



# JOHN VON NEUMANN and THE ORIGINS OF MODERN COMPUTING WILLIAM ASPRAY

# John Von Neumann And The Origins Of Modern Computing History Of Computing

**Mark Priestley**



## **John Von Neumann And The Origins Of Modern Computing History Of Computing:**

**John von Neumann and the Origins of Modern Computing** William Aspray, 1990-12-07 William Aspray provides the first broad and detailed account of von Neumann's many different contributions to computing. John von Neumann 1903-1957 was unquestionably one of the most brilliant scientists of the twentieth century. He made major contributions to quantum mechanics and mathematical physics and in 1943 began a new and all too short career in computer science. William Aspray provides the first broad and detailed account of von Neumann's many different contributions to computing. These Aspray reveals extended far beyond his well known work in the design and construction of computer systems to include important scientific applications, the revival of numerical analysis and the creation of a theory of computing. Aspray points out that from the beginning von Neumann took a wider and more theoretical view than other computer pioneers. In the now famous EDVAC report of 1945 von Neumann clearly stated the idea of a stored program that resides in the computer's memory along with the data it was to operate on. This stored program computer was described in terms of idealized neurons, highlighting the analogy between the digital computer and the human brain. Aspray describes von Neumann's development during the next decade and almost entirely alone of a theory of complicated information processing systems or automata and the introduction of themes such as learning, reliability of systems with unreliable components, self replication and the importance of memory and storage capacity in biological nervous systems. Many of these themes remain at the heart of current investigations in parallel or neurocomputing. Aspray allows the record to speak for itself. He unravels an intricate sequence of stories generated by von Neumann's work and brings into focus the interplay of personalities centered about von Neumann. He documents the complex interactions of science, the military and business and shows how progress in applied mathematics was intertwined with that in computers. William Aspray is Director of the Center for the History of Electrical Engineering at The Institute of Electrical and Electronics Engineers.

**A History of Modern Computing, second edition** Paul E. Ceruzzi, 2003-04-08 From the first digital computer to the dot com crash, a story of individuals, institutions and the forces that led to a series of dramatic transformations. This engaging history covers modern computing from the development of the first electronic digital computer through the dot com crash. The author concentrates on five key moments of transition: the transformation of the computer in the late 1940s from a specialized scientific instrument to a commercial product; the emergence of small systems in the late 1960s; the beginning of personal computing in the 1970s; the spread of networking after 1985; and in a chapter written for this edition, the period 1995-2001. The new material focuses on the Microsoft antitrust suit, the rise and fall of the dot coms and the advent of open source software, particularly Linux. Within the chronological narrative, the book traces several overlapping threads: the evolution of the computer's internal design; the effect of economic trends and the Cold War; the long term role of IBM as a player and as a target for upstart entrepreneurs; the growth of software from a hidden element to a major character in the story of computing; and the recurring issue of the place of

information and computing in a democratic society The focus is on the United States though Europe and Japan enter the story at crucial points on computing per se rather than on applications such as artificial intelligence and on systems that were sold commercially and installed in quantities

**The First Computers** Raul Rojas, Ulf Hashagen, 2002-07-26 This history of computing focuses not on chronology what came first and who deserves credit for it but on the actual architectures of the first machines that made electronic computing a practical reality The book covers computers built in the United States Germany England and Japan It makes clear that similar concepts were often pursued simultaneously and that the early researchers explored many architectures beyond the von Neumann architecture that eventually became canonical The contributors include not only historians but also engineers and computer pioneers An introductory chapter describes the elements of computer architecture and explains why being first is even less interesting for computers than for other areas of technology The essays contain a remarkable amount of new material even on well known machines and several describe reconstructions of the historic machines These investigations are of more than simply historical interest for architectures designed to solve specific problems in the past may suggest new approaches to similar problems in today's machines

Contributors Titiimaea F Alailima Lin Ping Ang William Aspray Friedrich L Bauer Andreas Brennecke Chris P Burton Martin Campbell Kelly Paul Ceruzzi I Bernard Cohen John Gustafson Wilhelm Hopmann Harry D Huskey Friedrich W Kistermann Thomas Lange Michael S Mahoney R B E Napper Seiichi Okuma Hartmut Petzold Raul Rojas Anthony E Sale Robert W Seidel Ambros P Speiser Frank H Sumner James F Tau Jan Van der Spiegel Eiiti Wada Michael R Williams

**Thinking Things Through** Clark N. Glymour, 1997 Thinking Things Through provides a broad historical and rigorous introduction to the logical tradition in philosophy and to its contemporary significance The presentation is centered around three of the most fruitful issues in Western thought What are proofs and why do they provide knowledge How can experience be used to gain knowledge or to alter beliefs in a rational way What is the nature of mind and of mental events and mental states In a clear and lively style Glymour describes these key philosophical problems and traces attempts to solve them from ancient Greece to the present Thinking Things Through reveals the philosophical sources of modern work in logic the theory of computation Bayesian statistics cognitive psychology and artificial intelligence and it connects these subjects with contemporary problems in epistemology and metaphysics The text is full of examples and problems and an instructor's manual is available Clark Glymour is Alumni Professor of Philosophy at Carnegie Mellon University and Adjunct Professor of History and Philosophy of Science at the University of Pittsburgh

*The ^ADigital Hand, Vol 3* James W. Cortada, 2007-11-06 The third volume of The Digital Hand describes how computers were used in all of the American public sector industries over the past half century in order to determine what were the critical uses of computing technologies how these technologies came into these industries and how they were changed by it Cortada claims that computing profoundly changed the nature of work in these public sector industries creating the bedrock of the Information Age

**Cellular** Daniel D. Garcia-Swartz, Martin

Campbell-Kelly, 2022-10-18 Tracks the evolution of the international cellular industry from the late 1970s to the present. The development of the mobile phone industry into what we know today required remarkable cooperation between companies, governments, and industrial sectors. Companies developing cellular infrastructure, cellular devices, cellular network services, and eventually software and mobile semiconductors had to cooperate, not simply compete with each other. In this global history of the mobile phone industry, Daniel D. Garcia Swartz and Martin Campbell Kelly examine its development in the United States, Europe, Japan, and several emerging economies including China and India. They present the evolution of mobile phones from the perspective of vendors of telephone equipment and network operators, users whose lives have been transformed by mobile phones, and governments that have fostered specific mobile phone standards. Cellular covers the technical aspects of the cellphone as well as its social and political impact. Beginning with the 1980s, the authors trace the development of closed, proprietary and open, available to all cellular standards, the impact of network effects as cellular adoption increased, major technological changes affecting mobile phone hardware, and the role of national governments in shaping the industry. The authors also consider the changing roles that cellular phones have played in the everyday lives of people around the world and the implications 5G technology may have for the future. Finally, they offer statistics on how quickly the cellular industry grew in different regions of the world and how firms competed in those various markets. Cellular is published in the History of Computing Series. This distinguished series has played a major role in defining scholarship in the history of computing. Hallmarks of the series are its technical detail and interpretation of primary source materials.

Calculating the Weather Frederik Nebeker, 1995-05-18 During the course of this century, meteorology has become unified physics-based and highly computational. Calculating the Weather: Meteorology in the 20th Century explains this transformation by examining the various roles of computation throughout the history of meteorology, giving most attention to the period from World War I to the 1960s. The electronic digital computer, a product of World War II, led to great advances in empirical, theoretical, and practical meteorology. At the same time, the use of the computer led to the discovery of so-called chaotic systems and to the recognition that there may well be fundamental limits to predicting the weather. One of the very few books covering 20th-century meteorology, this text is an excellent supplement to any course in general meteorology, forecasting, or history of science. Key Features: Provides a narrative account of the growth of meteorology in the 20th century. Explains how forecasting the weather became a physics-based science. Studies the impact of the computer on meteorology and thus provides an example of science transformed by the computer. Describes three traditions in meteorology: The empirical tradition of gathering data and making inferences; A theoretical tradition of explaining atmospheric motions by means of the laws of physics; The practical tradition of predicting the weather. Analyzes the increasing role of calculation within each of the traditions and explains how electronic digital computers made possible many connections between traditions. **Information Theory and Evolution** John Avery, 2012 Information Theory and Evolution discusses the

phenomenon of life including its origin and evolution and also human cultural evolution against the background of thermodynamics statistical mechanics and information theory Among the central themes is the seeming contradiction between the second law of thermodynamics and the high degree of order and complexity produced by living systems This paradox has its resolution in the information content of the Gibbs free energy that enters the biosphere from outside sources as the author will show The role of information in human cultural evolution is another focus of the book The first edition of Information Theory and Evolution made a strong impact on thought in the field by bringing together results from many disciplines The new second edition offers updated results based on reports of important new research in several areas including exciting new studies of the human mitochondrial and Y chromosomal DNA Another extensive discussion featured in the second edition is contained in a new appendix devoted to the relationship of entropy and Gibbs free energy to economics This appendix includes a review of the ideas of Alfred Lotka Frederick Soddy Nicholas Georgescu Roegen and Herman E Daly and discusses the relevance of these ideas to the current economic crisis The new edition discusses current research on the origin of life the distinction between thermodynamic information and cybernetic information new DNA research and human prehistory developments in current information technology and the relationship between entropy and economics

Grace Hopper and the Invention of the Information Age Kurt W. Beyer, 2012-02-10 The career of computer visionary Grace Murray Hopper whose innovative work in programming laid the foundations for the user friendliness of today's personal computers that sparked the information age A Hollywood biopic about the life of computer pioneer Grace Murray Hopper 1906 1992 would go like this a young professor abandons the ivy covered walls of academia to serve her country in the Navy after Pearl Harbor and finds herself on the front lines of the computer revolution She works hard to succeed in the all male computer industry is almost brought down by personal problems but survives them and ends her career as a celebrated elder stateswoman of computing a heroine to thousands hailed as the inventor of computer programming Throughout Hopper's later years the popular media told this simplified version of her life story In Grace Hopper and the Invention of the Information Age Kurt Beyer reveals a more authentic Hopper a vibrant and complex woman whose career paralleled the meteoric trajectory of the postwar computer industry Both rebellious and collaborative Hopper was influential in male dominated military and business organizations at a time when women were encouraged to devote themselves to housework and childbearing Hopper's greatest technical achievement was to create the tools that would allow humans to communicate with computers in terms other than ones and zeroes This advance influenced all future programming and software design and laid the foundation for the development of user friendly personal computers Productivity Machines Corinna Schlombs, 2019-10-01 How productivity culture and technology became emblematic of the American economic system in pre and postwar Germany The concept of productivity originated in a statistical measure of output per worker or per work hour calculated by the US Bureau of Labor Statistics A broader productivity culture emerged in 1920s America as

Henry Ford and others linked methods of mass production and consumption to high wages and low prices. These ideas were studied eagerly by Germany in search of economic recovery after World War I and decades later the Marshall Plan promoted productivity in its efforts to help post World War II Europe rebuild. In *Productivity Machines*, Corinna Schlombs examines the transatlantic history of productivity technology and culture in the two decades before and after World War II. She argues for the interpretive flexibility of productivity: different groups viewed productivity differently at different times. Although it began as an objective measure, productivity came to be emblematic of the American economic system post World War II. West Germany, however, adapted these ideas to its own political and economic values. Schlombs explains that West German unionists cast a doubtful eye on productivity's embrace of plant-level collective bargaining; unions fought for codetermination, the right to participate in corporate decisions. After describing German responses to US productivity, Schlombs offers an in-depth look at labor relations in one American company in Germany, that icon of corporate America, IBM. Finally, Schlombs considers the emergence of computer technology, seen by some as a new symbol of productivity but by others as the means to automate workers out of their jobs.

*Writing Computer and Information History* William Aspray, 2024-05-14

This is not a book about the history of computing or the history of information. Instead, it is a meta-historical book about the research and writing of these types of history. The formal presentation of historical research in the form of a publication often hides the process by which the topic was selected, boundaries were drawn, evidence was selected, an analytic approach was chosen, and applied results were presented. How this work fits into a larger body of scholarship, the implicit goals and biases of the author, and many other similar issues. This process of learning about the various ways to carry out computer history or information history can be enriched by this collection of reflective essays by experienced scholars discussing the craft that they practice. This is a book that concerns both computer history and information history. The first scholarship in computer history by professionally trained scholars began to appear in the 1970s, so we are approaching a half-century of research and publication in this area. The field has generated numerous pieces of exemplary scholarship from various perspectives, such as intellectual history of individual technologies, business histories of firms, economic histories of market sectors, externalist histories of funding and professionalization, and so on. However, the field continues to evolve, especially as computing and communication technologies have drawn together in the form of the Internet and social media, and with them, a new set of scholars is participating, drawn not only from the history of science and technology but also from the communication and media studies fields. Powerful theories, approaches, and frameworks are being increasingly drawn more widely from both the humanities and the social sciences to inform the practice of computer history. The scholars in this volume look at what's happened, what's happening now, and where historical scholarship in these disciplines is headed.

*History of Computer Science* Georg E. Schäfer, 2020-09-15

The history of Computer Science is a picture of dramatic changes. European scientists discovered many basic methods needed for computing. American companies saw the commercial

potential Asian factories produce first class products like mobile devices Chinese supercomputing is one of the leaders in the race to exascale computing power Freedom of information Open Data and Open Government are impossible without open Internet and net neutrality Privacy and security issues become important human rights while all of our avatars collect myriads of data and know more about us than we know ourselves Cloud Computing is the key for commercial organization of computing in the future Everyone needs orientation in this fast changing world A look into the history of computer science provides help to understand ICT technology of today **The Computer in the United States** James W.

Cortada,2016-09-16 This book studies how a technological innovation in this case the computer progresses from its origin as an idea in someone s mind to its eventual manifestation as a useable and marketable consumer product **Alan Turing's**

**Electronic Brain** B. Jack Copeland,2012-05-24 Well known for this crucial wartime role in breaking the ENIGMA code this book chronicles Turing s struggle to build the modern computer Includes first hand accounts by Turing and the pioneers of computing who worked with him **The Outsourcer** Dinesh C. Sharma,2015-03-06 A history of how India became a major

player in the global technology industry mapping technological economic and political transformations **When Computers Were Human** David Alan Grier,2013-11-01 Before Palm Pilots and iPods PCs and laptops the term computer referred to the people who did scientific calculations by hand These workers were neither calculating geniuses nor idiot savants but knowledgeable people who in other circumstances might have become scientists in their own right When Computers Were Human represents the first in depth account of this little known 200 year epoch in the history of science and technology Beginning with the story of his own grandmother who was trained as a human computer David Alan Grier provides a poignant introduction to the wider world of women and men who did the hard computational labor of science His grandmother s casual remark I wish I d used my calculus hinted at a career deferred and an education forgotten a secret life unappreciated like many highly educated women of her generation she studied to become a human computer because nothing else would offer her a place in the scientific world The book begins with the return of Halley s comet in 1758 and the effort of three French astronomers to compute its orbit It ends four cycles later with a UNIVAC electronic computer projecting the 1986 orbit In between Grier tells us about the surveyors of the French Revolution describes the calculating machines of Charles Babbage and guides the reader through the Great Depression to marvel at the giant computing room of the Works Progress Administration When Computers Were Human is the sad but lyrical story of workers who gladly did the hard labor of research calculation in the hope that they might be part of the scientific community In the end they were rewarded by a new electronic machine that took the place and the name of those who were once the computers **John von**

**Neumann: The Scientific Genius Who Pioneered the Modern Computer, Game Theory, Nuclear Deterrence, and**

**Much More** Norman Macrae,2019-07-31 John von Neumann was a Jewish refugee from Hungary considered a genius like fellow Hungarians Leo Szilard Eugene Wigner and Edward Teller who played key roles developing the A bomb at Los Alamos



during World War II As a mathematician at Princeton's Institute for Advanced Study where Einstein was also a professor von Neumann was a leader in the development of early computers Later he developed the new field of game theory in economics and became a top nuclear arms policy adviser to the Truman and Eisenhower administrations I always thought von Neumann's brain indicated that he belonged to a new species an evolution beyond man Macrae shows us in a lively way how this brain was nurtured and then left its great imprint on the world Hans A Bethe Cornell University The book makes for utterly captivating reading Von Neumann was of course one of this century's geniuses and it is surprising that we have had to wait so long for a fully fleshed and sympathetic biography of the man But now happily we have one Macrae nicely delineates the cultural familial and educational environment from which von Neumann sprang and sketches the mathematical and scientific environment in which he flourished It's no small task to render a genius like von Neumann in ordinary language yet Macrae manages the trick providing more than a glimpse of what von Neumann accomplished intellectually without expecting the reader to have a Ph D in mathematics Beyond that he captures von Neumann's qualities of temperament mind and personality including his effortless wit and humor And Macrae frames and accounts for von Neumann's politics in ways that even critics of them among whom I include myself will find provocative and illuminating Daniel J Kevles California Institute of Technology A lively portrait of the hugely consequential nonmathematician physicist et al whose genius has left an enduring impress on our thought technology society and culture A double salute to Steve White who started this grand book designed for us avid nonmathematical readers and to Norman Macrae who brought it to a triumphant conclusion Robert K Merton Columbia University The first full scale biography of this polymath who was born Jewish in Hungary in 1903 and died Roman Catholic in the United States at the age of 53 And Mr Macrae has some great stories to tell Mr Macrae's biography has rescued a lot of good science gossip from probable extinction and has introduced many of us to the life story of a man we ought to know better Ed Regis The New York Times A nice and fascinating picture of a genius who was active in so many domains Zentralblatt MATH Biographer Macrae takes a newspaperman approach which stresses the context and personalities associated with von Neumann's remarkable life rather than attempting to give a detailed scholarly analysis of von Neumann's papers The resulting book is a highly entertaining account that is difficult to put down Journal of Mathematical Psychology A full and intimate biography of the man who consciously and deliberately set mankind moving along the road that led us into the Age of Computers Freeman Dyson Princeton NJ It is good to have a biography of one of the most important mathematicians of the twentieth century even if it is a biography that focuses much more on the man than on the mathematics Fernando Q Gouv a Mathematical Association of America Based on much research his own and that of others especially of Stephen White Macrae has written a valuable biography of this remarkable genius of our century without the opacity of technical mathematical dimensions that are part of the hero's intellectual contributions to humanity Interesting informative illuminating and insightful Choice Review Macrae paints a highly readable humanizing portrait of a man whose

legacy still influences and shapes modern science and knowledge Resonance Journal of Science Education In this affectionate humanizing biography former Economist editor Macrae limns a prescient pragmatist who actively fought against fascism and who advocated a policy of nuclear deterrence because he foresaw that Stalin's Soviet Union would rapidly acquire the bomb and develop rocketry Macrae makes von Neumann's contributions accessible to the lay reader and also discusses von Neumann's relationships with two long suffering wives his political differences with Einstein and the cancer that killed him Publishers Weekly Macrae's life of the great mathematician shows dramatically what proper care and feeding can do for an unusually capacious mind John Wilkes Los Angeles Times

*The SAGE Handbook of Digital Technology Research* Sara Price, Carey Jewitt, Barry Brown, 2013-08-06 Research on and with digital technologies is everywhere today This timely authoritative Handbook explores the issues of rapid technological development social change and the ubiquity of computing technologies which have become an integrated part of people's everyday lives This is a comprehensive up to date resource for the twenty first century It addresses the key aspects of research within the digital technology field and provides a clear framework for readers wanting to navigate the changeable currents of digital innovation Main themes include Introduction to the field of contemporary digital technology research New digital technologies key characteristics and considerations Research perspectives for digital technologies theory and analysis Environments and tools for digital research Research challenges Aimed at a social science audience it will be of particular value for postgraduate students researchers and academics interested in research on digital technology or using digital technology to undertake research

**The ^ADigital Flood** Dr. James W. Cortada, 2013-02-01 In this book historian James W Cortada provides the first world wise history of how computers appeared and spread to over twenty nations in less than six decades It explores economic political social and technological reasons and consequences It is based on extensive research into primary and secondary sources and concludes with a discussion of implications for key players in the globalized economy

*Routines of Substitution* Mark Priestley, 2018-08-14 This work is a historical and philosophical study of the programming work carried out by John von Neumann in the period 1945-8 At the heart of the book is an examination of a manuscript featuring the earliest known surviving example of von Neumann's coding a routine written in 1945 to mesh two sequences of data and intended to be part of a larger program implementing the algorithm now known as mergesort The text of the manuscript itself along with a preliminary document describing the code he used to write this program are reproduced as appendices The program is approached in three chapters describing the historical background to von Neumann's work the significance of the sorting application itself and the development of the EDVAC the machine for which the program was written The subsequent chapters widen the focus again discussing the subsequent evolution of the program and the crucial topic of subroutines before concluding by situating von Neumann's work in a number of wider contexts The book also offers a unifying philosophical interpretation of von Neumann's approach to coding

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### **John Von Neumann And The Origins Of Modern Computing History Of Computing Introduction**

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