pregnant and lactating rats" by Pierre C. Karli, "Delayed implantation in mammals" by Robert K. Enders, "Morphology and physiology of the uteroplacental circulation" by James Dixon Boyd, "Uteroplacental circulation in mammals" by C. Sidney Burwell, "Pressures in the fetal circulatory system of the sheep" by S. R. M. Reynolds, "Distribution of arteries and veins in the mammalian placenta" by Elizabeth M. Ramsey.

These conferences are especially interesting, because there are interruptions throughout each presentation. Furthermore, the discussions are spirited, provocative and frank. As Fremont-Smith says, "the tradition, now well established, that authority carries little weight in evaluating the credibility of ideas, concepts, and data, help to make the conference a forum for searching examination of differences of opinion and of the reasons for contradictory experimental results. Overgeneralizations are quickly met with the question 'with respect to what?' "

The discussion of Boyd's paper concerning the uteroplacental circulation was particularly interesting to me, but it is unfair to select any of the papers presented as being more worthwhile than the rest.

The book is a very important contribution on the subject of gestation. It is up-to-date and contains a vast amount of valuable information presented by experts in anatomy, biological chemistry, physiology, cancer, biology, psychobiology, zoology, embryology, and obstetrics and gynecology. It is a pleasure to read the book, not only for its stimulating contents, but also because the type is clear and the illustrations are well reproduced.

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**Expanding Universes.** E. Schrödinger. Cambridge University Press, Cambridge, 1956. 93 pp. 10 illus. $3.50.

This lucid series of lectures is concerned with the kinematics of particles and waves in an expanding universe. The first two chapters present an interesting exposition of the geometric properties of the de Sitter universe and general spherical spaces. Various representations of the de Sitter universe are compared. Properties of the geodesics and null geodesics and the meaning of the red shift of light waves are discussed. The other two chapters deal with a question that led historically to the development of wave mechanics—that is, the relationship between geometric optics, wave optics, and the Hamilton-Jacobi equation. The propagation of waves in an expanding universe and the concept of paths along geodesics are examined. The discussion follows largely some research work of the author that was published in the 1930's.

The book is distinguished throughout by its delightful clarity, its constant emphasis on geometric visualization and its unhurried style. This forms a pleasant contrast to the modern tendency of piling formalism on formalism, and one cannot help wondering whether our contact with physical intuition is not seriously obstructed by the modern trend in the style of writing.

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**Engineering in History.** Richard S. Kirby, Sidney Withington, Arthur B. Darling, and Frederick G. Kilgour. McGraw-Hill, New York, 1956. vii + 530 pp. Illus. $8.50.

**History of American Technology.** John W. Oliver. Ronald Press, New York, 1956. $6.50.

The stimulating history of engineering by Richard S. Kirby and his associates emphasizes at all times the close contacts between science and engineering. The initiation of novelty emerges, at times, in some practical application for which scientific analysis finally affords a generalized explanation, as in the case of the suction pump; at times, applications emerge from the prior establishment of a general principle, as Boyle's law led to an efficient use of steam. Keen perception of this association between science and engineering has made it possible for the authors to compress into a single volume an impressive history of the fields of civil engineering, construction, transportation, and power engineering.

The short chapters on Egypt, Greece, and Rome emphasize the dependence of ancient engineering on massed human labor, despite the emergence of two types of water wheel toward the close of the pre-Christian era. The generalized use of water and wind mills in the Middle Ages is characterized as a revolution in power, which laid the foundations of a new economy. The development of science, beginning with Leonardo da Vinci, freed engineering from the limitations of mere empiricism in the use of pressure media, making possible a further advance in the power economy.

The development of stone work is covered step by step from the Roman arch through the Gothic. In bridge design, the use of wood led to truss designs as early as Palladio, and this innovation, of course, came to have special significance when iron and steel became available. The history of steam transportation on land and water is remarkable for its compactness and comprehensiveness. The outstanding features of the later chapters are the account of the electric industries, the techniques of caisson work, tunneling shields, and suspension bridges.

Despite the wide range of material, the narrative has a structure that is vividly felt and moves with such vigor that it is hard to lay the book down. It is a fine achievement in historical writing.

The study of American technology by John W. Oliver is unusual because of the emphasis on the intimate relationships between science, technology, and culture. Although new discoveries in science and major inventions are fully appreciated, much attention is given to the diffusion of scientific and technical knowledge by scientific societies and to modifications of engineering practice. The narrative is divided into four periods: 1607–1789, 1789–1865, 1865–1900, and 1900 to the present. For each period, the technical features of production and communication are surveyed comprehensively. Agriculture and the processing of agricultural products is, therefore, an integral part of the narrative. Communication, too, is broadly conceived; it includes the development of the newspaper, printing, paper-making, and the whole sequence of electric inventions for the transmission of news and pictorial material.

Although all the topics in each period are fully covered, the arrangement is not stereotyped; hence, the characteristic problems of the different periods are not obscured by a rigid plan.

The development of the economy of the United States is portrayed with great skill and without undue emphasis on any single factor. The book is a notable contribution to the economic and cultural history of the United States and will be invaluable to the general reader and to college students.

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**Yellow Fever Vaccination.** World Health Organization Monograph Series, No. 30. World Health Organization, Geneva, 1956 (order from Columbia University Press, New York 27). 238 pp. Illus. $5.

In the story of the evolution and practical application of knowledge concerning yellow fever, the subject of vaccination is an important chapter and is very competently discussed in this monograph. An initial section by Smithburn sets the stage for the more technical sections that follow by reviewing the general question of the immunology of yellow fever. Appropriately, he considers in some detail serological methods for demonstrating