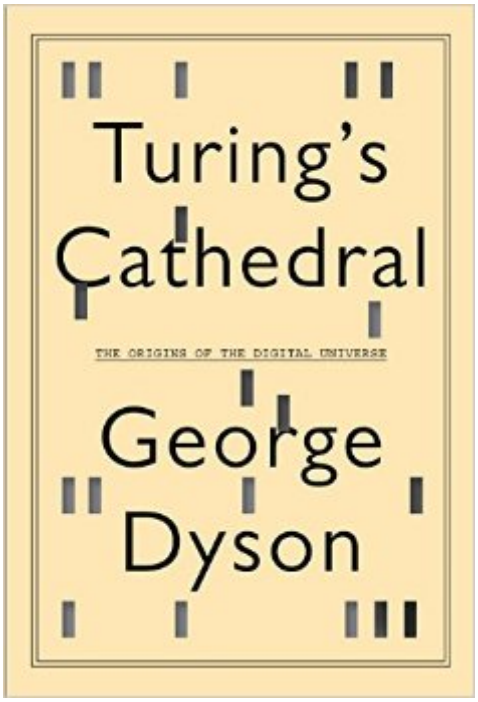
Turing's Cathedral: The Origins Of The Digital Universe



Synopsis

â œIt is possible to invent a single machine which can be used to compute any computable sequence,â • twenty-four-year-old Alan Turing announced in 1936. In Turingâ ™s Cathedral, George Dyson focuses on a small group of men and women, led by John von Neumann at the Institute for Advanced Study in Princeton, New Jersey, who built one of the first computers to realize Alan Turingâ ™s vision of a Universal Machine. Their work would break the distinction between numbers that mean things and numbers that do thingsâ ”and our universe would never be the same.Â Using five kilobytes of memory (the amount allocated to displaying the cursor on a computer desktop of today), they achieved unprecedented success in both weather prediction and nuclear weapons design, while tackling, in their spare time, problems ranging from the evolution of viruses to the evolution of stars.Â Dysonâ ™s account, both historic and prophetic, sheds important new light on how the digital universe exploded in the aftermath of World War II. The proliferation of both codes and machines was paralleled by two historic developments: the decoding of self-replicating sequences in biology and the invention of the hydrogen bomb. Itâ ™s no coincidence that the most destructive and the most constructive of human inventions appeared at exactly the same time. Â How did code take over the world? In retracing how Alan Turingâ ™s one-dimensional model became John von Neumannâ ™s two-dimensional implementation, Turingâ ™s Cathedral offers a series of provocative suggestions as to where the digital universe, now fully three-dimensional, may be heading next.

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Customer Reviews

The physicist John Wheeler who was famous for his neologisms once remarked that the essence of the universe could be boiled down to the phrase "it from bit", signifying the creation of matter from information. This description encompasses the digital universe which now so completely pervades our existence. Many moments in history could lay claim as the creators of this universe, but as George Dyson marvelously documents in "Turing’s Cathedral", the period between 1945 and 1957 at the Institute for Advanced Study (IAS) in Princeton is as good a candidate as any.Dyson’s book focuses on the pioneering development of computing during the decade after World War II and essentially centers on one man- John von Neumann. Von Neumann is one of the very few people in history to whom the label "genius" can authentically be applied. The sheer diversity of fields to which he made important contributions beggars belief- Wikipedia lists at least twenty ranging from quantum mechanics to game theory to biology. Von Neumann’s mind ranged across a staggeringly wide expanse of thought, from the purest of mathematics to the most applied nuclear weapons physics. The book recounts the path breaking efforts of him and his team to build a novel computer at the IAS in the late 1940s. Today when we are immersed in a sea of computer-generated information it is easy to take the essential idea of a computer for granted. That idea was not the transistor or the integrated circuit or even the programming language but the groundbreaking notion that you could have a machine where both data AND the instructions for manipulating that data could be stored in the same place by being encoded in a common binary language.

The focus of George Dyson’s well-written, fascinating but essentially misleading book,’Turing’s Cathedral’, is curiously not on celebrated mathematician, code-breaker and computer theorist Alan Turing but on his equally gifted and innovative contemporary John von Neumann. Von Neumann, whose extraordinarily varied scientific activities included inter alia significant contributions to game theory, thermodynamics and nuclear physics, is especially associated with the early development of the electronic digital computer (i.e. the ’EDC’), an interest apparently sparked by reading Turing’s seminal 1936 paper ’On Computational Numbers’ which attempted to systematize and express in

mathematical terminology the principles underlying a purely mechanical process of computation. Implicit in this article, but at a very theoretical level, was a recognition of the relevance of stored program processing (whereby a machine's instructions and data reside in the same memory), a concept emanating from the work of mid-Victorian computer pioneer Charles Babbage but which demanded a much later electronic environment for effective realization.What Mr Dyson insufficiently emphasizes is that, despite a widespread and ever-growing influence on the mathematical community, Turing's paper was largely ignored by contemporary electronic engineers and had negligible overall impact on the early development of the EDC. Additionally, he omits to adequately point out that von Neumann's foray into the new science of electronic computers involved a virtual total dependence on the prior work, input and ongoing support of his engineering colleagues.

Turing's Cathedral: The Origins of the Digital Universe by George Dyson"Turing's Cathedral" is the uninspiring and rather dry book about the origins of the digital universe. With a title like, "Turing's Cathedral" I was expecting a riveting account about the heroic acts of Alan Turing the father of modern computer science and whose work was instrumental in breaking the wartime Enigma codes. Instead, I get a solid albeit "research-feeling" book about John von Neumann's project to construct Turing's vision of a Universal Machine. The book covers the "explosion" of the digital universe and those applications that propelled them in the aftermath of World War II. Historian of technology, George Dyson does a commendable job of research and provide some interesting stories involving the birth and development of the digital age and the great minds behind it. This 432-page book is composed of the following eighteen chapters: 1.1953, 2. Olden Farm, 3. Veblen's Circle, 4. Neumann Janos, 5. MANIAC, 6. Fuld 219, 7. 6J6, 8. V-40, 9. Cyclogenesis, 10. Monte Carlo, 11. Ulam's Demons, 12. Barricelli's Universe, 13. Turing's Cathedral, 14. Engineer's Dreams, 15. Theory of Self-Reproducing Automota, 16. Mach 9, 17. The Tale of the Big Computer, and 18. The Thirty-ninth Step.Positives:1. A well researched book. The author faces a daunting task of research but pulls it together.2. The fascinating topic of the birth of the digital universe.3. A who's who of science and engineering icons of what will eventually become computer science. A list of principal characters was very welcomed.4. For those computer lovers who want to learn the history behind the pioneers behind digital computing this book is for you.5.

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