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A. W. F. Edwards
Cogwheels of the Mind: The Story of Venn Diagrams
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REVIEW

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To appreciate this book, it is necessary to explain first what it is not and what it does not deal with. Contrary to what its title might suggest, the author provides an historical survey of Venn diagrams, but does not include how the British logician John Venn developed his diagrams and how they were received in his time. This additional material perhaps would have made it possible to understand why (and how) these diagrams were widely adopted by nineteenth century scientists instead of other rival diagrams. In addition, the author does not explain how these "cogwheels of the mind" work. Indeed, it is not explained anywhere how these diagrams make it possible to solve the logical syllogisms and other problems for which they were designed. For at least these reasons, I do not believe that "you simply can not be knowledgeable of Venn diagrams until you have read Professor Edwards's delightful book", as it is claimed in one of the jacket blurbs.

That being said, in no way is the merit and the interest in this book decreased. The author indeed does not claim to explain the entire subject. In the foreword, he states that the object of the book is to provide "a popular but accurate account of Venn diagrams from a geometrical rather than a logical point of view, with emphasis on the many recent and beautiful developments." (p. xv) Later on, he writes: "In the present book we shall concern ourselves with Venn diagrams not as vehicles for mathematical logic so much as geometrical entities in their own right, and we shall not pursue the byways of logic further." (p. 8) It is thus clear that the author tackles the question using a geometrical and not a logical approach. Consequently, how can this book still interest logicians and historians of logic? We shall consider this question first.

Like the author is now, John Venn was a fellow of Gonville and Caius College, Cambridge. As a logician and historian, he was the author of *The Logic of Chance* (1866), *Symbolic Logic* (1881) and *The Principles of Empirical or Inductive Logic* (1889). To make Boole's logic more accessible, he invented his diagrams. He first presented them in a paper, "On the Diagrammatic and Mechanical Representation of Propositions and Reasonings" (*London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, **9**, 1880, pp. 1-18) in which he defined them as "figures, say circles, so that each successive one which we introduce shall intersect once, and once only, all the subdivisions already existing, and we then have what may be called a general framework indicating every possible combination producible by the given class terms." (quoted by Edwards on p. 5) So Venn proposed his now famous three-circle diagram for three classes. He also proposed diagrams for four classes. However he could not draw a *closed* diagram for five classes, the fifth one being represented by an annulus and not by a closed curve.

After Venn, the question of drawing "true" Venn diagrams for any number of sets attracted many logicians and mathematicians. The author focuses on the attempts of Charles L. Dodgson (Lewis Carroll) the Oxonian logician, who proposed new rectangular diagrams (See the article by A. Macula for the advantages of Carroll's approach). Though Branko Grünbaum made remarkable advances, the problem was not solved until 1988 by Edwards himself. He first presented his solution on 19 and 20 October 1988 as a poster at a Royal Society of London meeting "Fractals in the Natural Sciences". The book under review reveals, precisely, Edwards's solution to the problem of creating a closed Venn diagram for any number of sets.

Having defined what a "true" Venn diagram is, the author describes where it is found in objects as different as flags, tennis balls and Christian iconography. A copy of a Venn diagram drawn by Winston Churchill on 5 June 1948 is also included (p. 10). Its three-circles represent the British Empire, United Europe, and the English-Speaking World, the United Kingdom corresponding to their intersection. In later chapters, Edwards discusses the possibilities for drawing Venn diagrams for many sets. He briefly recounts previous attempts to resolve the problem, before suggesting his own solution. The later chapters are discussions on some combinatorial properties of Venn diagrams. The book also contains a foreword by Ian Stewart, two technical appendices, bibliographical references and an index.

Edwards's book is clearly intended for the general public. This explains his emphasis, a little exaggerated, on the recreational use of these

diagrams. Venn did not invent them for that purpose nor did Carroll. They both used them for resolving logical problems. Still today, they remain extremely useful in several scientific disciplines, particularly in logic but also in probability, in data processing and discrete mathematics, uses that the author does not explain. In addition, it would have been helpful if he had discussed the historical development of Venn diagrams at greater length. One can also regret the incomplete referencing of bibliographical sources, both printed and archival.

However, one should thank the author for having included in his discussions the work of certain mathematicians generally less cited like Lewis Carroll (though celebrated as a child author) and H. J. S. Smith. Another very positive aspect of the book is that Edwards gives a running account of how mathematicians work. Indeed, in this book, written in the first person, he takes the reader along with him during his own research, with all that that comprises in passion and disappointment. The personal tone makes this book pleasant to read. It is also pleasant to skim through, thanks to the richness and the beauty of illustrations, from flags to stained glasses, not to mention many diagrams with undeniable aesthetic qualities. It is curious that the cover of the book, a little striking, is not as good as the interior of the book.

This book will appeal to mathematicians, both professional and dilettante, who want to join the mathematical adventure (because it is one) to which Edwards invites us. Art lovers too will also be able to admire the beauty of the drawings obtained with mathematics. Logicians and historians of logic particularly will be interested in the solution of a one-hundred-year-old problem, that of obtaining a closed Venn diagram for an arbitrary number of classes. This is a wonderful book which, however should be taken simply for what it is, the story of the Venn-Edwards diagrams.

References

[1] Macula, A. J. 1995, "Lewis Carroll and the Enumeration of Minimal Covers", *Mathematics Magazine*, **69**, pp. 269-274.

[2] Grünbaum, B. 1975, "Venn diagrams and independent families of sets", *Mathematics Magazine*, **48**, pp. 12-22.

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