essential for the approach and initial union of the gametes, evidence for a direct role of these substances in the primary activation reaction is wanting.

The two chapters that follow deal with fertilization in mammals. C. R. Austin and M. W. H. Bishop analyze the highly specialized internal environment in which fertilization takes place. Many integrated processes and reactions ensure the meeting of the gametes in appropriate numerical relations and at the optimal phase of their life-cycle. However, different species of mammals exhibit wide variations in the details of these mechanisms. M. C. Chang deals with the physiological changes at sperm penetration, activation, and syngamy and points out the great gaps in our knowledge of these processes and of the physiology of the Fallopian tube, the corona radiata, the zona pellucida, and the vitelline membrane. Results obtained with marine eggs may not be applied to mammalian fertilization at present.

A. L. and L. H. Colwin contribute a lucid summary of their researches on the importance of the acrosome filament in the initial contact between sperm and egg in echinoderms, molluscs, annelids, and enteropneusts. In spite of these important discoveries, the mechanism of the subsequent movement of the sperm into the egg is still not known. A brief section on changes in proteins of the sea urchin egg following fertilization, by A. Monroy, is followed by an excellent review of nucleocytoplasmic relations in early insect development, by R. C. von Borstel, where the destruction of three of the four nuclei resulting from meiosis in the egg, and the inhibition of the accessory sperms, offer special and intriguing problems. The occurrence of photoreactivation of ultraviolet radiation damage following irradiation of the nucleus, and the absence of such photoreactivation when the egg cytoplasm is irradiated, may make it possible to distinguish between action of the nucleus and action of the cytoplasm in the causation of an embryonic event.

H. E. Lehman summarizes the evidence for nuclear differentiation during development, particularly the results obtained with nuclear transplantation in amphibian eggs, and concludes that progressive nuclear differentiation, presumably imposed upon the nucleus by the cytoplasm surrounding it, must be admitted at least as a possibility.

In the section entitled "Morphogenesis and metabolism of gastrula-arrested embryos in the hybrid *Rana pipiens* × *Rana sylvatica*," J. R. Gregg describes the peculiar biochemical features of hybrid embryos, one of which is the lowered rate of energy liberation from glycolytic processes. Unfortunately, it cannot yet be decided whether this biochemical deficiency is the cause of the arrest of development or is itself a parallel effect of the hybrid constitution of the embryo.

J. R. Shaver discusses the possible role of cytoplasmic particles, particularly of mitochondria, in differentiation. He is critical of attempts to explain differentiation on the basis of ordered distribution patterns of mitochondria, whose existence has not been demonstrated beyond doubt.

Under the uninformative title of "Early determination in development under normal and experimental conditions," S. Ranzi presents evidence that, in the sea urchin egg, fertilization activates certain enzyme systems at the animal pole and that the resulting metabolites lead to development of this area in the animal direction.

G. Reverberi presents an admirable summary of the role of some enzymes in the development of ascidians and other animals, studied by means of cytochemical methods and specific inhibitors. He concludes that there is "reasonable probability" that some enzymes play a role in morphogenesis of "mosaic" eggs, while the evidence for "regulative" eggs is less convincing.

The volume concludes with a chapter on "Immunological studies of early development," by A. Tyler, in which the author reviews recent studies on the detection in the embryo of specific antigens to adult tissues, on the development of antibody-forming capacity, and on the effects of antibodies on development. He relates the results to his well-known autoantibody concept.

The book as a whole contains a wealth of facts and hypotheses on various important aspects of the beginnings of development, which the reader is left free to evaluate and coordinate. I could not avoid having the strong impression that, at this time, it is still impossible to prove the causation of any process of differentiation by biochemical events, and that no new avenues of approach have opened up which would lead to crucial evidence in the near future.

G. FANKHAUSER
Department of Biology, Princeton University

Electron Impact Phenomena. And the properties of gaseous ions. G. H. Field and J. L. Franklin. Academic Press, New York, 1957. ix + 349 pp. Illus. $8.50.

Important to physical chemists and chemical engineers is the identification of molecules and molecular fragments that follow reactions with catalitic agents, breakdown in intense heat, or dissociation under electron bombardment. The modern commercial mass spectrograph is one of the most important tools at the disposal of the physicist and the chemist for making identifications, and yet the results may not always be unambiguous. It is one of the purposes of this book to discuss, in a critical manner, experiments and experimental techniques that yield data on electron impact phenomena that may help in the interpretation of research investigations of interest to physical chemists in general and physical organic chemists in particular.

The organization of the book follows a logical procedure. First the apparatus and methods are discussed. Then there is a brief discussion of theory, followed by an extensive treatment under the heading "Energetic considerations." These sections constitute approximately one-half of the book and are written in a manner that I consider very effective. Even though there is a minimum of equations and technical description, the subjects discussed are presented concisely and critically. Over 500 references to original researches are given, and the organization of these alphabetically by author at the end of the book is to be commended. The fact that there is a good "name index" and "subject index" permits the reader not only to use the book as an effective reference source but also to locate the sections containing critical evaluation.

Not only will the reader find interesting text; the book contains a vast compilation of numerical data in tabular form, such as critical potentials applicable to many molecules, organic and inorganic. Associated with these data are excellent references, so that the user can evaluate for himself the experimental details on the basis of which the numerical values were determined.

This book will serve as an excellent reference book, useful to both physicists and chemists, and represents an important contribution to the literature.

WAYNE B. NOTTINGHAM
Research Laboratory of Electronics, Massachusetts Institute of Technology

Behavioral Goals of General Education in High School. Will French and associates. Russell Sage Foundation, New York, 1957. 247 pp. $4.

The Russell Sage Foundation, The National Association of Secondary School Principals, and the Educational Testing Service, feeling that all learning is evidenced by changes in reactions, have jointly sponsored a volume on behavioral goals for general education in high schools and have organized these under three "maturity goals" and four "areas of behavioral competence." The first two parts of the book discuss the following topics: first, the history, purposes, nature, evidence, and scope of