phantus." In any case, it is to be hoped that someone before long will make as searching a study of Arabic algoristic impulsion toward modern algebra as Klein has made of Greek philosophical stimuli. Historians meanwhile will be grateful not only for the reappearance of Klein's study in a more convenient form, but also for the very welcome inclusion (in an appendix, pp. 313–353) of a long-desired English translation of Vieta's *Isagoge in artem analyticam*—the chief contribution made by "the true founder of modern mathematics."

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Surfaces and Interactions

The Cell Periphery, Metastasis and Other Contact Phenomena. LEONARD WEISS. North-Holland, Amsterdam; Wiley, New York, 1967. 388 pp., illus. $17.50. Frontiers of Biology, vol. 7.

It was once expected that the insights into control mechanisms derived from the study of single cells would be immediately applicable to the mammalian cell. One of the principal difficulties—both technically and theoretically—in exploiting these gains has been evaluating the importance of cell-cell interactions. It has always been appreciated that the physiology of cells, with respect to rates of reactions, must be determined by the highly organized environment existing in tissues where cells are closely and precisely juxtaposed. Many biologists, however, from the very beginning of the studies with single cells of higher organisms, have reserved the further possibility that the cell was regulated also at a primary level and that "contacts" in some way determined the biological capacity of the cell. Whether with respect to the regulation of physiological processes or to the determination of the biological potential of the cell, an increasing number of phenomena, such as induction, morphogenesis, immunological responses, contact inhibition, and metastasis, are being considered as determined by "contacts."

It is therefore particularly useful that there has appeared at this time a comprehensive, sound, and clear account of what is known about that part of the cell—the cell periphery—which is involved in contacts. Weiss has reviewed the chemical constitution of the surface, as now known, and given some account of physical and physiological dynamics in the peripheral zone. The various theories that have been advanced to explain cellular aggregation are considered. These include possible formation of antigen-antibody-like complexes, pairing or coordination involving cations, and stabilization of cells at critical distances by virtue of secondary minima that exist, theoretically, in the potential fields between identically charged particles in close contact. The experimental details given demonstrate the techniques and the inadequacies of many of the techniques needed for studying cells isolated from tissues.

Some of the physics and physical chemistry of the interaction of charged particles, mostly derived from studies of lyophobic colloids in dilute solutions, is given as a possible basis for understanding cellular interactions. The larger size of the particles, that is, the cells, and the concentrated nature of the solutions in which they interact are only a few of the formidable problems involved in the application of studies from simpler systems. The very valuable technique of cell electrophoresis, so beautifully exploited by Weiss himself, is described in considerable and useful detail.

It would be hoped that the vast quantity of data accumulated would permit an understanding of the molecular basis of cellular contacts and of any behavioral or functional changes. Perhaps the most valuable aspect of Weiss's presentation is the judicious (and gentle) way he has indicated that there are not enough data on any aspect of any problem to permit one to come to any conclusion. This is important, for many have accepted conclusions, especially concerning differences between normal and malignant cells in respect to surface properties, charge densities, and chemical constitution, without appreciating the limited nature of the available data or the technical and theoretical difficulties involved in obtaining and interpreting data. The detailed consideration of some of the findings from which conclusions have been drawn is perhaps the best way to reveal the nature of the difficulties.

The greatest difficulty in the field in general would appear to be the communication gap that exists between the biologist and the physical chemist working on these problems. The biologist describing behavior of cells—for example, movement at epiboly—rarely reports ionic strength or any physical constant which would be useful to the physical chemist trying to formulate mechanisms. On the other hand, the physical chemist uses models—for example, one using rigid steel plates to elucidate potential changes on interaction of charged particles—whose value is not appreciated by many biologists. The inadequacy of our present understanding of contact phenomena is thus due not only to the absence of critical information and to the complexity of the situation but also to a lack of appreciation of what each of the two disciplines can offer. Weiss's presentation should help to reduce this communication gap and make for a more productive effort between the two groups—one which may very well reveal an important mechanism of control peculiar to higher organisms.

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Medical Historian

Henry E. Sigerist: Autobiographical Writings. Selected and translated by NORA SIGERIST BACON. McGill University Press, Montreal, 1966. xiv + 247 pp. $5.75.

Few individuals have influenced the field of medical history in the United States as much as Henry E. Sigerist (1891–1957). Director of the Johns Hopkins Institute of the History of Medicine from 1932 until 1947, Sigerist affected countless physicians, founded the *Bulletin of the History of Medicine*, contributed to the reorganization of the American Association for the History of Medicine, and gave powerful impetus to the development of medical history as an aspect of American scholarship. His interesting life and diverse activities make this volume, containing an unfinished autobiography and diary entries, rewarding reading.

The autobiography furnishes an account of the formation of a medical historian. Educated in the classical tradition, Sigerist's humanistic orientation persisted throughout his medical training, causing him some concern until he discovered, in medical history, a field in which he could combine his various interests. After postdoctoral study with Sudhoff, Sigerist succeeded him to the chair of medical history at Leipzig's Institute of the History of Medicine. Later, anticipating Hitler's rise to power, Sigerist acceded to William Welch's

request that he accept the directorship of the Johns Hopkins Institute. The 15 years Sigerist spent at this institute were critical in the development of medical history in America.

The diaries enable an appreciation of Sigerist the man as well as his many travels and activities. One reads of Sigerist's hopes for medical history in America, of the energetic William Welch, of Harvey Cushing, at 62 still nervous before each operation. One encounters also Sigerist's bouts with the American press and medical profession resulting from his regard for the Soviet Union and his espousal of "the complete socialization of medicine." Finally, the reader finds Sigerist, ill, a scholar frustrated by criticism and administrative minutiae, leaving the United States to spend his last years in Switzerland.

Sigerist lived during eventful times that were generally unreceptive to his field of scholarship and his social ideas. Because he dedicated his total energies to both, Sigerist's perceptive personal writings illumine the academic and social modes of Europe and America during his lifetime and will interest the general reader as well as the medical historian.

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Superconductivity

An Introduction to the Theory of Superconductivity. CHARLES G. KUPER. Oxford University Press, New York, 1968. xxii + 301 pp., illus. $9.60. Monographs on the Physics and Chemistry of Materials.

This is an admirable little book. In its 272 pages of text it treats almost all aspects of the theory of superconductivity. It even includes a short development of some elementary aspects of the theory of solids, including the theory of electrons in a periodic lattice, and finally works up to the theory of the electron-phonon interaction. Some of the recent aspects of the effects of various "pair-breakers" in superconductors are not treated, although the chapter on propagators in superconductors can serve as an introduction to this field. Most aspects of the presentation are clear and concise, and because of this and the small size of the book it can be taken along on trips to pass the time during the usual airline delays.

The flavor of the book is overwhelmingly English, and much emphasis is given to the work of Pippard and Frohlich in the 1950's. This treatment gives a different perspective on the development of the theory of superconductivity, especially the work of Frohlich, which is not emphasized in most recent American treatments of the subject. Another interesting case is the crucial discovery of the isotope effect. In this country credit is usually given to E. Maxwell and to B. Serin, C. A. Reynolds, and L. B. Nesbitt for simultaneous discovery. I was surprised to see Maxwell's work neglected in Kuper's discussion; instead, the work of Allen *et al.*, which is virtually unknown here, is mentioned.

A few comments about the treatment of the Ginzburg-Landau theory are in order. In general this section appears unenthusiastic and a little weak, although with the brief analysis of type II superconductors it is probably a more detailed treatment than most general texts provide. The author begins with statements of why the Ginzburg-Landau theory is less general than the Pippard theory and also includes statements to the effect that the original motivation of the Ginzburg-Landau theory is less direct than the Pippard theory. In the first case Bardeen has shown that the Ginzburg-Landau theory can be modified to yield nonlocal equations of the Pippard type. As to the motivation of the Ginzburg-Landau theory, I think that theory is as clearly motivated as the Pippard theory. In their original paper Ginzburg and Landau make their motivations quite clear, and mention that they are taking surface energies into account. Next, there seems to be some confusion in the book between Pippard coherence length and the coherence length of the Ginzburg-Landau theory, which describes the characteristic distance over which the order parameter of the Ginzburg-Landau theory changes. In surface energy arguments, such as that on page 112, the Ginzburg-Landau coherence length should appear in the expression $\xi H_c^2/8\pi$, and not the Pippard length as stated. Also, the Ginzburg-Landau expression for the free energy given on page 108 is the Helmholtz function and not the Gibbs function as stated. Almost every author says something slightly different about this point, but I think that the expression on page 108 is the Helmholtz function.

The brief discussion of Pauli spin paramagnetism and the Knight shift is weak and does not take account of the latest results. With recent new measurements on Al and the theory of spin-orbit scattering of Ferrell and Anderson there are no particularly puzzling questions left to hamper our understanding of the Knight shift.

Of course, these criticisms are rather minor, and I would like to say more about some of the other excellent features of this book. The complete treatment of second quantization and the chapters on quasi-particles and propagators make for a fairly complete introduction to the more general aspects of the theory. Another valuable feature of the book is the extended discussion of the problem of the Meissner effect in both the phenomenological theory and the microscopic theory. In general, the author does not hide problems and difficulties presented by various theoretical arguments, and this gives the reader valuable perspective on the limitations of the treatments.

All in all, this book is one of the best elementary treatments of the subject and will be a valuable addition to the libraries not only of aficionados, but also of general readers interested in learning about superconductivity.

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Efforts toward a New Science

The Neurosciences. A study program planned and edited by GARDNER C. QUARTON, THEODORE MELNECHUK, FRANCIS O. SCHMITT, and the associates and staff of the Neurosciences Research Program. Rockefeller University Press, New York, 1967. xx + 962 pp., illus. $17.50.

Man must understand better his own behavior. His nature requires it. He is inquisitive and moves along a path whose direction and destination are determined by a constantly shifting balance between his preserving and destroying impulses. This truism has surely been uttered in some form since the beginning of men. And it is equally sure that man has no proper science now to lead him to this urgently needed understanding.

A sense of urgency is not enough, however, to create the new science. That it is needed and that talented people are willing to help make it are also not enough. A science begins to flourish when the tools are ready and when preliminary explorations reveal where to begin. The creation of a new