flashes repeatedly with telling observations upon the life of physics at the turn of the century. European professors, who earned enough to be members of the haute bourgeoisie, were shocked to discover that the wives of American colleagues often had to do their own housecleaning. On the other hand, in the United States everyone became an assistant professor, or so Sommerfeld once told a student, while in Germany, according to a sample analyzed by Forman, Heilbron, and Weart, a privatdozent had only about a 3 in 5 chance of obtaining a chair even after years of sacrifice. On the scientific side, perhaps the most expensive item in the well-stocked laboratory of the day was its 60 to 70 milligrams of radium, which at 250 to 300 marks a milligram was expensive indeed. Bespeaking the changing subject matter of physics, the new laboratory of 1900 was built without the traditional tower, previously deemed indispensable for experiments in free fall or pendulums. All the same, physicists of the day did pay enormous—later generations would say ridiculous—attention to insulating their new houses of research from vibration, including the vibration of nearby traction lines.

The rich statistical data here assembled constitute a benchmark for the history of physics in each of the nations surveyed, but the multinational scope makes this study especially arresting. In Germany, the United Kingdom, France, and the United States, the numbers of academic physicists per million of population or per milliard of national income were the same. And some American laboratories, notably the Jefferson Physical Laboratory at Harvard, enjoyed annual budgets comparable to that of the Cavendish. Yet America produced proportionately fewer papers than the leading European nations. Forman, Heilbron, and Weart candidly declare that they can say nothing on the basis of their study about "the relative contribution of each paper to the progress of physics, or about the existence and significance of national gifts and styles." Without the assessments made in this volume, however, the task of explaining the relatively low rank of the United States in world physics at the turn of the century would be all the more difficult. *Physics circa 1900* is not only a stimulating portrait of the discipline. It establishes a solid evidential foundation from which historians and sociologists may proceed to understand the perpetuation and diffusion of national styles, along with the social circumstances which make for intellectual vitality in physics.

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The X-ray Revival

Atomic Inner-Shell Processes. BERND CRASEMANN, Ed. Academic Press, New York, 1975. Two volumes. Vol. 1, Ionization and Transition Probabilities. xii, 468 pp., illus. $47.50. Vol. 2, Experimental Approaches and Applications. x, 220 pp., illus. $27.50.

Many problems of single and multiple inner-shell physics were left rather dangling when x-ray studies were largely abandoned in the years of World War II. New applications in condensed-matter physics, ion-atom collisions, astrophysics, and plasmas have now reexposed some of the unsolved problems and offered new tools for their treatment and new phenomenology tending to sharpen one's perceptions concerning them. In these two volumes Crasemann and the numerous contributing authors have aimed to expound key areas of the recent x-ray revival.

In the first volume, technical details of the experiments have been suppressed with good effect in permitting the data to be more quickly grasped. This is particularly evident in the chapter on ion-atom collisions (Richard). Several of the contributors to the volume are well known for work in calculation and modeling of inner-shell processes, and they provide treatments at a satisfying depth. The occasion of preparing chapters for this work has, moreover, led the theoreticians to an uncommon clarity of exposition. Thus, though most of the information in the chapters on charged-particle excitation (Madison and Merzbacher), photoionization (Cooper), and transition probabilities (Kelly) and energies (Larkins) is available in the literature, it is made considerably more accessible.

That some of the "hard" problems are now being grappled with to good effect is evident from Larkins's treatment of double-vacancy states and Åberg's discussion of coupled transitions. Both these phenomena need clarification before the taxonomy of x-ray satellites can be worked out. The newly revived interest in the extended absorption fine structure is not reflected in the book, however. The impetus in this area came from work with the intense x-ray beam from an electron storage ring, which was not completed in time for this book.

The second of the two volumes is oriented toward the experimental detail omitted from the first. Though the chapters are individually interesting, the volume as a whole is less successful. The contribution on proportional counter methods (Fink) is up to date and includes the recent work on position-sensitive detectors. Likewise, electron spectrometry (Krause) is as well represented as it could be in a one-chapter summary. In this case literature, including texts, treatises, and reviews, is already available in abundance. On the other hand, the chapter on radioactive atoms (Rao) should really have been in the first volume, since it is mainly a data summary and review. The chapter on crystal spectroscopy (Cauchois and Bonnelle) provides a satisfactory summary of basics and some guidance through the literature, but it neglects recent instrumentation, such as channel-cut and monolithic monochromators, and makes little use of recent dynamical theory.

Missing altogether from the work is discussion of radiation sources or collision chambers. There are unique problems and interesting techniques associated with target systems for accelerators. There have also been developments that might have been covered pertaining to electron bombardment x-ray sources, rotating anodes (mentioned in Krause's chapter), crossed beams, and so on. Nowhere does one find discussion of the problems associated with the x-ray wavelength scale and its connection with the scale of binding energies. Another conspicuous omission has to do with synchrotrons and storage rings. Although only a fraction of the newer results could have been included, the sources were well characterized and were in use at a sufficiently early date.

These flaws aside, the volumes are an admirable effort. I would recommend them to anyone wanting to know where the x-ray business has gone since Compton and Allison and volume 30 of the Flugge Handbook.

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Tropical Reptiles

The Biology of Sea Snakes. WILLIAM A. DUNSON, Ed. University Park Press, Baltimore, 1975. xii, 530 pp., illus. $34.50.

For most of this century research on sea snakes was more or less confined to clinical studies of the effects and treatment of their bites, a considerable effort to isolate and define biologically active components and properties of the venom, some taxonomic work, and much natural history, most of it anecdotal. Our knowledge was for the most part erratic and defied generalization.

Recently, a number of investigators have examined sea snakes with the result