ference, and the discussion by participants following each paper, are included in the text, and Dawson, Bering, and Welch have submitted supplementary papers on the formation, circulation, and drainage of the CSF and on the transport of materials by the choroid plexus.

The keynote of the opening remarks was a word of appreciation for Hans Winterstein who originally expressed the possible interrelation of the hydrogen ion of the CSF on respiratory ventilation. More than 50 years have elapsed since the formulation of his reaction theory embodying this concept (1911), and this symposium stressed that the complete stimulus to respiration is still not understood. The editors reflected that all authorities invited to the conference concluded that the state, composition, and nature of the CSF affected ventilatory functions. However, certain authors still held the classical concepts of peripheral and central ventilatory controlling devices as the key factor and could not accept the hydrogen ion of the CSF as the sole driving mechanism. Much new and refreshing interest in the CSF was engendered, and an interesting thesis was submitted—that the brain cell environment is the important factor in determining ventilatory reactions and the control of respiration is entirely secondary to affording a brain cell its proper chemical environment. Great interest was centered about the role of the chemoreceptor cells, which are either close to or interconnected with the CSF. Pappenheimer expressed this well in the following statement: "With regard to surface receptors, this I think is at the heart of our symposium and is extremely important to it." Studies on individual factors in the CSF—such as electromagnetic force, ion exchange, and change of constituents from its source to the surface of the brain cell —are needed for the basic understanding of the CSF; perhaps it is more truly the *milieu interieur* than ever before understood. I was surprised to learn that most authors now believe ion exchange from blood to brain or CSF and vice versa is more rapid than was previously believed.

This volume is of great importance to all respiratory physiologists and also a much needed text for those interested in the basic roles of the CSF.

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Market Economics of Maize in Tropical Africa

Maize ranks after cassava and the millets (*Sorghum* and *Pennisetum*) as a food source in tropical Africa, but owing to its palatability and the ease with which it may be transported, its commercial ramifications are more widespread than those of either of its rivals. A book on the subject therefore needs no apology, but the choice of title for this one, **Maize in Tropical Africa** (University of Wisconsin Press, Madison, 1966. 345 pp., $7.50), by Marvin P. Miracle, is most unfortunate. It is a surprise to find that agricultural and ecological matters are dealt with in the most superficial manner, and a more explicitly worded title would have indicated that the book is in fact a treatise on market economics. Indeed maize is barely mentioned in the first 80 pages, which are devoted to a miscellany of introductory topics concerned with farming, marketing, and levels of living in Africa necessary to set the economic scene for the newcomer to the continent. This is followed by detailed quantitative studies of maize production. The pan-African scope of this survey renders it rather indigestible fare for the agricultural reader, for the discussion lacks the depth necessary to expose the agronomic problems of the different territories. Among these are the ability to maintain soil fertility under increased production of a demanding crop like maize, and the economic consequences of extending production into climatic regions where statistical studies of rainfall reliability can predict a proportion of crop failures due to drought.

The last three chapters—on economic determinants of production, efficiency of production, and marketing—are of more interest to the agriculturalist, for they suggest future trends in the production and consumption of maize, and how they are likely to be influenced by innovations. An increasing preference for maize as a food has led to a striking rise in consumption during the last few decades, but a nascent taste for wheaten bread may raise an uncomfortable question mark over the future of all indigenous staples. It is perhaps worth remembering that under the British colonial policy of concentrating on export crops, maize was usually the only staple given serious attention by agricultural departments. With independence has come a belated awareness of the importance of subsistence crops, and the consequent improvement programs may well restore the balance in favor of millets and other indigenous staples.

To sum up: an interesting sourcebook of statistics, but heavy going and flying false colors.

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Ecological and Behavioral Studies of Social Insects

Social Insect Populations (Academic Press, New York, 1966. 143 pp., $6), by M. V. Brian, is an attempt to synthesize and review the abundant recent literature pertaining to ecological and behavioral studies of bees, ants, wasps, and, to a lesser extent, termites and the honeybee. It is the first such review published since 1937, and it covers the literature since that time. The author's intentions are to " . . . bring together a large number of disconnected observations on populations of social insects and to encourage a comparative approach in the future." The extensive literature survey accomplishes his first goal. More than 425 papers are cited in the 18-page reference list and are referred to extensively throughout the text. The comparative approach is evidenced by the arrangement of the book. Each topic is discussed in relation to each social insect group.

Emphasis is placed on those factors that are peculiar to social insects, and these are reviewed in the manner by which they may affect the population of the colony. The chapters are "Numbers and density," "Reproduction," "Brood periodicity," "Age structure," "Dynamics: Worker turnover," "Geometric growth," "Intrinsic limits," "Maturation," "Dynamics: Queen turnover," "Structural limitations," "Food supply," "Intraspecific competition," "Interspecific competition," "Intergeneric competition," "Predators and parasites," and "Population regulation." Foraging, feeding behavior, and caste determination have been omitted since they have been the subject of other, more recent reviews. A numerical approach is used in many cases,

but the book is not saturated with formulas. The interrelationships of these topics are left up to the reader.

The review is general, brief, and to the point. The extent to which each topic is discussed depends on the amount of published literature on the subject, and the author shows no original thought in presenting the subjects. His intentions could have been accomplished just as well by outlining the topics and listing the appropriate references under them. However, this book will be useful as a review for research workers and for those who are generally interested in social insects or in initiating research in this field. In view of the increased interest in population studies and the large amount of recent work, it serves as an adequate comprehensive survey of the subject.

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Geology

Controls of Metamorphism (Wiley, New York, 1965. 368 pp., $13.50), edited by Wallace S. Pitcher and Glenys W. Flinn, is a miscellaneous collection of essays on aspects of regional metamorphism considered against the background of experimental and analytical chemical data. Perhaps unavoidably, considering the broad scope implied by the title, the book is scrappy in content and uneven in quality. Much of its substance is accessible elsewhere; few of the ideas are new.

I found the following sections of interest: Part of chapter 3, on deformation paths (D. Flinn), in which a relatively new concept in interpreting strain in deformed rocks is presented; chapter 5 on metamorphism in metals (D. McLean), and chapter 12 on isotopic dating of metamorphism (S. Moorbath), which provide useful summaries of topics not previously treated in toto in geological literature; W. S. MacKenzie's concise, timely statement regarding equilibrium (stable versus metastable) in chapter 13; J. Sutton's model of regional metamorphism (chap. 2) based on his wide experience with its manifestations—especially structural aspects—in the Scottish Highlands; chapter 7 on reaction rates (E. D. Lacy) in which some aspects of reaction kinetics in ionic crystals are considered.

Mineralogical data are discussed in several chapters: chapter 14, iron-titanium oxides (M. I. Abdullah); chapter 15, garnets (M. P. Atherton); chapter 16, biotites (B. C. M. Butler); chapter 17, calc-amphiboles (B. E. Leake); chapter 18, pyroxenes in granulites (R. A. Howie); and chapter 20, feldspars (W. L. Brown). The chemical compositions of biotite and calciferous amphiboles are found to shed little light on metamorphic conditions. The inferences drawn from garnet composition are weakened by the recent demonstration of wide prevalence of zoning in garnet crystals. There is little new regarding feldspars. It is questionable whether these mineralogical essays are appropriate in a book on the controls of metamorphism.

The granite controversy still echoes in two chapters on migmatites: chapter 10, experiments on melting, said to prove anatexis (H. von Platen), and chapter 11, geological evidence, much of it exhumed from old sources, purporting to refute anatexis and to demonstrate postmetamorphic metasomatism (B. C. King). E. H. Hellner and others contribute a chapter, at most of minor interest, on synthesis of chlorites and amphiboles from unstable initial mixes. W. E. Pitcher, in chapter 19, extends generalizations on paragenesis of Al_2SiO_5 polymorphs into less valuable reflections on their possible stability relations. R. W. Rutland's 17-page chapter on tectonic overpressures adds little to Clark's two-page statement [*Amer. J. Science* **269**, 647 (1961)]. The reader should glance at the sections entitled "Conclusions," in chapter 9 on isograds (M. P. Atherton) and in chapter 4 on mineral nucleation and growth (N. Rast) before deciding whether to read them in full. They are too long and repeat ideas expressed more concisely and with greater insight elsewhere in the literature.

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Laboratory Design

Chemistry and Biology Laboratories: Design, Construction, Equipment (Pergamon, New York, 1965. 265 pp., $17.50), by Werner Schramm, is a translation of the second German edition of his *Chemische und Biologische Laboratorien* (1960); M. Jansen was the translator, and J. M. Leytham edited the translation. The volume is the German counterpart of recent English and Danish publications—*Laboratory Planning* (London, 1962) by James F. Munce and *Laboratorier—Projektering, Bygning, Indretning* (Copenhagen, 1961). The books are primarily intended as technical guides to what is best in building and equipping modern laboratories for chemical and biological work.

The Danish work covers all kinds of scientific and technical laboratories and is a useful source of references for architects and building committees who are concerned with the design of academic or industrial laboratories. It represents the viewpoint of 80 contributors, including civil engineers, architects, engineers, chemists, and biologists.

Schramm's book, on the other hand, contains 15 chapters and gives examples and basic rules for different types of laboratory equipment for use in academic laboratories. I do not believe it will be very helpful to an architect who is not familiar with the space requirements for laboratory facilities for modern courses in general chemistry, organic chemistry, physical chemistry, analytical chemistry, biochemistry, and molecular biology in the United States.

The inexperienced architect would be well advised to consult the books that have been sponsored by the Educational Facilities Laboratories (New York) or by the National Research Council (Washington, D.C.). These books include *Modern Physics Buildings* (Reinhold, New York, 1961) by R. R. Palmer and W. M. Rice; *Buildings and Facilities for the Mathematical Sciences* (Conference Board of the Mathematical Sciences, Washington, D.C., 1963); and *Laboratory Planning for Chemistry and Chemical Engineering* (Reinhold, New York, 1963; published for the Committee on Design, Construction, and Equipment of Laboratories, Division of Chemistry and Chemical Engineering, National Academy of Sciences–National Research Council), edited by Harry F. Lewis.

Schramm's book is based on German practice insofar as laboratory furnishings and services are described. Steel furniture is not commonly available in Germany, where it costs 35 to 50 percent more than traditional materials (wood is given a surface treatment—Desmophen-Desmodur varnish, or Resopal, for example, p. 59). Tops made of reinforced concrete tiles may be