

**Jack Copeland, Jonathan Bowen, Mark Sprevak, and Robin Wilson**

*The Turing Guide*. Oxford: Oxford University Press, 2017, 576 pages, ill., ISBN: 978-01-98-74782-6.

The world of Turing is infinite while *The Turing Guide* – naturally – is not, but this book does provide accounts and in-depth analysis of all the scientist's works, including those not very well known, and of his rich, fascinating life that ended so tragically and prematurely.

One of the editors' aims, according to the preface, was to produce a volume that could be easy to read and could offer comprehensible explanations of complex scientific concepts and innovations. This objective has been fully achieved and the approach adopted is undoubtedly successful. The fact that this collection of forty-two essays covers every aspect of Turing's life and work meant it run the risk of sounding haphazard, but it is not. The book is divided into numerous brief, focused, and well-written sections, and therefore readers can choose those parts that are most interesting to them.

The articles, which were written by expert biographers, former friends, colleagues, as well as by Turing scholars and even one member of the scientist's family (Sir John Dermot Turing, his nephew), take us on a gripping journey that evokes not only wonder, astonishment and pleasure but also sympathy, bewilderment and awe as Turing's immense scientific legacy is revealed. Splendidly produced and lavishly illustrated with photographs, drawings and diagrams, the volume is a valuable source not only of high-level, in-depth, wide-ranging articles but also of rare primary sources from the crucial period in the history of science.

On a first look, the book may appear to focus excessively on events connected to the War World II (there are 11 essays devoted to this subject). However, it should be pointed out that this section provides unparalleled and enlightening insights into a lot of material that remained secret for decades. Discussions of decoding techniques or of strategic impact are enriched with valuable first-hand accounts written by those who not only actually experienced and took part in the relevant events, but also worked closely with Turing and are thus able to contribute to painting a detailed picture of who he was. Jack Copeland, one of the editors, seems to be the main driving force behind the work. Author and co-author of sixteen of the essays, he explores Turing's most important scientific contributions, namely his *Universal Machine* and the famous *Test*. The introduction to, and explanations of, the ideas of the British mathematician, who maintained that mental activity is nothing other than computation, enable us to understand why the theory he put forward in 1950 opened up a debate that spans across numerous fields of study, including philosophy, cognitive sciences, logic, mathematics, and connectionism.

One surprising fact emerging from the book is Turing's interest in the paranormal. In his *Computing Machinery and Intelligence* he wrote: "I assume that the reader is familiar with the idea of extrasensory perception, and the meaning of the four items of it, viz., telepathy, clairvoyance, precognition and psychokinesis. These disturbing phenomena seem to deny all our usual scientific ideas." In an important contribution to the section of the book devoted to Artificial Intelligence, David Leavitt breaks new ground in tackling a topic which has been neglected on account of its being alien to serious science and extremely dangerous.

Like all collections of this kind, the book slightly suffers from a certain amount of repetition across the various sections and from the heterogeneity of the styles of writing. Nonetheless, the approach adopted allows the authors to delve deep into the technical aspects, thus making them accessible even for the novice. The switch between time periods does not create confusion but serves as a means for clarifying the purpose of the work. So in the space of just a few pages the reader is whisked from 1936 and the idea of a "pioneering universal machine" to the *Colossus* of the war years, then on to the proposal for the *ACE* – a stored-program digital machine – and through to 1948, the year in which Turing would collaborate on *Baby*, the first "modern" computer.

These papers leave no doubt about the origins of the idea of computing, clearly demonstrating that the achievement was British rather than American, and that the credit should therefore certainly go to Turing. The myth that it was in Bell Laboratories in the United States in 1957 that a machine first generated musical notes is debunked as well: the first time music was produced with the aid of a computer was actually in Turing's Computing Machine Laboratory at Manchester University some six years earlier. Jack Copeland and the composer Jason Long describe how in the course of their research, while examining the acetate disc recorded in 1951 by a BBC film crew, they discovered three tunes produced by Turing's computer: the British national anthem, the nursery rhyme *Baa Baa Black Sheep*, and Glen Miller's *In the Mood*.

So the *Guide* portrays Turing in all his complexity: as an engineer, musician, philosopher, psychologist, logician, cryptanalyst and neurologist, but also as a fine mathematician who made important contributions to the fields of both pure and applied mathematics, and as a player who invented a kind of chess-playing program. In the fourth section, *Biological Growth*, Turing also emerges as a prominent figure in the history of biology: in fact, in 1950 he proposed the use of reaction-diffusion equations to explain the origins of bodily forms and formalized his theory of morphogenesis. The latter explained pattern formation in living beings with reference to chemical morphogens whose real identity was still unknown at the time. *The Turing Guide* not only recognizes

the originality of this theory but also shows how it became a source of inspiration for new research in the fields of artificial life, experimental biochemistry, and developmental biology.

Turing's genius has attracted the interest of the entertainment industry, with the result that his remarkable life has featured in a number of plays, stories and songs. In the *Guide* we also encounter conjecture bordering on political fantasy: what would have happened if Bletchley Park had not managed to break the Nazi code? Copeland offers a theory of his own: the war would have proceeded more slowly, enabling Hitler to defend himself along the coast of Normandy and across Europe. In suggesting that Turing should rank alongside Churchill and Eisenhower as one of the main architects of the victory of the Allies, however, Copeland is perhaps going too far. It would be more useful to ask the question of how the world might have evolved differently if Alan Turing had never been born or if he had not died prematurely.

The chronological and biographical references that accompany the reader throughout the *Guide* provide glimpses of the changing circumstances in which the English mathematician found himself in the course of his brief life. There is also some valid conjecture regarding the nature of his death, and serious doubts emerge as to whether he really did commit suicide: the experiments that he was carrying out, together with the fact that his clarity of mind was badly affected by the devastating chemical therapy he was undergoing, suggests that the cyanide poisoning may have been accidental rather than deliberate.

While the book contains an abundance of anecdotes relating to Turing's odd personality, his homosexuality is only briefly touched upon, to the extent that it often has to be inferred. The result is a picture of a man with a secret that ultimately emerges from the numerous reminiscences and details about his unconventional lifestyle and "unusual" behaviour.

*The Turing Guide* then, just as its title suggests, is a compendium that celebrates Alan Turing by exploring the avenues of scientific research opened up by his brilliant intuitions. It is a book that testifies to the importance of his achievements and clearly illustrates the impact of his work sixty years after his death. We are left to ponder what a great pity it is that this publication was not delayed of a few months, since it would have included an account of the 148 letters written and received by the mathematician between 1949 and 1954, and would have thrown additional light on Turing's infinite universe.

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