action was upset in the House by a campaign that brought into action a new coalition. Paul Rogers, Chairman of the Subcommittee on Public Health and Environment of the House Committee on Interstate and Foreign Commerce, emerged as a thoughtful, solid, and effective congressional leader. The Association of American Medical Colleges exerted new strength as a spokesman for the academic community. Equally important, the scientific community was aroused and vocal. The new array of forces was basically different from the alignment during the '60's. Then John Fogarty's appropriation subcommittee both controlled appropriations and in effect wrote substantive law. In 1971, the legislative committee took control of the substantive decisions. The scientific and academic community took on the Lasker forces and won. The position of the White House was somewhat different during the two periods. Earlier the Administration simply opposed increases in appropriations for medical research on the scale proposed by Congress, and was routinely overridden. During the debate over the Cancer Authority, the White House wobbled so severely in a search for immediate political advantage that it had only minor influence on the ultimate outcome.

So the saga continues to unfold. The "heart people" will certainly seek parity with cancer research, and the other major disease entities will not be far behind. At this point, it looks as if the cancer episode will initiate a new cycle of increasing federal appropriations for biomedical research after the doldrums of the last few years.

Finally, and this is a point which Strickland does not stress, biomedical research is now debated in the context of the full range of problems related to the maintenance of health—delivery systems, the economics of health, the development of an adequate cadre of health manpower, and so forth. From 1945 to about 1970, biomedical research was the major national health program. Over that period, the nation was in no mood to consider seriously the nature of the public responsibility for the health of the population, and how this responsibility might be exercised. Hence research was the happy beneficiary of a national aspiration which could during those times be expressed only indirectly and partially. This accounted in large part for the outpouring of funds through the federal government. Support of research was the only respectable way in which legislators could simultaneously respond to the desire of people to do something about disease and their aversion to anything smacking of—to use a quaint phrase—socialized medicine. Other avenues are now opening before them.

Note added in proof. The recent dismissal of the director of NIH, Robert Q. Marston, was an event foreshadowed by the extension of NIH activities into areas of direct concern to the President. However, Marston was dismissed apparently not because of policy differences but simply because he was appointed during the Johnson Administration. Some way must be found to recognize both that the director of NIH does indeed have broad policy responsibilities and that back-of-the-hand treatment of this post as if it were a routine administrative job can cause irreparable harm to an important national institution. The answer must be to establish by law new selection procedures and criteria for the position, roughly analogous to those governing selection of the director of the National Science Foundation. The entire problem should be thoroughly reviewed in congressional hearings. This is something the scientific community could help to bring about.

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Fluoroacetate, Etc.

Carbon-Fluorine Compounds. Chemistry, Biochemistry and Biological Activities. A Ciba Foundation Symposium, London, Sept. 1971. North-Holland, Amsterdam, and Elsevier, New York, 1972. viii, 418 pp., illus. $18.75.

For many chemists, biochemists, toxicologists, and pharmacologists mention of carbon-fluorine compounds may call to mind a pesticide and rodenticide called "1080," known more scientifically as sodium fluoroacetate. Some may recall that this compound proved to be the active principle in a poisonous South African plant, and some may even remember it as exemplifying Sir Rudolph Peters's concept of "lethal synthesis," since it must be converted in vivo to fluorocitrate to become biologically active. For many years the status of C-F compounds could be succinctly described by two principles: if they can be metabolized to fluoroacetate, they will be highly toxic; and since F can readily masquerade as H and the C-F bond is apparently very stable in vitro, some fluoro compounds might enter into certain biological processes in such a way as to deceive one or another enzyme.

More recently Peters and P. W. Kent came to the conclusion that the time was ripe for an interdisciplinary meeting to consider the status of knowledge of C-F compounds. This volume records that meeting. That the situation has indeed progressed beyond the early concepts built around fluoroacetate is clearly brought out by the exciting papers presented here. It is readily apparent how much greater is the research potential and challenge of these compounds than was originally thought. The subject matter included is chemical, biochemical, and biological in nature, and though each paper basically fits one of these categories, each contains much that is appropriate to the others. This is equally true of the discussion following each paper, and of the three separate sections devoted to general discussion.

The expansion of knowledge is reflected in a more diverse use of fluoro compounds as metabolic probes, in investigations of microbial pathways of metabolism and enzyme systems, and in the development of therapeutically useful fluorine-containing drugs. Each of these subjects is discussed in this volume, and each in more than one paper. For example, as metabolic probes fluoro amino acids are now used to study amino acid uptake and amino acid and protein synthesis and fluorosugars are used to study membrane transport of sugars. These compounds, and fluorine-containing macromolecules, have been of use in studying the mechanisms of action of a variety of enzymes. Studies of microbial metabolism often are of wider applicability, and fluoro compounds have proven useful here; several instances of the rupture of the C-F bond by microbial enzymes are now known. Fluorinated pyrimidines and fluoro steroids are now among the most biologically potent analogs known of the naturally occurring compounds.

As a biochemically trained toxicologist, this reviewer must give pride of place to those papers that deal with the mechanism of action of fluoroacetate, still incompletely understood. The principal features of the toxicity and be-

havior of fluoroacetate in animals and plants are reviewed, and efforts to demonstrate the conversion of fluoride to an organic form in several species of vegetation are summarized, as is evidence for an organofluorine compound in serum. The genesis of the characteristic toxic convulsion of these compounds is not yet fully understood. This problem is explored in detail and much evidence is offered in support of the hypothesis that the fluoroinhibitors act to alter the metabolism and membrane transport of cerebral mitochondria as a result of enzyme inhibition. Work on the effect of fluoroacetate on the rat liver is presented, showing that sometimes conflicting reports on the accumulation of hepatic citrate can be explained by the nutritional state of the animal. In the fed rat the tricarboxylic acid cycle is strongly dependent upon pyruvate and fluoroacetate is converted to fluorocitrate, whereas in the starved animal the cycle depends more on fatty acids and less of the inhibitory fluorocitrate is produced. Certainly a chemist or biologist would prefer to emphasize the papers dealing more directly with his specialty, but surely we would agree that all the papers included are of high quality. The volume is attractively put together and remarkably free of typographical errors. It is a tribute to editors Katherine Elliott and Joan Birch, and to P. W. Kent, who assisted them.

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Developmental Process

Oogenesis. Proceedings of a symposium, Baltimore, Oct. 1970. JOHN D. BIGGERS and ALLEN W. SCHUETZ, Eds. University Park Press, Baltimore, and Butterworths, London, 1972. xii, 544 pp., illus. $19.50.

Mature ova are among the most massive and are possibly the most complex of all living cells. They are apparent contradictions of extreme specialization and complete totipotency. The developing oocyte, within its ovarian sanctuary, has long resisted the experimental manipulations of those bent upon learning secrets of its differentiation and growth. Recent observations on this developmental process are the subject of this volume, an offshoot of a symposium.

The book strongly reflects the editors' own research inclinations in that fully half of the 26 articles by 33 contributors deal only with mammalian oogenesis. Four of these, by Anderson, Calarco, Szollosi, and Zamboni, deal with various ultrastructural aspects of oocyte differentiation, growth, and meiosis. Biggers describes metabolism in early mouse embryos and draws inferences regarding oocyte metabolism. Beatty reviews evidence on parthenogenesis and summarizes known forms of heteroploidy, and Pederson presents data on kinetics of follicle growth. The remaining six mammal-oriented articles deal with various aspects of oogenesis as studied in vitro. These include observations on cultured primordial germ cells and ovarian material by Blandau and Odor, experiments on hormonal control and cellular interactions in meiotic maturation and ovulation by Baker and Neal, Thibault, Donahue, and Kennedy, and finally a description of ingenious experiments on induction of luteinization by Nalbandov.

Nine of the 12 nonmammalian articles deal exclusively with amphibians. Huang presents a concise review of eukaryotic chromosomal proteins, Miller reviews his electron microscopic observations on isolated nucleolar genes and lampbrush chromosomes, and Dawid comments on oocyte cytoplasmic DNA. King summarizes *Drosophila* mutations affecting oogenesis, and Blackler describes transfer of primordial germ cells between species of *Xenopus* to determine the effect of ovarian genotype upon oocyte phenotype. Crippa and Tocchini-Valentini, Ford, and Davidson discuss transcription, Smith demonstrates protein synthesis during maturation, and Wallace elegantly summarizes his work on vitellogenesis. Finally Kanatani and Schuetz describe hormonal regulation of maturation in starfish and amphibians, respectively.

The articles vary considerably in breadth and depth of coverage and in the proportion of new data. Some readers may regret the almost complete exclusion of invertebrate studies, although these were covered in Raven's 1961 volume of the same title. The texts have been professionally indexed and carefully edited, and there are few significant errors. Illustrations are frequent and of good quality. The result is a summary of the current status of many problems in oogenesis which will be of considerable value to investigators and advanced students of reproduction.

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Exercise Physiology

Energy Metabolism of Human Muscle. J. KEUL, E. DOLL, and D. KEPPLER. Translated from the German edition (Munich, 1969) by J. S. Skinner. University Park Press, Baltimore, 1972. xii, 314 pp., illus. $22.50. Medicine and Sport, vol. 7.

This is essentially an expanded and partially updated translation of the work *Muskelstoffwechsel: Die Energiebereitstellung im Skelettmuskel als Grundlage seiner Funktion.* Unlike many of the earlier volumes in the series Medicine and Sport, which have usually been proceedings of symposia or seminars, this one is written as a unity by the three authors, with some collaboration with G. Haralambie. This plan is an improvement on that of the earlier volumes and, with over 1000 references, this is the best available recent book on its topic.

The German title was more accurate, for coverage is by no means limited to energy metabolism. There are good discussions of "white" and "red" muscle, energy stores, anaerobic and aerobic energy supplies, the effects of hypoxia, and adaptation of the energy supply to physical activity. Most of the basic biochemistry and much of the basic physiology presented comes originally from work on muscles of frogs, rats, rabbits, guinea pigs, and pigeons. The authors have presented results from human muscle wherever possible, but in most cases the equivalent information just is not available for human muscle. The authors have, however, gathered together results on untrained and trained athletes that should be of great interest to a wide range of readers.

The Olympic games at Mexico City at an altitude of 2250 meters made possible a large-scale investigation of the performance of athletes under mildly hypoxic conditions. Many of the findings are presented here together with recent advances in training designed to increase speed, strength, or endurance.