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Book Review

Science in the Twentieth Century. Edited by Rene Taton. Translated from the French by A. J. Pomerans. (The fourth of four volumes on the history of science.) Basic Books, Inc., New York, N. Y. (1966). Pages xxiv + 638. $17.50.

When the gibbous moon of the nineteenth century gave way to the rosy pointed fingers of the dawn of the twentieth century, Charles Hermite and Queen Victoria had still another year to live; J. Willard Gibbs was lecturing on his vector analysis at Yale; C. T. R. Wilson, J. J. Thompson, W. C. Röntgen, H. Becquerel, and M. and P. Curie had, respectively, recently discovered the cloud chamber, the electron, x rays, radioactivity, and the elements polonium and radium; chemists were ready to synthesize indigo more cheaply than could God; in Greece, farmers were still growing an ever increasing surplus of currants which French vintners no longer needed as a wine additive; the Mademoiselle from Armentiers was a precocious child; the streets and houses of Boise, Idaho, were lighted with gas or kerosene, if at all; investors were pouring money into old Russia; Mendel's law had just been rediscovered.

Hermite, a French mathematician, is still remembered for his polynomials, his quadratic forms, his matrices, and for his solution of the general quintic equation by means of elliptic modular functions. The discoveries of Gibbs, Wilson, Thompson, Röntgen, Becquerel, and the Curies, and the chemists still influence the whole world in a very profound way. The Greek farmers proved that a currant explosion could, in the long run, adversely affect their very lives. In 1918 the Mademoiselle from Armentiers proved to American soldiers in France that there were flaws in Victoria's ideology. Boise is now lighted with electricity. In 1917 Russia changed her economic and political ideology. We now have chromosomes and genes.

With this brief background for the twentieth century before us now let us look at our book. It is divided into six parts, and each part consists of a number of chapters. Part I treats of Mathematics, Part II deals with Physical Science, Part III with Earth and Universe, IV with Biology, V with Medicine, and finally Part VI is devoted to Science and Society. A classed bibliography to Parts I-V appears on pages 562-569; each chapter in Part VI has its own appended list of sources. The several chapters in each part are contributed by different authors, which assures that the subject matter in any one chapter is treated by someone who really knows what he is talking about. There are a total of 64 very fine plates (photographs) and 33 figures in the book. The table of contents is excellent, and the name and subject indexes are adequate.

But the above elevated syntax doesn't tell much about the character of the book's contents. Many of the chapters are not much more than brief accounts of important researches that have been carried out up to about 1964, along with the names of those who did them. The virtue of these accounts rests in the fact that they strive to cover only those researches that appear to be of real fundamental importance; researches that are—often uncharitably—counted as mere academic routine do not find a place in the book. What is more, there is a sad lack of clear definitions of many of the scientific terms (and jargon) necessarily used throughout the book; this is really a mortal sin in a book dealing with science from a historical point of view. Furthermore, eyebrows will be raised at some of the curious errors to be found here and there in the book; for example, on page 212 Pauli is credited with the idea of the neutrino, but on page 246 the credit goes to Fermi. In another place the publication date of Lewis and Randall's "Thermodynamics" is given as 1934, but we (= the reviewers) have before us an autographed copy published in 1923. Professor Manne Siegbahn's name appears in the text but not in the index.

But we are glad to report that there are very happy exceptions to our complaints. One exception is the splendid chapter by L. de Broglie on contemporary atomic and quantum physics; since he triggered off what, in the hands of Schrödinger and Dirac, became the wave mechanics, it is not surprising to find that, in ten vivid pages, he carries us from the beginning of the quantum theory (Planck, Einstein, Bohr) down to the present when we are about to enter a new and unpredictable phase of physical theory (R. Oppenheimer); the present quantum theories (or algorithms?) can make fairly good predictions but can give no explanations. Also, the revered principle of cause and effect seems to have given way to a hoyden called probability. Fortunately scientists understand these difficulties, and this sets them apart from the schoolmen and philosophers of the middle ages.

Another exception is the chapter on Einstein's (special and general) relativity theory by Mme. M. -A. Tonnelat, a girl. Unlike all other chapters, Mme. Tonnelat's includes a brief but interesting biographical sketch of Einstein's life and career; he attended a Catholic primary school but his teachers didn't catch on to his potential talents. The presentation Mme. Tonnelat gives of relativity theory is both lucid and interesting. Ordinarily a girl is considered to be educated if she can spell "cat"; Marie and Irene Curie, Lise Meitner, and Mme. Tonnelat—along with their accomplishments—should serve as prime examples to California of the virtues of higher education to all who are qualified.

Because the book covers all of science—that is, everything from prime numbers, topology and cybernetics, to cosmic rays and quasars, and then on to earthquakes, chromosomes and genes, and finally to Muslim science and science in China and India—it is perfectly plain that no matter what our self-confidence may be in our ability to judge the merits of the subject matter in the many, many chapters, space (as the saying goes) does not permit of

more than overall comments on the book's considerable and scholarly contents.

All but 3 of the 56 contributors are French, and 2 of these latter are women (Relativity and Zoology). Because France was the active scene of two major wars in this century, her scientific efforts suffered painful setbacks; it is gratifying to have in this book good evidence that the French are headed for a strong comeback in the vital fields of science. There are, to be sure, ideologies still afloat which are more concerned with arbitrary, unprovable views than with verifiable truth, but our increasingly manmade world promises to abandon these curiosities to the world of make believe.

We have already more than hinted that the level of the book is high in general; it was meant for professional scientists rather than for amateurs and laymen. Such items as Godel's remarkable theorem, automorphic functions, PCT, leptons, promethium, chromosomes, and many others would probably floor a housewife, a bishop, a banker, or a statesman. A carpenter would scoff at Bertrand Russell's whimsical statement that the square root of two is any number whose square is less than two. It might appear, then, that if the book were designed for professionals, its audience would consist of those who already were familiar with the book's contents. But the carpenter, the bishop, banker, and the housewife should not be intimidated into believing that the book is written in such lofty and arcane prose that it is beyond their comprehension. The facts are that the book would be downright interesting to most literate persons; in some places it is really exciting.

The plates deserve much more than perfunctory mention. The photographs of Élie Cartan, Fermi, and of the Curies and the Curie-Joliots show them as distinguished looking and warmly human. The same can be said of the photographs of Sir Alexander Fleming, Rutherford, L. de Broglie, Planck, Bohr, Hilbert, and Thomas Hunt Morgan. The various photographs of the various principle telescopes, radiotelescopes, cyclotrons and synchrotrons, and prehistoric creatures, are, among others, splendid.

Finally there is an excellent photograph showing Einstein and Oppenheimer together. It was the late J. Robert Oppenheimer who proved that his adversaries and severe critics were naive and given to wild alarums; moreover, he did not marble seek, otherwise he would have carved in Latin and in Greek.

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About the Reviewers: Our senior reviewer, Professor Don Yost, Professor Emeritus at the California Institute of Technology, needs no introduction to the readers of these columns. His delightful and thoughtful prose we welcome again. His collaborator, Señora Lupe de Sinaloa, who has also contributed to our reviews in the past, is a graduate in chemistry from the University of California at Berkeley and has pursued advanced studies in library science, cybernetics, and other profound subjects.

The reviewers record indebtedness to their artistic capitalist friend, Mr. Pancho P. Gomez of Boise, Idaho, for relevant technical and philosophic discussions. They acknowledge also the kind help of Mrs. Yost and of Mrs. Ruth E. Hanson, secretary in the Chemistry Department, Cal Tech, in preparation of the review.