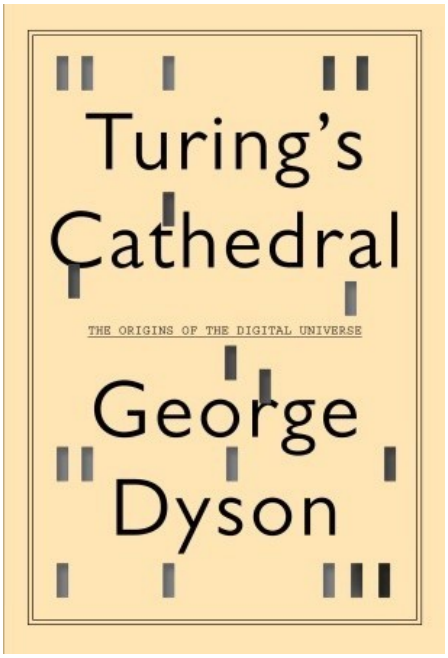

Turing's Cathedral: The Origins Of The Digital Universe

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Legendary historian and philosopher of science George Dyson vividly re-creates the scenes of focused experimentation, incredible mathematical insight, and pure creative genius that gave us computers, digital television, modern genetics, models of stellar evolution—in other words, computer code.

In the 1940s and '50s, a group of eccentric geniuses—led by John von Neumann—gathered at the newly created Institute for Advanced Study in Princeton, New Jersey. Their joint project was the realization of the theoretical universal machine, an idea that had been put forth by mathematician Alan Turing. This group of brilliant engineers worked in isolation, almost entirely independent from industry and the traditional academic community. But because they relied exclusively on government funding, the government wanted its share of the results: the computer that they built also led directly to the hydrogen bomb. George Dyson has uncovered a wealth of new material about this project, and in bringing the story of these men and women and their ideas to life, he shows how the crucial advancements that dominated twentieth-century technology emerged from one computer in one laboratory, where the digital universe as we know it was born.

From the Hardcover edition.

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From Reader Review Turing's Cathedral: The Origins Of The Digital Universe for online ebook

Jenny Brown says

This book is fatally marred by Dyson's failure to understand computer architecture. I note many reviewers assuming that they are confused because they are math phobic. But I was a programmer in the late 1970s and 1980s. I wrote in Assembly language and have read machine language (in hex) when debugging, so when I read Dyson's long passages of gibberish purporting to describe what is going on in a computer I knew they were just plain gibberish.

The stories about the people involved in the project were very interesting, as was the description of the environment--the IAS--and its politics, but Dyson's failure to explain the most important technical concepts to the reader (or to understand them himself) limit the books usefulness. These concepts are not all that complex. They were explained to a class of recent high school graduates in Tennessee back when I took my first computer class in 1979 and we all wrote a simplified machine language program for our final exam. So there isn't any reason that the intelligent people this book was designed for couldn't have had the architecture of a Van Neumann machine explained in more depth--in a way that would have made sense to them.

I found this book saddening because it made me really want to understand the technology whose description it butchers. I'd really love to know more about how the engineers built these early computers and how they differ from the ones in use today. I gleaned many facts from the mishmash presented here, for example that CRTs were used in place of what was later called "core" memory in slightly later computers.

But Dyson clearly doesn't understand what a register is, nor does he understand why shifting bits would do arithmetic and reading the same bits in a CPU provides the machine with its program. For that matter, he doesn't seem to understand what a program is. A simple explanation of what a computer algorithm is and why 17 instructions can lead to thousands of operations being performed would make long tracts of this book make sense, which they currently don't.

But statements like one claiming that the CRT screen on a PC represented a CPU buffer were sheer imbecility. (The CPU on that computer functions as an output device, similar to the tape or punched paper on the early computers.) And there were dozens more of these uninformed statements.

Bottom line: If you read this book and are confused you are getting the authors message, since he, too, was terminally confused by the technology he was attempting to describe.

Warwick says

A fascinating and illuminating book, but also a frustrating one because it should have been a lot better than it is.

The heart of the story is more or less on target – a collection of very interesting anecdotes and narratives about the personalities involved in building America's first computer, at Princeton's Institute for Advanced Study after the Second World War. Leading the team was the quite extraordinary figure of John von Neumann, about whom I knew rather little before reading this. He comes across as by far the most brilliant

mind in these pages (not excluding the presence of one A. Einstein), with a near-eidetic memory, an ability to understand new concepts instantly and make staggering leaps of reasoning to advance them further. Not a very endearing character, though – a refugee from 1930s Europe, he pushed the nuclear programme hard and argued to the end of his life that the best way to create world peace was to launch a full ‘preventive’ hydrogen bomb strike against the USSR, mass civilian deaths and all.

The nuclear project was central to the invention of the computer. The first incarnation of the machine (the ‘ENIAC’, later nicknamed ‘MANIAC’) was developed specifically to model fission reactions, which involve some rather tricky maths. But von Neumann and other thinkers realised early on that a machine capable of doing that would also be able to fulfil Alan Turing's description of a ‘universal computer’: if it could do the arithmetic, it turned out, it could do practically anything else too, provided there was a way of feeding it instructions.

> ‘It is an irony of fate,’ observes Françoise Ulam, ‘that much of the hi-tech world we live in today, the conquest of space, the extraordinary advances in biology and medicine, were spurred on by one man's monomania and the need to develop electronic computers to calculate whether an H-bomb could be built or not.’

What is particularly fascinating is how these studies gradually let to a blurring of the distinction between life and technology. The development of computing coincided with the discovery of DNA, which showed that life is essentially built from a digital code (Nils Barricelli described strings of DNA as ‘molecule-shaped numbers’), and early programmers soon discovered that lines of code in replicating systems would display survival-of-the-fittest type phenomena. This is entering a new era with the advent of cloud-sourcing and other systems by which computing is, in effect, becoming analog and statistics-based again – search engines are a fair example.

> How can this be intelligence, since we are just throwing statistical, probabilistic horsepower at the problem, and seeing what sticks, without any underlying understanding? There's no model. And how does a brain do it? With a model? These are not models of intelligent processes. They *are* intelligent processes.

All of this is very bracing and very interesting. Unfortunately the book is let down by a couple of major problems. The first is a compulsion to give what the author presumably thinks is ‘historical colour’ every two minutes – so the IAS is introduced by way of an entire chapter tracing the history of local Algonquin tribes, Dutch traders, William Penn and the Quakers, the War of Independence – all of which is at best totally irrelevant and at worst a fatal distraction.

The second, even more serious failing is that the technology involved remains extremely opaque. One of the most crucial parts of this story should be following the developments of cathode-ray storage, early transistors, the first moves from machine language to codes and programs. But the explanations in here are poor or non-existant. Terms like ‘shift register’, ‘stored-program computer’, ‘pulse-frequency-coded’, are thrown around as though we should all be familiar with them.

My favourite story to do with the invention of the digital world involves Claude Shannon and his remarkable realisation – one of the most civilisation-altering ideas of our species – that electronic transistors could work as logic gates. It's not even mentioned in this book. And so the crucial early building blocks of what a

computer actually *is* – how, on a fundamental level, it really does what it does – that is all missing. And it's a pretty serious omission for someone that finds it necessary to go back to the Civil War every couple of chapters.

A lot of reviews here, especially from more technical experts, really hate this book, but on balance, I'd still recommend it. It's a very important story about a very important period, and the later chapters especially have a lot of great material. But reading around the text will probably be necessary, and this book should have offered a complete package.

Justin says

I might have easily given this book four stars if Dyson could have stuck to history instead of indulging himself in inane speculations, and commentaries that are sadly meant to sound profound. The connections he draws between completely unrelated aspects of technology and biology are so strained that whenever I read a particularly grievous one, I'm forced to put the book down and walk around the room until the waves of stupidity subside a bit. For example, at one point Dyson asks us to consider whether digital computers might be "optimizing our genetic code ... so we can better assist them." At another he explains the reason we can't predict the evolution of the digital universe is because algorithms that predicted airplane movements in WW2 had to be normalized to the reference frame of the target... or something? Throughout the entire book there's a complete disconnect between the technical nature of the things he describes and the vague abstractions that he twists into obscenely trite metaphors.
Dyson seems to live in some sort of science-fiction wonderland where every computer program is a kind of non-organic organism. He calls code "symbiotic associations of self-reproducing numbers" that "evolved into collector societies, bringing memory allocations and other resources back to the collective nest." They are active, autonomous entities which "learned how to divide into packets, traverse the network, correct any errors suffered along the way, and reassemble themselves at the other end." By the end of the book I'm not even sure if Dyson means this as a metaphor - he appears to genuinely believe that it's merely a matter of perspective.
The truth is, if every human died tomorrow and the internet was left to run from now to infinity, not a single advance would be made in the state of computing. The viruses would quickly burn themselves away, the servers would grind monotonously at their maintenance routines, and the Google webcrawlers would stoically trudge through every porn site on Earth, an infinite number of times.
Dyson might respond that programs integrate humans as a symbiotic part of their evolution, but in that case you could say the same thing about clothing, music, or furniture. In this light the IKEA franchise must be viewed as a great self-replicating organism, conscripting humans in the propagation of its global hegemony of coffee tables.

David says

Despite the title, this book is not primarily about Alan Turing. It is really about the group of people at the Institute of Advanced Studies at Princeton. Much of the book focuses on John von Neumann, who spearheaded the effort to build some of the earliest electronic computers. These first computers were very unreliable--incorrect results were as likely due to faulty vacuum tubes as coding errors. In fact, circuits had to be designed to be robust to vacuum tubes that did not follow specs.

Quite a large chunk of the book--and the most fascinating--dealt with the types of mathematical and physical problems that the earliest computers could solve. In fact, that was the principal interest of von Neumann--

learning what types of problems could be solved using computers. Here, Alan Turing and Kurt Godel played a large role in defining what sorts of problems might be solvable.

Among the problems that the earliest computers attacked was weather forecasting. In the late 1940's, there was much controversy about the feasibility of numerically computing forecasts *in principle*. Of course, weathermen wanted to continue to use their gut feelings to forecast the weather, while some scientists thought that, given sufficient spatial resolution, the weather could be forecast far in advance. It was not until later that people like Lorenz discovered that there are fundamental limits to how far in advance weather can be forecast.

The earliest computers were also used for developing the atomic bomb. Many aspects of the physics were not solvable using direct means. Simulations using a brand new numerical method called "Monte Carlo" were extremely significant for solving them. For this method to work, random numbers are required for initiating independent simulated trajectories. But random numbers were not easy to come by, so a special program helped to develop algorithms for computing them.

This book goes into considerable depth, in describing the people who developed and used the first computers at the institute. There are fascinating descriptions of the mathematical, physics, and biological puzzles that were attempted. I recommend the book highly, for those interested in the history of numerical computation.

Holly says

Though I would never dare to participate in anything but a cursory, general conversation about Turing machines or Gödel's theorem or the Monte Carlo method, I just love histories of science and this book made me happy. I listened to the audio version, and often arcane concepts requiring visualization or anything involving equations would blow past me, but all the wonderful details and biographies and momentum more than made up for my muddled moments. I love that it started with a disorienting-orienting historical story about the ground on which the Princeton Institute for Advanced Study was built (with details about the Lenni Lenape Indians and then William Penn!?), then the Flexner family, and Thorstein Veblen and his brother .... who'd have thought? and weather predicting, and Los Alamos, and Einstein, and the roles of women - such as Clari von Neumann - whom I'd never read about, etc. It's all here. I also liked the book's spiral structure that gradually moved linearly forward but always, by necessity, returned to von Neumann, the true center of the book. (Like every other reader I feel obligated to mention that the eponymous Turing had very little screen-time.)

JodiP says

This book started off rather confusingly--without a clear description of what it was to be about. It did not improve. For some reaosn,the author thought it very important to tell how Princeton was founded and had a lengthy chapter on William Penn from the 1600s. I thought it might be the format--I was reading on Kindle, and entertained the idea of getting the hard copy to flip through irrelevant sections. I then checked reviews and decided to give it a pass all together. Other folks have found it rambling as well. I didn't finish it.

Paul says

Three quarters of a century ago a small number of men and women gathered in Princeton, New Jersey. Under the direction of John von Neumann they were to begin building one of the world’s first computers driven by the vison that Alan Turing had of a Universal machine. Using cutting edge technology, valves and vacuum tubes to store the data, the first computer was born. This unit took 19.5kW to work and had a memory size of five, yes five kilobytes. It caused a number of revolutions, it was this machine that laid the foundations for every single computing device that exists on the planet today, it changed the way that we think about numbers and what they could do for us and the calculations that it ran gave us the hydrogen bomb…

I had picked this up mostly because of the title, Turing's Cathedral, thinking that it would be about that great man, the way that he thought and the legacy that he left us with regards to computing and cryptography. There was some of the on Turing and his collaboration with the American computer scientists and engineers through the war, but the main focus was on the development of the computer in America and the characters that were involved in the foundation of today’s technological society. Some parts were fascinating, but it could be quite tedious at times. There were lots and lots of detail in the book, the characters and political games that they were playing and subject to, not completely sure why we needed to go so far back in time on the origins of Princeton. Definitely one for the computer geek, not for the general reader.

Hadrian says

A history of the early computer and what miracles were done with it. The computer, says the author, is one of the great creative forces of the 20th century, compared to the great destructive force of the atom bomb - and certain instrumental figures worked on both.

The title appears to be misleading, as Mr. Turing himself only appears some 200 pages in. His contributions, although not immediately evident, are still quite important. The majority of the early part of the book concerns Princeton's Institute for Advanced Study - originally intended as a refuge from the bureaucracy and 'old-boys-club' mentality of American universities, which became one of the greatest accumulations of mathematical talent anywhere in human history.

One of the central figures here is a certain John von Neumann, who can be truthfully described as a genius, responsible for the foundations of everything from game theory, to nuclear physics. There are too many others in the book to list here, but you get the idea of their sort of caliber.

With the earliest and most primitive of computers, the scientists here were able to work on weather prediction, statistical analysis, and basically the foundations for almost every computer since - all with the processing power reserved for single cursors today.

Even with this bare minimum of processing power, the ideas which these thinkers discussed are still used today - advanced climate modelling is still a topic of various supercomputers. von Neumann's and Turing's theories on 'self-replicating autonoma' can be used in both biological mathematics applications and possibly a description of computer viruses. It would be futile to attempt to list it all, but Dyson gives a very solid overview.

The tragedy is that some of the greatest architects of our new age never lived to see it. Turing's tragedy is well known, and computer scientists and the LGBT community see him as a martyr. John von Neumann died in his 50s from cancer, possibly from all of his atomic bomb observations. Both for those others who

survived, and many of the great ones did, they bore witness to a new age in discovery, the greatest shift in human knowledge seen since the printing press and the Renaissance.

Thore Husfeldt says

The history of the universal electronic computer at the Institute of Advanced Studies in Princeton, pioneered by the leading genius of his time, John von Neumann, and driven largely by the computational requirements of building a nuclear bomb, makes for a good book. George Dyson's *Turing's Cathedral* is not that book.

At his best, Dyson writes compelling, erudite, witty, and idiosyncratic prose with a gift for poetic analogies and elegant turns of phrase. The opening of chapter XVII, on the vast computational power we have today and in the future, is a good example:

> Von Neumann made a deal with "the other party" in 1946. The scientists would get the computers, and the military would get their bombs. This seems to have turned out well enough so far, because, contrary to von Neumann's expectations, it was the computers that exploded, not the bombs.

Alas, these morsels are thinly spread.

Worse, many of them are abject nonsense.

Dyson seems to have no internal error correction mechanisms that shield him from stretching his analogies far beyond what their flimsy fabric can endure. He combines this infatuation with his own literacy with digital, mathematical, and technological *illiteracy*: a cavalier attitude towards the details of the technology that he aims to describe and reason about.

> Search engines and social networks are analog computes of unprecedented scale. Information is being encoded (and operated upon) as continuous (and noise-tolerant) variables such as frequencies (of connection or occurrence) and the topology of what connects where, with location being increasingly defined by a fault-tolerant template rather than by an unforgiving numerical address. Pulse-frequency coding for the Internet is one way to describe the working architecture of a search engine, and PageRank for neurons is one way to describe the working architecture of the brain. These computational structures use digital components, but the analog computing being performed by the system as a whole exceeds the complexity of the digital code on which it runs. [p. 280]

(The chapter ends with a bold one-liner, "Analog is back, and here to stay.") It's unfair to cherry-pick particularly egregious passages from a book about a complicated subject, but the book is full of stuff like that. With the first few instances I tried to adopt a charitable stance and wanted to understand Dyson is trying to tell me, behind the noise of half-understood technical inaccuracies. But after a few chapters I just became annoyed.

Generously put, the technical passages of this book are *inspiring*, in the sense that I was inspired to actually find out how the ENIAC and other machines worked. Using other sources, such as Wikipedia, because Dyson's book does very little to tell me. Dyson is clearly out of his depth here, and his confused and confusing descriptions read like the account of a blind man explaining the concept of colour. The result is

dense, conceited, and just plain annoying. As Goodreads reviewer Jenny Brown puts it, “this book is fatally marred by Dyson’s failure to understand computer architecture.” Other reviewers of this book, both professional and amateur, seem to be appropriately humbled and impressed by the opaque technology, and write off their confusion to their own cognitive inadequacy. Here’s an example from judy’s review: “I stand in awe of the geniuses who envisioned and constructed the digital universe—largely because I haven't a prayer of understanding what they did. Although written in plain English, somehow my brain will simply not grasp the concepts.” Well, neither does Dyson’s.

Our message should be that *computers are simple*. Instead, we get yet another book that makes technology into magic, and its inventors into Byronic heroes.

Which leads us to the biographical sketches. The book gives us a rich anecdotes about many of the leading figures associated with Princeton’s computer group in the 40s and 50s. Bigelow, Ulam, Gödel, — all secondary to the book’s main character, the titanic John von Neumann. Many of these descriptions are entertaining and insightful, it’s clearly the best part of the book. Dyson tells much of the story in the voice of others, by quoting at length from interviews and biographies. This works well. However, even these sketches remain disjointed, erratic, meandering, and quirky. Dyson clearly has had access to unique sources at Princeton’s Institute of Advanced Studies, which make for the most interesting parts of the book. Examples include endlessly entertaining log messages from ENIAC programmers. On the other hand, I *really* don’t need to know that Baricelli had his $1,800 stipend was renewed in 1954. These random facts are many, obviously motivated by the author’s access to their sources, and never play a role in the greater narrative.

Even Alan Turing, after whom Dyson’s book is named, makes an appearance in chapter XIII. Otherwise the book has nothing to do with Turing, and little to do with universal computing, so the book’s title remains a mystery.

Von Neumann’s Cathedral would have been a fine title for this book, or better *Von Neumann’s Bomb Bay*. This is a book about von Neumann, not Turing, and his monomaniacal dream of building a computer. Von Neumann’s motivation was mainly militaristic: to leverage computational power for simulation of complex phenomena, such as the physics of nuclear bombs. As such, the early history of computing co-evolves at the ENIAC project in Princeton and the Manhattan project in Los Alamos. This is a story worth telling, and from that perspective, Dyson’s book is a book worth reading. Just remember to read the technological passages like the techno-babble in a Star Trek episode: It’s window-dressing, not there in order to be understood.

The final prophetic chapters about the future of computation and mankind are worthless and incompetent.

In summary, a misleadingly-titled, meandering, technologically illiterate, annoying, beautifully written, confused, and sometimes entertaining book about an important topic.

Ushan says

This book covers essentially the same material as William Aspray's 1990 *John von Neumann and the Origin of Modern Computing*, the life and times of John von Neumann and the IAS computer. Aspray's book is much more to the point, though, while Dyson's takes large detours into the history of the atomic and hydrogen bomb, World War II cryptography and the like - all these topics have better books dedicated to them. George Dyson has a personal connection to the Institute of Advanced Study because his father, famous physicist and mathematician Freeman Dyson, worked there in the 1950s, when the IAS computer was being constructed and operated, and George was a child. Dyson Jr. had the run of the Institute's archives but he did not fish any radically new discoveries out of them.

As in Dyson's books about Project Orion and the evolution of artificial intelligence, I wish that someone better educated had written on this topic. For example, Dyson mentions the von Neumann architecture without clearly defining, what it is. The ENIAC and the Colossus were early non-von Neumann-architecture computers whose programs were input using a plugboard and switches; a modern equivalent is the FPGA. A better book would make this distinction more explicit. Dyson also talks about digital versus analog computation. A digital computation represents different digits of a mathematical variable with separate physical variables, and an analog one represents them with different digits of the same physical variable; an abacus is digital and a slide rule is analog. It is not true that search engines and social networks are enormous analog computers! They are not fault tolerant: a single bug in the implementation of the core algorithms can wreck them both!

Eric_W says

If you are looking for information about Alan Turing, look elsewhere. The title is a metaphor.

The Nazis did the U.S. a huge favor with their boorish and stupid racial policies. Many prominent Jews were brilliant mathematicians and physicists, and when the “cleansing” of universities began by the Nazis, people like Van Neumann, Einstein, and many others fled to the United States where they were of immense assistance in the development of the atomic bomb.

This book is about the origins and development of the digital age and Dyson spends considerable space on the people and institutions key to that development. The Princeton Institute for Advanced Research, for example, under Abraham Flexner and Oswald Veblen, recruited many of these refugees who helped build the Institute into one of the premier research institutions. I suppose it all has special interest for me as my life span parallels the development of the computer. I was born in 1947. In the 7th grade I became fascinated by ham radio and electrons and studied the intricate workings of the vacuum tube, a device for which I still have some reverence. I’m still dismantling and messing with the insides of computers.

Ironically, given the book’s title, John Van Neumann takes center stage with Turing playing only a peripheral role. Van Neumann’s interest in digital computation was apparently sparked by reading Turing’s seminal article. “On Computational Numbers” that led him to the realization of the importance of stored program processing.

What Turing did that was so crucial was to take Gödel’s proof of the incompleteness theorem that permitted numbers to carry two meanings. Turing took that and thought up the paper tape computer that produced both data and code simultaneously. That realization alone was fundamental in providing the basic building block for the computer.

The builders had conflicting views of the incredible computational power they had unleashed that was to be used for both ill and good. Van Neumann recognized this: “ A tidal wave of computational power was about to break and inundate everything in science and much elsewhere, and things would never be the same.”

It would have been impossible to develop the atomic bomb without the computational abilities of the new “computers.” So naturally, the Manhattan Project is covered along with the influence of the evil Dr. Teller (I must remember to get his biography,) who was the character (Dr. Strangelove) brilliantly played by Peter Sellers. After the war, Teller pushed very hard for the development of the “super-bomb” even though he knew, or must have known, that his initial calculations were flawed because he didn’t have the computational power to do them completely. One number that I questioned was the Dyson’s reporting that when the Russians exploded a three-stage hydrogen bomb in 1961, the force released was equivalent to 1%

of the sun’s power. That sounds wildly improbable. Anyone able to contradict number?

Some interesting little tidbits. One computational scientist refused to use the new VDTs, preferring to stick with punched cards (he obviously never dropped a box of them) which seemed far more tangible to him than dots on a screen. I guess fear of new technology is not reserved for non-scientists.

One of the major and very interesting questions addressed by Turing and reported on in the book is what we now call artificial intelligence. When we use a search engine are we learning from the search engine? or is the search engine learning from us? It would appear currently the latter may be true. Clearly, the search engines have been designed to store information and use that information to learn things about us both as a group and individually. I suspect that programs now make decisions based on that accumulation of knowledge. Is that not one definition of intelligence? (I will again highly recommend a book written and read quite a while ago that foresaw many of these issues: The Adolescence of P-1 by Thomas Ryan (1977)** . Note that Turing talked about the adolescence of computers and likening them to children.)

Some reviewers have taken Dyson to task for emphasizing abstract reasoning that went into the development of the computer while downplaying the role of electrical engineers (Eckert and Mauchly) in actually building the things. I’ll leave that argument to others, not caring a whit for who should get the credit and being in awe of both parties. On the other hand, the book does dwell more on the personalities than the intricacies of computing. There are some fascinating digressions, however, such as the examination of digital vs analog and how the future of computing might have been altered had Vann Neumann not tragically died so young as he had a great interest in biological computing and the relationship of the brain to the computer.

**For a plot summary of The Adolescence of P-1 see https://en.wikipedia.org/wiki/The_Ado...

Ints says

Uz šo gr?matu acis metu sen, kopš t? par?d?j?s 2012. gad?. Mani vienm?r ir interes?juši skait?ošanas maš?nu pirms?kumi, grib?j?s vair?k uzzin?t, k? no T?ringa univers?l? skait?ot?ja rad?s m?sdienu datori, k?das tehnolo?ijas izmantoja pirms?kumos, un galu gal?, ja paveicas, iesp?jams, saprast, k? tas viss notiek dzelžu l?men?. Kad gr?matu k?rt?jo reizi sastapu Dubajas gr?matu veikal?, padevos un nopirku.

Gr?matas anot?cij? tiek sol?ts, ka autors izv?rsti un izjusti par?d?jis ciparu visuma spr?dzienu p?c Otr? pasaules kara beig?s. Izgaismos elektronisko skait?ot?ju dabu un to cilv?ku dz?ves, kuri pielikuši savus pr?tus, lai modernie datori visp?r rastos. Pag?juša gadsimta ?etrdesmitajos un piecdesmitajos gados Džons fon Neimans Prinston? sapulcin?ja spož?kos matem?ti?us un meh?ni?us, lai realiz?tu T?ringa ideju par Univers?lo Maš?nu. S?kum? digit?lais visums bija vien piecu kilobaitu liels – m?sdien?s vienas ikonas atainošanai aiziet vair?k resursu, ta?u ar to pietika, lai simul?tu kodolspr?dzienus, evol?ciju un pav?rtu durvis digit?lajai revol?cijai.

Ar iesaist?to cilv?ku dz?v?m viss ir k?rt?b?, t?s ir aprakst?tas l?dz s?kumiem. Autors ar entuziasmu ataino katra jaun? projekta dal?bnieka izcelsmi l?dz vect?vam, to ar ko šis prec?jies, ja ir un laiku pa laikam k?dai sievai paveicas, un ar? vi?as dz?ves g?jums uz p?ris lapaspus?m tiek izkl?st?ts. Priekš manis t? bija gr?matas garlaic?g?k? un liel?k? da?a. Man nav nekas pret biogr?fij?m un, iesp?jams, pats vien esmu vain?gs, vajadz?ja b?t uzman?gam lasot anot?ciju. Š?s biogr?fijas manu las?tprieku beidza nost, nu neinteres? mani, k? Neimanis ar savu sievu saticies, vai k? katrs mucis no Eiropas. Viet?m vieni un tie paši fakti ir j?lasa pat p?ris reizes. Ta?u, ja slavenu fizi?u un matem?ti?u dz?ves ir Tava v?j?ba, te var?si izv?rsties uz neb?du.

Paral?li tam visam rit ar? Prinstonas universit?tes piegu?ošas teritorijas v?stures izkl?sts. M?s s?ki un smalki uzzin?m par katra š???a v?sturi. Tas var b?t pat no revol?cijas laikiem. Ja b?v?ts kas jauns, las?t?jam ir iesp?ja uzzin?t, kurš ir bijis pret, kurš par. Cik tas maks?jam, un par cik lielu summu s?kotn?j? t?me atš??r?s no beigu cipara. Kurš to finans?ja, un kuram zin?tniekam bija gali ar finans?t?ju. Ja uz visu to neskat?s ar v?lmi redz?t, k? ASV aizsardz?bas strukt?ras att?st?ja jaunus iero?us un bija galvenais skait?ošanas tehnolo?iju finans?t?js, tad ar? š? sada?a ir drausm?gi garlaic?ga.

Ta?u no visas gr?matas aptuveni ceturtda?a ir visnota? interesanta. Iz?emot vietas, kur autors propagand? no pirksta izz?stus apgalvojumus vai nepamatoti postul? interneta sapr?t?gumu. Taj? patiesi st?st?ts par agr?naj?m skait?ošanas maš?n?m un probl?m?m, kuras ar t?m risin?tas. Laikos, kad viss balst?j?s uz lamp?m, galven? probl?ma bija, k? no daudziem neuzticamiem elementiem uzb?v?t uzticamu skait?ošanas sist?mu. Papildus probl?mu sag?d?ja atmi?a, un te nu inženieri lika liet? visu izdomu, nesm?d?ja pat konvert?t no digit?l? sign?la uz akustisko, un tad, izmantojot dz?vsudrabu, saglab?t rezult?tu p?ris milisekundes l?dz n?košajam ciklam. Pamatprincipu aprakstam gan piem?t saraust?ta st?st?juma iez?mes. Viet?m pat rodas priekšstats, ka autors pats l?ga neapj?dz, ko vi?š ir v?l?jies pateikt.

Toties viss ir k?rt?b? ar to, kas saist?s ar simul?cijas iesp?j?m izmantojot piecu kilobaitu atmi?u. Piln?gi neticas, bet tika izveidoti pirmie metrolo?ijas mode?i, kas pat reiz?m sp?ja izr??in?t prognozi p?ris dienas p?c prognozes datuma, labi nosimul?t kodoltermisko reakciju rad?to spr?dzienvilni un t? ietekmi uz bumbas strukt?ru un pasauli apk?rt. Daži entuziasti test?ja pirmos digit?los rad?jumus, un bija tikai p?ris so?us l?dz datorv?rusa rad?šanai. Par to k? simul?ciju starpposmus rezult?tus las?ja no katodstaru lampas, perfokartes vai magnetiz?ta vada.

Kopum? 7 no 10 ball?m. ?sti nesapratu, vai autoram visp?r ir nojausma, k? pirmie elektroniskie skait?ot?ji str?d?ja, varb?t vi?š vienk?rši neprata to paskaidrot man saprotam? veid?. Iesp?jams biju p?rp?l?jies lasot cilv?ku biogr?fijas un faktiem par maš?n?m, kas k? likums bija atrodami noda?u beig?s, vairs nepietika sp?ka. Las?t jau var, ir daudzas interesantas lietas, ta?u viss ir nedaudz izpl?dis un nosl?pts.

Bryan Alexander says

I'm fascinating by the history of computing. There are so many delights there, both geeky and otherwise: glimpses of our present, odd characters, brilliant technical solutions, politics. *Turing's Cathedral* is a delightful and useful contribution to this field.

George Dyson's book takes place during the 1940s and 1950s, focusing on the extraordinary collection of geniuses in Princeton's Institute for Advanced Study, and who created a huge amount of modern computing. A large part of *Turing's Cathedral* consists of biographical sketches of key players in early computing, including Stan Ulam, Nils Barracelli, Klari Dán Von Neumann, Thorstein Veblen's nephew, Alan Turing, of course, and especially Johnny von Neumann. This is really von Neumann's book. He gets the lion's share of the text (and photos), becoming the Institute's prime driver and most productive thinker. *Turing's Cathedral* essentially ends with von Neumann's death.

Other chapters explore the hardware and theory of early computing, from cathode ray tubes and punch cards to stored program architecture and the Monte Carlo method. Dyson also races off in related directions with something like glee, showing, for example, how the IIS was right on top of major Revolutionary War sites, and how one scientist was related to Olivia Newtown John.

Arching across all of these themes is the intertwined history of atomic weapons and computing. This is a

controversial theme in cyber-history, and Dyson assembles a great deal of evidence to demonstrate their deep connections.

Turing's Cathedral is filled with energy and some fun writing. A few quotes demonstrate this:

> What if the price of machines that think is people who don't? (314)
>
> "Information was never 'volatile' in transit; it was as secure as an acrophobic inchworm on the crest of a sequoia." -Julian Bigelow (137)
>
> Our ever-expanding digital universe is directly descended from the image tube that imploded in the back seat of [Vladimir] Zworykin's car. (81)
>
> We owe the existence of high-speed digital computers to pilots who preferred to be shot down intentionally by their enemies rather than accidentally by their friends. (116)
>
> Von Neumann made a deal with "the other party" in 1946. The scientists would get the computers, and the military would get the bombs. This seems to have turned out well enough so far, because, contrary to von Neumann's expectations, it was the computers that exploded, not the bombs. (303)
>
> "It is an irony of fate that much of the high-tech world we live in today, the conquest of space, the extraordinary advances in biology and medicine, were spurred on by one man's monomania and the need to develop electronic computers to calculate whether an H-bomb could be built or not." -Francoise Ulam (216)
>
> "A clock keeps track of time. A modern general purpose computer keeps track of events." This distinction separates the digital universe from our universe, and is one of the few distinctions left. (300)
>
> "We are Martians who have come to Earth to change everything - and we are afraid we will not be so well received. So we try to keep it a secret, try to appear as Americans... but that we could not do, because of our accent. So we settled in a country nobody ever has heard about and now we are claiming to be Hungarians." -Edward Teller (40)

The book has plenty of gems, like the Swedish scientist Hannes Alfvén and his utopian novel about an AI-ruled future, von Neumann's possibly accidental vision of what post-robotic economics might look like (289), and Nils Barracelli's early visions of artificial life. The sheer ambition, nigh unto mad science, of these early explorers, seeking even to control the weather, is infectious.

There are a few weaknesses, starting with Dyson's aphoristic tendency occasionally backfiring (I don't buy the return of analog idea). Some of the explanations aren't as lucid as they need to be - I'm still not sure what template-based addressing means. And the focus on Princeton and some historical figures doesn't recognize their extraordinary privilege. I was also surprised that Tyson didn't reference Howard Rheingold's groundbreaking and accessible Tools for Thought.

But that's nitpicking. *Turing's Cathedral* is a treat for geeks, history buffs, and anyone interested in how our digital era came to be.

Brendan Dolan-Gavitt says

The IAS MANIAC project was indeed a truly revolutionary computing endeavor, and it deserves a well-written history. Unfortunately, you will not find it here. Dyson doesn't seem to understand most of the technical issues he tries to describe, and he often resorts to vague attempts at seemingly profound statements (see the end of almost every chapter for examples). Dyson is at his best when he describes the personalities of those who contributed to the project, but this doesn't really save the work as a whole.

The book is also suffused with Dyson's theory that the Internet is a living (and possibly sentient) creature. This kind of idiocy is annoying enough by itself, but it really has no place in a history of a computing project. The most concentrated dose of this is found in the latter half of the chapter on Nils Barricelli, so feel free to skip it -- Barricelli had some interesting ideas, but in the end I think he falls closer to the side of "crank" than "visionary".

Finally, the writing is often a bit tortured and hard to follow, and his biographies jump confusingly between various parts of the individual's life, seemingly whenever the author thought of something new to add. These sapped what was left of my will to finish the book, and had I not been on transatlantic plane flight with no other source of entertainment I doubt I would have made it.

I hope someone comes along and does a better job of this, because the early history of computing is a story that deserves the same kind of treatment that the Manhattan Project got in Richard Rhodes's "The Making of the Atomic Bomb".

Bradley says

I had an issue with this non-fiction, but also a whole lot of love.

So this is about the mathematicians who heralded the whole computer movement. You know, the OTHER, more disreputable and crazy smart people like Von Neumann, Gödel, and all the other nutters like Turing who ushered in the computer age from just a thought experiment into a hand-made lab and later into the co-authors of the nuclear age.

Yeah. THOSE crazy nutters. The ones that ran enough physics programs on their automatic machines to model nuclear explosions and bring about the bomb. Computers, and not the poor women (and a few men) who got paid to crunch math by hand for years, are the real reason we have the nuclear age. And also why we have genetic sciences.

Pretty obvious, I know, but still, these guys are some unsung heroes. Just programmers. Sheesh. Whatever.

The book is full of love. I love the people. And then there was a wholly appropriate section expounding on science fiction and the future of AIs and I LOVED that, too, especially the form a realistic alien might take.

So what issues did I have?

WAY too much time was spent on the schools. Early schools, history, blah blah blah. Sure. Colleges are important and such, but I lost my caring factor until a while after we were introduced to Von Neumann. And

what an interesting guy he was! :)

A side issue I should have more problem with is the role of women in this non-fiction, but like real history, too much idiocy prevents half our population from having more active roles. I'm not too fond of how the women here were relegated to being facilitators, suicidal wives, or footnotes to Crick and Watson. But let's be real here. We have a horrible track record at pushing these people aside in reality, not just in history.

I can appreciate the minds SHOWN HERE while still wishing the other minds had a chance. It didn't diminish my fascination. I can have MORE fascination to spare elsewhere. :)

So. Maybe not the best non-fiction I've ever read, but I did learn a hell of a lot about the people who ushered in the computer age and it's quite a story. And honestly, it makes for a more realistic story than the others I've read that focused more on WWII encryption engines as the real focus and impetus for computers. Making nukes is pretty damn huge. And obvious. :)
