known and undeveloped. His field is therefore that of regional geology and all sedimentary rocks. Thus, a text on structural geology for petroleum geologists must also be a text on the structural geology of sedimentary rocks in general.

This viewpoint is indicated by the subject matter of the chapters of the present book, which includes treatment of folds, faults, joints and fractures, unconformities, salt domes, buried hills, sedimentary features, regional structures, superficial structures, and continental shelves. The book concludes, however, with two chapters of more practical application to petroleum geology on classification of traps for oil and gas accumulation and on structural factors in petroleum prospecting.

With these objectives, the book may well find its place as a textbook in a structural geology course in those schools of the country where the surrounding terrain is made up dominantly of sedimentary rocks, or where the study of geology is primarily in preparation for entrance of the student into the various professions of the petroleum industry.

In assemblying his book, Russell has covered a vast amount of original source material, largely contained in articles in the technical journals, and in the various state and federal publication series. One of the most useful feaures of the book for the professional geologist, in fact, is the careful documentation of most topics, both in footnote references and in the lists of "additional references" at the ends of the chapters. The professional geologist will find these citations an up-to-date survey of numerous topics of interest.

In a work with objectives as novel as this, a first attempt may not prove to be as well rounded as later ones, by the same author or others; in the present book, I feel that this is to some extent the case. Thus, some of the chapters seem to be largely revisions of chapters in the author's previous *Principles of Petroleum Geology*; they cover essentially the same subject matter with only slight change in emphasis. This is notably true of the chapters on salt domes in the two books, and to a lesser extent of the chapters on sedimentary structures, structure of the continental shelves, and classification of oil and gas reservoirs; the two books, instead of being mutually supplementary, partly duplicate each other.

Also, in this first attempt, treatment of the subject matter appears uneven. Some chapters, such as those on faults and sedimentary structures, are largely statements of definitions and general principles, little fortified by examples or indications of how the principles might apply to petroleum geology. On the other hand, some topics, such as salt domes and buried hills, are rather exhaustively covered and well supported by examples.

Some areas with special problems are also given an interesting summary treatment—for example, the problem of the cherts of the Ouachita facies (pp. 268–270)—and I wish that more of these summaries could have been included. I would like to see a treatment in one place of the assemblage of related structural features that characterize the Gulf Coastal Plain, to which some geologists have given the term "homoclinal tectonics"; many of the individual features are mentioned throughout the text, but their relationships to each other in bringing about a peculiar structural style in the region is not made evident. The chapter on faults contains little mention of faults with large components of transcurrent movement of the type of the San Andreas fault in California, although some of them, such as the San Gabriel fault north of Los Angeles, pass through productive oil territory. It is also disappointing to find no mention of the problems of "gravity tectonics" in the chapter on superficial structures, although structures resulting from this process are important in the oil fields of Iran and northwestern Peru, and the area where they are most spectacularly developed, in the northern Apennines of Italy, is currently being prospected for petroleum. Some of these features may seem odd or exceptional, yet they may be more common than realized, and the petroleum geologist should make himself aware of them.

On the other hand, I am puzzled at the inclusion, and in some cases the rather full discussion, of some items that seem to have little bearing on petroleum geology, such as erratic blocks (pp. 287–288) and cryptovolcanic structures (pp. 329–332).

It seems to me, however, that the greatest opportunity for improvement of the book is in the text figures. Many of these are simply outline sketches illustrating general principles such as an instructor customarily puts on the blackboard to demonstrate some item to his classs. A printed book, in contrast to an oral lecture, provides an opportunity for more elaborate demonstration from actual examples. Such demonstration would appear to be desirable, for most of the students who will use the book will have little notion of how the principles illustrated in the sketches apply in field problems or in the occurrence of petroleum. Even some of the general discussions in the text might well have been tied to cross-sections or maps showing specific structures, rather than to theoretical diagrams.

For example, under faulting, reverse drag shown in Figs. 5–1 and 5–12 might have been illustrated by a cross-section of a fault with reverse drag in the Coastal Plain area; thrust faults shown in Figs. 5–9 and 5–13 could have been illustrated by sections in the Ventura Basin, Calif., the Anadarko Basin, Okla., and Turner Valley, Alberta; and fensters in a thrust fault shown in Fig. 5–14 could have been illustrated by a section of the Rose Hill oil field, Va. One misses, too, maps showing the interesting and significant relation between faults and oil-bearing anticlines, such as those in the Kettleman Hills field, Calif., and various anticlinal fields of Wyoming.

Examples of this sort are in proved oil territory; many of them involve producing oil fields; all are supported by abundant drilling data that indicate the structure for many thousands of feet below the surface. They would emphasize to the student that the structures discussed in the text are not merely theoretical concepts of whose application he is uncertain, but genuine features of the sort with which he will have to deal in his work as a professional petroleum geologist. It is true, of course, that the examples are in developed territory, whereas much of the student's professional work will be as an explorer in areas where these have not been deciphered and have not been proved by drilling, but they will demonstrate to him the types of structure he must consider in planning for the drilling of promising localities.

In summary, in these days when efforts are so often duplicated by different authors, so that the purchaser of technical books is more often puzzled to make a choice between several works on the same subject, rather than to locate the unique book for his purpose, Russell is to be congratulated for discovering a well-known subject on which no specific book has been prepared. Opinions will probably differ from one reader to another about how fully the objectives of the book have been met, but I feel that this worthy undertaking could be further amplified and improved. This may well be Russell's intention as he continues to gather material on the subject and to teach it to his classes. In the meantime, the book as now published is a useful and much needed source book on an important and neglected subject.

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New Zealand Geomorphology. Reprint of selected papers 1912–1925. C. A. Cotton. New Zealand University Press, Wellington, 1955. 281 pp. Illus. + plates. 42s.

Those who are familiar with the students of geomorphology need no introduction to C. A. Cotton. Indeed, all the older students have already read these chapters in the various learned journals,

for if we inspect the subtitle, we find "Reprints of selected papers 1912–1925." And I would recommend that all who have not read them do so. First, they describe various phases of the geomorphology of an area that few of us are fortunate enough to see. Second, they are the building up of the ideas that Cotton's students have carried beyond the borders of New Zealand and applied in other regions with considerable ability. Third, they are good reading.

Sixteen papers are reprinted, and I can see no good being served in listing the 16 titles with their sources. I compliment the Victoria University College in bringing together these 16 excellent papers in one volume and wonder if it was a birthday surprise for Cotton for his 70th year. I am sorry, though, that the original paging is lost.

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Physical Chemistry. Farrington Daniels and Robert A. Alberty. Wiley, New York; Chapman & Hall, London, 1955. vii + 671 pp. Illus. $6.50.

This new textbook is a successor to the long series of previous editions that were initiated by Frederick H. Getman in 1913 and continued by Farrington Daniels. Some new subject matter and new exercises and problems are introduced, and, in some instances, the order in which topics within a chapter are presented has been changed. The sequence and titles of the 20 chapters are essentially the same as in the last edition of Daniels' book. The text follows its predecessors' excellent example in that it has a number of exercises throughout each chapter that illustrate the more important principles in detail. References to original work and to more recent reference works have been brought up to date and many new citations are included.

Although adding new figures to the chapter on crystals, for instance a Fourier plot for maleic acid, is highly desirable, it apparently necessitated omitting other figures that were quite useful for class purposes, such as those illustrating interplanar distances. The addition of some figures and some rearrangement of topics, such as placing Onsager's conductance theory in the chapter on electrolytic conductance rather than in the chapter on ionic equilibria, make the teaching of the subject matter of these chapters somewhat more orderly. A brief discussion of the application of light scattering and the more extended discussions of diffusion and other physicochemical principles in the chapter on colloids are significant improvements.

The inclusion of the chemical potential and free-energy functions is a welcome addition, although use of the former may well have been illustrated in connection with the chapters on equilibrium. Tables of heats of formation, bond energies, standard entropies, standard electrode potentials, and so forth, have been revised, using the most recent values. The contraction effected in the appendix of this new textbook is more apparent than real since the essentials of much of the material deleted from the appendix of previous editions is incorporated in appropriate chapters. The omission of elementary subject matter that was included in earlier editions seems quite appropriate for, as the authors say, such topics are now generally handled adequately in prerequisite courses.

The fundamentals of physical chemistry are well covered, and experience with teaching this book's forerunner indicates that a radical departure in the new volume from the established pattern would hardly be justified at this time.

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Chemical Engineering. vol. 2, *Unit Operations.* J. M. Coulson and J. F. Richardson. McGraw-Hill, New York; Pergamon, London, 1955. 975 pp. Illus. $9.

Of all the engineering disciplines, chemical engineering defies attempts at systematization. The range of the field is so great that the sort of continuity one expects in moving from one topic to another is impossible. These reasons, perhaps more than any others, explain the sort of treatment of chemical engineering given in U.S. schools under the catchall "unit operations." Now come two Englishmen who recognize that unit operations is exactly chemical engineering if we include a discussion of basic theory, as was done in volume I. One must admit that basic theory is a strongly unifying ingredient.

Coulson and Richardson have done a remarkably fine piece of work. Their first volume is superior to anything that has thus far appeared in the United States, and now the second volume presumably integrates the field. Unfortunately, this cannot be so. There must eventually be a third volume, because the discussions on the diffusional processes are not only sketchy but also are not sufficiently comprehensive.

Since the last chapter of volume I was devoted to mass transfer theory (with a single application), one had begun to look forward to what has long been needed in chemical engineering—a detailed analysis of the diffusional processes. This has not been done to the extent anticipated. Instead, a great deal has been written with reference to particulate technology—particle motion, sedimentation and fluidization, size reduction and classification. All these are, of course, needed and are better and more thoroughly done in the second volume than in several U.S. textbooks combined. But some day, a third volume must appear that will bring together the sections dealing with the diffusional processes. Then Coulson and Richardson will have settled once and for all what chemical engineering means and is.

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Biochemistry and Physiology

Biochemistry and the Central Nervous System. Henry McIlwain. Little, Brown, Boston, 1955. vii + 272 pp. Illus. $9.50.

This book is apparently intended for use as a textbook of neurophysiology and psychological medicine and, as such, it fulfills a valuable function in bringing students and workers in the general area of CNS research up to date on biochemical methods and findings in the field. Although in general, the author deals with the same material as is covered by the recent encyclopedic works on neurochemistry by Elliott *et al.* and by Waelsch, his treatment is necessarily far more concise but still sufficiently detailed for clarity. Many of the chapters contain well-documented, valuable summaries of quantitative data collected from various sources.

The chapter headings are "Biochemical studies of the brain," "Metabolism of the brain *in situ*," "The chemical composition of the brain," "Metabolism of separated cerebral tissues," "Cell-free cerebral systems," "Glycolysis and an oxidative pathway," "Pyruvate metabolism," "Oxidative phosphorylation," "Amino acids and cerebral activities," "Vitamins and the central nervous system," "Cerebral lipids," "Cytochemical and histochemical aspects," "Chemical and enzymic make-up of the brain during development," "Acetylcholine, sympathin and related substances," "Depressants and excitants of the central nervous system," "The speed of chemical change in the brain."

It seemed to me that the discussions of general metabolic processes in the brain—for example, glycolysis and the tricarboxylic acid cycle—although quite adequate themselves, did not emphasize sufficiently that these, or closely related reactions, occur in other mammalian organs as well as in some microorganisms and plants. This suggests that the brain is not distinguished from the other organs on the basis of its gross energy-