sponges, coelenterates, annelids, arthropods (excluding insects), and nematodes, are hardly mentioned, but lists of these would have served a practical purpose.

The James River Basin is an impressive thick octavo. The text is easily read, and is printed on heavy, high-grade paper; the photographs and maps are reproduced on strong bond paper. The book is bound in heavy blue cloth and is handsomely stamped. The Virginia Academy of Science is to be congratulated on such an excellent contribution to the ever-expanding culture of the South.

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Physics and Mathematics

Introductory Nuclear Physics. David Halliday. New York: Wiley; London: Chapman & Hall, 1950. 558 pp. $6.50.

College texts notoriously suffer from a tendency to conservatism and overemphasis on "classical" developments of historical importance. Too often an author also tries to force a whole field into the mold of a personal point of view. Professor Halliday's book is entirely free from both these faults. It takes the student directly into the spirit of our great new laboratories: up to date in every respect and not unduly concerned with broad unifying principles. A large number of the most modern experimental and theoretical results is presented, on the whole accurately and clearly. Some sections (e.g., chap. 2, sec. 18, and chap. 8, sec. 17) consist of a review of a recent paper in the *Physical Review,* briefly presenting the fundamental knowledge required for its understanding.

The book is divided into 13 chapters and two appendices: an introductory chapter, two on radioactive processes, one each on interaction of radiations with matter, on detecting equipment, on neutrons, on nuclear masses and abundances, on nuclear forces, on accelerating equipment, on nuclear reactions, a separate chapter on fission, one on cosmic rays, and, finally, one on nuclear moments. One appendix is a table of physical constants, the other reviews 6 papers on experimental results which appeared during 1950. Each chapter is divided into about 20 sections and is provided with well-selected and stimulating problems. There are almost 300 illustrations, many of them helpful and relevant. Format, type selection, and paper are unusually pleasing. It would be useful if future editions would list section headings as well as chapters in the table of contents, since some topics do not appear in the most obvious places.

The treatment is weakest in the exposition of basic principles. For example, in the discussion of mass-energy equivalence (chap. 1, sec. 9): "If 1000 cal of heat is added to a block of copper, its mass . . . should increase by 1000 cal divided by the square of the velocity of light." For the beginner this may obscure the significance of c^2 as a factor connecting the units of mass and energy. Similar lapses occur in the discussion of the range of nuclear forces (chap. 8, sec. 5, and elsewhere).

In the presentation of techniques the emphasis is on accurate description of specific instruments rather than on general methods. For example, design data of one particular modern magnetic electron spectrometer are given in considerable detail (chap. 3, sec. 4), but the reader is referred to the literature for a systematic discussion of magnetic focusing.

About 70% of the numerous literature references are to publications that appeared during the past 5 years; over 80% are American. This may lead the less experienced reader to overestimate the significance of progress in experimental technique compared with the selection of important problems. For example, the author index contains only two references to Joliot (one in a historical summary, one to the failure to recognize the neutron). Bothe's name does not appear at all, and Heisenberg is mentioned only once, in passing. Neither Schmidt nor Kopfermann is quoted in the sections on nuclear moments. On the other hand, this reviewer finds *his* name in the index eight times.

The approach should prove most stimulating to a graduate student eager to join the main stream of thought and activity in his chosen field of specialization, particularly if his fundamental training was quite thorough and conservative. It will be less valuable to the beginner, still uncertain about the nature of important progress in physics.

As a textbook in a basic course in nuclear physics the volume must be supplemented by lecture notes explaining the fundamental principles. Its main value will be its use as a source book, providing specific illustrations and problems for the general material of the course.

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The Friction and Lubrication of Solids. F. P. Bowden and D. Tabor. New York: Oxford Univ. Press, 1950. 337 pp. $7.00.

Friction between solid bodies is one of the most basic of physical phenomena—one that affects nearly every phase of human activity. If, on some mythical cosmic control panel, one should pull the switch marked "Friction (Earth)," what a shambles would rapidly ensue. There would lie man, sprawled helplessly on the ground, unable to rise, while much of his physical world, both man-made and natural, would come sliding down about his ears. If, on the other hand, by a simple twist of the wrist one should flip the cosmic rheostat marked "Friction Intensity (Earth)" to "HIGH," the results would be almost equally grim. Civilization would quickly grind to a halt, with much squealing and smoke, and the lubrica-

tion engineer would probably become the most popular man on earth.

Such whimsical imaginings are not a part of the subject matter of this serious-minded and scholarly book. Until a few years ago, they might almost have been as tenable as any of the then-existing theories of friction—so few and sporadic had been the attempts to establish the fundamentals of the friction process. It is truly remarkable that such a basic phenomenon could so long have remained so little explored. However, in recent years the research group for whom the authors speak, together with many of their scientific contemporaries, has attacked the study of solid friction with vigor, so that much of the mystery surrounding this basic occurrence is now being dispelled. Publication of this book marks an important milestone in this belated process.

The book itself, one of the "International Series of Monographs on Physics," is a worthy addition to that series. It is concerned mainly with the basic mechanisms of the processes of friction and lubrication, although it also presents the results of the authors' delvings into many closely bordering fields. It will be of genuine interest and is recommended to all who have a scientific curiosity about basic causes. The general descriptions of the mechanisms associated with friction and lubrication are quite readable, as well as simple and understandable. In addition, the text contains a wealth of valuable detail for all scientists and technical men who require a basic understanding of the many complex factors influencing friction and the action of lubricants. Some of the subjects covered are the area of contact between solids, the surface temperature of rubbing solids, the action of bearing alloys, friction of nonmetals, action of extreme-pressure lubricants, the nature of contact between colliding solids, the nature of metallic wear, and chemical reactions produced by friction and impact. It should be pointed out, however, that the book does not deal with the case or theory of pure hydrodynamic lubrication. Only boundary lubrication (in its broadest sense) is treated.

Admittedly the subject matter is limited rather closely to the findings of the authors' own school of workers. This, however, is no serious drawback, because of the very wide scope of the research carried out by this group and their intelligent interpretation of their own findings and those of certain others—in fact it was almost a physical necessity to limit the scope of the book in this way because of the prolificacy of this group. Surely such a means of summarizing research is far better than publishing a selected collection of papers, since, among other things, it has allowed the authors to temper their earlier findings and opinions with their later judgment. However, as must be the case in any restrictive process, the book does lose some value and broadness of outlook by being confined largely to the research of one group. For example, much of the authors' thinking and interpretations must thereby revolve mainly around a particular type of friction apparatus. The usual main elements of this instrument, of which there are several variations, are a hemispherical (or spherical) slider moving along a flat surface, the slider having a resilient mounting so that "sticking" and "slipping," when they occur, can be observed and readily measured.

The book's subject matter is quite current, with many references to 1949 and 1950 papers, as well as to previously unpublished work. The entire presentation is a shining example of the fact that even today, when the emphasis in science seems to be on superinstrumentation, a wealth of basic information can still be discovered by ingenious experimentation with relatively simple apparatus and techniques. We hope that there can be many more such publications from this group in the future.

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Weltsystem, Weltäther und die Relativitätstheorie. Karl Jellinek. Basel, Switzerland: Wepf & Co., 1949. 450 pp. Sw. fr. 45.

The purpose and scope of this book are very clearly set forth in the introduction. There are many books on relativity, written especially for the layman, and others for the theoretical physicist, but the former are far too superficial, and the latter too mathematical, for the experimental scientist. It is in order to give the experimental scientist an understanding of this theory that this book has been written. A knowledge of differential and integral calculus and the elements of theoretical physics are the only prerequisites.

The fundamental concepts of nonrelativistic physics are first discussed. This includes Newtonian mechanics, emission and wave theories of light, electromagnetic theory, nonrelativistic wave mechanics, including the prerelativistic conceptions of space, time, and the ether. This is followed by a very complete development and discussion of the special theory of relativity, and the modifications that it forces upon the concepts of prerelativistic physics. After a thorough treatment of Einstein's theory of gravitation, and his general theory of relativity, the cosmological theories of Einstein, De Sitter, and the expanding universe are developed. Although the book is not written primarily for the theoretical physicist, he will be interested in many developments that are unlikely to be found in such detail elsewhere in the literature. Among these should be mentioned: (1) a thorough treatment of many so-called paradoxes, (2) the homogeneous gravitational field, and its application to the study of the nonhomogeneous gravitational field, (3) the inhomogeneous field of the sun, and particle orbits in this field, (4) the study of clock synchronization in the case not only of the special theory of relativity but also for the homogeneous field, the inhomogeneous field, and the expanding universe.

The contention that the theory of relativity denies the existence of an ether not only has been shown invalid, but the necessity of a certain type of world ether has been emphasized. However, one might question

Jellinek's argument that the world ether at each locality of space is approximately at rest with the matter in that locality. It would seem to be more in the spirit of the Michelson-Morley and similar experiments, to consider the relative velocity of ether and matter to be a concept without physical significance. Although the argument used, in this case, does not seem at all convincing to this reviewer, he has been unable to find other sections of the book open to similar criticism. The book is written throughout with exceptional clarity of style by an author who shows great understanding and love of his subject, and would be suitable as a textbook either for the classroom or for individual study.

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Negative Ions. 2nd ed. H. S. W. Massey. New York: Cambridge Univ. Press, 1950. 136 pp. $2.50.

This is another of the excellently produced monographs in the postwar series of Cambridge Monographs on Physics—the present one a revised edition of the Cambridge physical tract of the same title. The difference between the original and the revised edition lies mainly in the last chapter, which deals with the role negative ions play in glow discharges and in terrestrial and stellar phenomena.

The book is very lucidly written and one only regrets that the author did not treat some aspects in more detail. In particular, the section dealing with the part theoretical considerations about the continuous absorption by H^- have played, in finally obtaining agreement between the computed and the observed solar spectrum in the visible region, might well have been expanded.

A very valuable innovation one would like to see in all monographs of this kind is a complete bibliography taking the place of the usual author index. From this bibliography it is immediately clear how much work has been done in this field between the publication of the first and the revised editions.

There are two minor points on which I would beg to differ with the author. First, I find it strange to read in a book written by a physicist, who has applied mathematics so successfully to so many physical problems, that mathematics really has no place in a physical tract and should be relegated to small-type sections. Theoretical considerations that, by their very nature, often involve rather complicated mathematics are to my mind just as much part of present-day physics as experiments.

Second, the last paragraph of the book seems to me to be unintelligible to anyone not completely familiar with interstellar problems. In the "hot" interstellar regions where kinetic temperatures of about 10,000° K are reached, all hydrogen is ionized, and H^- is certainly not present. In those regions where H^- is present, the kinetic temperature is only of the order of 100° K, and recent investigations of Spitzer's (*Astrophys. J.*, **109**, 337 [1949]; **111**, 593 [1950]) make it improbable that H^- plays a role at all in the determination of the kinetic temperature.

These points are, however, of small importance, and both the author and the publishers should be congratulated on a book in which one can find practically all relevant information about negative ions.

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Mathematics: Queen and Servant of Science. Eric Temple Bell. New York: McGraw-Hill, 1951. 437 pp. $5.00.

The Main Stream of Mathematics. Edna E. Kramer. New York: Oxford Univ. Press, 1951. 321 pp. $5.00.

Both these volumes are introductions to fundamental mathematical ideas intended for the general reader. Both make plain the relevance of these ideas for natural science; but neither of them places any emphasis upon the narrowly practical values of mathematics, and each is written to appeal to readers with a taste for theoretical understanding and intellectual adventure.

Dr. Bell's present book is an integrated and considerably enlarged version of his earlier *The Queen of the Sciences* (1931) and *The Handmaiden of the Sciences* (1937). No one who has ever seen his publications intended for general audiences need be reminded that he can write on difficult matters clearly, informatively, and entertainingly. He has now composed an inviting introduction to selected, but nonetheless quite numerous, chapters of active mathematical research, and his book undoubtedly opens doors to engrossing mathematical concepts that are not easily accessible to the lay reader. The material is about evenly divided between so-called pure and "applied" mathematics—physics and astronomy being the chief sources for examples of the latter. The longest but not the most successful single chapter is on abstract algebra, much of it inevitably devoted to the definition of key notions. Since few obviously "interesting" theorems are stated and illustrated, the beginner, for whom it is intended, is more likely to be impressed than enthralled. However, none of the remaining chapters suffers from this defect, and to the present reviewer Dr. Bell's account of the theory of numbers and the theory invariants seems especially well done. It is nevertheless a pity that *The Queen of the Sciences* will now be permanently out-of-print. For, although its contents are included in this new book, the smaller bulk of the earlier volume (both in ideas and in physical size) made it a more ideal introduction to the character of modern mathematics, at least for most beginners, than is this fuller presentation of mathematical achievements.

Dr. Bell has definite opinions on a large number of debatable questions, and he does not hesitate to state them vigorously. For example, he does not believe

that mathematical physicists should be given a rigorous course in calculus—apparently because mastery of the subtleties involved in a rigorous treatment may be bought at the price of hamstringing creative minds. Again, he declares the Ptolemaic theory to be one of humanity's major blunders, though it is not clear what the basis for this curious opinion is. He is not a uniformly reliable guide on more philosophical questions concerning the foundations of mathematics. He indicates strong sympathies for the "finitists," although he does not offer even a brief set of reasons for his preferences. Nor is he entirely accurate in his account of Hilbert's final attitude to Goedel's epoch-making discoveries and their consequences for the former's *Beweistheorie*. Hilbert did not declare the latter to be a fiasco, and he did not succumb to the despair concerning this theory with which Dr. Bell credits him.

Dr. Kramer's book is considerably less ambitious in the materials it tries to cover and makes fewer demands on its readers. In fact, it assumes familiarity with nothing beyond high-school mathematics, and explains at some length many things that Bell takes for granted. Despite its smaller scope, the book is nevertheless a useful addition to the literature of "popularized" mathematics; for, although Dr. Kramer employs some of the familiar devices for making novel and difficult matters attractive to large and miscellaneous audiences, her popularization is on a high level. She introduces much of her material partly by way of the personal histories of mathematicians, and she does not neglect to include into her account some of the famous anecdotes and romantic moments in the history of mathematics. Her discussions are pitched on an elementary level, but she manages to convey quite successfully many of the fundamental ideas of such relatively advanced subjects as non-Euclidean geometry, the theory of invariants and relativity theory, the theory of classes and of transfinite numbers, and probability and the theory of experimental design. Her chapter "Science and the Sweepstakes," which deals with probability and statistics, is particularly successful. The book contains many pages of real charm and is uniformly readable and informative.

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Methods in Climatology. 2nd ed. Victor Conrad and L. W. Pollak. Cambridge, Mass.: Harvard Univ. Press, 1950. 459 pp. $7.50.

In its second edition, this book remains the only work in English on climatological methods. Review of the first edition (by Conrad alone) contained a number of suggestions for the inclusion of more modern methods. The authors have adopted only a few of these on the grounds that most of them fall into the first of two classes: "Methods . . . applied to the solution of an *individual* problem" rather than "a *group* of problems" . . . and "are not of general interest." The applied climatologist will not be pleased with these omissions, for all his problems are in this first class. (See review of 1st edition, *J. Am. Statist. Assoc.*, 41, 249 [June 1946]). However, among the adopted suggestions are the rearranging of chapters in Part I into a more logical order, adding brief discussions of punched cards and degree-days, and adding a new chapter, "Aids to Computation." An entirely new part (II) of over 100 pages, "Computing Devices," has also been included. This consists mainly of a discussion of the evaluation of hidden periodicities and completes the discussion of harmonic analysis of Chapter V. It is difficult to understand why the latter was not combined with Part II. The discussion of periodography is the most thoroughly done section of the book. It will be very useful to meteorologists, although they are cautioned that the discussion does not take into account much modern work done by statisticians in time series analysis.

The book now consists of two main parts as compared to four previously. Part I, called "Methods in Climatology," is essentially the same as in the first edition, with some changes and enlargement. Chapter I consists of general remarks on meteorological observations and errors of measurement. In Chapters II, IV, and V, general statistical methods are covered. It cannot be said that the statistical discussion of these chapters shows much improvement—for it is still largely of an early vintage (1910–20), irrespective of some modern reference citations. Chapter III is on "Aids to Computation," such as graphs and nomograms. It would perhaps have been more logical to place this chapter ahead of the statistical discussion instead of in the middle of it. The applications of statistical methods to climatic elements are considered in Chapters VI and VII. Chapter VIII returns to statistical analysis to discuss "Comparison of Climatic Elements," and Chapter IX is concerned with the application of these methods to specific elements, as well as certain methods of graphical and numerical "characterization." Static and dynamic climatology are very briefly discussed in Chapter X, and some very general remarks on bioclimatology and climatic phenomena are included as well.

In the second part of the book, "Computing Devices (and) Periodography," Chapter XI, entitled "Computation with Mechanical and Electrical Devices," bears a close relationship to Chapter III and could well have been combined with it. The final three chapters are all on the analysis of time series and bear little relation to the preceding chapters.

Readers will again be disappointed if they expect to find in this new edition many methods useful in applied climatology. Through the publication of much wartime work, there has been a great increase in the number of modern methods that fall into the authors' "first class" pertaining to the solution of individual problems. Nevertheless, the second edition is greatly improved over the first and can be recommended as a source book for the classical methods in climatology. It cannot be recommended as a text- or handbook of modern methods.

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Superfluids: Macroscopic Theory of Superconductivity, Vol. I. Fritz London. New York: Wiley; London: Chapman & Hall, 1950. 161 pp. $5.00.

In this volume Dr. London presents a macroscopic theory of superconductivity, which is an extended treatment of the electrodynamic theory he developed with H. London in 1934 to account for the Meissner effect, and subsequently elaborated in 1948. The Meissner-Ochsenfeld experiment emphasized the basic difference between a "perfect conductor" and a superconductor, whereby the former should be characterized by the magnetic induction relation $\dot{B}=0$ and the latter by $B=0$ or perfect diamagnetism. Thus the essential reversibility of the transition was established, in harmony with the success of predictions based upon the application of thermodynamics by Keesom and others, and irreversible effects were ascribed to imperfections in the superconductor.

The Meissner effect indicated that there is just *one* well-defined current distribution for a given applied magnetic field, but the theory shows that the assumption of perfect diamagnetism is also unable to account for the facts. The London equations are, in effect, a reduction from those derived for a nonviscous electronic liquid, and take into account the uniqueness of the current distribution.

This is a purely phenomenological theory, although in a final chapter the author draws conclusions from it as to a program for the development of a molecular theory of superconductivity. Daunt and Mendelssohn have drawn attention to the closely analogous behavior of superconductors and liquid helium at temperatures below the "λ-point"; the fundamental idea underlying the macroscopic theory is that the superfluids provide examples of a pure quantum mechanism, with a wavefunction of macroscopic scale, and are characterized by a long-range order in the momentum vector. In the case of liquid helium, a possible mechanism for the ordering in momentum space is the condensation of the Bose-Einstein gas, as Dr. London suggested in 1938. On the other hand, the great difficulties inherent in the quantum-mechanical treatment of electronic interactions in metals have so far prevented a successful derivation of the electrodynamical properties of the superconductor. It should be mentioned that recently Heisenberg, Born and Cheng, and Frohlich[1] have all developed molecular theories which lead to a spontaneous current in the lowest energy state, but that London raises the objection that there is no experimental evidence for such a state. The theory of Bardeen, as thus far published. aims at deriving the condition of perfect diamagnetism.

This book, part of the Wiley "Structure of Matter" series, maintains the standard of clear presentation and excellent typography. There are one or two minor text errors, and one feels that a table of the known superconductors with the relevant data would be a welcome addition, even in this essentially theoretical text. The author emphasizes that he has not attempted to achieve complete coverage of the experimental work, but the coverage is generally adequate and references are given in each case.

There are five sections, following an introductory discussion of the general features of low-temperature superflow phenomena and their possible explanation. Part A, the longest section of the book, deals with the basic electrical and magnetic properties of the superconductor and the thermodynamics of the *pure* superconducting state. The fundamental equations are set up and the theory developed to cover a number of simple applications. The choice of these equations is justified by demonstrating how the equations for a perfect conductor must be restricted to cover the case of the superconductor (nonlinear terms being shown to be negligible); then follows further development of the theory, including the energy-momentum and uniqueness theorems. One striking result obtained is that if a rotating sphere be cooled through the transition temperature, it should become magnetized at that point. The magnetization is very small even for very high angular velocities ($\sim 10^{-5}$ gauss at $\sim 10^{4}$ rpm), but it might be possible to confirm the prediction experimentally. The chapter ends with a description of high-frequency measurements of the field penetration depth and an interpretation of the results.

In Part C the author discusses the intermediate state, in Part D the surface energy between the phases and properties of very thin films, and in the final section his "program for the molecular theory of superconductivity." The long-range order of the momentum vector is considered from the viewpoint of quantum kinematics, whence deductions may be made concerning the divergence of the properties of "superelectrons" from those of ordinary free electrons. Superconductivity should result if the eigenfunction of a fraction of the electrons is undisturbed when the system is brought into a magnetic field. What is required is a "condensation" of the average momentum distribution, in contrast to earlier ideas of a freely mobile electronic "crystal" or superlattice.

In the London interpretation, there is no permanent current in an isolated superconductor in thermal equilibrium, except in the presence of a magnetic field. There is no conservation of such currents, but there is a conservation of magnetic flux in multiply-connected superconductors. In order to maintain $B=0$ the supercurrents adjust themselves to the slightest change of an external applied field, and there is no hysteresis within the limits of the pure superconducting state. Molecular theories which allow a great number of equilibrium states corresponding to different spontaneous currents, and which feature unsymmetric distributions in momentum space without regard for the applied magnetic field or the topology of the system, are rejected.

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[1] In a second paper Frohlich has shown that it is possible to derive the London equations from his theory.

The Theory of Valuations. O. F. G. Schilling. New York: American Mathematical Society, 1950. 253 pp. $6.00.

A valuation is a generalization of the concept of an absolute value. The absolute value $|u|$ of a real or complex number u satisfies the laws

A1: $|u|$ is a real number, $|0| = 0$, $|u| > 0$ if $u \neq 0$.
A2: $|uv| = |u|\,|v|$.
A3: $|u+v| \leq |u| + |v|$.

A rational number $u \neq 0$ will be of the form $u = p^a r/p^b s$ where p is some fixed prime, and r and s are integers not divisible by p. We may define a function $f_p(u) = 2^{b-a}$ for $u \neq 0$ as above and $f_p(0) = 0$. Here the laws are

B1: $f_p(u)$ is a real number, $f(0) = 0$, $f(u) > 0$ if $u \neq 0$
B2: $f_p(uv) = f_p(u) f_p(v)$
B3: $f_p(u+v) \leq \text{Max}\,[f_p(u), f_p(v)]$,

and the third law B3 is definitely stronger than A3. A valuation $V(u)$ is a generalization of this second arithmetical "absolute value" $f_p(u)$ in that we consider a function $V(u)$ with arguments u from a general division ring D and values $V(u)$ in a simply ordered group Γ. Here the laws are

V1: $V(u)$, $u \neq 0$ is an element of a simply ordered additive group Γ. $V(0) = \infty$ is greater than any element of Γ.
V2: $V(uv) = V(u) + V(v)$.
V3: $V(u+v) \geq \text{Min}\,[V(u)\ V(v)]$.

Here for the rational field we may take $V_p(u) = a - b$ with $u \neq 0$ as above; i.e., $V_p(u) = -\log_2 f_p(u)$, and so $V_p(u)$ is in an additive group where $f_p(u)$ was in a multiplicative group. Since the law V3 is stronger than the corresponding triangle law A3, valuations are in general, like V_p for the rationals, bound up with arithmetical properties.

Hensel's theory of p-adic numbers, with its theory of p-adic convergence, threw new light on problems of congruences associated with the ideal theory of algebraic numbers. Similarly the realization that formal power series were sufficient for the study of algebraic curves opened the way to the study of algebraic geometry over general fields. Both p-adic series and formal power series may be regarded as convergent with respect to an appropriate valuation.

By every standard this is an advanced treatise and the reader will find in Appendix II, "Facts about Linear Algebras," a measure of the background required. But one of the most commendable features of the book is the careful way in which the author has indicated at every stage precisely what background is needed. The book is abundantly supplied with remarks and examples which clarify the motivation and give point to the distinctions made in the definitions. Only the absence of an index will cause the reader any regrets.

In a division ring D with a valuation $V(u)$, those u's with $V(u) \geq 0$ form a ring O and those u's with $V(u) > 0$ form a two-sided prime idea P in O. The residue class ring of O modulo P is again a division ring *D*. If D was an algebra over a field F, then *D* will be an algebra over a field *F*. Thus the valuation is an appropriate tool for studying the "local" theory relating properties of D and F to those of *D* and *F*.

The first two chapters are devoted to general theory of valuations, including the completion of D with respect to $V(u)$ as a metric. The next four lead up to local class field theory, the norm residue symbol being defined by means of the Brauer class group for simple algebras. A final chapter is devoted to a study of the structure of complete division rings, regarded as topological algebras with respect to the valuation.

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Chemistry and Biochemistry

Advanced Organic Chemistry. Reynold C. Fuson. New York: Wiley; London: Chapman & Hall, 1950. 669 pp. $8.00.

This is a textbook for graduate students, containing the reactions, syntheses, and concepts of organic chemistry that are really useful in research. The book is not an omnibus volume, but a carefully selected and organized treatment of specifically valuable processes for which yields can be, and are, cited throughout.

The material is not arranged according to homologous series or functional groups, as in most first-year textbooks. Instead, the chapters deal either with certain large classes of compounds, such as hydroxy compounds, halogen compounds, derivatives of carboxylic acids, carbonyl compounds, active methylene compounds, nitro, nitroso, and oximino compounds, amines and amino compounds, azo and diazo compounds, and organic sulfur compounds, or with general reactions or processes. As examples of the latter may be mentioned cleavage of carbon-carbon bonds, aliphatic substitution, organometallic compounds in synthesis, carbon monoxide in synthesis, oxidation, hydrogenation, aromatic substitution, ring closures, conjugate addition and polymerization. This organization gives the student a different viewpoint and permits correlations of reactions and mechanisms.

The useful and fundamental behavior of organic compounds is well presented and very well indexed. The text is full of solid organic chemistry, no descriptive or "essay material" being given. Do not look in this book for stories about vinegar, violets, vitamins, or veronal; but do look in it for all well-known "name" reactions, chelation, isoster concept, vinylogy, Blanc's rule, decarboxylation, telomers, cyclization, acylation, nucleophilic substitution, cyanoethylation, oxo reaction, etc. Reactions important in industry are given, as well as those of theoretical value. Older work is cited by references to *Annual Reports, Chemical Reviews, Organic Syntheses, Organic Reactions,* and *Organic Chemistry,* by Gilman. Specific literature