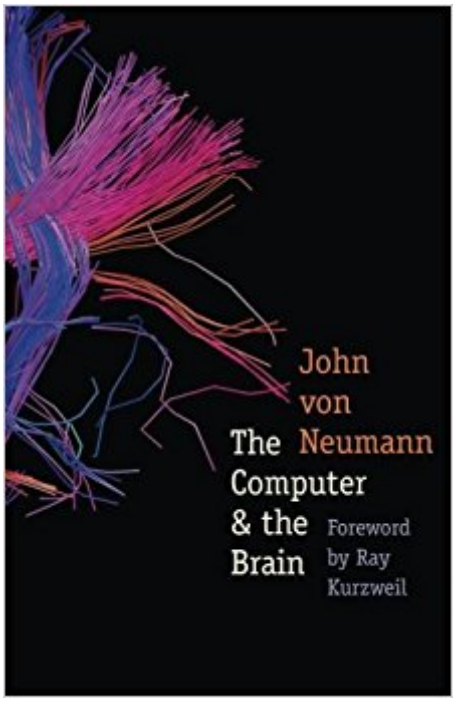
The Computer And The Brain (The Silliman Memorial Lectures Series)



Synopsis

In this classic work, one of the greatest mathematicians of the twentieth century explores the analogies between computing machines and the living human brain. John von Neumann, whose many contributions to science, mathematics, and engineering include the basic organizational framework at the heart of today's computers, concludes that the brain operates both digitally and analogically, but also has its own peculiar statistical language. In his foreword to this new edition, Ray Kurzweil, a futurist famous in part for his own reflections on the relationship between technology and intelligence, places von NeumannÃ¢â ¬â„¢s work in a historical context and shows how it remains relevant today.

Book Information

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Customer Reviews

"Highly original and intensely stimulating. His ideas will have great value to further investigation."Ã¢â ¬â •S. Ulam, Scientific American (fromÃ Â an earlierÃ Â edition) "On opening The Computer and the Brain, I expected to find it 'of historical interest only'Ã Â (as one of my own professors used to say rather loftily of Principia Mathematica).Ã Â To the contrary, the book abounds with insights so deep they have not yet been internalized by any but a very small number of specialists."Ã¢â ¬â •John Derbyshire, New Criterion "The mind of the later Dr. von Neumann was so luminous, so lucid, and so far reaching that interested laymen can read this book with occasional flashes of comprehension that justify the groping."Ã¢â ¬â •American Business (from

an earlier edition) "Von Neumann was one of the top experts in all aspects of computing . . . and one of the most rigorous minds ever to discuss the computational organization of brains. His last book presents one of the most sophisticated comparisons ever made between computers and brains. . . . ItÃ¢â ¬â„¢s a landmark in the history of computing, psychology, and neuroscience, and itÃ¢â ¬â„¢s required reading for anyone interested in the foundations of those disciplines."Ã¢â ¬â •Gualtiero Piccinini, Minds and Machines "An outstanding example of J. von NeumannÃ¢â ¬â„¢s insight, brilliance and clarity."Ã¢â ¬â •Mathematical Reviews "This book is the earliest serious examination of the human brain from the perspective of a mathematician and computer pioneer. Prior to von Neumann, the fields of computer science and neuroscience were two islands with no bridge between them."Ã¢â ¬â •Ray Kurzweil, from the foreword "This book contains exactly the line of reasoning that inspired the architecture underlying Watson, the machine that beat the best human champions at Jeopardy!. A must read for any new computer scientist and reread for all of us who enjoy the stunning power of thoughtful observation and objective reason."Ã¢â ¬â •David Ferrucci, IBM T.J. Watson Research Center "This innocent-looking little book lies at the eye of a hurricane. It represents a locus of clarity and calm at the center of a vast vortex of powerful arguments and competing research programs."Ã¢â ¬â •Paul and Patricia Churchland, on the earlier edition "Perhaps the most powerful, lucid and penetrating mind in the history of computer science, von Neumann's observations about the language of the brain resonate with remarkable insight. Decades ahead of his time, he launches a thread of reasoning based on his unmatched understanding of computing that suggests the human nervous system is best understood, not as a digital machine but has a statistical one. . . . 'The nervous system is a computing machine which manages to do its exceedingly complicated work on a rather low level of precision....what matters are not the precise positions of definite markers, digits, but the statistical characteristics of their occurrences, i.e., frequencies. . . .' It is exactly this line of reasoning that inspired the essential architecture underlying Watson, the machine that beat the best human champions at Jeopardy! There is no precise mathematics to human language and yet it is the foundation for expressing human thought. Von Neumann reasons his way from analog machines to digital machines to delivering unparalleled insight into the computational paradigm underlying the human brain. A must read for any new computer scientist and reread for all of us who enjoy the stunning power of thoughtful observation and objective reason."Ã¢â ¬â •David Ferrucci, IBM T.J. Watson Research Center "This sparse book,Ã Â from the time when giants walked the halls of academe and government and laid down the basic notions of what it is to compute, remains an essential text for those interested in understanding how brains differ from

computers."Ã¢â ¬â •Christof Koch, Allen Institute for Brain Science, and author of Consciousness: Confessions of a Romantic Reductionist

At the time of his death in February 1957, John von Neumann, renowned for his theory of games and his work at the Electronic Computer Project at the Institute for Advanced Study, was serving as a member of the Atomic Energy Commission.Ã Â Ray KurzweilÃ Â is an inventor, author, and futurist who has writtenÃ Â six books including The Singularity Is Near: When Humans Transcend Biology.

Perhaps more so than Alan Turing, (If we accept the intro by Kirtzweil, a man with serious credentials), John von Neuman was one of the most important figures in developing the basic architecture of the modern digital computer. The two did work together, but von Neuman was the senior and I propose had a better grasp of the juncture of math and machine.The Computer and the Brain is the last published work by von Neuman and was an attempt to bring together what was known about the machine qualities of the brain and what the machines of 1957 might one day be able to accomplish.As such almost everything is dated and new discoveries in neuroscience more so than in computers place limits on the absolute value of his comments.That said, there was a head line in recent science news that there is a prototype computer in testing that combines both digital and large scale parallel computing in the manner von Neuman suggests as the model for how the brain may work.The Computer and the Brain is the printed from of a lecture. He was too ill (mortally) for the series he was offered to conduct. So great was the respect for the man that he was allowed to present only these papers, sufficient for one lecture and about 3 hours reading. I do not think he read the paper; he had just the strength to write it.Besides having been a vitally important mathematician, he was active in the cause of scientific ethics and as the man who drafted the letter, signed by Einstein credited with America committing to atomic research he is therefore a originator of the atomic age. He was a man of great thought and influence.Reading this book is a chance to listen to a great mind. I make no claim to have understood all of it. I suspect that no one should read it in an effort to be at the leading edge of math, computers or neurology. It is a hard, but worth it read, and a glass into our recent history.

As other reviews stated; great for the history lesson, and the introduction is excellent--and worth buying for that alone. The actual content of von Neumann’s focus isn’t particularly useful for modern work, at least in the context that I am working on.

This monograph is worth reading to get a sense of how von Neumann approached a problem using his mathematical intuition. I found it a valuable if short read.

Like Panasonic, Neumann was slightly ahead of his time.I'm currently reading Neumann's biography by Macrea. In addition to his understanding of mathematics, Neumann had the ability to extrapolate evolving seemingly unrelated sciences with astonishing accuracy.People interested in these topics should also have interest in reading The Mind and the Brain: Neuroplasty and the Power of Mental Force by Jeffrey Schwartz (not a new book).JPK

John von Neumann was the principal architect (in 1945) of the design from which all subsequent electronic computers trace their lineage. As he was dying of bone cancer, this giant of 20th Century mathematics and physics wrote the last of his 150 research papers, "The Computer and the Brain".In 80 pages, von Neumann describes the key components and processes of computers and of brains and then analyzes their similarities and differences. Developments in both computer science and neuroscience during the intervening six decades have corroborated his overall analysis. Von Neumann had a better grasp in 1956 than proponents of AI have today of what differentiates artificial intelligence (computers) from biological intelligence (brains). In the last section of "The Computer and the Brain", von Neumann goes to considerable lengths to explain exactly how computers differ from brains:"It should also be noted that the message-system used in the nervous system, as described in the above, is of an essentially statistical character. In other words, what matters are not the precise positions of definite markers, digits, but the statistical characteristics of their occurrence, i.e., frequencies of periodic or nearly periodic pulse-trains, etc."Thus the nervous system appears to be using a radically different system of notation from the ones we are familiar with in ordinary arithmetic and mathematics. Instead of the precise systems of markers where the position--and presence or absence--of every marker counts decisively in determining the meaning of the message, we have here a system of notations in which the meaning is conveyed by the statistical properties of the message. We have seen how this leads to a lower level of arithmetical precision but to a higher level of logical reliability: a deterioration in arithmetics has been traded for an improvement in logics."Or, to quote von Neumann again farther down the same page, "The Language of the Brain is Not the Language of Mathematics".Try to imagine transistor logic gates, arithmetic logic units, integrated circuits, multi-core microprocessors, neuromorphic chips, neural networks, massively parallel systems, software algorithms, etc.--all without math. Good luck.

The book is mildly interesting from an historical perspective about what von Neumann was thinking about before he died, but really not that useful from a neuroscience point of view.

Very hard to understand

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