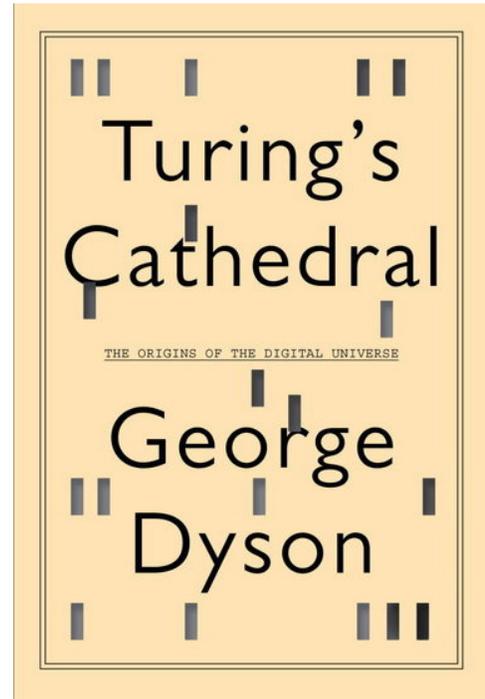


Turing's Cathedral, by George Dyson The Origin of the Digital Universe

The book gives an in-depth account of the history of the digital computer developments at Cambridge, Princeton and Los Alamos with the prominent actors starting with Leibnitz jumping to the pioneers Johnny von Neumann, Herman Goldstin, Julian Bigelow, Allan Turing as well as their scientific and engineering associates from Europe (Stan Ulam and Kurt Goedel) and the USA, with the focus on US developments.

The interesting biographies and the contributions of those early pioneers of the "digital age" are described detailing their private and professional fate, including their motivations and their individual thoughts.



Turing's Cathedral Book Cover

The main focus is on John von Neumann and his activities at Princeton and as the "mastermind" (genius) of the Institute for Advanced Study (IAS), founded in 1930 - the "intellectual hotel": Neumann wanted "a fast electronic, completely automatic all-purpose computing machine which could answer as many questions as there were people who could think of asking them" and set out to build the first IAS computer (1945-1951).

It is admitted that this development was basically driven by war efforts, first supporting the Aberdeen Proving Ground (bomber flight predictions and targeting), later Los Alamos (thermonuclear program), but also weather predictions (Jules Charney) and evolutionary biology (Nils Barricelli).

Von Neuman, driven by the "usefulness of useless knowledge" (Abraham Flexner, founder and first director of IAS) pulled all strings to get the development of an electronic, error-free digital "computer" going and to keep it alive.

On the other side of the Atlantic Ocean Turing thought of a machine which would become programmable "self-teaching" allowing errors in its processes and learn from them by "intuition", thus coming closer to the workings of the human mind (computer intelligence) according to the notion: "how can the brain with a sloppy software and hardware come up with reliable results".

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Turing first described his machine in 1936 as: "A Turing machine is an idealized computing device consisting of a read/write head (or 'scanner') with a paper tape passing through it. The tape is divided into squares, each square bearing a single symbol--'0' or '1', for example. This tape is the machine's general purpose storage medium, serving both as the vehicle for input and output and as a working memory for storing the results of intermediate steps of the computation.

The input that is inscribed on the tape before the computation starts must consist of a finite number of symbols. However, the tape is of unbounded length--for Turing's aim was to show that there are tasks that these machines are unable to perform, even given unlimited working memory and unlimited time

There are just six types of fundamental operation that a Turing machine performs in the course of a computation. It can:

- read (i.e. identify) the symbol currently under the head
- write a symbol on the square currently under the head (after first deleting the symbol already written there, if any)
- move the tape left one square
- move the tape right one square
- change state
- halt.

These are called the primitive or atomic operations of the machine. A complicated computation may consist of hundreds of thousands, or even millions, of occurrences of these atoms (AlanTuring.net)

For me, chapter 5 of the book is the most interesting, because it describes the visionary of Turing's ideas and relates them to the current Web 2.0 situation like Apps, virtual machines, memory storage indexing and searching or the reliability of the internet itself.

Neumann's notion was that it would be much easier to find an answer to a structured question than to have an answer and

ask the right question. This is the basic principle all modern search engines are based on, i.e., by collecting the number of similar questions and ranking the answers.



John von Neumann at The Princeton Institute for Advanced Study
(Left to right: Julian Bigelow, Herman Goldstine,
J. Robert Oppenheimer, and John von Neumann).

George Dyson came up with the title for his book when visiting Google and saw the "miles" of server banks, impressing him like a cathedral.

What I am missing is the "commercial" aspect of nowadays internet which was absent in the pioneers minds (Flexner: "knowledge not profit"), therefore my conclusion is that indeed computer systems might be the "better human beings" with respect to deciding problems which can be clearly structured - be it economic, political or scientific issues -as long as they are not manipulated by humans.

The book is highly recommendable - although in long passages very "dry" for non-computer experts because it provides the relevant mathematical and technical details referenced to the original publications, but it might be the last chance to retrace the origins before we take the influence of computers on our lives as a "given" like a natural law.

January 2015, Joachim J. Kehr (Editor SpaceOps News)