no matter how complex." The material has been arranged in the form of a well-organised glossary, which makes for easy reading. In general, the presentation is clear and sound. It is at times perhaps unnecessarily dogmatic : thus, there are some who would take exception to Wiener's statement, " Reports that pregnancies even with Rh-negative babies may cause a non-specific anamnestic rise in titer (of Rh antibodies) are erroneous." The term " conglutination " is retained for the albumin agglutination technique in spite of the fact that conglutination has long been used in quite another sense in serology.

The booklet is marred by the trumpet blasts which are sounded *fortissimo* against the CDEF notation and theory of linked factors. None the less, the theory and the notation, unlike the walls of ancient Jericho, still stand, and they are of great value to the student who is being initiated into the problems presented by the Rh groups. In any case, a proper understanding of the CDEF terminology is necessary for the interpretation of current papers on the subject. ANTHONY ALLISON.

ANIMAL SPECIES AND THEIR EVOLUTION. By A. J. Cain. London : Hutchinson's University Library. 1954. Pp. 190. 8s. 6d.

Until about two generations ago, systematics and descriptive morphology were predominant in biological research and in academic curricula. Owing to the spectacular development of experimental biology, the pendulum of popularity has swung far away from systematics. At least in the United States, theses based on research in systematics are not regarded in many universities as satisfying the requirements for the doctor degree. Some of the major foundations show a disinclination to support research in systematics, while being very generous to other branches of biology. Since the war, however, signs are multiplying which suggest that the anti-systematics bias is also passing. The current of the so-called " new systematics " has definitely gathered strength, and systematics seems to become once more integrated with other biological disciplines in a broad synthesis which is now emerging in modern biology. Perhaps this re-integration is being brought about not so much by new systematics as by new systematists, who combine a wide knowledge of the variety of living things with an insight into the problems of general biology and a thorough understanding of the scientific method. Dr A. J. Cain is one of these new systematists, and his compact but forceful book should be equally useful to systematists and to other biologists as a prophylactic against mutual prejudice and short-sightedness.

Dr Cain has devoted the first five chapters of his book to a brief exposition of the scope and of the working methods of taxonomy. The presentation is concise and admirably clear. The illustrative examples are well chosen to elucidate the ideas discussed, although these examples often deal with animals which inhabit remote lands and which will be rather unfamiliar to a majority of the probable readers. The sixth (" The Biological Species ") and the eighth (" Geographical Speciation ") chapters are perhaps the most important, and also the best written, in the book. The last chapter (" Sympatric Speciation ") deals with some more specialised topics.

The species of classical taxonomy are morphological species, or " morpho-species " according to Cain. Morphospecies are defined entirely on morphological characters ; some taxonomists still persist in refusing to

consider even the possibility that species can be defined in any other way. Morphospecies are static and unchangeable in space and in time, because they are essentially names attached to a single " type " specimen or to a small series of specimens. But Cain rightly points out that morphospecies continue to be useful in modern biology. They epitomise the results of the first stage of investigation of biological materials, which consist frequently of isolated specimens, often imperfectly preserved, of little known animals and plants from little known lands and seas. An orientation in the biological materials is needed before a deeper study is undertaken. Before all else, biologists must know what they are talking and writing about. But the first stage of investigation should not be also the last. Morphospecies is an inference of biological species. Biological species are not names and not specimens. They are Mendelian populations, or groups of populations, reproductively isolated from other populations or groups of populations.

In 1935 this reviewer proposed a definition of biological species embodying the above principles ; this definition seemed then far-fetched to many taxonomists and even to some geneticists, since it required that certain organisms which are similar morphologically must nevertheless be considered belonging to distinct species. For example, the so-called A and B " races " became two species, *Drosophila pseudoobscura* and *Drosophila persimilis*, because they maintain their integrity in nature when living side by side in the same territory. Much water has flowed under the bridges since 1935, and the existence of some morphologically similar but reproductively isolated " sibling " species is no longer shocking to most systematists. As stated by Cain, " There is no reason why the techniques commonly employed in museums up to now should be all-sufficient for detecting the limits of species. One might as well ask all chemists to use only the apparatus known to John Dalton, since he was able with it to produce the atomic theory."

Like so much else in biology, the phenomenon of species acquires its full meaning only when considered in the light of evolutionism. Cain gives a very lucid and concise account of the modern theories of origin and maintenance of species. Geographic differentiation of a species into spatially segregated races is recognised as the usual precursor of the splitting of an ancestral species into two or more derived ones. Races may diverge and become incipient species. Sympatric speciation (splitting of a Mendelian population into two or more populations inhabiting the same geographic area) may also occur under certain exceptional circumstances, but it is probably rare compared to geographic (allopatric) speciation. Adaptation to environmental diversity by means of natural selection is rightly recognised as the principal driving force of race and species formation and of evolution in general. Some arguments used to demonstrate this point are, unfortunately, overstated. Thus, the existence of stable geographical gradients (clines) in many traits of many species is said to be evidence of the operation of natural selection in race formation. Now such gradients probably are due to selection in most instances, but to say that they prove selection is a specimen of circular argument. So, one may well apply to the author his own words applied by him to Charles Darwin : " The cause of his error was only over-appreciation of certain truths." THEODOSIUS DOBZHANSKY.