

succession and to uncover any evidence bearing on the fate of a group of colonists (the "Lost Colony") who disappeared shortly after they founded Fort Raleigh (in 1587). Although the program was unsuccessful with respect to the latter aim, a considerable amount of useful data bearing on the former problem was obtained.

Since the area selected was too large for a complete survey, the field strategy was "to obtain representative sites throughout and, where circumstances suggested favorable results, to make test excavations in order to establish the chronological sequence of cultural events" (page 2). Consequently, most of the field work was in the nature of surface collecting, but stratigraphic test excavations were made at five sites, which were the most promising from the standpoint of depth of midden. Cultural materials, principally pottery sherds, were obtained from most of 81 "sites" located on Hatteras, Ocracoke, Bodie, Collington, and Roanoke islands, on the adjacent mainland in the vicinity of the Neuse River, and on Albemarle and Pamlico sounds.

As one might expect in a report of this nature, the bulk of the study is taken up by a description of the individual sites and a technical analysis and comparison of the pottery with that of adjacent regions in terms of temper, paste, surface finish and decoration, and form. However, in two final chapters Haag skillfully combines limited inferences from sparse archeological data with good regional historical data to produce a plausible reconstruction of aboriginal culture history. The latter is divided into an early period (hunter-fisher-gatherers), a middle period (introduction of agriculture), a protohistoric period (a time of numerous contacts with other areas, especially with the interior Piedmont and the Virginia coast and Chesapeake), a historic period (a period of considerable political adjustment), and a displacement of aboriginal culture period (post A.D. 1587).

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The Second (1957) University of Utah Research Conference on the Identification of Creative Scientific Talent. Calvin W. Taylor, principal investigator. University of Utah Press, Salt Lake City, 1958. vii + 255 pp.

The need for identification and support of individuals gifted with creative scientific talent has been increasingly recognized in the United States since the fall of 1957. It is to the credit of the National Science Foundation that since

its inception, and particularly since 1954, it has effectively encouraged investigation aimed at discovering and nurturing potentially creative scientists, and it has supported two summer research conferences on this topic, in 1955 and 1957. This report of the second conference, held in Brighton, Utah, 17-20 Aug. 1957, has the same form as that of the earlier conference [reviewed in *Science* 125, 813 (1957)]; it is prepared from a complete transcript of proceedings and presents 15 original papers, discussion of each paper, and two committee reports. Restrained and judicious editing by the participants has served to retain the liveliness of the discussions; the enthusiasm of the participants is apparent and contributes to the readability of the product.

A reader in search of hypotheses concerning characteristics of the creative scientist and methods for identifying him will find that almost every contribution to the conference offers stimulating suggestions. Of particular interest is the view of a criterion committee, which reported to conferees, "The measure of a creative product should be the extent to which it restructures our universe of understanding." The committee report continues by suggesting means for estimating degree of creativity for established scientists and proposes a series of testable hypotheses which specify promising relations between this estimate and other variables (for example, the diversity of a scientist's contributions).

To one hoping to discover proven methods for the successful selection of promising scientific talent, the report will be provocative but disappointing. In the empirical studies cited, attempts to distinguish creative scientific achievements or to discriminate between creative and noncreative scientists on the basis of academic grades or standard aptitude measures were not remarkably successful. While in two or three studies certain aptitude measures showed some promise, the more typical finding was one of no relationship between this class of variables and creative scientific achievement. In explanation, the report does not rule out inadequate criteria of creativity, unsatisfactory predictor variables, or inappropriate experimental design and analysis. Nevertheless, there remains the tenable conclusion that conventional measures of intelligence and academic achievement are not good measures of creativity. Participants emphasize the probably greater value, as indicators of creativity, of certain special aptitudes (such as the aptitude for divergent thinking), of certain qualities of temperament (for example, independence versus conformity), and of certain kinds of motivation (for instance, inquisitiveness of mind); it is suggested that new tests be developed where none now exist for measuring such variables.

Not the only challenge contained in the report is directed toward research on identification of creative scientific talent. Repeatedly participants emphasize the danger that academic training procedures or environmental working conditions may inhibit rather than excite the creative impulse. In the words of one, "More good people are spoiled scientifically and in their creative thinking by being frightened than [by] anything else." While this report will affect most directly the research area which it represents, its relevance to the training of scientists should not be overlooked.

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Symposium on Sociological Theory.

Llewellyn Gross, Ed. Row, Peterson, Evanston, Ill., 1959. ix + 642 pp. \$7.25.

This book of 19 essays covering theory in sociology is as good as anything available. Happily, one advantage—not more than three of the essays are long-winded or dull—will assure recognition of the book's merit. The essays range from a confessional "how-to-do-it" piece, by C. Wright Mills, through an artfully complex but not difficult "axiomatization" of linguistics, by Joseph H. Greenberg, to Anatole Rapoport's "Uses and Limitations of mathematical models in social sciences."

Unfortunately, however, a prejudiced outsider will probably leave the book with his prejudices intact. The difficulty is stated forthrightly in Robert Bierstedt's article: "The important lacuna . . . is that between metasociological theory on the one hand and sociological theory on the other or, stated differently, between methodological theory and substantive theory. Metasociological theory is now a highly developed discipline; sociological theory, on the contrary, is still a weak and pallid thing whose pursuit receives no special encouragement within the profession and whose major achievements frequently come not from academicians, but from novelists, journalists, publicists, and those relatively few sociologists who are not afraid of epithets like 'unscientific'." Even Greenberg says of linguistics, which vies with economics for being the most thoroughly "scientific" of the behavioral sciences, that it "does not at present have a general theory as this term is employed, e.g., in physics. What can be axiomatized is rather the descriptive methodology of the science."

There is a lot of "metasociological theory" in this book. Sociologists must, apparently more than other scientists, recognize that all "facts" are perceived phenomena and that the statement of a

fact is a statement of the relationship between perceiver and perceived. The concern with the perceiver is neither to be wondered at nor condemned. However, one danger does exist: the perceiver may become the subject matter, and social relationships (which are, after all, what sociology studies) may be left out in the cold.

Sociology, like any science (and Carl G. Hempel's lucid critique "The logic of functional analysis" shows that the word *science* is not a misnomer) is a mode of perceiving. Taking a cue from the brief résumé by Rapoport of simple game theory, we can note that scientific procedure demands players and rules. But the sociologist is both player and game analyst. Sociologists study a game (persons engaging in social relationships); their procedure is also a game (sociologists watching people engaging in social relationships). The trouble seems to be, in this complex game, keeping one's eye on the ball.

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Physical Sciences

The Neutrino. James S. Allen. Princeton University Press, Princeton, N.J., 1958. viii + 168 pp. \$4.50.

I have, on occasion, wondered about the sort of world we would experience if our planet, Earth, were to have a perpetual cover of cloud over its entire surface, as does Venus. No man, in this circumstance, would ever have seen the sun or the moon—or even one star! Would man ever have emerged from the grey winter of primitive knowledge to feel the warm shafts of intellectual sunlight that now occasionally pierce his ignorance? Certainly, wonderment upon gazing into the clear sky and the practical lessons of celestial mechanics would have been beyond the realm of his experience.

Yet there would have been those who sat by the ocean shore, watching the rise and fall of the tides, who counted the periods of night and day and season following season. Some would try to find the thread connecting such mysterious events to the more prosaic things of life. In the gradual building, through the years, of intellect with intellect, a sudden flash of understanding might have occurred in the mind of one man and suggested to him the existence of the sun.

One can see the initial disbelief in the eyes of his colleagues (those who adhered to theories of great whales in the depths who sloshed the seas with gigantic tails, and the like). But as those less skeptical than most used the strange hypothesis of a "sun" that must remain forever concealed from the eyes of men

to build a "sun theory" that would account for the tides and the night and day, disbelief might have turned into acceptance. But what a strange object this "sun" must be—describable to some extent, but hardly to be understood by mortals!

Providence has permitted man to see the stars, but at the other extreme of experience the vast regions of the subatomic are forever obscured from our vision. The myriad spaces of the very small, where reality begins, are beyond the range of our senses; and so we sit on the shores of a sea poorly charted—and wonder.

A quarter of a century ago, however, to one of our number, Wolfgang Pauli, came a flash of understanding. In his mind's eye he saw the neutrino. Rejected at first as just a poor excuse for forgetting the whales lashing our theories with improvident tails. Pauli's thought was soon embedded in our science. There it has continued to grow, bearing fruit as one of the most basic ideas of our times, while its consequences, one by one, are comprehended and fitted into place. But what a strange object this "neutrino" must be—describable to some extent, but hardly to be understood by mortals!

Allen accomplishes this description as adequately as a scientist of today can hope to do. He proceeds in a most readable but careful manner to lay the case for the neutrino before the colleagues of Wolfgang Pauli. In his eight chapters Allen reviews the experimental evidence and the theoretical case for the reality of the neutrino.

To compress into 163 pages of concise statement the volume of extant literature concerning the neutrino is no mean achievement. Allen relies heavily, of course, on references to the detailed papers to make the rigorous case, but in so doing he always keeps the principal threads of reasoning clearly in sight. The fine points of technique, experimental and theoretic, must be sought through additional reading.

Major puzzles concerning the neutrino are also treated. Is the neutrino of meson decay the same as that of nucleon beta decay, and as that emitted by nucleon capture of mu mesons? Is the strange new particle in the nuclear firmament indicative of a universal Fermi interaction? And is this poltergeist of modern physics the principal agent in the startling denial of the cherished parity rule?

Explaining some puzzles while it uncovers others, Pauli's and Fermi's neutrino continues to be a fascinating subject for today's physicist. That the story is far from complete is underlined by Allen in his preface, wherein he states that his volume should be considered a progress report of neutrino physics through May 1957. He expresses the

common belief that the subject is far from closed and that active research in the field will continue. I hope that Allen is even now assembling the sequel to his first report, and that he will have much that is new and illuminating to present in his next volume.

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Géologie de l'uranium. Marcel Roubault. Masson, Paris, 1958 (available from Stechert-Hafner, New York). 462 pp. Illus. \$13.

Marcel Roubault is director of the School of Applied Geology and Mineral Exploration, and a professor on the faculty of sciences, of the University of Nancy, and he has been president of the Committee on Mines of the Atomic Energy Commission of France. This book was written with the collaboration of Georges Jurain of the faculty of sciences of the University of Nancy. A preface by Francis Perrin, high commissioner of Atomic Energy for France, is included. Under such authorship it may be assumed that the work has met with the approval of the French Atomic Energy Commission.

More than half of the book (282 pages) includes a survey of the geological features concerned with the occurrence of uranium and thorium. Heretofore, the role of France in the development and exploitation of uranium resources has been given less attention than developments in other parts of the world. Roubault has filled this gap by writing an excellent French text in which a large, well-illustrated section is devoted to uranium occurrences in France; another fair-sized section is devoted to occurrences in Madagascar. This is a welcome addition to uranium literature. Further geological discussions of occurrences in Europe, as well as of localities in Australia and South America, and brief descriptions of deposits in the U.S.S.R. are included. Discussions of the Belgian Congo, South Africa, the Colorado plateau, and the Canadian shield are also given.

One section (51 pages), illustrated with conventional figures and two exceptional colored plates, is devoted to uranium minerals. Another section (50 pages) is devoted to prospecting and covers detectors, probes for drill holes, airborne surveys, and radioactive anomaly maps. A short section is devoted to the reserves of uranium and thorium. The minerals of thorium and the occurrences of thorium are also covered.

The text contains a number of well-chosen photographs illustrating textures of uranium ores. The numerous geologic