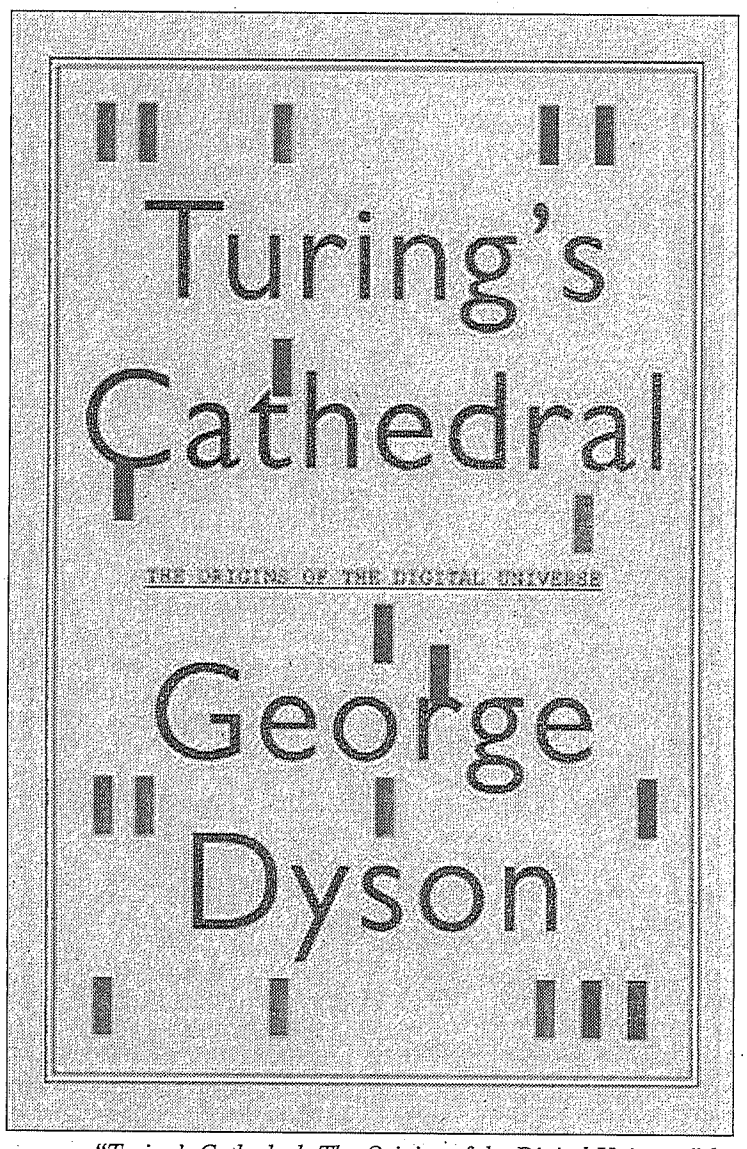
Author illuminates achievements of those who shaped digital world



"Turing's Cathedral: The Origins of the Digital Universe" by George Dyson. New York, NY: Pantheon Books, 2012. 401 pages, $29.95 (hardbound).

"It is possible to invent a single machine which can be used to compute any computable sequence," proclaimed 24-year-old Alan Turing in 1936. That he was on to something really big is probably one of the greatest understatements of all time.

Just how fundamentally our existence has indeed changed since the inauspicious beginnings of the computer age is the subject of George Dyson's book, "Turing's Cathedral: The Origins of the Digital Universe." The author's profound understanding of the complexities he writes about is obvious from the very first page of this exceptional chronicle. The son of one of the most brilliant and influential physicists who ever lived, Dyson had a front-row seat to many of the innovations he so eloquently describes.

"In 1956, at the age of three, I was walking home with my father, physicist Freeman Dyson, from his office at the Institute for Advanced Study in Princeton, New Jersey, when I found a broken fan belt lying in the road," Dyson writes.

"I asked my father what it was. 'It's a piece of the sun,' " he said.

"Turing's Cathedral" is a veritable who's who of the scientists and engineers who shaped the world we now live in. Dyson does a superb job of illuminating the achievements of these individuals in a manner that makes the subject matter accessible to mere mortals.

Perhaps the most endearing feature of the book is the way the author also delves into the personal lives of those whose accomplishments he is so aptly explaining. Of all the individuals profiled in the book, however, the one I found most intriguing was John von Neumann.

"As a child, von Neumann was at the head of his class in mathematics, history, languages, and science – everything except music and sports," Dyson notes. "According to Herman Goldstine, he 'was able on once reading a book or article to quote it back verbatim,' even after a period of years. 'On one occasion I tested his ability by asking him to tell me how the 'Tale of Two Cities' started. Whereupon, without any pause, he immediately began to recite the first chapter and continued until asked to stop.' "

As an adult, his intellectual prowess was almost unmatched: "Von Neumann could deliver publishable test, and even mathematical proofs, on the first draft," Dyson notes.

"His handwritten letters sometimes end with an informal 'P.S.' that continues, for several pages, to explain some new result. It was never enough for him merely to establish a result; he had to do it with elegance and grace."

Dyson has written extensively on the history of technology; his previous books include "Baidarka," about the development (and redevelopment) of the Aleut kayak, "Darwin Among the Machines," which chronicled the evolution of digital computing and telecommunications, and "Project Orion," which dealt with space exploration.

"Turing's Cathedral" is one of the most thoroughly researched books I've read recently, with no fewer than 36 pages of source notes at the conclusion of the 18 chapters that make up the main text.

The volume also contains another rather unique feature, a six-page listing of the "Principal Characters" who populate the book, found just before the beginning of the first chapter. Finally, Dyson includes 16 pages of pictures, diagrams and other illustrations that help the reader acquire a more realistic understanding of the people and events that are the main focus of his work.

Central to the primary thesis of the book is the critical role played by the Institute for Advanced Study in Princeton.

It was there, over the objections of several eminent faculty who felt the institute's mission should remain purely theoretical, that MANIAC (Mathematical and Numerical Integrator and Computer), one of the first "real" computers, was developed. As Dyson convincingly points out, the progression from those early days to the present time has been nothing short of astonishing.

"In October 2005, on the occasion of the 60th anniversary of von Neumann's proposal to Lewis Strauss for the MANIAC (Mathematical and Numerical Integrator and Computer), and Turing's proposal to the National Physical Laboratory for the ACE (Automatic Computing Engine), I was invited to Google's headquarters in California, and given a glimpse inside the organization that has been executing precisely the strategy that Turing had in mind: gathering all available answers, inviting all possible questions, and mapping the results," Dyson explains.

"I felt I was entering a fourteenth-century cathedral while it was being built. Everyone was busy placing one stone here and another stone there, with some invisible architect making everything fit.

"What began as an isolated 5-kilobyte matrix is now expanding by over two trillion transistors per second (a measure of the growth in processing and memory) and five trillion bits of storage per second (a measure of the growth in code)," Dyson observes.

"Yet we still face the same questions that were asked in 1953. Turing's question was what it would take for machines to begin to think. Von Neumann's question was what it would take for machines to begin to reproduce."

If you want a better understanding of why the world is the way it is at the present moment, I seriously recommend "Turing's Cathedral."

Much more than a treatise on how the technology now permeating our lives was developed, it is a story about how extraordinary human beings found a way to work together (mostly) to create something that few among us could have even imagined in our wildest dreams less than a century ago.

— *Reviewed by Aaron W. Hughey, Department of Counseling and Student Affairs, Western Kentucky University.*