Book Reviews

Progress of Science in the Southern States

Atomic Energy and Southern Science. WILLIAM G. POLLARD. Oak Ridge Associated Universities, Oak Ridge, Tenn., 1966. 147 pp., illus. Paper, $1.50.

Many of us were brought up to think of science as an international enterprise knowing no political or other boundaries. However, as science has become linked with economic growth and prestige, we perceive competition—or at least comparison—among nations and even among regions within the United States. Perhaps no event has brought this point home more forcefully than the recent vying of about a hundred groups from nearly every state for the location of the projected 200-Gev accelerator. Partisans for each proposed site were impelled to assess local strengths and weaknesses in science, among other factors, and the author of *Atomic Energy and Southern Science* acknowledges that his attention was drawn to his subject by those efforts.

Through his position as executive director of Oak Ridge Associated Universities, Pollard has had a good vantage point from which to observe and evaluate the progress of science in the American South, as well as to attempt systematic collection of data. "The image of Southern Universities held by academic people outside the South," he writes, "is still largely that of the prewar period. This report attempts to correct that image in . . . the sciences and engineering related to or stimulated by the national effort in atomic energy."

Perhaps it is because my own central location in the U.S. protects me to a degree from the myopia of either coast, but I certainly do not feel that I evaluate Southern academic science as it was evaluated before World War II. Most of us are aware of great progress and substantial accomplishment by scientists in the South. However, there has also been great progress in all of U.S. science, and the question which continually suggests itself as one reads the book is whether Southern science has gained in relation to the rest of U.S. science. This question is not really addressed by the book, nor, in fairness, does the author claim that it is.

I rather suspect that science in the South *has* gained relative to the rest of U.S. science. In trying to understand why this might be, I was impressed by Pollard's mention of the large number of scientific or technological research installations which the federal government has placed in the South since World War II. These are largely Atomic Energy and NASA installations, although the National Science Foundation and the Department of Defense are also represented, as is the Public Health Service. Whether or not it is the seniority system in Congress which is responsible, certainly the long list of these installations ought to be borne in mind by those who feel that the North, with its prestigious universities of acknowledged high competence in science, has made off with perhaps too large a share of the federal science dollar. It could not have been the initial competence of Southern science which led to so many of these federally supported installations in the South, and charges that the U.S. does not distribute science resources geographically seem not to take such facts adequately into account. Therein lies a really significant socioeconomic question: To what extent can location of major federal research installations, in regions that are culturally, educationally, or scientifically less well developed, be an effective means of bringing such regions along so that they share in and contribute effectively to the overall advance of the nation? Pollard's book does not treat that question but may well be an important resource for those who will deal with it.

A book of this kind is, inherently, hard to read in places. In listing specific accomplishments in various scientific disciplines, the author is, as he concedes, plagued by difficulties with areas of science which are not his specialty, and the reader's similar problems are superimposed. For the parts of science in which I am somewhat knowledgeable, it went well and interestingly. The fact that the book describes a list of scientific efforts and advances leads, inevitably, to some discontinuities and unevenness of treatment. The author has coped with these problems more effectively than most of us could.

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A Scientist Enjoying Science

Of Scientists and Salamanders. VICTOR CHANDLER TWITTY, Freeman, San Francisco, 1966. 190 pp., illus. $4.50.

This delightful little book, at once scientific and autobiographical, traces the development of a distinguished man of science and his research. We are taken from Butler College in Indiana to Yale, to Berlin, and then to Stanford, through embryology, pharmacology, ecology, and the study of behavior. These subjects may be diverse, but they are shown here as logical extensions of the author's original interest, embryology.

The book puts life into a subject which, in many textbooks, seems like sheer drudgery. In the 1920's and early 1930's Twitty studied embryology under R. G. Harrison at Yale and came under the influence of Spemann in Berlin. From these experiences he gives a fascinating account of the development of the use of tissue culture and of the origin and growth of the "organizer" theory in embryology. This is succinctly carried through to the present day, and we gather that the reins have now been handed over to the chemical embryologists.

When Twitty returned to California in 1932 he was impressed by the toxic effects of grafts from the embryos of local newts on those of salamanders imported from the east. In classic pharmacological manner saline extracts were made and were found to be toxic to many other species, including frogs, turtles, and mice. These observations were published in 1937, and recent

work has identified the toxic material and shown it to be identical to the poison of the Japanese puffer fish, tetrodotoxin, a neurotoxin that is also a useful tool for the study of conduction in nerve fibers.

Embryological work on newts in the laboratory led to questions about species and to experiments on cross fertilization in vitro. It was not initially possible to raise the hybrids to maturity in the laboratory, so it was decided to let nature do the job. A "newt ranch" was opened near Pepperwood Creek in Sonoma County, California, and in this admirable setting it has been possible to study the homing behavior, longevity, and breeding habits of the newts. The first mature hybrid was not caught for six years, and, perhaps justifiably, the student who found it was "insufferable for days."

The book includes descriptions of social interludes such as one in a Berlin night spot where "well endowed young women in their full epidermal glory" were observed. The whole book is written in an entertaining manner, and at the same time the author's research is well set out, with conclusions clearly summarized at the end of each section. There is a bibliography of over 100 references.

Of Scientists and Salamanders reminds us that science should be enjoyable. As "big" science and the "monkeys and typewriters" approach to research become more prevalent, the potential pleasures of a more personal approach tend to be forgotten. I would therefore especially recommend the book to young people contemplating careers in science in the hope that they may learn to expect fun from their work.

[As this goes to press, word has been received of Dr. Twitty's death.]

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Autobiography of a Mexican Physiologist

Desde un Alto en el Camino. Visión y Examen Retrospectivos. J. JOAQUÍN IZQUIERDO. Ediciones Ciencia, Mexcio, D.F., 1966. 542 pp., illus. $10.

José Joaquín Izquierdo, now emeritus professor of physiology at the great national university of Mexico, has, in spite of political and other obstacles, been instrumental in establishing a high standard for physiology and biomedical science in Mexico, and indeed has influenced the development of these sciences throughout Latin America. With his wide international friendship among physiologists and scientific leaders, he presents, in his richly illustrated and documented autobiography, an admirable picture of the development of the life sciences not only in his own country but throughout the world.

Izquierdo was born in 1893 of a distinguished family in Puebla. It is astonishing that he describes in detail the 93 texts which comprised his collegiate training there. This documentation well illustrates the relatively high quality of collegiate training in provincial Mexico at the time. Izquierdo received his medical training at Puebla and in Mexico City. Again, he gives a careful account of his training, and his illustration from the 80 required texts he used shows the breadth of his studies. Greatly moved by the ideals of the Mexican Revolution, Izquierdo determined to devote himself to the improvement of medical training in his country. He began his career with a report on studies of malaria in Puebla and, with an excellent library at his disposal, he cautiously began laboratory experimentation. In 1918 he undertook his first physiological demonstrations in Mexico City, finally, in 1923, winning approval from the Mexican National Academy of Medicine for conventional physiological investigation.

He came to the United States under the auspices of Richard Pearce of the Rockefeller Institute, studying there as well as at the Cornell Medical School, the University of Pennsylvania, the Johns Hopkins University, and Harvard. In 1925 he became an assistant to Walter B. Cannon, and this association influenced his entire subsequent career. From Harvard he went to England, where he worked with Joseph Barcroft and Lord Adrian. He became acquainted with all the leading British physiologists and through them met Pavlov, as well as the leading physiologists in Belgium, France, Germany, and Spain. The influence of Corneille Heymans was promptly reflected by Izquierdo's publication of several papers on carotid sinus reflexes.

On his return to Mexico he prepared, with the help of Walter Cannon, a laboratory course in physiology which gradually developed into an outstanding teaching program. He was active in promoting an appreciation of the importance of a scientific background for the health professions. Meanwhile, Izquierdo's historical interests were aroused, and he published a series of accounts of the early development of medicine in Mexico. In order to acquaint his students with the classics of physiology he translated Harvey's *De motu cordis* and published it together with an inspiring account of Harvey's career. He also issued an outstanding appreciation of Claude Bernard, whom he regarded as the founder of scientific medicine. During World War II, Izquierdo was increasingly visited by outstanding physiologists from all over the world. For the benefit of his students he gathered, at his own expense, a large, first-class library in physiology and in the history of philosophy and medicine. He adorned his laboratory with pictures and bronzes of medical greats. A patron of the arts, he has also written wisely and well on many of the artistic treasures associated with medical history.

It is clear that Izquierdo has really enjoyed his busy and brilliant career. His 18 books and dozens of technical papers testify to his intellectual leadership. He is, moreover, a delightfully friendly person. He has continually emphasized the high ideals of the health professions, and in his own career he has certainly pushed close to their attainment.

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Mathematical Physics

The Analytic S-Matrix. R. J. EDEN, P. V. LANDSHOFF, D. I. OLIVE, and J. C. POLKINGHORNE. Cambridge University Press, New York, 1966. 295 pp., illus. $14.

For about the past dozen years, theoretical physicists concerned with high energy phenomena and elementary particle physics have been carrying on a torrid love affair with complex variable theory. It all began innocently enough when it was found that a generalization of the well-known classical