tional errors), not from a common convergent point. The reality of these groups can be further checked by their H-R diagrams and, in some cases, by the peculiarities of their spectra and of their ultraviolet excesses. If most stars have been born in just a few groups, as seems possible, this would have many far-reaching implications. Eggen's groups, in Woolley's view, are the ghosts of old spiral arms. Identification of new moving groups and of new stars in known groups is greatly hampered by the appalling inaccuracy of the proper motions presently available. For example, more than 27,000 of the 33,342 stars in the *Boss General Catalogue* have proper motions less than 0.01 sec/yr and with probable errors of the order of half that figure. Clearly it is important to take the more than a hundred recent positional catalogs and derive more accurate proper motions, and this is being done. Even more desirable for the future would be the photography of the entire sky with wide-angle astrographs having focal lengths from three to five times longer than those that have been used in the past; this, most unfortunately, is not being done.

Perhaps the most outstanding contribution in the book is Jesse Greenstein's chapter on subluminous stars (chap. 17). This experienced astrophysicist has had continued access to the magnificent and (unfortunately) unique spectroscopic instrumentation available at Palomar. This equipment is ideal for the spectroscopic investigation of faint blue stars and of the faint, nearby stars of large proper motion. Much of his chapter is new and fundamental to our understanding of these objects. One should remember, however, that Greenstein's work has been made possible by astronomers such as Luyten who, during the years, have patiently and laboriously sorted out these unusual specimens—by means of a blink microscope—from tens of millions of ordinary star images. Greenstein lists seven major groups of subluminous blue stars, all of them objects of considerable astrophysical interest. An eighth major group of faint blue "stars" was identified by Sandage after the chapter was written, a group that is even more interesting. These are the extragalactic and superluminous quasi-stellar galaxies, the faintest of which are at the edge of the observable universe. Although there may be more than 100,000 of these objects brighter than 19th photographic magnitude, scarcely a hint of their possible existence can be found in Greenstein's chapter or in Luyten's chapter on blue stars at high latitudes.

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Mathematics

One finds no new subject matter in this book, **The Theory of Sets and Transfinite Arithmetic** (Saunders, Philadelphia, 1965. 420 pp., $10), by Alexander Abian. It is a basic treatment of the classical theory of sets, designed specifically for upper university or graduate students in mathematics. The coverage of the theory is complete and fairly rigorous. In sequence, one finds the study of sets and logic; axiomatic set theory; the algebra of sets; Boolean rings; order relations; equivalence and real numbers; finite and infinite sets and denumerability; similarity and ordinal arithmetic; and the cardinal numbers.

In good pedagogical style, sets and logic are introduced simultaneously with a minimum of symbolic language. All concepts are defined in terms of the fundamental set $\{x, \exists, \epsilon, \sim, V,$ and $(,)\}$. This leads to clarity and simplicity.

The presentation is clear, with the mathematical theory elaborated by descriptive paragraphs which sometimes become repetitive. While making a clear distinction between a theory and a model of the theory, the author does not make a fetish of such metamathematics. The set theory is based on the six axioms of Zermelo-Fraenkel. The real numbers are achieved by a set theoretic development in the common order, cardinal-integers-rationals-irrationals-reals. The treatment of denumerability, finite sets, equipolent sets, and Bernstein's theorem reflects the classical treatment of these topics by Cantor himself. The text closes with a rather voluminous treatment of similarity, ordinality—although ordinal types are not developed—and cardinality.

The book is not for the initiate. For one who has read or used elementary notions of sets, for example, Halmos's *Naive Set Theory*, this is an excellent subsequent treatise.

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Ornithology

In this little book, **Birds Around the World: A Geographical Look at Evolution and Birds** (published for the American Museum of Natural History by Natural History Press, Garden City, N.Y., 1966. 187 pp., $3.95), the author, Dean Amadon, attempts to express in nontechnical language the problems and ideas associated with a study of the distribution and evolution of various kinds and families of birds of the world. Starting with simple questions—for example, "Why does one bird occur only in a very restricted area, while another, fairly similar one has a wide geographic range, or why do some areas have many kinds of woodpeckers while other equally forested places have few or even none"—Amadon goes on to explain how the present picture may be clarified in terms of the past history and evolution of species and of faunas. This is the content of the introductory chapter, properly entitled "First principles."

Several chapters deal with the limiting effects on distribution of physical barriers (for example, land and water), of ecological requirements of individual species (such as vegetational types, food, shelter, and migratory paths), and of other factors (climate and the impact of man's inroads on the environment which has resulted in the disappearance of forests or swamps, or the production of new types of local terrain).

All of this leads to a discussion of how species react (in the long-range, historical sense) to areal movement—what happens when similar species meet, why some species are declining and others are becoming more abundant. Then, on the basis of these individual cases, the author leads into a discussion of the existing distribution of families and higher groups of birds, and, in turn, to a discussion of the distinctive features of avifaunas in several parts of the world, what evolutionary significance these geographic aggregates of higher systematic units may have, and how recently each began or was cut off from others. The discussion terminates with a brief description of life zones, biotic provinces, and biomes.

Throughout, the author has drawn on significant examples from all parts of the world, and his presentation has the clarity and understandability necessary to reach and to inform the lay audience for which it is intended. On