

THE COMPUTER SIMULATION ARCHIVE: DEVELOPMENT AND CURRENT CONTENTS

Richard E. Nance

Emeritus Professor of Computer Science
Virginia Tech
Blacksburg, VA 24061 USA

Gwyneth A. Thayer

Associate Head and Curator of Special Collections
NCSU Libraries
Campus Box 7111
Raleigh, NC 27695 USA

ABSTRACT

The development history of the Computer Simulation Archive is described from its inception in 1998 to the present. An overlap of visions among the creators produces an asset for the simulation community and the North Carolina State University Libraries. Collections donated over this period have produced impressive growth. Usage statistics show a steady increase in access, and the simulation endowment has nearly tripled over the past six years. The commitment of the North Carolina State University Libraries staff and the strong, consistent support of the simulation community are the key factors in this record of success.

1 THE COMPUTER SIMULATION ARCHIVE CREATION

A companion paper in this proceedings focuses on the founding of the Computer Simulation Archive (Archive); hence, the description here is limited to characterizing the foresight of Professor Robert G. Sargent in recognizing the need for a historical repository that he might initiate with a donation of materials from his distinguished career. Discussion of his perceptions of the need with Professor James R. Wilson of North Carolina State University (NCSU) produce glimpses of a vision of how this need might be met. Conversations between the two lead to the realization of Sargent's idea by the establishment of the Archive within the Special Collections Research Center (SCRC) of the NCSU Libraries in 1998.

1.1 The Initiators' Vision

Both Sargent and Wilson recognize that they are members of a small cadre of individuals who are contributors to the advancement of a science and technology that already has served a key role in producing "earth shaking" results: the [Monte Carlo simulations conducted on the ENIAC and MANIAC](#) for calculating artillery-firing tables and, subsequently, experiments leading to the hydrogen bomb (Atomic Heritage Foundation 2014). Sargent feels that his professional holdings in computer simulation -- consisting of conference proceedings, group and society newsletter issues, and an extensive collection of books on discrete event simulation -- can provide a strong start in creating a historical repository. Wilson is keenly aware of the interest of the Libraries in special collections development, and concurs with Sargent in pursuing the possibility of initiating a professional asset for the simulation community and the Libraries.

1.2 Role of the Special Collections Research Center (SCRC)

The SCRC at NCSU Libraries identifies and collects rare and unique materials to support the mission of North Carolina State University (NC State) and the scholarly community at large. The SCRC strategically builds distinctive collections to support and promote research and scholarship in key focus areas,

emphasizing established and emerging areas of excellence at NC State. The commitment to documenting the history of computer simulation in 1998 defines a priority for SCRC. A companion paper in these proceedings by Raschke and Nutter (2017) addresses the importance of the Archive. In addition to a companion paper by Sargent and Wilson (2017) in these proceedings, the creation of the archive is chronicled in a [video oral history in the Computer Simulation Archive](#) (Wilson, Sargent, and Nance 2013). As noted in this group interview, the creation of the archive is announced by Sargent during the 1998 Winter Simulation Conference.

2 DEVELOPMENT OF THE CONTENTS

The papers and records of prominent scholars in the history of computing and computer simulation are key collecting areas for the Computer Simulation Archive. Capturing the history of computer simulation encompasses the theory, methodology, and practice arising at the intersection of applied probability, computer science, electrical and computer engineering, industrial and systems engineering, management, manufacturing engineering, operations research, and statistics. When individuals are approached for donations, they are asked to include the following types of materials, in addition to relevant books and monographs:

- research and project files;
- drafts of publications, technical reports, and working papers;
- correspondence, particularly with other simulation pioneers, or related to meetings, workshops, organizations, and events associated with simulation;
- proceedings of little-known or one-of-a-kind workshops and conferences;;
- newsletters produced by simulation organizations or working groups;
- course syllabi;
- student course notes;
- biographical materials;
- speeches, lectures, and presentations; and
- digital files on any medium.

Donors work with the curator in order to determine which materials are suitable additions.

2.1 Growth and Key Contents

The substantial initial donations of papers and research materials comes from three pioneers in the field of computer simulation: A. Alan B. Pritsker, Robert G. Sargent, and Julian Reitman. Alan Pritsker's professional library (namely books, not personal papers) is transferred to the NCSU Libraries from Purdue University in 2003. Pritsker is recognized for key contributions to the field of computer simulation as well as industrial engineering and operations research. His extensive publication record is achieved while serving on the faculties of Arizona State University, Virginia Polytechnic Institute and State University, and Purdue University. Actively serving in several professional societies and governmental organizations, Pritsker is the recipient of numerous awards attesting to his leadership and professional achievements.

Following his commitment in 1998, Robert G. Sargent delivers hundreds of items, among them books as well as his own papers (proceedings, newsletters, correspondence, etc.) in 2003. Sargent is Professor Emeritus at Syracuse University. His academic pedigree includes a BS in Electrical Engineering in 1959, a MS in Industrial Administration in 1963, and a Ph.D. in Industrial Engineering in 1966, all from the University of Michigan. At Syracuse University, Sargent's faculty appointments involve multiple departments and interdisciplinary programs in the L. C. Smith College of Engineering and Computer Science. He is also the Director of the Simulation Research Group. In initiating the reestablishment of the Winter Simulation Conference (WSC) in 1976, Sargent writes the WSC Bylaws, serves as the General

Chair of the 1977 WSC, and as a member (1974-1984), Chair (1979-1981) of the WSC Board of Directors. Sargent is the Founding President of the WSC Foundation (2004), and his significant involvement with the development of the Simulation Archive includes starting its endowment in 2007 and serving as the initial chair of the Advisory Committee (2007-2011).

The Robert Sargent Papers, 1961-2002, include teaching materials, publications, research files, presentations, books, and data tapes documenting his work at Syracuse University, where he taught simulation courses for over thirty years. Sargent also worked with the United States Air Force at the Rome Air Development Center (RADC) in Rome, New York, in addition to serving on a number of committees within the Department of Defense. His donated materials, including conference programs, document Sargent's activities on behalf of the WSC and other professional organizations and meetings.

Julian Reitman's contributions in 2003 also help to establish the new Computer Simulation Archive. Reitman, a long-time advocate of simulation for solving complex problems, is widely esteemed among the pioneers in the simulation community. In 1947 he begins an engineering career with the United States military. He joins the Teleregister Corporation as a system engineer in 1955, designing real-time computer/communications systems for airline reservations. Reitman is one of the first individuals to use IBM's General Purpose Simulation System, commonly known as GPSS. He begins a lengthy productive association with the Norden Division of United Aircraft Corporation beginning in 1961, solving numerous complex problems using GPSS. His research activities lead to extensions of the capabilities of GPSS, from which GPSS/NORDEN and NGPSS are produced.

The Julian Reitman Papers, 1967-1998, include professional papers that document Reitman's work in the field of computer simulation. The collection consists mainly of budget reports and conference proceedings of the WSC, 1968-1998. Numerous technical reprints and operational manuals used by Reitman during his career with Norden are included. Reitman is one of the founders of the WSC, and has served in active leadership positions since its beginning. He is the author of one of the first simulation textbooks, *Computer Simulation Applications: Discrete Event Simulation for Synthesis and Analysis of Complex Systems*, published in 1971.

These initial donations from 2003 comprise more than 500 books in addition to more than 60 linear feet (l.f.) of archival materials. By 2011, the collection reaches more than 100 l.f. with substantial donations from Richard E. Nance, James R. Wilson, Philip J. Kiviat, and Harry M. Markowitz and an addition by Ingolf Stahl to his 1999 donation.

Richard E. Nance donates the bulk of his papers in 2005, with a few additions added in subsequent years. Nance, Emeritus Professor of Computer Science at Virginia Tech, holds BSIE (1962) and M.S. (1966) degrees from N.C. State and the Ph.D. from Purdue University (1968). He has held faculty positions at Southern Methodist University and Virginia Tech, where he is Department Head of Computer Science, 1973-1979, and Director of the Systems Research Center (1984-2004). Nance's research appointments include the Naval Surface Weapons Center and the Imperial College of Science and Technology (UK), as well as visiting appointments at Old Dominion University and Brunel University (UK). Nance is the author of over 150 papers on discrete event simulation, performance modeling and evaluation, computer networks, and software engineering. His professional service is marked by several editorial appointments, and he is the founding Editor-in-Chief of the *ACM Transactions on Modeling and Computer Simulation (ACM TOMACS)*.

The Richard E. Nance Papers, 1950's-2004, contain correspondence, articles, technical reports and reprints, manuals, periodicals, videos, books, magnetic tapes, and other materials documenting Nance's teaching, research, and professional service in the field of computer simulation and computer science.

Philip J. Kiviat donates his papers in 2011, with additional items added in 2014. He is a graduate of Cornell University where from 1955-1961 his studies include mechanical engineering, industrial engineering, and computer simulation. He has served as the President of Guerra-Kiviat, Inc., from 1999 to the present. Kiviat is the recipient of numerous awards and honors during his career, including the President Jimmy Carter Certificate of Appreciation (1978), the A. A. Michaelson Award (1976), and the

Government Computer News Hall of Fame (1988). He is the founder of the Industry Advisory Council (1989) and is a five-time Federal 100 Award Winner. Kiviat is best known as the creator of the General Activity Simulation Program (GASP) language and as a co-developer with Harry Markowitz of SIMSCRIPT II.

Donations from James R. Wilson and Harry M. Markowitz are received in 2011. James Wilson is a professor in the Edward P. Fitts Department of Industrial and Systems Engineering (ISE) at North Carolina State University, with an initial appointment in 1991. His education includes a BA in mathematics from Rice University (1970) and a M.S. and Ph.D. in industrial engineering from Purdue University (1977, 1979). At NCSU he serves as director of ISE graduate programs from 1995 to 1999 and department head from 1999 to 2007. Prior faculty appointments include the University of Texas at Austin (1979-1984) and Purdue University (1985-1991). Wilson's service on behalf of The Institute of Management Sciences (TIMS) College on Simulation includes secretary-treasurer (1984-1986); vice president (1986-1988); and president (1988-1990). His stint as Editor-in-Chief of *ACM TOMACS* (2004-2010) draws high praise. He is active in the Winter Simulation Conference (WSC), serving as proceedings editor (1986); associate program chair (1991); and program chair (1992). His outstanding service on the WSC Board of Directors, co-representing the INFORMS College on Simulation, leads to the creation of an award bearing his name.

Harry Markowitz holds the Ph.D. in economics (1955) from the University of Chicago. He is presently an adjunct professor at the Rady School of Management at the University of California, San Diego, and a consultant for the Harry Markowitz Company. He is the recipient of the John von Neumann Theory Prize (1989), awarded by the Institute for Operations Research and the Management Sciences (INFORMS). Markowitz is a Nobel Laureate in Economic Sciences (1990), recognized for his seminal work in portfolio selection theory. He is the originator of the SIMSCRIPT family of languages, and is highly regarded in computer simulation for that work and as a co-developer of SIMSCRIPT II,

Ingolf Ståhl is Professor Emeritus at the Stockholm School of Economics. Ståhl begins teaching computer simulation in 1976. In a very energetic, lengthy career since then, his instructional activities include over 7,000 university and high school students in five countries. His donations in 2011, and again in 2013, add to the materials originally given in 1999.

Currently, in 2017, the Computer Simulation Archive contains more than 150 l.f. of archival materials, in addition to more than 1.5 TB (terabytes) of born digital content. Several different individuals have donated their papers in recent years, including Paul F. Roth (2013), Bruce Schmeiser (2014), Thomas Schriber (2016), and Bernard Zeigler (2014-2017).

The Paul Roth Papers, 1970-1995, include technical reports, proceedings, computer disks, and other items that mark Roth's notable professional contributions to the field of computer simulation. Roth is retired from Virginia Tech as Associate Professor of Computer Science. As a pioneer in the field of computer simulation, he is twice elected as Chairman of the Association for Computing Machinery, Special Interest Group on Simulation and Modeling (ACM/SIGSIM). While a member of the staff of the National Bureau of Standards (now, the National Institute for Standards and Technology), Roth is instrumental in effecting the revival of the WSC in 1976. His career also includes affiliations with the Burroughs Corporation, and the General Electric Company. He is a co-developer of the Burroughs Operational Systems Simulator (BOSS), circa 1967; and the CONVERSIM language for teaching modeling and simulation concepts, circa 1988.

Bruce W. Schmeiser is Professor Emeritus of Industrial Engineering at Purdue University. His education includes B.A. and M.S. degrees from the University of Iowa in 1969 and 1971, respectively, and the Ph.D. from the Georgia Institute of Technology in 1975. He has served on the faculties of Southern Methodist University and Purdue University, and has held visiting appointments at several other institutions. Schmeiser is noted for advising 20 doctoral students during a career also distinguished by his receiving several teaching awards. He is a Fellow of the Institute of Industrial and Systems Engineers (IISE) and a recipient of the I-Sim Distinguished Service Award (1997) and the David F. Baker

Distinguished Service Award from IISE (2004). Schmeiser's leadership is prominent in his activities benefitting both the I-Sim and the WSC.

The Bruce Schmeiser Papers, circa 1960-2014, document various aspects of his work in the field of computer simulation. His research is notable in its contributions to simulation theory, methodology, and various forms of practical applications.

Thomas J. Schriber is Professor Emeritus of Technology and Operations in the Stephen M. Ross School of Business at the University of Michigan. His undergraduate degree in chemical engineering at the University of Notre Dame (1957, Magna Cum Laude) is followed by M.S.E., M.A., and Ph.D. degrees from the University of Michigan (1958, 1959, 1964). His career is marked by visiting appointments at the National University of Singapore (1995), the Swiss Federal Technical University (ETH Zurich, 1987), and Stanford University (1972-1973). From 1957 to 1960 he holds a National Science Foundation Fellowship, and currently is a Fellow and charter member of the Decision Sciences Institute. Schriber is a member of ASIM (Arbeitsgemeinschaft Simulation, the German-language simulation society), the Institute of Industrial and Systems Engineers, and INFORMS.

The Thomas J. Schriber Collection, established in 2016, is a compilation of materials, including important periodicals on the history of computer simulation such as *Simulation News/Notes Europe* and the ACM/SIGSIM *Simuletter*, in addition to other key publications that Schriber contributed to or collected during his career. Especially significant are publications relating to the GPSS (General Purpose Simulation System) programming language. His donation includes his famous textbook on GPSS, written in 1974, and often referred to as the "Big Red Book."

Prominent among Schriber's donations in 2016 is the Winter Simulation Conference Collection. This collection includes proceedings, 1968-2003, and printed final programs, including exhibit directories, 2013-2014, from the WSC. The donations of others to the Archive include various WSC materials, but Schriber's collection creates a nearly complete set of WSC materials, organized as a single resource to facilitate ease of inquiry, particularly for research.

Currently a Professor Emeritus of Electrical and Computer Engineering at the University of Arizona, Bernard P. Zeigler holds a Ph.D. in Computer/Communication Sciences from the University of Michigan (1968), preceded by the M.S. in Electrical Engineering from the Massachusetts Institute of Technology (1964), and a B.S. in Engineering Physics from McGill University in Montreal, Canada (1962). Zeigler's extensive list of faculty appointments include the University of Michigan (1969-1975, 1980-1981), the Weizmann Institute in Israel (1975-1980), Wayne State University (1981-1984), The University of Arizona (1985-2010), and Arizona State University (2005-2008). During his stint in Arizona, Dr. Zeigler serves as the Co-Director of the Arizona Center for Integrative Modeling and Simulation (ACIMS). He is currently affiliated with the Center of Excellence in Command, Control, Communications, Computing and Intelligence (C4I Center) at George Mason University, and is also the Chief Scientist at RTSync Corp.

Bernard P. Zeigler initiates his donations in 2014. The Bernard P. Zeigler Papers, 1962-2011, consists of files containing technical reports and early journal articles from Zeigler's period as a graduate student and assistant professor at the University of Michigan. It also includes extensive files from unpublished books, as well as presentations and related materials. His collection is distinctive in that it is comprised entirely of "born digital" content, which is increasingly more common in archival holdings.

In sum, the contents of the Computer Simulation Archive, not including published books, exhibits the diversity of contents by archival material type shown in Figure 1. While the extent of the differences among divisions as shown is not surprising, the addition of material in the categories of Correspondence and Newsletters would seem to be especially desirable. These less formal archival types can provide more in-depth perspectives on organizations, individuals, and the developing relationships as they are evolving.

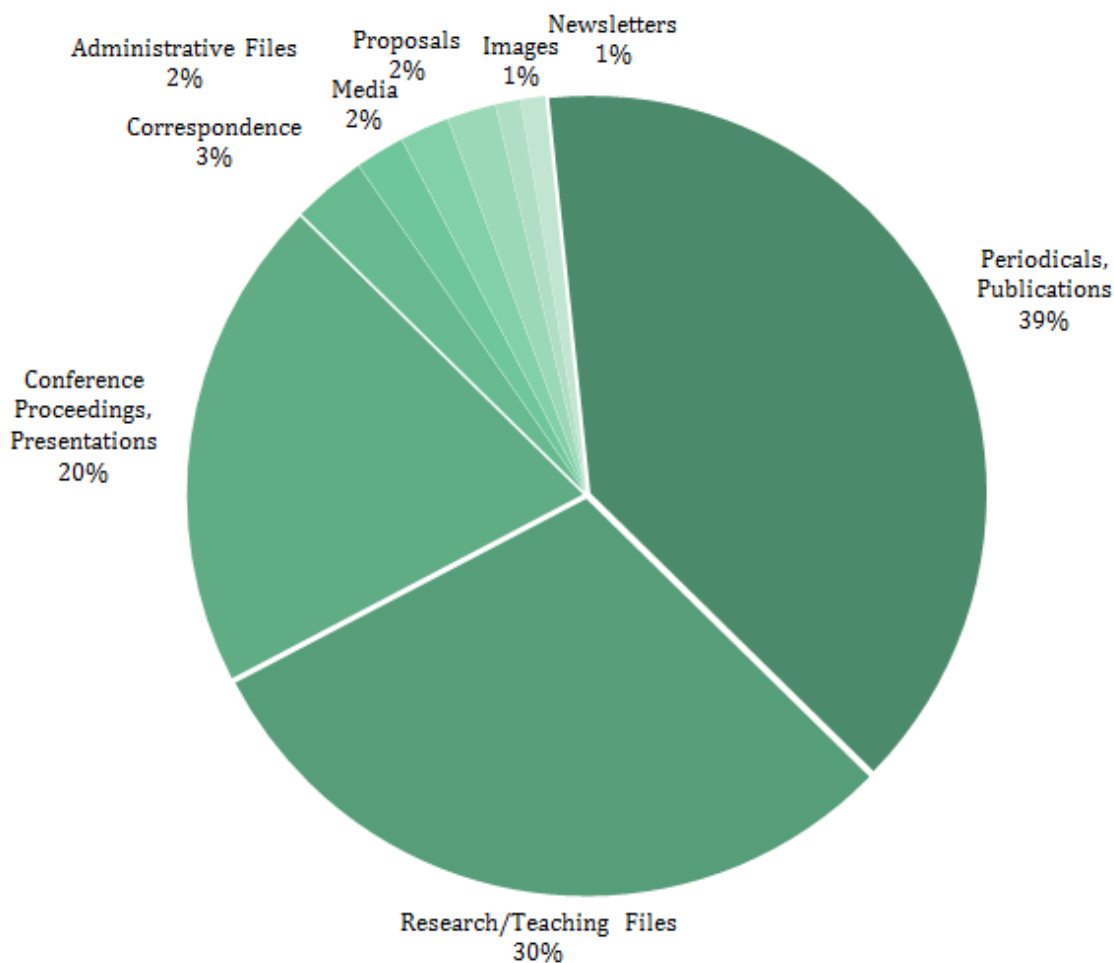


Figure 1: The composition of the Computer Simulation Archive by archival material type (physical materials; does not include online video oral histories).

2.2 The Computer Simulation Archive Endowment

The endowment in support of the Archive has proved to be continually strong in support of development and expansion. The endowment facilitates the addition of more collections, expedites the processing of materials in the archive, and enables the digitization (scanning) of selected materials documenting the history of computer simulation. With the assistance of simulation scholars; relevant professional societies such as ACM/SIGSIM and INFORMS/I-Sim; Friends of the Library; and individual donors, the Archive continues to progress, providing researchers with valuable insights into the history of the field. Endowment growth since 2010 is displayed in Figure 2.

2.3 Archived Media

The Computer Simulation Archive is open to any type of media that holds information of historical value; current examples include approximately 20 floppy disks, including some CONVERSIM system disks; six VHS tapes; one 3/4-inch U-matic cassette; three single-perforation 16 mm films; one 3M DC 600A data

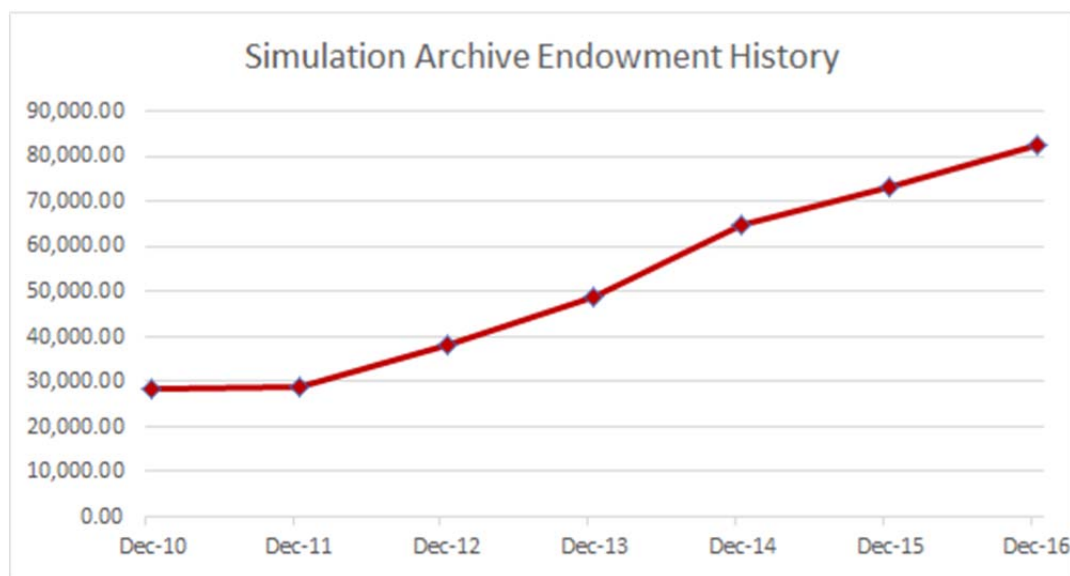


Figure 2: Demonstration of growth in the Archive endowment.

cartridge; two 9-track tapes; three 3M data cartridges; and several CDs, including a diskette, “Simulation Made Simple with Micro-GPSS.” All of these items can be viewed in the Special Collections Reading Room since NCSU Libraries manage the digitization process (converting old media into a digital format) through a third-party vendor. The Archive accepts obsolete media formats when the content is deemed historically significant, recoverable, and of permanent value.

2.4 Accessibility of Computer Simulation Archive Contents

A major effort to capture the historical origins and evolution of computer simulation occurs in 2013 when Wilson, assisted by Nance and Sargent, partners with NCSU Libraries on a large-scale project to create a unique video oral history of computer simulation pioneers. A proposal to the National Science Foundation (NSF) is successful, and funding enables the Retrospective Oral History of Computer Simulation Project (ROHCSP) to continue during 2013–2016. The ROHCSP objective is to capture and preserve accounts of seminal efforts, related pivotal events, and significant contributors from the perspective of individuals who witness or create that history and to relate the accounts in the words of these pioneers. The importance of collecting these accounts is underscored by the pervasive influence of computer simulation in so many subject areas, not the least of which is the design of computer software. Audio tapes, primarily from early donors, already exist, and the ROHCSP adds audio oral histories as well. More significant is that all of the [video oral histories](#) are accessible online with the biographical information on each of the 22 computer simulation pioneers.

Supplementing the individual accounts are three “group” interviews that include:

- “Discussion about the Computer Simulation Archive” with James R. Wilson, Robert G. Sargent, and Richard E. Nance;
- “GPSS Discussion” led by Robert G. Sargent with Thomas J. Schriber, Julian Reitman, James O. Henriksen, and Richard E. Nance; and
- “Simula Discussion” led by Richard E. Nance with Birger Møller-Pedersen, Bjarne Stroustrup, and Ole Lehrmann Madsen.

These video oral histories comprise 1.5 TB (terabytes) of data that are stored and backed up at NCSU Libraries. All of the video interviews are transcribed; however, the transcriptions are not yet available for direct use. Also included in the Archive are some audio-only oral histories on cassette tapes; not all of which are transcribed. Other materials, including books and papers of prominent individuals in the field, are yet to be digitized but are available for on-site use.

2.5 Materials of Special Interest

Highly valued in every collection are the rare, perhaps unique, items that add a personal, cultural, or historical touch, sometimes telling a parallel story by their existence. A few items included in the Simulation Archive are:

- Check for \$1 written by Donald Knuth to persons informing him of errors (verified) in the volumes from his iconic *Art of Computer Programming* series;
- A letter dated circa 1970 from W. D. McElroy, then Director of the National Science Foundation, thanking Richard Nance for his example of the research in congruent number theory, done with no practical application until the invention of the digital computer centuries later;
- A 1981 picture of Robert Sargent with Keith Douglas Tocher, the author of the first discrete event simulation book, and an iconic figure in British computing;
- A photograph of the “first computer bug” -- the carcus trapped between a relay of the Mark II Advanced Scientific Calculator; the details of this finding appear to remain unsettled.

3 ARCHIVE EFFECTIVENESS FROM VARYING PERSPECTIVES

Researchers access the Archive for numerous purposes. Overall, SCRC reference staff provide research support and instruction on the use of finding aids, digitized materials, and collections. Throughout the prior fiscal year (2015-2016), the SCRC records show 450 visitors to the Special Collections Reading Room. Additionally, 426 contacts to SCRC involve reference inquiries through the World Wide Web (web) site or email account. Researchers and research requests are recorded from 26 states and ten countries. Special Collections handle 2,663 reference questions altogether, a number that grew significantly from the previous year.

How many of these questions and requests pertain to the Archive? That statistic is not available, but some undoubtedly do. For instance, one case study of a researcher using the Archive involves a question concerning an important term/concept in computer simulation. The researcher wants to survey all of the oral histories in order to determine, from a historical perspective:

- Who discusses this concept, and what is stated about this concept?
- When does this concept first become commonly used, and why?

SCRC staff conduct a search in all of the transcripts to determine when this term is used in the oral histories. The researcher is provided with “time stamps” of the usage of the term for each oral history, so s/he can listen to the discussion online. Other examples of research inquiries include questions about the content of past and current WSC proceedings; requests for copies of simulation proceedings; and access to books relating to computer simulation.

3.1 Endowment Support

Two professional bodies mentioned above, ACM/SIGSIM and INFORMS/I-Sim, are substantial continuing contributors to the Archive endowment. Individual contributors span the spectrum of the simulation community. The academic domain is a primary source, but many of these individuals are also successful entrepreneurs. Government ties, military support, and private industry consultancies are

prominent in the experiences of many contributors. A prevalent thread in the careers of all contributors is an overriding commitment to the preservation of the history and the future advancement of computer simulation.

3.2 Potential Users and Use Statistics

Although no definitive measurement is employed or contemplated, the potential user community is likely to be quite diverse, with markedly different motivations and needs:

- undergraduate students responding to a course assignment or seeking a project or paper topic;
- graduate students seeking a thesis or dissertation topic or performing a literature search;
- faculty seeking material for course assignments or doing research in computer simulation; and
- researchers in the history of computer simulation specifically, or the history of technology in general.

Especially noteworthy is the extent of material that is accessible online and the planned expansion in digitized material.

NCSU Libraries has acquired data from Google Analytics on the frequency of access to the Archive website. The year 2013 marks the initiation of the current version of the Archive website. In that initial quarter-year, 224 users access the website. The number of users consistently grows as new content is added: 1075 users in 2014, 1398 users in 2015, and 1458 users in 2016. During the first four months of 2017, the website experiences 615 users. Determining individual user identities is not possible since Google Analytics collects the number of users based on unique IP addresses. Google Analytics collects other data as well; from 2016-2017 thus far, 1710 sessions are recorded with 3157 page views. Previously, from 2015-2016, 1,934 sessions are recorded, with 3,847 page views. In 2014-2015, 1,704 sessions are recorded, with 3,700 page views. These numbers collectively indicate a steady and healthy growth in the number of users accessing the Archive website.

3.3 The NCSU Libraries

The NCSU Libraries, which house the Archive, is the gateway to knowledge for the NC State community and partners. The Libraries define the leading edge of information services and collections to support the university's mission and to further disseminate knowledge. The NCSU Libraries' goal is to provide its users—the faculty and students of NC State, as well as other researchers in this country and abroad — with the innovative spaces, technologies, services, and resources needed to access and create knowledge, develop competitive skills, compete for funding, and ultimately develop solutions for the challenges facing the state, the nation, and the world. The Libraries' aim is to provide the user community with the collaborative spaces, leading-edge technologies, robust collections, and embedded librarianship that match the university's world-class talent and entrepreneurial spirit. In order to fulfill the land-grant mission, the Libraries intend to serve not only the campus community but researchers here and abroad.

NCSU Libraries is also one of the most decorated academic research libraries in the world: recognized as the first university library to win the Association of College and Research Libraries (ACRL) Excellence in Academic Libraries Award and having both the most Library Journal Movers & Shakers with eight and ARL Leadership Fellows, with six. Following the opening of the James B. Hunt Jr. Library in 2013, NCSU Libraries is recognized with the 2014 Stanford Prize for Innovation in Research Libraries, the AIA/ALA Building Award, the ALA/IIDA Library Interior Design Award, and the 2014 John Cotton Dana Award for Libraries Public Relations, among others.

3.4 Library Support of the Computer Simulation Archive

Within the approximately 200 full-time employees of the NCSU Libraries, the SCRC staff oversees much of the management of the Archive, and acquires and describes the rare and unique materials as they are added. Arranging, describing, and preserving its most distinctive and important materials allows SCRC to make these unique collections available to university scholars and international researchers in local research space and online. SCRC is committed to providing open access to its collections as soon as possible after acquiring materials. In order to promote accessibility, a collection is arranged in a comprehensible order with a written description (collection guide or initial inventory, known as a “finding aid”) that enables researchers to identify appropriate materials in the collection. SCRC creates machine-readable catalog records and preliminary collection guides available on the web within weeks of receiving collections. Individual book donations are also cataloged and searchable online.

The online portion of the Archive is produced by staff members in Digital Library Initiatives (DLI) in partnership with SCRC’s digital program librarian. These digital collections provide web access to collections that drive research, highlight innovation, and add unique value to the research enterprise and scholarly communication. The Digital Program collaborates closely with colleagues in the SCRC, DLI, and IT (Information Technology) units on important projects featuring innovative technical and promotional components. The SCRC’s Digital Program serves as a gateway to hundreds of thousands of materials from its rich holdings.

The Computer Simulation Archive site origination is as a Ruby on Rails web application using a relational database. Search functionality is provided by Elasticsearch, a non-schema full-text search engine based on Lucene. An administrative interface facilitates the insertion of information about the videos and interviewees. The core code of this initial version is a plugin (an engine in Rails terminology) that NCSU Libraries has developed as part of the Student Leadership Initiative video oral history project. This oral history video and biography administration code is then applied to both sites, reducing duplication of effort.

Since its initial launch, the site has migrated to the Middleman static site generator. By statically generating the HTML pages and removing server-side code, long-term maintainability is improved, and the information architecture and technical infrastructure are simplified. Both the relational database and search engine are no longer needed. All the data on videos and biographies are now managed as YAML and Markdown files alongside the code. A static search index is generated for use by the Lunr.js JavaScript library which uses a TF-IDF algorithm for relevancy, similar to Solr. This statically generated index is then used by Historical State Search to probe within the Archive site.

All of the video for the web site is delivered via progressive download HTML5 video. To provide the same video player experience across browsers, the Video.js web video player is used. NCSU Libraries provide an MP4 download of the video for offline viewing as well as an MP3 for listening to the interviews. Future plans entail delivery of the video via adaptive bit-rate formats like MPEG-DASH and HLS which allow for both higher quality versions and quality-of-experience adaptations based on network conditions.

4 FUTURE PLANS FOR THE SIMULATION ARCHIVE

Improvements in accessibility, as noted in the above paragraphs, are a continual combination of reaction to technology advancement and recognition of opportunities afforded by technology. This responsibility lies with the SCRC staff, who maintain a view well beyond the Archive boundaries while demonstrating responsiveness to emerging needs.

The role of the Simulation Archive Advisory Committee (SAAC) is to serve a communications and liaison function between the SCRC staff and the simulation community. Annual oral reports at ACM/SIGSIM and INFORMS/I-Sim business meetings during the WSC and written reports in the I-Sim

Newsletters provide status and feedback information for both parties. Such information factors significantly into the planning for content development.

The SAAC has adopted a proactive posture in accruing financial support for the Archive. The ROHCSP, described above, is an example of the committee's assuming responsibility for obtaining resources – in this case NSF funding – to add an extremely significant component to the Archive. Specific project definition and support from external sources are essential elements in future planning.

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AUTHOR BIOGRAPHIES

RICHARD E. NANCE is Emeritus Professor of Computer Science at Virginia Tech. He received BSIE and M.S. degrees from N.C. State University in 1962 and 1966 respectively, and the Ph.D. from Purdue University in 1968. He has served on the faculties of Southern Methodist University and Virginia Tech, where he was Department Head of Computer Science, 1973-1979. He was named to the John Adolphus Dahlgren Chair in Computer Science in 1988. Dr. Nance has held research appointments at the Naval Surface Weapons Center and at the Imperial College of Science and Technology (UK). He has held visiting appointments at Old Dominion University and Brunel University (UK). He is the author of over 150 papers on discrete event simulation, performance modeling and evaluation, computer networks, and software engineering. Dr. Nance has held several editorial positions and was the founding Editor-in-Chief of the *ACM Transactions on Modeling and Computer Simulation (TOMACS)*. He served as Program Chair for the 1990 Winter Simulation Conference. Instrumental in the development of the Simulation Archive at N.C. State, he currently chairs the advisory committee. Dr. Nance received the Lifetime Professional Achievement Award from the INFORMS Simulation Society and was elected a Fellow in 2008. He was elected a Fellow of the Association for Computing Machinery in 1996. In 2006 he was recognized by the faculty of the Edward P. Fitts Department of Industrial & Systems Engineering of N.C. State as one of the 12 Distinguished Alumni over the first 75 years of the department's history.

Nance and Thayer

His e-mail address is nance@vt.edu.

GWYNETH A. THAYER is the Associate Head and Curator of Special Collections at the Special Collections Research Center (SCRC) at NCSU Libraries. As a part of her curatorial work she consults with the Computer Simulation Archive advisory committee in overseeing the management and growth of the Computer Simulation Archive. She earned her B.A from Brown University; M.A. from the University of Texas at Austin; and Ph.D. in public history from Middle Tennessee State University in 2010 and has worked at NCSU Libraries since 2013. Her previous employment was at the Tennessee State Library and Archives in Nashville, Tennessee. Her e-mail address is gathayer@ncsu.edu.