetry principle, such observations are of fundamental importance. But in the great majority of experimental observations, the problem faced by the experimenter, or by the interpreter of his results, is one of extracting from the observations those aspects that only describe the effects of known conservation laws, in order to determine whether the observations can yield some new information relating to the dynamics of the interactions involved.

Towards this end, every nuclear experimenter will find this book indispensable for plying his trade. Beautifully organized, concisely presented, and written by a trio of physicists admirably qualified for their task, the book is concerned with this problem of extracting from experimental observations the inevitable results of kinematical relationships and conservation principles. The first part deals with the kinematical rules that govern nuclear interactions, deriving the relationships necessary for the interpretation of experimental observations, in simple and useful form. The second part is an exposition of the effects of conservation principles on the interactions among the elementary particles, utilizing the methods of the "S-matrix" as the formal device for imposing the conservation laws, especially those that are required by the quantum mechanics, on the interpretation of experimental observations.

The translation is excellent. Compared with another translation of this book, issued by Pergamon Press, this one is far superior in accuracy of translation, in printing and format, and in relative freedom from typographical errors. A short work, it manages to include in some 300 pages practically all the tables, graphs, and formulas that an experimental physicist might need. Although the authors apologize for not having covered more, they should be congratulated for having covered so much with such clarity and excellent organization. In the material covered, the only omission worth noting is in the chapter on multiple processes, where a brief discussion of the kinematics of the "two-fireball" model would have been a welcome addition.

Readers will look forward to the revised and enlarged version promised by the authors.

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Lucid, Concise Volume

Manual of Field Geology. R. R. Compton. Wiley, New York, 1962. x + 378 pp. Illus. $7.50; text. ed., $6.25.

Many fledgling geologists are inclined to panic when faced with their first mapping project—the jump from lecture hall and laboratory to the field seems so severe. Here is a book that should ease the transition; it is written by a man with considerable and varied experience gained from detailed mapping work in California, Nevada, and western Europe and from 10 years of instructing the geology field course at Stanford University. The manual is intended to provide students with the advice and information essential for independent field work, and the intention is well executed.

The organization and presentation of the material is lucid and concise. Almost all of the technical terms used are carefully defined and indexed. The numerous illustrations by the author are superb, and happily a scale, where appropriate, is included. Chapter 1 begins with a geologist's definitions of *field* and *field geology* and discusses methods of collecting data and samples. Included are numerous techniques that most geologists eventually devise themselves and then mistakenly regard as original. Chapters 2 and 3 describe the use of basic instruments; 4 and 5, the plotting of geologic features on base maps and aerial photographs (including a valuable discussion of the delineation of rock units and contacts). The next four chapters thoroughly describe procedures for constructing base maps by alidade and plane table methods, by transit surveying, and by