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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Donald E. Eckdahl
Interviewer:	Henry Tropp
Date:	September 25, 1972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 47 pp.

Abstract: Eckdahl, born in 1924, studied electrical engineering at the University of California, entered the Navy's V-l2 program and served as a Navy officer from August 1945 until the following spring. He considered doing graduate work at the California Institute of Technology, but was hired by Erik Ackerlind of Northrop. There he worked with Richard Sprague and Floyd Steele on a guidance system for the Snark missile. Eckdahl was particularly interested in logic and architecture design and circuitry. Steele not only saw how Boolean algebra could be applied to vacuum tube circuits, but came up with the idea of the Digital Differential Analyzer (DIDA). Eckdahl worked on an alternative magnetic drum machine, the MADDIDA, in which addition was handled serially rather than in parallel. The Northrop engineers learned of stored programs from the Electronic Discrete Variable Automatic Computer (EDVAC) proposal and consulted with Eckert and Mauchly. Steele, Sarkissian, Sprague, Eckdahl, and others left Northrop to start Computer Research Corporation (CRC). They first designed the CRC 101, an airborne digital differential analyzer built for North American. The CRC 102 or the Cambridge Digistal Automatic Computer (CADAC) was a binary general purpose computer, with magnetic drum memory, serial design and as few vacuum tubes as possible. Designers made early use of flow diagrams, an approach picked up by General Electric. Eckdahl comments on the acquisition of CRC by NCR, on diverse Northrop and CRC staff, and on the differences between early designers of computers like him and users who developed the software of assemblers, compilers, and executives. People mentioned several times are J.W. Mauchly, Harold Sarkissian, Richard Sprague, and Floyd Steele.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Robert Philip Eddy
Interviewer:	Uta C. Merzbach
Date:	October 30, 1969
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 33 pp.

Abstract: Eddy graduated from Brown University in 1948 with a master's in applied mathematics. During the summer of 1948, Eddy applied for and was offered a summer job at the Naval Ordnance Laboratory (NOL) working on a heat conduction problem for an anti-aircraft projectile. He comments on the MARK II, the computer used in connection with the project. Eddy's remaining time at NOL was spent on the mathematics of computation, the integration of partial differential equations, and explosion problems. In 1952, Eddy joined the staff of the Applied Mathematics Lab at David Taylor Model Basin, Bureau of Ships, as head of one of the two programming branches. He discusses the arrival of the Universal Automatic Computer (UNIVAC) I, his experience with the machine, and its language, C-10. Individuals mentioned are, William Parager, Herbert J. Greenberg, Ralph Nieman, Daniel Shanks, Theodore Thalheimer, Jean Boyer, Lewis Landweber, Grace Murray Hopper, Franz Alt, and Betty Cuthill.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Walt Edwards
Interviewer:	Richard R. Mertz
Date:	February 2, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 22 pp.
Abstract:	See Leroy Kaufold interview.
Citation:	Computer Oral History Collection, Archives Center, National Museum of American History.
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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Robert D. Elbourn
Interviewer:	Richard R. Mertz
Date:	March 23, 1971
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 66 pp.

Abstract: Elbourn, born in Indiana in 1919, obtained a B.S. in electrical engineering from Purdue University in 1940. His specialty was acoustics, and he worked for a year on musical acoustics for C.G. Conn, Ltd. During World War II, Elbourn was at the Naval Ordnance Laboratory. He stayed on after the war to work with J.V. Atanasoff, both on a general purpose scientific computer that was never built and on seismic and barometric measurements of shock waves generated by explosions of munitions. Elbourn also attended a summer course on computing at the Moore School of Engineering in 1946. There he met Samuel Alexander, who later offered him a job at the National Bureau of Standards (NBS). Elbourn accepted and stayed at the Bureau from 1947 until the end of his career. Elbourn comments on the memory of Atanasoff `s pre-war computer and on the programming of the Electronic Numerical Integrator and Automatic Computer (ENIAC). At NBS, he first worked on an input/output device for the Electronic Discrete Variable Automatic Computer (EDVAC) and the Institute for Advanced Study (IAS) computers. By 1948, impatient with delays in the production of these machines, the Bureau decided to build its own binary, 4-address computer with a mercury acoustic delay line memory. This machine, the Standards Eastern Automatic Computer (SEAC), was patterned after the EDVAC and completed in May 1950. Elbourn was especially involved in the design of the memory and the logic; Ralph Slutz directed the entire project. Elbourn also comments on the selection and testing of tubes and diodes, on maintenance, on causes of delay and on problems of the external electrostatic memory. S. Alexander, J.V. Atanasoff, J.H. Bigelow, E. Cannon, H.D. Huskey, S. Lubkin, J.W. Mauchly, H. Senf, A. Sultz and J. von Neumann are mentioned several times.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Harlan Elkins
Interviewer:	Robina Mapstone
Date:	January 29, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 30 pp.

Abstract: Interview begins discussing Elkin's exposure to VERDAN in late 1959. VERDAN was in place at Edmund Air Force Base to help test the GAM 77 Hound Dog Missile. Also comments on the CONLOC, the continuity and logic checker which was used to aid in trouble shooting the computer. Elkins discusses several other computers, Dinosaur, V-9-L VERDAN, MARDAN used to solve aircraft navigation problems in detail. Comments on training and competitors.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Gerald Estrin
Interviewer:	Robina Mapstone
Date:	January 26, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 42 pp.

Abstract: Estrin received a doctorate in electrical engineering at the University of Wisconsin in 1950 and was then hired by John von Neumann to work at the Institute for Advanced Study (IAS) at Princeton. He discusses his work there in computer design: first in input-output devices, then in memory, arithmetic units, and design and implementation of the control system. He talks about the importance of establishing the underlying philosophy of the organization and laying the groundwork for what should be done. Another topic he addresses is the difficulty getting the equipment to work properly, leading to extensive repair and redesign. In 1953, Estrin and his family went to Israel, where he worked on a Lipsky fellowship at the Weizmann Institute of Science. During the 18 months he was there, he worked on the design and construction of the first computer in Israel. He also trained the technicians and engineers who worked on the computer. Later in his career, the Estrins moved to UCLA. Among those mentioned in the interview, particular emphasis is given to John von Neumann, Julian Bigelow, Chaim Pekeris, and Ephraim Frei.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Robert Everett
Interviewer:	Richard R. Mertz
Date:	January 26, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 24 pp.

Abstract: Everett graduated from Duke University in June of 1942, with a degree in electrical engineering. Upon graduating, Everett entered the Massachusetts Institute of Technology (MIT) to begin graduate work and to work in the Servomechanisms Lab for Jay Forrester. At the lab, he was responsible for testing portions of new pumps, motors, and amplifiers Forrester was developing. Everett graduated from MIT in 1943 and became a fulltime member of the Servomechanisms Lab. He discusses his work in the lab, particularly events and projects leading up to WHIRLWIND. He comments on Forrester's decision to go from analog to digital, and the problem of a serial machine versus a parallel machine. Mentions Jay Forrester and Gordon Brown.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Robert Everett
Interviewer:	Richard R. Mertz
Date:	May 29, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 44 pp.

Abstract: Interview appears to be a continuation of the January 26, 1970, interview.

Everett discusses various components of WHIRLWIND, design changes from a serial to a parallel machine, and block diagrams. He comments on meeting von Neumann and discussing the advantages to the using a parallel machine. Everett notes that WHIRLWIND was a different machine from all the other machines being designed and built because it was for real time applications with increased speed and reliability.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Robert Everett
Interviewer:	Henry S. Tropp
Date:	August 3, 1972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 40 pp.

Abstract: Begins discussion with the control analyzer in 1944.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Fall Joint Computer Conference
Interviewer:	
Date:	November 17, 1971
Repository:	Archives Center, National Museum of American History
Description:	No transcript

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Fall Joint Computer Conference
Interviewer:	
Date:	December 6, 1972
Repository:	Archives Center, National Museum of American History
Description:	No transcript

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	William Farrand
Interviewer:	
Date:	January 29, 1973
Repository:	Archives Center, National Museum of American History
Description:	No transcript

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	William Farrand and William Downey
Interviewer:	Robina Mapstone
Date:	June 25, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 55 pp.

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_farr730625.pdf

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	David Feign
Interviewer:	Robina Mapstone
Date:	April 4, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 83 pp.
Abstract:	See Allan Beek interview.
Citation:	Computer Oral History Collection, Archives Center, National Museum of American History.
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Computer Oral History Collection, 1969-1973, 1977

Interviewee: Louis Fein
Interviewer: Henry S. Tropp
Date: May 4, 1973
Repository: Archives Center, National Museum of American History
Description: Transcript, 73 pp.

Abstract: Louis Fein graduated from Long Island University in 1938, with a bachelor's degree in physics. Upon graduating, Fein entered the University of Colorado at Boulder to work on his master's degree in physics. He graduated from Colorado in 1941 and went to work as as an instructor in mathematics at Earlham College in Richmond, Indiana. By 1943, Fein had left Earlham and went to work for the Harvard Underwater Sound Laboratory as an engineer on sonar devices, underwater sound gear, acoustic gear, and ultrasonic gear. While working at the Lab, Fein took courses at Harvard and the Massachusetts Institute of Technology (MIT) in electronics and mathematics. When the Harvard Underwater Sound Laboratory closed, Fein went to work for Submarine Signal Company, The Submarine Signal Company permitted Fein to enroll at Brown University to work on his doctorate in 1945. After finishing his doctorate, Fein began looking for employment that would utilize all of his interests: ultrasonics, physics, and electronic engineering. In 1948, Fein applied to the Raytheon Manufacturing Company, who had a contract to make two computers under the HURRICANE project for Point Magu in California. At Raytheon, Fein's first task was to design a magnetic tape system. Comments on colleagues associated with the project and the features of the machine that they were responsible for in great detail. Discusses WHIRLWIND and role, not in terms of duplication, but in discussions with Forrester regarding HURRICANE. Identifies the characteritics—checking, full buffer, tape, and cooling—behind the Raytheon Digital Automatic Computer (RAYDAC). RAYDAC would be completed in 1951, delivered in 1952, and stay in operation at Point Magu until 1960. Fein left Raytheon after the RAYDAC was completed to start Computer Control Company. Fein ultimately moved to California to start a computing center at Point Magu and to maintain the RAYDAC. Discusses his contribution with respect to education in the computer field. Fein taught from 1952 to 1953 at Wayne State University a course on digital computer systems and then later in 1956, at Stanford University. He comments on the topics discussed and the types of things he had his students do. Fein would later be

hired as a consultant to Stanford University to recommend what they should do with respect to the computer field. Fein developed a report that outlined a graduate school in computer science. This would be the first time a program about computers would be totally independent of mathematics and physics. Comments briefly on the development of computer science curriculums and their importance. Mentions Norman Taylor, Jay Forrester, Dick Bloch and Bob Campbell.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Alfred Fenaughty
Interviewer:	Robina Mapstone
Date:	May 4, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 48 pp.

Abstract: Fenaughty discusses the history of Engineering Research Associates (ERA), its start as an outgrowth of a Navy group assembled to build cryptanalytic equipment during World War II, its development as a part of Northwestern Aeronautical Corporation, the gradual change of name to ERA, and the change of function to digital computer design. Fenaughty discusses the ERA 1100 series, and, after his transfer to Remington Rand, the interaction with the Eckert-Mauchly group, which had been acquired by Remington Rand at about the same time. He also talks about the "bootleg" machine he worked on at Computer Control Company (3C), the DDP24. At the time of the interview, he was with Information International. Among those most often mentioned are Sidney Rubens, J. Presper Eckert, Joe Brustman, and John Coombs.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	George Forbes
Interviewer:	Robina Mapstone
Date:	June 7, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 40 pp.

Abstract: George Forbes contact with computers came in approximately 1938 when he went to the Massachusetts Institute of Technology (MIT) to work with desk calculators. By 1949, at Inyokern, CA, Forbes worked with an IBM installation at a test facility for 275 rockets and other ordnance. From 1951 to 1952, Forbes worked at Edwards Air Force Base with data reduction using desk calculators for flight testing. Forbes soon left Edwards for Lockheed to work with Fred Cozzone's group on the Magnetic Drum Digital Differential Analyzer (MADDIDA). Comments on his work with the MADDIDA, 701, 702, and CRC-105. Forbes joined Litton in 1956 to work on their Litton-20 program and help write an instruction manual for the machine. He also addressed potential customers' problems, helped with sales, and demonstrated the computers at shows. Discusses the technology of the Litton-20 in detail and makes general remarks on the Digital Differential Analyzer (DDA). Litton internally split into two sections, Data Systems and Guidance. Forbes went with Guidance (which was concerned with inertial systems) to make the 704 work as a simulator. Forbes began to leave this type of work in favor of programming airborne arithmetic computers and what today are known as minicomputers. Concludes with reflections on differences in approach to differential equations. Mentions George Steele and Max Palevsky.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee: Cameron Forrest
Interviewer: Robina Mapstone
Date: June 1973
Repository: Archives Center, National Museum of American History
Description: Transcript, 44 pp.

Abstract: Forrest graduated from the University of Alabama in chemistry in 1943. He then received extensive training as a Navy radar officer and had just joined a ship when the war ended. He pent a year acquiring the equivalent of a B.S. in electrical engineering at the University of California. As a graduate student there he worked under Paul Morton on the Califronia Digital Computer (CALDIC). In 1948, Forrest obtained his master's degree; the next year he went to work for Hughes Aircraft Corporation. Forrest left Hughes for Litton industries in 1955. He worked on the design of the magnetic drum, the magnetic recording heads, the divider and the logic of the CALDIC; leaving before the computer was built. At Hughes he built the drum memory for the DIGITAC, a prototype computer designed to guide aircraft of the Tactical Air Command on bombing runs. The DIGITAC was tested in flight in 1951, but never actually produced. It was followed by a second general purpose computer, the CYTAC, which also never went into production. Well before the DIGITAC was complete, Forrest was pulled off the project to work on another general purpose digital computer with drum memory, the MX-ll79 (later called the MA-I). This was the control computer for the Air Force's FALCON missile. Designing its logic, E. Nelson came up with a method for representing logic design by algebraic equations. Forrest also devoted some time at Hughes to thinking about magnetic core memories. From 1952 to 1954 he concentrated his attention on digital circuitry for the Hughes Commercial Computer, another machine with a drum memory that was to compete with RCA and IBM products. Although the commercial computer featured innovative input/output devices and variable word length, Hughes management concluded that production would be too expensive. Several technical staff quit to form Ramo-Wooldridge, while others started Litton Industries. At Litton, Forrest worked on digital differential analyzers, the Litton-20, Litton-40, and Litton-80, machines generally patterned on ideas of Floyd Steele. People mentioned often in this interview are R.L. Ash, Pete Bolles, D. Burbeck, D.L. Curtis, G. Kosmetzky, M. MacKnight, B. Miller, and E. Nelson.

Computer Oral History Collection, 1969-1973, 1977

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Jay W. Forrester
Interviewer:	Richard R. Mertz
Date:	November 4, 1969
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 27 pp.

Abstract: Jay Forrester was born on July 4, 1918, in Climax, Nebraska. He graduated from the University of Nebraska in 1939, with a bachelor's degree in electrical engineering. Later, Forrester earned his masters in electrical engineering from the Massachusetts Institute of Technology (MIT) in 1945. At MIT, Forrester worked under Gordon Brown in what came to be known as the Servomechanisms Laboratory where the development of feedback devices for the control of gun mounts and radar antennas. In addition to Brown and Forrester, other staff members included Albert Hall and Jack Silvey. This small staff eventually evolved into an organization of a hundred or more people. Forrester's graduation from MIT signaled his transition into electronic computers. He began considering various options and Brown asked him to become involved with an aircraft simulator project and remain at MIT. Comments on the direction his research activities went, suggestions by Brown, and the awareness that digital computing offered something to this project. Discusses in great length the early developments, problems, and various components of the machine as well as his personal managerial, inspirational, and technical contributions. Magnetic Core Memory was perhaps Forrester's largest contribution to the machine. WHIRLWIND's contributions to computer technology were numerous—synchronous parallel logic combined with clock timed parallel logic, cathode ray tube output and reliable vacuum tubes. Forrester mentions the individual's active in research at that time and their contributions. By the 1956, Forrester began to sense that his real interest was in pioneering new technologies or new areas of the computer and so Forrester joined the Management School at MIT where he established the field of system dynamics, urban and industrial. Mentions frequently Gordon Brown, Perry Crawford, and John von Neumann.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_forr691104.pdf

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Jay W. Forrester
Interviewer:	Richard R. Mertz
Date:	January 22, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 19 pp.

Abstract: This interview repeats many of the same topics discussed in the November 4, 1969 interview.

Forrester discusses his early involvement with the Servomechanisms Laboratory at MIT at the point of its inception. In 1939, Forrester began working as a teaching assistant in the electric machinery laboratory. By 1940, Forrester had joined Gordon Brown in the electrical engineering department to develop a hydraulic control mechanism for the 40mm antiaircraft gun being designed at the time. This would be Forrester's first exposure to feedback systems. Working with the Sperry Gyroscope Company, the project eventually evolved into a design of a hydraulic mechanism with various feedback features. Discusses in great detail aspects of this hydraulic development and how the project expanded over time to include more staff and a larger lab facility. Comments on Nat Sage's presence in the laboratory and him personally. Sage was a great supporter of Forrester's financially and otherwise. Mentions Nat Sage, Gordon Brown, and Perry Crawford.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_forr700122.pdf

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Jay W. Forrester
Interviewer:	Richard R. Mertz
Date:	May 27, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 5 pp.

Abstract: Interview discusses the stages through which the WHIRLWIND project proceeded between December 1944 until its incorporation in the Lincoln Laboratory. Forrester divides the stages into two periods: December 1944 to Spring 1948 and from 1948 onward . The first period was concerned with the construction of an antiaircraft stability analyzer aimed at a goal of creating an instrument that would aid in the design of large aircraft. The initial stage in December of 1944 began with the idea that a sophisticated differential analyzer would be built—an analog computer—which would simulate the behavior of a large aircraft. Analog computing techniques proved to be an unsatisfactory solution and in 1946, the attention shifted towards the use of digital techniques. This in turn gave way to the idea of high speed digital computing to handle data processing requirements of a military operation. By 1949, the second stage had begun. This involved digital computing in which information would be gathered from a number of sources. Comments on the Project Charles Study Committee and how it studied aspects of air defense. Discusses the movement of WHIRLWIND from the Servomechanisms Lab to the Digistal Computing Lab.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_forr700527.pdf

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Fortran IV Lecture
Interviewer:	Lecture
Date:	No date
Repository:	Archives Center, National Museum of American History
Description:	No transcript

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Stanley Frankel
Interviewer:	Robina Mapstone
Date:	October 15, 972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 66 pp.

Abstract: Stanley Frankel, born in 1919, received a B.A. from the University of California in 1938, earned a Ph.D. in physics there in 1942, and then spent some time at the Massachusetts Institute of Technology (MIT) radiation laboratory. From 1943 to 1946 he was at Los Alamos, working first on punched card calculations in the theoretical division and then in Edward Teller's group on the development of the hydrogen bomb. Frankel spent a year after the war at the University of Chicago and then returned to Los Angeles to establish a consulting firm with Eldred Nelson. From 1949 to 1954 he was at the California Institute of Technology, leaving there to work as a consultant on Continental Oil's Continental Automatic Computer (CONAC) and later on the Packard-Bell 250. Frankel first encountered electronic computers toward the end of World War II, when he and Nicholas Metropolis went to Philadelphia to set up weapons-related problem on the Electronic Numerical Integrator and Automatic Computer (ENIAC); they finally ran the program when the machine was finished in late 1945. In the summer of 1946 Frankel used the ENIAC to do calculations based on the liquid drop model of the nucleus and found it well suited to this work. While at Cal Tech, he ran an IBM installation and visited computing facilities on the east coast and in Britain. He also set out to design the logic for a general purpose "poor man's computer," eventually produced as the LGP-30. Following the example of Floyd Steele, Frankel used the equations of Boolean algebra in his design rather than extensive drawings. Frankel also contributed to computational techniques, particularly numerical solution of differential equations by the relaxation method (the extrapolated Liebmann method). He comments on Ada Lovelace and Charles Babbage, on the jealousy between those around John von Neumann and those who worked with J.P. Eckert and J.W. Mauchly on the beginnings of the Binary Automatic Computer (BINAC), on the relative merits of the LGP-30, the Bendix-15, and on clever tricks for multiplying and taking square roots with the CONAC. People mentioned include: J. Cass, H.H. Goldstine, J.W. Mauchly, Nicholas Metropolis, Eldred Nelson, and John von Neumann.

Computer Oral History Collection, 1969-1973, 1977

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Stanley Frankel
Interviewer:	Robina Mapstone
Date:	October 26, 1972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 96 pp.

Abstract: Toben and Woodbury's success with the CPC persuaded Frankel that many people might make computers. Although Northrop had difficulty getting the BINAC to run properly, Frankel was able to program it for a problem in ray tracing for an electron microscope. He later ran the same problem more successfully on the Universal Automatic Computer (UNIVAC). Frankel and Nelson's first consulting work had been for Northrop, advising on purchase of a missile guidance system. Frankel did not use the Standards Western Automatic Computer (SWAC), although he marveled at the detailed records kept on its maintenance. He doubts that angle calculations for navigational systems were the problem that led Steele to introduce Boolean algebra in logic design. Frankel designed a decimal desk calculator marketed by SCM as the Cognito; he much prefers binary machines. As a high school student, a problem about how five sailors might divide a stack of coconuts encouraged him to think about bases other than base 10. In 1951, Frankel spent the summer in England, using the MADM in Manchester to study neural networks. In London he first encountered the magnetic drum, as it had been developed by Andy Booth. He vividly recalls anecdotes of John von Neumann, although Turing's contributions to computing were greater. Frankel was surprised that von Neumann claimed to know nothing of the work of Charles Babbage. He reports his horror of the complexity of the WHIRLWIND, describes the building of the prototype the Binary Automatic Computer (BINAC), recounts work on machine character reading of checks, and comments on the use of flexowriters as input/output devices for the LGP-3O. He notes the reincarnation of the crystal detector as the germanium diode, the changing constraints on logic design with the introduction of solid state circuits, and his own limited experience as a computer user. Frankel is an anti-Luddite when it comes to considering the social implications of the computer. In the late l950s, he envisioned two machines never built, a microwave computer he designed for General Electric and the MAC, a machine intended to achieve maximum simplicity. Finally, Frankel describes the IBM machines used at Los Alamos during

World War II and comments on the importance to the history of computing of ancient devices such as the abacus and of Turing's concept of a stored program. People mentioned frequently in this interview include: Goldstine, John Mauchly, Eldred Nelson, Ken Shoulders, Floyd Steele, A.M. Turing, and John von Neumann.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Burt Garbow
Interviewer:	Henry Tropp
Date:	June 21, 1972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 83 pp.

Abstract: See Argonne National Laboratories interview.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Ken Garrison
Interviewer:	Robina Mapstone
Date:	June 28, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 53 pp.

Abstract: No transcript. Interview combined with August 10, 1973 interview.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Ken Garrison
Interviewer:	Richard Mertz
Date:	August 10, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 55 pp.
Abstract:	See Richard Canning interview.
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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Ken Garrison
Interviewer:	
Date:	September 19, 1973
Repository:	Archives Center, National Museum of American History
Description:	MISSING

Abstract: Garrison graduated from UCLA in January of 1952. That same year he took a job with Pacific Mutual Insurance Company in the administrative training program. In 1953, the company taught Garrison how to program a computer, specifically the Universal Automatic Computer (UNIVAC) I. By using the UNIVAC I, Pacific Mutual was able to do their billing, collecting, and valuation of all the service work. The main focus of the company was the consolidation function theory—an approach whereby the company's entire records were put on a master file and processed overnight. Pacific Mutual's decision to use computer's company wide came in 1954. By 1957, the company was fully operational under what was then a new scheme in the life insurance business of a consolidating functions approach to record-keeping. Garrison comments on the general atmosphere at the company and how his fellow employees reacted to the introduction of a company wide computer system. Discusses other associated problems of the UNIVAC installation and training for its use.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Murray A. Geisler
Interviewer:	Richard R. Mertz
Date:	February 22, 1971
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 88 pp.

Abstract: Geisler, born in 1917, obtained an undergraduate degree in mathematics from the City College of New York in 1938. He went on to earn an M.A. in statistics at Columbia in 1940, studying the use of punched card machines with Wallace Eckert and doing his thesis under Abraham Wald. He first worked analyzing records of maternal health using W.P.A. computing facilities. In March 1941, he went to work for the Office of Price Administration on predictions of the gross national product (GNP) based on calculations with electromechanical calculators. In 1943, Geisler joined the U.S. Army's Air Weather Service at the Pentagon, doing analog weather forecasting using IBM tabulators specially wired by Colonel Sherman and developing ratings of forecasters. From 1945 to 1946, Geisler did statistical analysis of medical records at the Army Institute of Pathology, particularly a study of soldiers with heart disease done with Wallace H. Yates and Aaron Traum. He admired the statistical analysis done using punched cards at the Mayo Clinic and at Cook County Hospital, but found the Institute of Pathology's staff too small to carry out a full study of existing records. From 1946 to 1948, Geisler worked in the Air Force Operations Analysis Office analyzing data from flights in polar regions, testing systems for landing planes, and evaluating the accuracy of bombing in World War II. There he met George Dantzig and Marshall K. Wood; in 1948 he joined them as head of the Standards Evaluation Branch of the Air Force Planning Research Division. The Division helped to fund National Bureau of Standards projects including the SEAC, aided the building of the Universal Automatic Computer (UNIVAC), and encouraged development of simplex methods of solving linear programming problems. Geisler worked on the triangular method of solving linear equations and on Air Force logistics, using card punched machines and, from 1952, the UNIVAC. In 1954, he joined the logistics department at RAND, where he worked on simulation, including the simulation programming language Simulation Script (SIMSCRIPT). In the early l960s he took one year's leave of absence and, in 1962, obtained a Ph.D. at Stanford University. People mentioned several times in the interview are George

Dantzig, Robert Dorfman, Hel Dresher, and John von Neumann.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Stanley Gill
Interviewer:	Henry S. Tropp
Date:	May 16, 1972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 66 pp.

Abstract: Stanley Gill received his master's from Cambridge University in England. In 1947, Gill joined the Mathematical Division of the National Physical Laboratory that was founded by John Womersley. At the lab, Gill worked in the punch card section until Huskey joined the staff to begin work on the electronic project. Gill comments on the electronic project and Turing's grand design. By 1948, Gill had returned to Cambridge to finish his degree work which had been interrupted by the war. While at Cambridge, Gill obtained a grant to work under Wilkes who had recently succeeded in constructing the Electronic Delay Storage Automatic Calculator (EDSAC). He discusses the Automatic Computing Engine (ACE), and its overall architectural and philosophical design, and software developments proposed by Turing. By 1949, Gill began writing routines to compute standard mathematical functions on the EDSAC. Wilkes promoted and pushed the idea of library subroutines. Gill comments at length about his contributions to developing the concepts of subroutines. Notes what major modifications were made to EDSAC. Concludes with various anecdotes about computing and colleagues. Frequently mentions Alan Turing, Maurice Wilkes, Harry Huskey, T.R. Thompson, and David Wheeler.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Wallace Givens
Interviewer:	Henry Tropp
Date:	June 21, 1972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 83 pp.

Abstract: See Argonne National Laboratories interview.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	E.L. Glaser and Fred Way
Interviewer:	Robina Mapstone
Date:	November 8, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 91 pp.

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Harry Goheen
Interviewer:	Henry Tropp
Date:	August 15, 1972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 40 pp.

Abstract: Born in 1915, Goheen earned his doctorate from Stanford University in 1940. During the war he served with the Navy in the Pacific. In 1945, Goheen went to Boston to Join Aiken's group at Harvard University. At Harvard, Goheen helped in the Writing of the *Manual of Operations* for the MARK I Calculator and computing Bessel functions. He comments on Aiken, his relationship with him and how others perceived Aiken. Recounts some anecdotes related to the Association for Computing Machinery (ACM) meeting held at Columbia and some of the discussions held there. Goheen taught at the University of Delaware and Syracuse University before joining the Moore School in 1950 to work on the design of telescopic systems. Goheen discusses his work there in addition to other various topics and colleagues. Mentions Dick Bloch, Howard Aiken, John von Neumann, and Ed Berkeley.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_gohe720815.pdf

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	I.J. Good
Interviewer:	
Date:	March 27, 1972
Repository:	Archives Center, National Museum of American History
Description:	No transcript

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	C.C. Gotleib
Interviewer:	Henry S. Tropp
Date:	June 29, 1971
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 21 pp.

Abstract: Gotlieb's interest with computers began in 1948, when he was hired by the University of Toronto to study a project for constructing a computer. Gotlieb met with George Stibitz and E.G. Andrews to discuss relay computers since the University of Toronto was interested in building a Bell Model 6 Relay Computer. He discusses the work done on the cathode ray tube memory by Kates. In 1950, Gotlieb shifted from the design side to computations and formed a computing group. Working with an IBM punched card machine installation, the group began working with Ontario Hydro who were interested in computing water levels for the Seaway. IN 1952, Gotlieb traveled to England to work at Manchester University where Turing was working. At Manchester, he learned to program the Manchester Machine. The University of Toronto had purchased a Ferranti Machine (known as FERUT at Toronto) which stayed in Toronto from 1952 to 1958. The machine performed hundreds of calculations, the most important being a computation on flooding that the Seaway would produce. By 1955, Toronto began to outgrow the Ferranti Machine and began looking into building their own machine. They became interested in the Illinois Automatic Computer (ILLIAC) project in Illinois and participated in the early ILLIAC studies. The building of the ILLIAC II took longer than expected and Gotlieb and his group grew impatient. In 1958, they purchased an IBM 650. While the IBM 650 was a step down in computing capacity, this venture brought Gotlieb and the University of Toronto into contact with IBM. In 1961, they purchased an IBM 7090, the first of its kind in Canada. This machine generated interest in large scale computing and the university began selling substantial amounts of computer time to organizations such as Imperial Oil and Ontario Hydro. Mentions Joseph Kates, George Stibitz, and Alan Turing.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	C.C. Gotleib
Interviewer:	Henry S. Tropp
Date:	July 29, 1971
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 30 pp.

Abstract: Interview expands upon previous discussion of June 29, 1971. Gotlib begins discussing his doctorate work in the area of proximity fuses. Discusses his teaching graduate courses, specifically in the area of business data processing. Gotlieb eventually proposed and succeeded with establishing a Graduate Department in Computer Science at the University of Toronto in 1966. Comments on Kates and his work on the machine at Toronto, funding issues, and mentions various colleagues, particularly Morris Rubinoff.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee: Jackson Granholm
Interviewer: Robina Mapstone
Date: June 7, 1973
Repository: Archives Center, National Museum of American History
Description: Transcript, 34 pp.

Abstract: Jackson Granholm was born in 1921, and graduated from the University of Washington in Seattle, Washington with a degree in physics. Upon graduation in 1947, Granholm went to work for Boeing in the Industrial Engineering Department, but was soon transferred to the Physics Laboratory where he participated in the testing and design of instrumentation for an early set of guided missiles. While at Boeing, Granholm also became operations manage of the computer laboratory. Granholm eventually left Boeing for the General America Corporation to work on a study of computers in the insurance business. Granholm then returned to Boeing after solving the insurance business problem to work experimental flight tests. The problem was computer related and required the gathering of information from a series of airplane flight tests and reduce it to form fit for human consumption in some reasonable amount of time. The computer used to compute this information was the Universal Automatic Computer (UNIVAC) 1103A. After a successful completion of this project, Granholm left Boeing again to work for TRW for approximately fourteen months and then spent three years as an independent management consultant. He would later make countless other professional moves. He discusses Boeings involvement in the mainstream west coast computer development scene and the company in general. Comments on building the B-Mac, an electro-mechanical analog computer and the B-Ac, an electronic analog computer. Boeing produced a language titled the Boeing Airplane Company Algebraic Interpretative Computing System (BACAIC) which was the FORmula TRANslator System (FORTRAN) like, but one which was implemented differently. Discusses his view of the computer industry and belief that computers ought to be designed so that the world's important work could talk to a computer. Recalls what he believes to be the most significant contributions to the computing field: John Parker's ability to have individuals and organizations finance computer projects; and Eckert and Mauchly's work at the Moore School. Those mentioned in the interview are Randall Porter, George Stoner, George Roe, Fred Gruenberger Walter Frantz, John Parker, and Paul Armer.

Computer Oral History Collection, 1969-1973, 1977

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Transcript:	http://invention.smithsonian.org/downloads/fa_cohc_tr_gran730607.pdf

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Computer Oral History Collection, 1969-1973, 1977

Interviewee: Irwin Greenwald
Interviewer: Robina Mapstone
Date: April 3, 1973
Repository: Archives Center, National Museum of American History
Description: Transcript, 72 pp.

Abstract: Greenwald, born in 1926, attended New York University and began graduate work at the University of California at Los Angeles. In June 1950, he was hired by the Numerical Analysis Department at RAND. He had no previous experience with computers but learned about them from a stint as an operator and from informal discussions. By late 1951, he was using a Universal Automatic Computer (UNIVAC) I to solve shock wave problems for the AEC, in work related to the development of the hydrogen bomb. He later ran similar problems as a test program for RAND's John von Neumann Integrator and Automatic Computer (JOHNNIAC), on the IBM 701, and on the IBM 704. When Greenwald was given primary responsibility for RAND's IBM 704, he set out to bring together programmers to write software for it as part of the Society to Help Avooid Redundant Effort (SHARE). Because RAND was nonprofit and sensitive concerning privileged information, it proved a natural meeting place for people from diverse aerospace companies. SHARE also wrote programs for the IBM 709, although Greenwald persuaded RAND not to buy one of these machines. Such a practical meeting ground for non-academic programmers proved less effective in the late l950s, when companies began to develop proprietary programs. Greenwald also worked with John Matousek on a project to improve the training of radar operators that led to RAND's System Research Laboratory. When RAND was asked to train operators for the Semi-Automatic Ground Environment (SAGE), this section expanded into a division and then into a separate System Development Corporation. Greenwald joined SDC in 1960, after a protracted illness, and soon was programming the IBM 7090 and working on satellite control. He returned to RAND in 1964, working on the programming language JOSS and on a video graphic system. In 1969, he went to SDS (later Xerox). Greenwald comments on the selection and training of RAND staff, on problems of the parity check on the IBM 704, on utility programs, assembly programs, macro-instructions and pseudo-instructions, and on the contributions of the Advanced Research Project Agency of the Department of Defense to research

in computer science. He notes the role of Sketchpad in the growth of computer graphics and General Motors's early work with computer aided design. JOSS was originally designed for RAND's JOHNNIAC and then made more widely available within the company. The language was one of the first to put the user directly on line to the computer and proved relatively simple to use. The name was copyrighted [sic] to prevent deviations, and the Johnniac Open System (JOSS) never was widely used. Greenwald outlines the difference between assemblers and compilers and also mentions numerous RAND staff. People noted often include Paul Armer, Dan Madden, Wes Mehlan, Bill Orchard-Hayes, Stan Rothman and Joe Smith.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Sidney Greenwald
Interviewer:	Richard R. Mertz
Date:	November 25, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 74 pp.

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_ gree701125.pdf

Computer Oral History Collection, 1969-1973, 1977

Narrative:	Ralph Griswold
Date:	May 14, 1972, May 21, 1972; and May 28, 1972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 38 pp.

Abstract: Ralph Griswold was born on May 19, 1934 in Modesto, California. Griswold received his BS, physics from Stanford University in 1956; his MS, electrical engineering from Stanford in 1960, and his Ph.D. in electrical engineering from Stanford in 1962. Griswold is credited with inventing and creating the String-Oriented Symbolic Language (SNOBOL) programming language in the 1960's and the ICON language in the 1980s.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_gris720514.pdf

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Herbert Grosch
Interviewer:	Richard R. Mertz
Date:	July 15, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 86 pp.

Abstract: This series of interviews is fragmented and information is duplicated in other interviews.

Herbert Grosch was born on September 13, 1918, in Saskatoon, Canada. He graduated in 1938 from the University of Michigan with a BA in astronomy. In 1942, he received his Ph.D. in astronomy from the University of Michigan. The interview begins with some detailed biographical information from childhood through his high school years. Comments upon his favorite classes, friends, hobbies, and parents. Discusses courses he took at the college level and his ultimate interest in computing. Mentions frequently John von Neumann, Norbert Wiener, and Alan D. Maxwell.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_gros700715.pdf

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Herbert Grosch
Interviewer:	Richard R. Mertz
Date:	August 24, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 89 pp.
Abstract:	Tape #1
Citation:	Computer Oral History Collection, Archives Center, National Museum of American History.
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Transcript:	http://invention.smithsonian.org/downloads/fa_cohc_tr_gros700824.pdf

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Herbert Grosch
Interviewer:	Richard R. Mertz
Date:	August 24, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 66 pp.

Abstract: Tape #3 and Tape #4

Discusses some general intellectual influences. Comments on his work for and with Dr. Alan Maxwell at the University of Michigan and his time spent at Harvard University. In 1941, Grosch joined the staff at the US Naval Observatory in Washington, DC as a P-1 junior astronomer in the astrographic department. Comments on Wallace Eckert and Thomas J. Watson Sr. and the work they were doing. Grosch discusses work at the Watson Scientific Computing Laboratory at Columbia University. This work involved conventional punched-card machines. Grosch comments on several of IBM's machines used at the Watson Lab and the individuals associated with the lab. Mentions Marge Severy, Bob Serrell, Elizabeth Ward, Richard Fineman, and Howard Aiken.

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_gros700824.pdf

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Herbert Grosch
Interviewer:	Richard R. Mertz
Date:	August 26, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 72 pp.

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org
fa_cohc_tr_gros700826.pdf

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Herbert Grosch
Interviewer:	Richard R. Mertz
Date:	August 28, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript 120 pp.

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_gros700828.pdf

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Herbert Grosch
Interviewer:	Richard R. Mertz
Date:	November 9, 1970
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 142 pp.

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/ fa_cohc_tr_ gros701109.pdf

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Herbert Grosch
Interviewer:	Richard R. Mertz
Date:	March 30, 1971
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 308 pp.

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_gros710330.pdf

Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Herbert Grosch
Interviewer:	Richard R. Mertz
Date:	May 7, 1971
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 214 pp.

Abstract:

Citation: Computer Oral History Collection, Archives Center, National Museum of American History.

Transcript: http://invention.smithsonian.org/downloads/fa_cohc_tr_gros710507.pdf

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	Fred Gruenberger
Interviewer:	Robina Mapstone
Date:	February 9, 1973
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 76 pp.

Abstract: Gruenberger, born in 1918, obtained a B.S. in 1940, started teaching high school math and then trained as an army radar specialist. He was assigned to cryptanalysis, serving in Europe as a keypunch operator, using the latest IBM equipment. After the war, Gruenberger did graduate work at the University of Wisconsin in mathematics. The lab at the University of Wisconsin used punched card equipment, progressing from an IBM 602A to an IBM 604 to a CPC. In the same period, Gene Amdahl a graduate student at Wisconsin designed the Wisconsin Integrally Synchronized Computer (WISC) for his doctoral dissertation. Amdahl was hired by IBM before the machine was built. Gruenberger started *Computing News* in 1953, and continued the publication when he went to the General Electric (GE) Hanford Atomic Plant in 1954; with issue 34 it became a commercial publication. When he left GE for RAA0 in 1957, he gave *Computing News* to Jackson Granholm, who kept it going 3 more years. Gruenberger found the computing section at Hanford well-informed and well-equipped, despite its isolation. In 1955, GE became the first company to use computers in a commercial plant, an appliance factory in Kentucky. During Gruenberger's years at RAND staff did pioneering work on list processing, time sharing, computer chess playing and artificial intelligence. Cliff Shaw wrote compilers in the language being compiled. Gruenberger wrote a book *Problems for Computer Solution* and a text Introduction to Electronic Computers. He also calculated a table of 6 million prime numbers. Other RAND contributions in his era included organization of the Society to Help Avoid Redundant Effort (SHARE), preparation of the 9-PAK system for the IBM 709, the idiot-proof customer operated systems QUAD and the Quadratic Arc Computer (QUAC), and the programming language the Johnniac Open System (JOSS). Gruenberger encouraged the annual RAND symposia on computing that began in 1958 and continued them after he left the company in 1967 to work at Informatics. He soon moved from there to teach at California State University at Northbridge. Gruenberger comments on duplication of mistakes, such as the saturated operating code on

both the IBM 701 and the GE 225, and on more successful repetition such as a technique he used to take square roots in about 1950 that he found dated to the l800s. He comments on Paul Armer's contributions and leadership, on Ken Arnold, Dick Andree, Harrison Tellier, Clarence Poland, Gene Amdahl and Joe Weizenbaum, and on teaching computing to the deaf. Those mentioned frequently include Gene Amdahl, Paul Armer, Kenneth Arnold, Cliff Shaw, and Joe Weizenbaum.

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Computer Oral History Collection, 1969-1973, 1977

Interviewee:	William F. Gunning
Interviewer:	Robina Mapstone and Henry Tropp
Date:	October 9, 1972
Repository:	Archives Center, National Museum of American History
Description:	Transcript, 94 pp.

Abstract: Bill Gunning worked his way through college fixing radios, obtaining an A.B. in physics from the University of California at Los Angeles in 1941. He was hired by Project RAND of Douglas Aircraft to build an analog computer to study the temperature distribution of airplane windows. Another device from this period simulated an aircraft bomber, a third was meant to generate random numbers. Gunning remained at RAND when it broke away from Douglas so that it could do independent evaluations for the Air Force. He participated in the rebuilding of a Reeves Electronic Analog Computer (REAC) in the late l940s, worked on the electrostatic memory of the Standards Western Automatic Computer (SWAC), and was surprised at how long the latter machine worked. In 1950, Gunning joined John Williams and George W. Brown on a tour of computer facilities on the east coast. They were most impressed by the reliability and parallel design of the Institute for Advanced Study (IAS) computer. RAND copied the machine, first in a small size John von Neumann Integrator and Automatic Computer (JOHNNIAC), Jr., used to test the selectron tube memory, circuits and registers, and then, increasing dimensions four-fold, in the JOHNNIAC. Gunning compares the JOHNNIAC with the IAS and the Standards Eastern Automatic Computer (SEAC) with the IBM 701. He notes the use of modular design in the JOHNNIAC, Raytheon Digital Automatic Computer (RAYDAC) and SEAC, and compares error detection in the Universal Automatic Computer (UNIVAC), RAYDAC, Binary Automatic Computer (BINAC) and Bell computers. Gunning and other engineers modified a RCA selectron tube for use in the JOHNNIAC, and set up a special console to display trouble spots in the machine. The greatest influence of RAND was on making computers available, on memory diagnostics, on the idea of a channel and on programming languages through the example of Johnniac Open System (JOSS). Mathematicians there valued the advice of engineers, unlike the mathematicians who designed the Illinois Automatic Computer (ILLIAC) IV with no regard for error detection. During the McCarthy era, Gunning lost his security clearance and left RAND for International Telemeter. The firm

had just been selected to build a magnetic core memory for the JOHNNIAC, and Gunning worked on this project. Gunning comments on von Neumann's genius, J.P. Eckert's engineering style, the radical design of the BINAC and his own failure to anticipate widespread demand for computers. More generally, it was the need to predict the performance of airplanes at high speeds that led the aircraft industry to sponsor the development of the computer on the west coast, from Gilbert D. McCann's analog devices to Floyd Steele's Magnetic Drum Digital Differential Analyzer (MADDIDA) and Litton differential analyzer to the REAC and other machines at RAND. Gunning also briefly mentions Kates's prototype memory tube. People mentioned on several pages are J. Bigelow, George Brown, H. Huskey, H. Larson, G.D. McCann, L. Ridenour, K. Uncapher, J. von Neumann, and John Williams.