work singling out the importance of Renaissance Hermeticism as a source of scientific values. The Hermetic philosophy of raising man's dignity by hailing his ability to discover magical powers, developed first in Italy, is shown to have been successively absorbed and transformed in England by Bacon, Boyle, and the Cambridge Platonists to meet the shifting requirements of 17th-century Protestantism. Rattansi's argument is complex and subtle and has the ring of truth about it. The effortless introduction into his story of the content of scientific theories is also a convincing argument for discarding the distinction between "external" and "internal" history of science which Mathias clings to in the introduction. The next speaker, A. R. Hall, seems to disagree with Mathias in his contribution, "Science, technology and Utopia in the seventeenth century," which turns on the separation between "internal" scientific progress and "external" technological change and literary expression. Both articles seem cogent despite their apparent contradiction on a higher plane.

In another useful essay, entitled "Who unbound Prometheus?," Mathias meticulously reviews the known links between scientific change and technological innovation in the 17th and 18th centuries, concluding that the role of scientific attitudes of rationalism, independence from tradition, experimentation, and accuracy were more significant for technology than was specific new knowledge uncovered by contemporary science. As if to offer a counter example, D. S. L. Cardwell argues in the next essay for the relevance of hydro and steam technologies to the concepts underlying thermodynamics. His exposition is too truncated to permit these relationships to be appreciated fully, but the reader is referred to a longer work by Cardwell for elaboration.

The last two articles are confined to topics strictly within England. On the basis of a few significant statistics from the York County Hospital, E. M. Sigsworth challenges the view that hospitals were "gateways to death" where diseases were caught and spread rather than checked and where surgery was often lethal. The evidence, sparse as it is, certainly calls for a reexamination of standard views. R. M. MacLeod's closing talk on "the endowment of science movement, 1868–1900" recounts an important phase in the gradual acceptance by government and society in Victorian England of the need to pay stipends to scientists for their occupation, rather than to award them medals and accolades after their work has proved significant. Failure to grasp this necessity was a serious block to developing research careers in science, hindering science from taking its legitimate place alongside other respectable professions. MacLeod's article, thoroughly steeped in untapped sources, demonstrates the possibilities of this approach for the study of science-society links.

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The Kidney

Developmental Nephrology. WALLACE W. MCCRORY. Harvard University Press, Cambridge, Mass., 1973. xiv, 216 pp. + plates. $12. A Commonwealth Fund Book.

This compact monograph is dedicated to the manifold processes involved in the structural and functional development of the human kidney. Quite properly, the focus is on the tubular units, nephrons, and collecting ducts. The review of their developmental history is conducted under five chapter headings: embryologic development, development of renal function in utero, quantitative measurement of renal function in infancy and childhood, renal function in the postnatal period, and cellular processes underlying growth and development.

The opening chapter describes human nephrogenesis in a setting of comparative mammalian nephrogenesis, both descriptive and analytical, and for its data and interpretations McCrory has relied heavily on Jean Oliver's 1968 monograph *Nephrons and Kidneys* (Hoeber). Included is a reproduction of nine plates of Oliver's exquisite reconstructions of microdissections of developing nephrons. As elsewhere throughout the monograph, attention is directed to important unresolved problems, in this instance (i) the mechanism of junction of nephrons and collecting ducts, (ii) formation of glomeruli, and (iii) the mechanism for segregation of the nephrons to the cortex and branches of the collecting system to the medulla.

The inaccessibility of the human fetus obviously accounts for the paucity of direct measurements of fetal renal function and related roles played by the placenta and amniotic fluid in water and solute exchange. Accordingly, any investigator is confronted with the uncertain validity of extrapolation of data derived from other mammals, notably the exteriorized sheep fetus. Chapter 2 assumes a cautious stance in this regard, to wit: "The reliance on data in other mammals for a description of the pattern of functional maturation of the kidney in man is obviously hazardous" (p. 77).

In contrast to the unknowns of embryonic and fetal life, the continuing structural and functional maturation of the kidney of infant and child is more directly documented. Chapters 3 and 4 summarize current understanding. Particularly interesting to this reviewer are the data, summarized in chapter 5, on developing cellular patterns of enzymes, nucleic acids, and structural proteins. Delineation of these patterns goes far toward revealing the mechanisms of compensatory hypertrophy following uninephrectomy.

McCrory not only has admirably synthesized current knowledge of the structural and functional development of the human excretory system but has submitted thoughtful and stimulating reappraisals of "concepts of the pathophysiology of many childhood renal diseases." Clinicians and researching embryologists and physiologists will find the monograph a valuable asset. A bibliography of just under 400 citations and a brief, but adequate, index round out this scholarly treatise.

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Meteorology

Atmospheric Energetics. JACQUES VAN MIEGHEM. Clarendon (Oxford University Press), New York, 1973. x, 306 pp., illus. $24. Oxford Monographs on Meteorology.

Measurements of meteorological quantities are practically all in some sort of time-averaged form, and meteorological problems can be approached appropriately only with the use of the governing equations in Reynolds form (time-averaged). Books on atmospheric dynamics, however, have mostly been written in the traditional line of approach, namely by the introduction or derivation of the governing equations and analysis and solution of these equations under various assump-

tions. It is indeed a pleasure to read Van Mieghem's *Atmospheric Energetics*, which explicitly presents the time-averaged governing equations and analyzes the effect of Reynolds stresses on the energy of the mean and turbulent motions, exactly the things that should be emphasized.

The monograph consists of two parts. The first, which provides the theoretical background for a general understanding of the atmospheric energetics processes, presents essentially the basic equations for the energy of the mean and turbulent motion and for the eddy flux of sensible and latent heat. The second, which presents the atmospheric energy processes in various space and time scales, deals with the Boussinesq approximation, the energetics of forced and free convections and of small- and large-scale motions, Lorenz's cycle of energy conversion and transfer, and quasistatic and ageostrophic motions in the atmosphere. The space and time averages are precisely defined and applied to atmospheric motion of various scales. Energy balance in both the boundary layer and free atmosphere is analyzed carefully and in detail.

Although the book is handsomely produced, a number of misprints appear. For example, the term on the left-hand side of eq. 11.2 (p. 115) should be time-averaged and in the first term on the right-hand side a divide sign is missing.

In spite of the misprints, the material of the monograph is well organized and presented, and the book is both detailed and comprehensive. It is suitable for students at the graduate level and for researchers in atmospheric dynamics.

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The Sun

Solar Activity Observations and Predictions. PATRICK S. MCINTOSH and MURRAY DRYER, Eds. M.I.T. Press, Cambridge, Mass., 1972. xvi, 444 pp., illus. $17.50. Progress in Astronautics and Aeronautics, vol. 30.

The extensive solar observations now being conducted by the astronauts on Skylab are giving beautiful new results and insights into the nature of the sun. Each day's observing schedule is prepared on the previous day at Houston by the group of experimenters who have supplied the instruments for Skylab. To prepare the most efficient observing schedule it is necessary to have a good anticipation of the location and extent of solar activity on the following day. The supplying of the solar forecasts to the Skylab experimenters is probably the most intensive use of the solar physics and techniques that are described in this book. The terrestrial results of solar activity and the associated need for forecasting this activity become increasingly significant as our globe shrinks and we become increasingly dependent on long-range communications, power networks covering an appreciable portion of a continent, and travel in high-altitude jet aircraft. All of these may be seriously disturbed by solar activity, and there is also increasing evidence that our weather and climate may be significantly influenced by solar activity.

The attempts to forecast solar activity provide a meeting place for solar physics research and the operational forecasting techniques. Forecasting looks to solar physics for the fundamental knowledge on which the daily specific techniques will be based, and the resulting degree of success provides an evaluation of the solar physics involved. Both the solar physics and the forecasting techniques are far from perfected, but the past few years have seen significant improvements as a result of spacecraft observations, improved ground-based observations, and the use of modern digital computers.

A basic dichotomy in solar physics is discussed in the present volume. In the classical picture, sunspots and flares are comparatively localized and short-lived features deriving their energy from magnetic fields that have been amplified by differential rotation. The newer half of the dichotomy, discussed by Schatten, involves large-scale and long-lived sectors within each of which the solar magnetic field is predominantly directed either inward or outward. This sector structure is carried outward by the solar wind and flows past the earth, causing an appreciable portion of the total terrestrial response to solar activity. The sector structure tends to recur from one solar rotation to the next, enhancing the forecasting possibilities.

This book is an excellent encyclopedia of the basic solar physics and of the resulting forecasting techniques. I would recommend it to a new student of solar physics, and it would be obligatory for a practitioner of forecasting. Each of the chapters is concise yet complete, with a rather uniform technical level, showing evidence of a firm editorial hand.

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Metal Chemistry

The Chemistry of Platinum and Palladium. With Particular Reference to Complexes of the Elements. F. R. HARTLEY. Halsted (Wiley), New York, 1973. xiv, 544 pp., illus. $45.

Now for the first time a book has been written assembling practically all of the available information about the chemistry and structures of platinum and palladium compounds in one place. The subjects covered range from the isolation of these elements from ores to inorganic complexes, to substitution mechanisms, to organometallic complexes and their reactions.

Particular emphasis is placed upon spectral and structural information. Not only the usual infrared and nuclear magnetic resonance data but, where available, electronic, vibrational, and photoelectron spectra and nuclear quadrupole absorptions are given. An appendix gives the bond lengths and angles for essentially all of the platinum and palladium complexes that have been investigated.

The book is more than just a compilation of data, however. The author discusses many relevant subjects in detail while presenting the data. For example, the concept of hard and soft acids and bases is used to predict the formation and relative stabilities of complexes. The bonding involved in the various complexes is considered in detail in an attempt to explain the observed bond lengths and spectral data. Reaction mechanisms are discussed where information is available to explain the many new and unusual reactions these complexes undergo.

The formation and chemistry of the inorganic complexes are the concern of the major part of the book. An entire chapter is devoted to hydrides, since these complexes are involved in many commercially important catalytic reactions of platinum and palladium. Other topics include complexes with boranes and group IV B, V B, and