DOWNLOAD PDF PAPERS OF JOHN VON NEUMANN ON COMPUTING AND COMPUTER THEORY

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This volume brings together for the first time John von Neumann's long-out-of-print articles on computer architecture, programming, large-scale computing, and automata theory. A number of significant papers in these areas that were not included in the multivolume John von Neumann.

He was the first of the great creative mathematicians to devote major effort to the social sciences. After studying in Budapest and Zurich, von Neumann became a Privatdozent in Berlin; in he received an appointment at Princeton University , and in he joined the Institute for Advanced Study in Princeton, where he remained for the rest of his life. In , on leave from the institute, he was made a member of the U. For his scientific work and public services he received several honorary doctorates, academy memberships, prizes, medals, and other distinctions. He made important contributions to the axiomatics of set theory, mathematical logic, Hilbert space theory, operator theory, group theory, and measure theory. He proved the ergodic theorem, established a continuous geometry without points, introduced almost-periodic functions on groups, and at the end of his life was much concerned with nonlinear differential equations. In addition, he had a consuming interest in numerical applications, ranging from the development of new computing techniques to the study of the mathematical validity of large-scale numerical operations as they are carried out by modern electronic computers. In his Mathematical Foundations of Quantum Mechanics , a study of enduring significance, he laid a firm basis for this new field by the first comprehensive use and development of Hilbert space. In statistics he made contributions to trend analysis, and he developed the Monte Carlo method. He established the logical basis for electronic computer design and built the first of the truly modern flexible machines. He was also concerned with the development of a logical theory of automata and proved the possibility of a self-reproducing machine. For example, he opened up entirely new avenues in mathematical economics. In he published a fundamental paper on the theory of games of strategy in which the now famous minimax theorem was proved for the first time. This theorem establishes that, in a two-person zero-sum game with finite numbers of strategies, there always exist optimal strategies for each player. Selection of an optimal strategy is shown to involve the selection of proper probabilities of adopting each of the pure strategies available. The Theory of Games also developed a theory of individual choice in situations of risk, which has given rise to an extensive literature on utility. Game theory, besides analyzing games proper, is taken as a model for economic and social phenomena; it applies to all situations where the participants do not control or know the probability distributions of all variables on which the outcome of their acts depends, situations that therefore cannot be described as ordinary maximum or minimum problems even allowing for side conditions. Since the publication of the Theory of Games, hundreds of books and papers by many authors in many countries have furthered and applied the theory. In von Neumann wrote on the general equilibrium of a uniformly expanding closed economy under conditions of constant returns to scale in production and unlimited supply of natural resources. The linear production relations in the model include linear inequalities and take full account of alternative processes and of indirect production among industries. In these respects, the model is the forerunner of linear programming and activity analysis, both of which are related to game theory by virtue of the minimax theorem. This work, together with that of Abraham Wald , marked the beginning of a new period in mathematical economics. A solution of the system must satisfy the inequality constraints, and the existence of a solution is not ensured merely by the equality of the number of unknowns and the number of equations. He also believed that the mathematical treatment of the social sciences must be quite different from that of the physical sciences. His profound involvement with the social sciences and his very good knowledge of the natural sciences give special weight to his judgment that these two types of science have different mathematical structures. He expected the mathematical study of social phenomena to bring about the development of new mathematical techniques. He took the largely combinatorial approach of game theory as an indication that the time when this would happen might still be remote. While von Neumann was primarily interested in the mathematical problems of the physical sciences, he nevertheless had a profound concern for the social sciences, which he considered to be in a state comparable to that of physics prior to Newton. This concern expressed itself also in his interest in history and politics, two fields in which he read widely. He had great influence on his contemporaries not only through the large amount of his published work but also through his many contacts with scientists all over the world. Volume 4, pages in A. Duncan Luce editors , Contributions to the Theory of Games. Investigations in Physics, No. Volume 4, pages in John von Neumann, Collected Works. Ergebnisse eines mathematischen Kolloquiums 8: Annals of Mathematical Studies, Nos. Volume 5, pages in John von Neumann, Collected Works. Princeton Mathematical Series, No. Edited and completed by A. Ein grosses Mathematikerleben unserer Zeit. John von Neumann, American Mathematical Society, Bulletin 64, no. Morgenstern, Oskar Obituary:

Chapter 2 : DR. JOHN VON NEUMANN - THE OFFICIAL RECORD

John von Neumann was a Hungarian-born American mathematician with a minor interest in economics. He earned a degree in mathematics from the University of Budapest and one in chemical engineering from the Hochschule in Zurich.

Four different experts respond: The roots of the modern computer virus go back to , when computer pioneer John von Neumann presented a paper on the "Theory and Organization of Complicated Automata," in which he postulated that a computer program could reproduce. Strangely enough, two science-fiction books in the s helped to promote the concept of a replicating program. Back in the real world, Fred Cohen presented the first rigorous mathematical definition for a computer virus in his Ph. Cohen coined the term "virus" at this point and is considered the father of what we know today as a computer virus. He sums it up in one sentence as "a program that can infect other programs by modifying them to include a, possibly evolved, version of itself. Morris unleashed the infamous "Internet Worm. Reporters grew infatuated with the idea of a tiny piece of software knocking out big mainframe computers worldwide. The rest, as they say, is history. Protection, by Pamela Kane. Bantam Books, New York, Theory and Experiments," described by Frederick B. ASP Press, Pittsburgh, The term "computer virus" was coined in the early s. Fred Cohen, then a Ph. He showed this idea to Len Adleman, his thesis advisor. Adleman pointed out the similarity to a biological virus, which uses the resources of the cell it attacks to reproduce itself, and the term "computer virus" began its journey into everyday English. Since then, computer viruses have mimicked their biological namesakes, spreading digital disease around the world. The history of the computer virus began in the s when John von Neumann published a paper called "Theory and Organization of Complicated Automata," which documented the possibility of replicating computer programs. John Conway is credited with creating the first "virus" in the form of a life emulating program called the "Game of Life" in the s. In the s the first true self-replicating programs, referred to as "organisms," were written as experiments in artificial intelligence on UNIX systems and used in small, isolated network type games by large research companies. In the term "virus" was first coined to describe self-replicating programs by Frederick Cohen and his colleague, Len Adleman. The first reports of serious damage from a PC virus occurred in ; the infection was caused by the "Pakistani Brain" virus, which was written by two brothers, Basit and Amjad Farooq Alvi, of Lahore, Pakistan. A final reply comes from Jacob Motola of Integralis, a software security company: The concept behind the first malicious computer programs was described years ago in the Computer Recreations column of Scientific American. The metaphor of the "computer virus" was adopted because of the similarity in form, function and consequence with biological viruses that attack the human system. Computer viruses can insert themselves in another program, taking over control or adversely affecting the function of the program. Like their biological counterparts, computer viruses can spread rapidly and self-replicate systematically. They also mimic living viruses in the way they must adapt through mutation to the development of resistance within a system: Computer viruses also act like biologics in the way they can be set off: But computer viruses can also be triggered at a specific time time bomb. Most viruses act innocuous towards a system until their specific condition is met. The computer industry has expanded the metaphor to now include terms like inoculation, disinfection, quarantine and sanitation. Now if your system gets infected by a computer virus you can quarantine it until you can call the "virus doctor" who can direct you to the appropriate "virus clinic" where your system can be inoculated and disinfected and an anti-virus program can be prescribed. Answer originally posted September 2,

Chapter 3 : John von Neumann

Rao Mikkilineni, Giovanni Morana, Cognitive distributed computing: a new approach to distributed data centres with self-managing services on commodity hardware, International Journal of Grid and Utility Computing, v.7 n.2, p, January

Zermeloâ€"Fraenkel set theory provided a series of principles that allowed for the construction of the sets used in the everyday practice of mathematics, but they did not explicitly exclude the possibility of the existence of a set that belongs to itself. In his doctoral thesis of , von Neumann demonstrated two techniques to exclude such setsâ€"the axiom of foundation and the notion of class. If one set belongs to another then the first must necessarily come before the second in the succession. This excludes the possibility of a set belonging to itself. To demonstrate that the addition of this new axiom to the others did not produce contradictions, von Neumann introduced a method of demonstration, called the method of inner models , which later became an essential instrument in set theory. Under the Zermeloâ€"Fraenkel approach, the axioms impede the construction of a set of all sets which do not belong to themselves. In contrast, under the von Neumann approach, the class of all sets which do not belong to themselves can be constructed, but it is a proper class and not a set. The next question was whether it provided definitive answers to all mathematical questions that could be posed in it, or whether it might be improved by adding stronger axioms that could be used to prove a broader class of theorems. Moreover, every consistent extension of these systems would necessarily remain incomplete. Von Neumann algebra Von Neumann introduced the study of rings of operators, through the von Neumann algebras. Murray , on the general study of factors classification of von Neumann algebras. The six major papers in which he developed that theory between and "rank among the masterpieces of analysis in the twentieth century". Lifting theory In measure theory , the "problem of measure" for an n-dimensional Euclidean space Rn may be stated as: The positive solution for spaces of dimension at most two, and the negative solution for higher dimensions, comes from the fact that the Euclidean group is a solvable group for dimension at most two, and is not solvable for higher dimensions. In anticipation of his later study of dimension theory in algebras of operators, von Neumann used results on equivalence by finite decomposition, and reformulated the problem of measure in terms of functions. In mathematics, continuous geometry is a substitute of complex projective geometry , where instead of the dimension of a subspace being in a discrete set 0, 1, Earlier, Menger and Birkhoff had axiomatized complex projective geometry in terms of the properties of its lattice of linear subspaces. Von Neumann, following his work on rings of operators, weakened those axioms to describe a broader class of lattices, the continuous geometries. While the dimensions of the subspaces of projective geometries are a discrete set the non-negative integers , the dimensions of the elements of a continuous geometry can range continuously across the unit interval [0,1]. Von Neumann was motivated by his discovery of von Neumann algebras with a dimension function taking a continuous range of dimensions, and the first example of a continuous geometry other than projective space was the projections of the hyperfinite type II factor. It is conserved by perspective mappings "perspectivities" and ordered by inclusion. The deepest part of the proof concerns the equivalence of perspectivity with "projectivity by decomposition"â€"of which a corollary is the transitivity of perspectivity. This conclusion is the culmination of pages of brilliant and incisive algebra involving entirely novel axioms.

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Chapter 4 : Von Neumann architecture - Wikipedia

Papers of John von Neumann on Computers and Computer Theory is volume 12 in the Charles Babbage Institute Reprint Series for the History of Computing. A number of significant papers in these areas that were not included in the multivolume John von Neumann.

His was a mind comfortable in the realms of both man and machine. His kinship with the logical machine was displayed at an early age by his ability to compute the product of two eight-digit numbers in his head. He was the first-born son of Neumann Miksa and Kann Margit. In Hungarian, the family name appears before the given name. Max Neumann, born , arrived in Budapest in the late s. He was a non-practicing Hungarian Jew with a good education. He became a doctor of laws and then worked as a lawyer for a bank. He had a good marriage to Margaret, who came from a prosperous family. In , Budapest was growing rapidly, a booming, intellectual capital. At a very young age, Von Neumann was interested in math, the nature of numbers and the logic of the world around him. The young Von Neumann was not only interested in math, though. Just as in his adult life he would claim fame in a wide range of disciplines and be declared a genius in each one , he also had varying interests as a child. Even this early, Von Neumann showed that he was comfortable applying his mind to both the logical and social world. His parents encouraged him in every interest, but were careful not to push their young son, as many parents are apt to do when they find they have a genius for a child. This allowed Von Neumann to develop not only a powerful intellect but what many people considered a likable personality as well. It was never in question that Von Neumann would attend university, and in , at the age of 10, the educational road to the university started at the Lutheran Gymnasium. This was one of the three best institutions of its kind in Budapest at the time and gave Von Neumann the opportunity to develop his great intellect. Before he would graduate from this high school he would be considered a colleague by most of the university mathematicians. His first paper was published in , when he was 17, in the Journal of the German Mathematical Society, dealing with the zeros of certain minimal polynomials. Though John Von Neumann had little interest in either chemistry or engineering, his father was a practical man and encouraged this path. So, Von Neumann set on the road planned in part by his father Max. He would spend two years in Berlin in a non-degree chemistry program. After this, he would take the entrance exam for second year standing in the chemical engineering program at the prestigious Eidgennossische Technische Hochschule ETH in Zurich, where Albert Einstein had failed the entrance exam in and then gained acceptance a year later. During this time of practical undergraduate study, Von Neumann was executing another plan that was more in tune with his interests. In the summer after his studies at Berlin and before he went to Zurich he enrolled at the Budapest University as a candidate for an advanced doctorate in mathematics. At the time, this was one of the hot topics in mathematics and had already been studied by great professors, causing a great deal of trouble to most of them. None-the-less, the young Von Neumann, devising and executing this plan at the age of 17, was not one to shy away from great intellectual challenges. Von Neumann breezed through his two years at Berlin and then set himself to the work on chemical engineering at the ETH and his mathematical studies in Budapest. He received excellent grades at the ETH, even for classes he almost never attended. He received a perfect mark of 6 in each of his courses during his first semester in the winter of - ; courses including organic chemistry, inorganic chemistry, analytical chemistry, experimental physics, higher mathematics and French language. From time to time he would visit Budapest University when his studies there required his presence and to visit his family. He worked on his set theory thesis in Zurich while completing classes for the ETH. After finishing his thesis he took the final exams in Budapest to receive his Ph. This was just after his graduation from the ETH, so in he had two degrees, one an undergraduate degree in chemical engineering and the other a Ph. Quantum mechanics deals with the nature of atomic particles and the laws that govern their actions. Theories of quantum mechanics began to appear to confront the discrepancies that occurred when one used purely Newtonian physics to describe the observations of atomic particles. One of these observations has to do with the wavelengths of light that atoms can absorb and emit. For example, hydrogen atoms absorb energy at This was contrary to the principles of physics as they were at the end of the nineteenth century, which would predict that an electron orbiting the nucleus in an atom should radiate all wavelengths of light, therefore losing energy and quickly falling into the nucleus. This is obviously not what is observed, so Berliner Max Planck introduced a new theory of quanta in that said energy could only be emitted in certain definable packets. They contested that these values were not directly observable only the light emitted by the atom could be observed and so could behave much differently from the motion of a particle in Newtonian physics. They theorized that the values of position and momentum should be described by mathematical constructs other than ordinary numbers. The calculations they used to describe the motion of the electron made use of matrices and matrix algebra. These two systems, although apparently very different, were quickly determined to be mathematically equivalent, two forms of the same principle. The proponents of the two systems, none-the-less, denounced the others theories and claimed their own to be superior. It is in this environment, in , that Von Neumann appears on the scene and quickly went to work reconciling and advancing the theories of quantum mechanics. Von Neumann wanted to find what the two systems, wave mechanics and matrix mechanics, had in common. Through a more rigorous mathematical approach he wanted to find a new theory, more fundamental and powerful than the other two. He abstracted the two systems using an axiomatic approach, in which each logical state is the definite consequence of the previous state. His formalism of the subject allowed considerable advances to be made by others and even predicted strange new consequences, one that consciousness and observations alone can affect electrons in the laboratory. Von Neumann was now a rising star in the academic world, lecturing on new ideas, assisting other great minds of the time with their own works, and creating an image for himself as a likable and witty young genius in his early twenties. He would often avoid arguments with the more confrontational of his colleagues by telling one of his many jokes or stories, some of which he could not tell in the presence of ladies though there were few women at these mathematical seminars. Other times he would bring up some interesting fact from ancient history, changing the subject and making Von Neumann seem surprisingly learned for his age and professional interests. Near the end of he was offered a lectureship at Princeton in an America that was trying to stimulate its mathematical sciences by seeking out the best of Europe. At this same time, Von Neumann decided to marry Mariette Kovesi, whom he had known since his early childhood. They had a daughter, Marina, in Von Neumann was affectionate with his new daughter, but did not contribute to the care of her or to the housework, which he considered to be the job of the wife. The gap between the lively year-old Mariette and the respectable year-old John Von Neumann began to increase and in they broke up, Mariette going home to Budapest and Von Neumann, after drifting around Europe to various engagements, went to the United States. Soon after, on a trip to Budapest, he met Klari Dan and they were married in Although this marriage lasted longer than his first, Von Neumann was often distant from his personal life, obsessed and engrossed in his thoughts and work. It is important to remember that there was a collection of great minds there, recruited by the American government to produce what many saw as a necessary evil. They needed some way to predict what was going to happen in these complex reactions without actually performing them. Von Neumann therefore was a member of the team that invented modern mathematical modeling. He applied his math skills at every level, from helping upper officials to make logical decisions to knocking down tough calculations for those at the bottom of the ladder. The atomic bombs that were eventually dropped were of two kinds, one using Uranium as its fissionable material, the other using Plutonium. An atomic chain reaction occurs when the fissile material present in the bomb reaches a critical mass, or density. In the Uranium bomb, this was done using the gun method. A large mass of Uranium, still under the critical mass, would have another mass of Uranium shot into a cavity. The combined masses would then reach critical mass, where an uncontrolled nuclear fission reaction would occur. This process was known to work and was a relatively simple procedure. The difficult part was obtaining the Uranium, which has to be separated from other isotopes of Uranium, which are chemically identical. Plutonium, on the other hand, can be separated using chemical means, and so production of Plutonium based bombs could progress more quickly. The problem here was that Plutonium bombs could not use the gun method. The Plutonium would need to reach critical mass through another technique, implosion. Here, a mass of Plutonium is completely surrounded by high explosives that are ignited simultaneously to cause the Plutonium mass to compress to supercritical levels and explode. Development of Modern Computing Just like the project at Los Alamos, the development of the modern computer was a collaborative effort including the ideas and effort of many great scientists. Also like the development of nuclear weaponry, there have been many volumes written about the development of modern computer. With so much involved in the process and Von Neumann himself being involved in so much of it, only a few contributions can be covered here. Also, because of his far reaching and influential connections, through the IAS, Los Alamos, a number of Universities and his reputation as a mathematical genius, he was in a position to secure funding and resources to help develop the modern computer. In this was a very difficult task because computing was not yet a respected science. Most people saw computing only as making a bigger and faster calculator. Von Neumann on the other hand saw bigger possibilities. Von Neumann wanted computers to be put to use in all fields of science, bringing a more logical and precise nature to those fields as he had tried to do. Today we have extremely powerful computing machines used in scores of scientific fields, as well many more non-scientific fields. In this vein, Von Neumann developed a theory of artificial automata. Von Neumann believed that life was ultimately based on logic, and so any construct that supports logic should be able to support life. Artificial automata, like their natural counter parts, process information and proceed in their actions based on data received from their environment in light of rules and instructions they hold internally. Cellular automata are a class of automata that exist in an infinite plane that is covered by square cells, much like a sheet of graph paper. Each of these cells can rest in a number of states. The whole plane of cells will go through time steps, where the new state of each cell is determined by its own state and the state of the cells neighboring it. In these simple actions there lies a great complexity and the basis for life like actions. This constructs an arm that extends and forms a new automaton, exactly like the original. He died on February 8, , 18 months after he was diagnosed with cancer. He never finished his work on automata theory, although he worked as long as he possibly could. He attended ceremonies held in his honor using a wheelchair, and tried to keep up appearances with his family and friends. Though he had accomplished so much in his years he could not accept death, could not consider a world that existed without his mind constantly thinking and solving. But today, his ideas live on and affect our lives in more ways than the few examples given here can demonstrate. New York, NY, Aspray, William, and Arthur W.

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Chapter 5 : History of Computers and Computing, Birth of the modern computer, The thinkers, John von Ne

The codon table is formal, not physical. Genetic cybernetics inspired Turing's, von Neumann's, and Wiener's development of computer science The discrete nature of genes.

History[edit] The earliest computing machines had fixed programs. Some very simple computers still use this design, either for simplicity or training purposes. For example, a desk calculator in principle is a fixed program computer. It can do basic mathematics , but it cannot run a word processor or games. Changing the program of a fixed-program machine requires rewiring, restructuring, or redesigning the machine. The earliest computers were not so much "programmed" as "designed" for a particular task. A stored-program computer includes, by design, an instruction set , and can store in memory a set of instructions a program that details the computation. A stored-program design also allows for self-modifying code. One early motivation for such a facility was the need for a program to increment or otherwise modify the address portion of instructions, which operators had to do manually in early designs. This became less important when index registers and indirect addressing became usual features of machine architecture. Another use was to embed frequently used data in the instruction stream using immediate addressing. Self-modifying code has largely fallen out of favor, since it is usually hard to understand and debug , as well as being inefficient under modern processor pipelining and caching schemes. Capabilities[edit] On a large scale, the ability to treat instructions as data is what makes assemblers , compilers , linkers , loaders , and other automated programming tools possible. It makes "programs that write programs" possible. Some high level languages such as LISP leverage the von Neumann architecture by providing an abstract, machine-independent way to manipulate executable code at runtime, or by using runtime information to tune just-in-time compilation e. On a smaller scale, some repetitive operations such as BITBLT or pixel and vertex shaders can be accelerated on general purpose processors with just-in-time compilation techniques. This is one use of self-modifying code that has remained popular. Development of the stored-program concept[edit] The mathematician Alan Turing , who had been alerted to a problem of mathematical logic by the lectures of Max Newman at the University of Cambridge , wrote a paper in entitled On Computable Numbers, with an Application to the Entscheidungsproblem , which was published in the Proceedings of the London Mathematical Society. In , Konrad Zuse also anticipated in two patent applications that machine instructions could be stored in the same storage used for data. This was the first time the construction of a practical stored-program machine was proposed. Many people have acclaimed von Neumann as the "father of the computer" in a modern sense of the term but I am sure that he would never have made that mistake himself. He might well be called the midwife, perhaps, but he firmly emphasized to me, and to others I am sure, that the fundamental conception is owing to Turingâ€" in so far as not anticipated by Babbageâ€¦ Both Turing and von Neumann, of course, also made substantial contributions to the "reduction to practice" of these concepts but I would not regard these as comparable in importance with the introduction and explication of the concept of a computer able to store in its memory its program of activities and of modifying that program in the course of these activities. It described in engineering and programming detail, his idea of a machine he called the Automatic Computing Engine ACE. Although Turing knew from his wartime experience at Bletchley Park that what he proposed was feasible, the secrecy surrounding Colossus , that was subsequently maintained for several decades, prevented him from saying so. Various successful implementations of the ACE design were produced. In the publication Faster than Thought: Bowden , a section in the chapter on Computers in America reads as follows: The report contained a detailed proposal for the design of the machine that has since become known as the E. This machine has only recently been completed in America, but the von Neumann report inspired the construction of the E. In , Burks, Goldstine and von Neumann published another report that outlined the design of another type of machine a parallel machine this time that would be exceedingly fast, capable perhaps of 20, operations per second. They pointed out that the outstanding problem in constructing such a machine was the development of suitable memory with instantaneously accessible contents. At first they suggested using a special vacuum tube â€”called the " Selectron "â€”which the Princeton Laboratories of RCA had invented. These tubes were expensive and difficult to make, so von Neumann subsequently decided to build a machine based on the Williams memory. This machineâ€”completed in June, in Princetonâ€”has become popularly known as the Maniac. The design of this machine inspired at least half a dozen machines now being built in America, all known affectionately as "Johniacs. The equipment so far erected at the Laboratory is only the pilot model of a much larger installation which will be known as the Automatic Computing Engine, but although comparatively small in bulk and containing only about thermionic valves, as can be judged from Plates XII, XIII and XIV, it is an extremely rapid and versatile calculating machine. The basic concepts and abstract principles of computation by a machine were formulated by Dr. In , however, an examination of the problems was made at the National Physical Laboratory by Mr. Womersley, then superintendent of the Mathematics Division of the Laboratory. He was joined by Dr. Turing and a small staff of specialists, and, by , the preliminary planning was sufficiently advanced to warrant the establishment of the special group already mentioned. Early von Neumann-architecture computers[edit] The First Draft described a design that was used by many universities and corporations to construct their computers.

Chapter 6 : When did the term 'computer virus' arise? - Scientific American

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John von Neumann (/ v É’ n Ëˆ n É”Éª m É™ n /; Hungarian: Neumann JÃ¡nos Lajos, pronounced [ËˆnÉ’jmÉ’n ËˆjaË•noÊƒ ËˆlÉ’joÊƒ]; December 28, - February 8,) was a Hungarian-American mathematician, physicist, computer scientist, and polymath.

Chapter 8 : John von Neumann - Wikipedia

David K. Allison, "Papers of John von Neumann on Computing and Computer calendrierdelascience.com von Neumann, William Aspray, Arthur Burks," Isis 78, no. 4 (Dec.,):

Chapter 9 : Papers of John von Neumann on computing and computer theory - John Von Neumann - Goog

W. Aspray, John von Neumann's Contributions to Computing and Computer Science, IEEE Annals of the History of Computing, v n.3, p, September Pierre Marchal, John von Neumann: the founding father of artificial life, Artificial Life, v.4 n.3, p, Summer