of the Grignard reagent. The Russian chemists have done very significant work in this area, but it is regrettable that no mention is made of workers such as Kohler, McKenzie, Oddo, Ruzicka, and Tiffeneau. For example, Kohler's classical studies not only developed, at an early stage, some fundamental aspects of organomagnesium chemistry but also provided an uncommon and extensive contribution to our knowledge of conjugated systems.

A cursory examination of some of the entries reveals the incorrect spelling of the names of some authors. This is not an overly serious matter when one reflects on the equally inadvertent but much more frequent misspellings or transliterations that are made in the names of Russian chemists by non-Russians. However, the same cursory examination did reveal the omission of some literature references concerned with the broad development of the Grignard reagent and its reactions.

In a sense, this compilation supplements the more critical and readable *Grignard Reactions of Nonmetallic Substances,* by Kharasch and Reinmuth. That one-volume work is more restrictive in its scope (as its name indicates), but it covers two more years of the literature (up to *Chemical Abstracts* of June 1950).

The authors have done a great and splendid service to organic chemistry, and this *Handbook* should be available in libraries, where one can confidently count on its extensive use as a valuable work of reference.

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Dynamic Programming. Richard Bellman. Princeton University Press, Princeton, N.J., 1957. xxv + 342 pp. $6.75.

The book under review may be considered to be a mathematics book, since the author is a well-known mathematician. However, it is not a book primarily about mathematics, as all too many mathematics books are apt to be. It is devoted to developing mathematics in response to problems arising in the social, business, military, economic, and political worlds as well as in engineering and the natural sciences.

Here, then, one may find direct statements of the applications of the mathematical theories developed, together with the construction of theories to solve specific classes of problems, such as inventory problems, depletion problems, and scheduling problems in general. The title *Dynamic Programming* refers to development of a dynamic optimal policy or program as a guide for the making of time-dependent decisions in complex problems involving many variables. Optimization may refer to maximizing net profit, to minimizing risk probabilities, to minimizing storage space, to minimizing delivery times, and so on.

Dynamic Programming takes its place among the comparatively recent attempts to develop mathematics to meet problems of modern civilization and was undertaken in somewhat the same spirit as were John Von Neumann's study of the theory of games and Abraham Wald's of the theory of sequential analysis.

While the book includes many problems indicating the scope of applications, it is not a book that can be easily read for its philosophical content alone, since the author uses concepts of advanced mathematics with ease and makes comparisons which require mathematical experience on the part of the reader.

The need for some serious attention to higher-dimensional geometry and analysis in the undergraduate curriculum is again seen in this book, which could be read with profit by leaders in a wide variety of fields if they had the capacity to assimilate its contents.

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Elementary Theory of Angular Momentum. M. E. Rose. Wiley, New York; Chapman & Hall, London, 1957. x + 248 pp. $10.

The student of quantum mechanics is soon introduced to the simplest properties of angular momenta, whereupon he is often inclined to believe that his knowledge of the subject is complete. In later stages of his development he will meet with increasing frequency references to sophisticated general theorems, usually accompanied by the casual remark that they follow from group theory, and his knowledge has not advanced by more than the realization that there is evidently more to the matter than he thought.

At this point he is well advised to turn to the new book of Rose, which neither minimizes the complexity nor introduces an unnecessarily elaborate mathematical apparatus. Thus, the orbital angular momentum of a single particle is used as an illustration and not as a substitute for the general definition which requires the consideration of rotation; on the other hand, there is wise economy insofar as the theory is directly based upon the truly necessary geometrical properties of infinitesimal rotation rather than upon the actual but immaterial fact that one deals with a special case of continuous groups. A logical development leads from this start to the coupling of two and three angular momenta, the Wiger-Eckert theorem, Racah coefficients, and other more complex aspects of the general theory treated in part A.

It cannot be expected that the relatively short second part, part B, would deal with more than a fraction of the many applications. In particular, it stresses those relating to angular correlations and nuclear reactions, and it contains an introduction to the properties of static moments. Nevertheless, the reader will be equipped to acquaint himself more thoroughly with some of the special literature, quoted as reference.

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The Inner Metagalaxy. Harlow Shapley. Oxford University Press, London; Yale University Press, New Haven, 1957. xiii + 204 pp. Illus. + plates. $6.75.

This book, by the former director of the Harvard College Observatory, has been awaited with keen interest for several years by all workers in the field of extragalactic astronomy. It covers the region of the extragalactic universe within reach of telescopes of moderate size; this region Shapley calls the "inner" metagalaxy, following a nomenclature introduced some thirty years ago by K. Lundmark of Sweden. The exploration of this domain has been for several decades the special interest of the Harvard College Observatory, and it is essentially a synopsis of this work, carried out by Shapley and his coworkers, that the reader will find described in this volume, on a semipopular level.

After an introduction designed to assist the nonspecialist, Shapley describes the various surveys or censuses of faint galaxies in several strategic locations of the sky and the main conclusions derived from them relative either to the large-scale distribution of galaxies—the evidence for density gradients, for clustering, and so on—or to the distribution of the absorbing material—the cosmic "smog"—in our own Galaxy. This section comprises seven of the 14 chapters of the book and may be the most attractive and useful part, for it gives a clear and well-organized summary of results that, until now, had remained scattered over many publications. The details of the galaxy counts are conveniently summarized in five appendices. There is also a brief discussion (one chapter) of the thousand brightest galaxies in our imme-