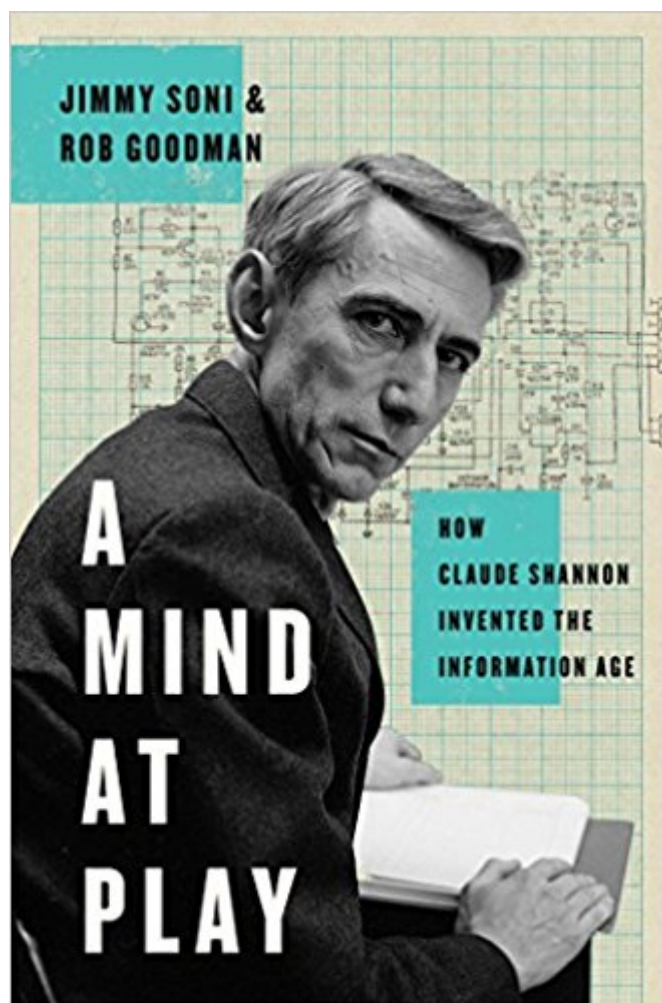


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# A Mind At Play: How Claude Shannon Invented The Information Age



## Synopsis

“A charming account of one of the twentieth century’s most distinguished scientists. Readers will enjoy this portrait of a modern-day Da Vinci.”

• Fortune The life and times of one of the foremost intellects of the twentieth century: Claude Shannon—the architect of the Information Age, whose insights stand behind every computer built, email sent, video streamed, and webpage loaded. Claude Shannon was a groundbreaking polymath, a brilliant tinkerer, and a digital pioneer. He constructed a fleet of customized unicycles and a flamethrowing trumpet, outfoxed Vegas casinos, and built juggling robots. He also wrote the seminal text of the digital revolution, which has been called “the Magna Carta of the Information Age.” His discoveries would lead contemporaries to compare him to Albert Einstein and Isaac Newton. His work anticipated by decades the world we’d be living in today—and gave mathematicians and engineers the tools to bring that world to pass. In this elegantly written, exhaustively researched biography, Jimmy Soni and Rob Goodman reveal Claude Shannon’s full story for the first time. It’s the story of a small-town Michigan boy whose career stretched from the era of room-sized computers powered by gears and string to the age of Apple. It’s the story of the origins of our digital world in the tunnels of MIT and the “idea factory” of Bell Labs, in the “scientists’ war” with Nazi Germany, and in the work of Shannon’s collaborators and rivals, thinkers like Alan Turing, John von Neumann, Vannevar Bush, and Norbert Wiener. And it’s the story of Shannon’s life as an often reclusive, always playful genius. With access to Shannon’s family and friends, *A Mind at Play* brings this singular innovator and creative genius to life.

## Book Information

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## Customer Reviews

“Claude Shannon wrote the Magna Carta of the Information Age and conceived of the basic concept underlying all digital computers. Jimmy Soni and Rob Goodman offer a long overdue, insightful, and humane portrait of this eccentric and towering genius.” (Walter Isaacson, author of *Steve Jobs*, *The Innovators*, and *Einstein*)

“An exceptionally elegant and authoritative portrait of a man of few words but many big ideas. Soni and Goodman’s elucidations of Claude Shannon’s theories are gems of conciseness and clarity, and their case for placing him in the same pantheon as Turing and von Neumann is compelling.” (Sylvia Nasar, author of *A Beautiful Mind*, winner of the National Book Critics Circle Award)

“Jimmy Soni and Rob Goodman have written a fascinating, readable, and necessary biography of a true American genius. This is the book that finally explains Claude Shannon’s character and career as well as the context of his extraordinary life and times.” (Jon Gertner, author of *The Idea Factory: Bell Labs and the Great Age of American Innovation*)

“An avid biography full of freewheeling curiosity and fun. It’s a pleasure getting to know you, Claude Shannon!” (Siobhan Roberts, author of *Genius at Play: The Curious Mind of John Horton Conway*)

“Shannon was to information and communication what Newton was to physics. By following his curiosity through the playground of science, he discovered mathematical laws that govern our digital age. The Shannon I worked with comes alive in these pages.” (Edward O. Thorp, author of *A Man For All Markets* and *Beat The Dealer*)

“At last a biography of a man who shaped the Information Age we live in, and a thinker who combined the playfulness of Richard Feynman with the genius of Albert Einstein. For anyone interested in living both a playful and a thoughtful life, there is no better model than Claude Shannon—and no better writing team than Soni and Goodman to have written the book on it.” (Ryan Holiday, bestselling author of *The Daily Stoic* and *The Obstacle Is The Way*)

“A brilliant treatment of the life of Claude Shannon, one of the 20th century’s most remarkable scientists in the field of information technology. This giant of a man launched the digital world we now inhabit, but his not the household name it deserves to be. Jimmy Soni and Rob Goodman have corrected this with their superb new book presenting Shannon’s amazing personal and professional life.” (Professor Leonard Kleinrock, Distinguished Professor of

Computer Science, UCLA, and winner, 2007 National Medal of Science) “We are familiar with the bright young stars who brought us the web, Google and Facebook, but this engaging book demystifies the digital communications revolution and shows how it really began! In telling the story of Claude Shannon, Jimmy Soni and Rob Goodman have given a fascinating introduction to the ideas and the people who made our digital age possible. (Robyn Arianrhod, author of *Seduced by Logic: Marie Du Châtelet, Mary Somerville and the Newtonian Revolution*) “In this fine biography of Claude Shannon, Soni and Goodman make accessible the origins of digital communications while revealing how engineers think deeply not only about things but through things; it was through tinkering that Shannon was able to bring us the modern digital world. (W. Bernard Carlson, Professor and Chair, Engineering & Society Department, University of Virginia) “The biography of one of the towering geniuses of the 20th century we have been awaiting for decades. In this veritable labor of love by Jimmy Soni and Rob Goodman, one has on offer an enthralling and beautifully rendered portrait of Claude Shannon, the mathematician, the engineer, the inventor, the tinkerer, and, above all, the enigmatic man who became the intellectual father of the vital lifeblood of our age: information. (Professor Sergio Verdu, Eugene Higgins Professor of Electrical Engineering at Princeton University) “The fact that there has never been a comprehensive biography of Claude Shannon, “The Father of Information Theory,” has seemed a particularly egregious oversight as the world has hurtled further and further into the Information Age. Jimmy Soni and Rob Goodman have finally rectified this injustice. They have woven comprehensive research into a compelling and personal narrative, accessible to non-specialists but also of interest to people in the field for whom Shannon is an almost mythical figure. A *Mind at Play* is an insightful and moving portrait of the very original genius whose work affects nearly every aspect of the modern age. (Dr. Mark Levinson, Director, Particle Fever) “A *Mind at Play* bubbles over with energy and verve and insight. This is biography as it should be, but seldom is. (Edward Dolnick, author of *The Clockwork Universe*) “A welcome and inspiring account of a largely unsung hero because, the authors suggest, he accomplished something so fundamental that it’s difficult to imagine a world without it. (Kirkus Reviews) “A key figure in the development of digital technology has his achievements, if not his personality, burnished in this enlightening biography. . . . The authors’ rundown of the science behind these advances, probing everything from the structure of language to the transatlantic telegraph, is lucid and fascinating. . . . Soni and Goodman open an engrossing window onto what a mind hard at work can do. (Publishers Weekly) “A *Mind at Play* takes its readers through the extraordinary life of

someone so deserving of this well-researched and smooth-reading biography. Read it. Lose yourself in the pages. For just a few worthwhile hours, you will become a shadow following Shannon's life and playful mind. (Joseph Mazur, Author of *Fluke: The Math and Myth of Coincidences*) "Terrific. *A Mind at Play* is fluidly written, thoroughly researched, and important. It brings to our attention the fascinating life of Claude Shannon, considered by his colleagues to be the Einstein of our information age. It is a story we should all know, and it is a read that you all will enjoy. (Martin J. Sherwin, coauthor (with Kai Bird) of the Pulitzer Prize-winning biography, *American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer*.) "Claude Shannon (1916–2001) is to computer science what Newton is to physics: the mind that revolutionized its field. . . . a warm and engaging portrait that traces Shannon from his Michigan boyhood to his standing as a modest scientific celebrity." (BOOKLIST) "Soni and Goodman deftly illustrate how personality, humility, courage, and, above all, curiosity facilitated [Shannon's] historical contributions. In addition to sympathizing with Shannon's awestruck colleagues and starstruck graduate students, readers will come away with a feeling of having gotten to know the man personally. . . . For historians, philosophers, cryptographers, geeks, introverts, and anyone who has ever taken something apart to understand how it works." (Library Journal) "In *A Mind at Play*, journalist Jimmy Soni and political theorist Rob Goodman tell Shannon's story engagingly, from the perspective of a lay reader wrestling with the sophisticated ideas that Shannon explored with dedication and panache. The book is a boon for those eager to know more about his incredibly influential life—whimsical, independent and curiosity-driven....Soni and Goodman have done their research. [A] vivid portrayal." (Nature) "We owe Claude Shannon a lot, and Soni & Goodman's book takes a big first step in paying that debt." (San Francisco Review of Books) "What we learn most from this biography is how Shannon was as a person: A tinkerer and a loner who preferred to work with his door closed, but kind and patient if one cared to enter." (Euro Math) "This is the most comprehensive biography of the man I've come across." (Brain Food) "To read this book is to take a journey through history and understanding...Simply put, this will henceforth be one of the books I can't shut up about when people ask for recommendations. If you enjoy anything at all about the digital age we live in, go out and get yourself a copy...You should know how these things that bring you joy, or money, or allow you to communicate easily have come into being. And for all of it, you owe a debt of gratitude to the man who is the subject of this thoroughly well-written book; Claude Shannon." (Agent Palmer) "If Soni and Goodman manage to make the key ideas the centrepiece, they also succeed in

maintaining interest in the man behind the theory." (Financial Times) "Jimmy Soni and Rob Goodman make a convincing case . . . Without Shannon, the digital revolution would have ground to a halt." (Wall Street Journal) You know Einstein, but you should know Shannon. A Mind at Play, a charming account of the life of Claude Shannon, one of the 20th century's most distinguished scientists, makes that compelling case. The biography is full of entertaining bits about the thinker-tinkerer who first divined the significance of the bit (aka "binary digit," the fundamental unit of information). Readers will enjoy this portrait of a modern-day Da Vinci from his incredible early career breakthroughs to the more flippant pursuits of his later years, like juggling through the halls of Bell Labs on a unicycle, or engineering a flame-throwing trumpet. (FORTUNE)

Jimmy Soni has served as an editor at The New York Observer and the Washington Examiner and as managing editor of Huffington Post. He is a former speechwriter, and his written work and commentary have appeared in Slate, The Atlantic, and CNN, among other outlets. He is a graduate of Duke University. With Rob Goodman, he is the coauthor of Rome's Last Citizen: The Life and Legacy of Cato, Mortal Enemy of Caesar and A Mind at Play: How Claude Shannon Invented the Information Age. Rob Goodman is a doctoral candidate at Columbia University and a former congressional speechwriter. He has written for Slate, The Atlantic, Politico, and The Chronicle of Higher Education. His scholarly work has appeared in History of Political Thought, the Kennedy Institute of Ethics Journal, and The Journal of Medicine and Philosophy. With Jimmy Soni, he is the coauthor of Rome's Last Citizen: The Life and Legacy of Cato, Mortal Enemy of Caesar and A Mind at Play: How Claude Shannon Invented the Information Age.

For years, I have been reading references to Claude Shannon because of his involvement in so many critical developments in science, communications, Bell Labs, and even the stock market. About his sense of humor or his riding a unicycle through Bell Labs while juggling (a favorite hobby). And about his groundbreaking, earth-shaking realization that all communication, from voice to music to documents to photos is all data and could be treated the same way. Without this insight, I could not post this review today. But there was no way to get my fill of Claude Shannon no biographies or documentaries of an American genius who lived until 2001! A Mind At Play begins to fill this yawning gap (and it seems a documentary is finally in the works as well). Shannon was a natural. He simply did. Whatever caught his eye. He invented machines all his life, designed them, machined them, theorized their

optimization, and cleared the air on numerous topics that concerned them. His great gift to us was his reductionism. He could look at a problem and strip away the redundancies, the tangents, the superfluities and the noise. Especially the noise. The bare core that was left was now addressable and solvable. With that, he could add back the other factors as needed. It made his solutions elegant. This clarity of vision is dispiritingly rare. That a man of his many other abilities had it has benefitted the world disproportionately. He was in it for the intellectual challenge. While other scientists won Nobel Prizes, fame, fortune, privilege and rank, Shannon shunned the limelight and kept working (and playing). “Down to Earth” doesn’t begin to describe him. His toy room served him to the end. He hated speeches, and preferred playing the clarinet (or chess) to lecturing. This was in no way a stock-standard scientist. His brilliance was evident to everyone throughout his long life. And he worked with all of the most brilliant. My favorite story in the book is when his young daughter brought out a package of toothpicks and dropped them all over the wood plank floor. Rather than scold her or instruct her to clean it right up, Shannon observed: “You know, you could calculate the value of pi from that.” I also liked the index finger he installed in the basement toy room. When his wife wanted him to come upstairs, she pulled the cord in the kitchen and the finger curled upward. This man makes for a fascinating biography. Among his great discoveries was how to eliminate noise. Noise in the transmission of data corrupts it, making the message incomplete, wrong or unintelligible. Shannon broke down elements to their smallest, and assigned them numeric labels. If you gave (say) a letter a two digit equivalent, you would get a wrong letter if one of the digits was blurred by noise. By giving them longer strings of digits, they could tolerate noise and still be correct at the receiving end. This sort of outside the box thinking revolutionized countless industries. We owe Claude Shannon a lot, and Soni & Goodman’s book takes a big first step in paying that debt. David Wineberg

If you are reading this on any sort of electronic gadget, thank Claude Shannon. Though never as famous as some of his colleagues, Shannon was responsible for the mathematics and logic that made modern electronics possible. He was, like many geniuses, somewhat of an aloof and difficult character, and didn’t go out of his way to seek publicity. The Good Stuff I don’t suppose there is any such thing as an “intimate portrait” of Claude Shannon. He simply wasn’t that type of man. Jimmy Soni and Rob Goodman do about as credible a job as possible of peering through the veil, but much of the “personal” side of Shannon come from indirect

sources, and is based on a mix of conjecture and guesstimates.\* You can't understand Shannon's genius without understanding some of the concepts of Electrical and Computer engineering. The authors do a nice job of explaining enough of the basics in layman's language so that at least the general sense of Shannon's brilliance comes through. I am an electrical engineer, and was familiar with Shannon's work, but even I was impressed with how far and wide his skills took him. For example, Shannon took a bit of a vacation to work in a biology project or two, and came close to some fundamental breakthroughs in analyzing genetics.\* Probably the most interesting part of Shannon's life were his many interests. It was not unusual to see him pedaling through Bell Labs on a custom-made unicycle, or one built for especially for juggling, and he was noted for spending time on music, analyzing chess games, or any other of his many hobbies. An interesting sidebar to the story is that this was tolerated at Bell Labs-almost as a recognition for the great work he had done early in his career.\* The authors try to give a balanced look at Shannon's life. It was not a completely happy life, and perhaps saddest of all, his mental faculties left him before he had a chance to truly see the digital and internet age which his work enabled.=== The Not-So-Good Stuff ===\* I don't envy the authors the task of creating a biography of Shannon suitable readable by a non-technical audience. This forces them into some strange compromises of trying to explain technical concepts in such a way to be simple enough for everyone to understand, but not so tedious as to alienate more techy readers. At times, they were more successful at this than others, but it is a fine line which they occasionally crossed. For example, technically-oriented readers, who I suspect is the true audience for this book, might be put off by explanations of simple switch-networks.\* Much of Shannon's genius was his ability to work in both the theoretical and real-life world. The authors spend quite a bit of time discussing this, but I think shortchange Shannon a bit in describing just how rare and valuable this trait is.=== Summary ===I admit, I was hooked before I started the book. Claude Shannon is a man who amazes me, and I knew a bit about him from previous reading. He was an amazing man, and it would be tough to write an uninteresting biography of him. The authors did an excellent job, and handled a difficult subject and complicated material quite well. I would recommend the book to any "geek", or anyone with an interest in how the technology of computers and advanced electronics got to where it is.=== Disclaimer ===I was able to read an advance copy through the courtesy of the publisher and NetGalley.



A good biography of Shannon. However it does not do a very good job of explaining the impact of his work on technology. As a communications engineer I wanted more. An understanding of the technical aspects of his work is not developed well enough for a non-technical reader.

Claude Shannon is the most important scientist that most people have never heard of despite his enormously important contributions.. It is a book that is long overdue. Glad that Shannon is at long last being recognized for the general public to appreciate.

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