1 Formation of the Computer Science Center

This paper traces the beginning of computing at the University of Maryland in the late 1940s at the University of Maryland through the first six years of the Department of Computer Science to 1979.

1.1 State of Computing in Universities in the United States in the 1940s–1950s

Before discussing the start of computing at Maryland, it is well to review the status of computing, and the introduction of computers at universities in the United States. As noted by Aspray\(^2\), computer science started in American universities in the 1940s. Five universities played important roles in establishing computing: MIT, Harvard University, the University of Pennsylvania, Columbia University, and Princeton University. MIT had a long tradition in computing going back to the 1920s and 1930s with Vannevar Bush and the Differential Analyzer. The strong engineering capability at MIT led to the development of the Whirlwind computer, in 1949, under Jay Forrester. It was the first real-time computer. Harvard’s entry in computing revolved around Howard Aiken, who, together with engineers from IBM led the development of the Mark I computer, installed at Harvard in 1945. The University of Pennsylvania, under the direction of John Mauchly, and J. Presper Eckert, led the team that developed the Electronic Numerical Integrator and Calculator (ENIAC), the world’s first electronic calculator, completed in 1946 at the Moore School of Electrical Engineering at Penn. Columbia University and IBM agreed to establish the Watson Scientific Computing Laboratory on the Columbia campus in 1945. Princeton University, influenced by the work of John Von Neumann at the Institute for Advanced Computer Studies started computer activities. All of these universities introduced computer courses into their curricula in the 1940s. Aspray considers 1945 to be the starting point for academic computing.

The 1950s was the start of the introduction of computers in the commercial market\(^3\). In 1951, The Ferranti Mark I and Univac I, were the first commercial computers available. The Aberdeen Proving Grounds, which had sponsored the ENIAC computer had obtained the ORDVAC computer in 1952. IBM developed the 704, and Univac, the 1103 computer in 1956, and became the first commercial computers to use random access magnetic core memories. In 1959, the IBM 1400, 7070, and 7090; and the DEC PDP I were developed.

In the 1950s, with the availability of computers, computing was introduced at other universities. The University of Illinois, the University of Michigan, and Purdue University developed strong programs in computing. Other prominent computer science programs were developed at Stanford University and at Purdue University in the early 1960s. As noted by Aspray\(^4\),

The first doctoral program with the name “computer science,” was not formed until the 1960s, and it was not until the 1980s that the National Science Foundation gave the same institutional status of computer science as it confers upon traditional scientific disciplines such as physics, mathematics, or chemistry.

The first student with a Ph.D. in computer science obtained his degree in 1962. The designation of computer science as a distinct discipline within the NSF came during the period 1980–1982. The Computer Science Section of the NSF was under the Division of Mathematics at the time. The Advisory Committee to the Computer Science Section believed that it was important that the CS


\(^4\)See the previous footnote
Section become a Division since computer science was a discipline in its own right, was increasingly important, and needed independence to flourish and meet its potential. The issue was brought to the NSF administration, was discussed within the NSF and it was decided that the CS Section would be made a Division.

1.2 Introduction to Sections

There are three major sections to the paper. The first covers the period before the start of the Computer Science Center (CSC) on February 1, 1962; the second the period 1962-1973 when the CSC started and had both computer service and academic functions; and the third period 1973-1979 that discusses the first 6 years of the start of the Department of Computer Science. Two major entities are covered: the Computer Science Center and the Department of Computer Science. The focus of the paper is on events that occurred in the Computer Science Center that impacted on the Department of Computer Science. Hence, only part of the history of the Center is covered. The two entities are intimately related. Events that happened prior to the formation of the Department are of critical importance. Wherever an event started in one period and extended to the next period, I have mainly chosen to present the entire history in the period in which it started so as not to break the continuity. This will become apparent when discussing the first computer purchased for the Center, the Center building construction, and other events.

Section 1.3 describes the beginning courses that taught about computers, and the events that led to the formation of the Computer Science Center and the hiring of the first Director of the Computer Science Center, Dr. Werner C. Rheinboldt on February 1, 1962. It also describes Rheinboldt’s work between August 1961 when he was hired as a consultant to the University until the date that he was hired as Director.

Section 2 discusses the objectives of the Computer Science Center and how those objectives were met. The objectives, developed by Rheinboldt, and approved by the administration, were to:

1. Provide centralized high-speed computing service and programming assistance to all research activities of the University;

2. Build and administer an interdisciplinary educational program in computer sciences; and

3. Build and conduct a research program in computer sciences.

I discuss the computers selected for the Center, the work done to prepare a building to house the Center, develop a staff to run the computer, and hire faculty to start research and education programs. In addition to developing three degree programs: Master of Science, Doctor of Philosophy, and Bachelor of Science, I discuss the unique contribution made at Maryland to the development of a world-wide curriculum in computer science under the auspices of the Association for Computing Machinery (ACM). Dr. William F. Atchison, who succeeded Rheinboldt as Director of the Center in 1966, was Chairman of the ACM Curriculum Committee, Rheinboldt who was a founding member of that committee, and Associate Professor Earl J. Schewpe, the first professorial faculty member hired by Rheinboldt in the Center, who became a member and secretary to the committee, all played major roles in the development of a world-wide curriculum for computer science.

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5Professor Jack Minker was Chair of the Advisory Committee to the CS Section of the NSF during the period 1980-1982. He recalls that, as Chair of the committee, he accompanied Kent Curtis, the Director of the CS Section, to discuss the issue with top administrators at the NSF and with prominent mathematicians who did not support a split of computer science from the Mathematics Division. The mathematicians would not consider an applied mathematician, a distinguished numerical analyst who had moved into computer science as the head of a Division including mathematicians and computer scientists. Minker believes that this diminished their arguments, and convinced the NSF administrators to make computer science a separate division.
Section 3 discusses the formation of the Department of Computer Science in July 1973 and the selection of Dr. Jack Minker as the first permanent Chairman in 1974. I describe the problems faced by a new department and the growing number of students that had to be handled when the Bachelor of Science Degree, approved in 1973, was initiated in 1974. The history is terminated in 1979 when Minker completed his five (5) year tenure as Chairman and returned to research, teaching and service in the Department.

Several appendices are listed following the main text:

1. Appendix 1 - List of Computer Science Courses Offered in 1973;
2. Appendix 2 - Chronology of Significant Events up to 1979;
3. Appendix 3 - List of Faculty in the Computer Science Center, 1962-1973;
4. Appendix 4 - List of Faculty in the Department of Computer Science, 1973-present;
5. Appendix 5 - List of Personnel in the Computer Science Center in 1968.

1.3 Computing at Maryland Before 1962

This section discusses the state of computing in the University before 1962. It discusses computer usage during the late 1940s-1962 time period, the introduction of the first computer courses on campus, the steps leading to the formation of the Computer Science Center, and the hiring of Professor Werner C. Rheinboldt as Director, and Mr. John Menard as Assistant Director.

1.3.1 Computer Usage

The use of computers for research and administration started in the late 1940s/early 1950s at the University of Maryland. As happened at many universities, the computing activities arose in many different departments. As noted in an undated memorandum by Werner C. Rheinboldt (circa 1962)\(^6\), Director, “The Computer Science Center at the University of Maryland,”

The lack of a central computing center on the campus has not prevented the build-up of a substantial computing effort for the research projects of a large number of faculty members. ..., these computing efforts have made extensive use of the machines available in the area, but they were often hindered by these inadequate or inconvenient arrangements. ...

The report noted that the most substantial computing projects were being undertaken by the Physics Department in connection with their high-energy nuclear physics projects (involving bubble-chamber, counter and nuclear-emulsion experiments). Other computing included calculations in space physics, plasma-physics, quantum-field theory, astro-physics and solid-state physics. Molecular physicists were also using computers. An accurate figure of the time used per week for these computations is not known. As noted below, there were some computers on campus, but none were

\(^6\)The seven (7) page undated document by Werner C. Rheinboldt, “The Computer Science Center at the University of Maryland,” may be found in the Menard collection in the University of Maryland Archives, Hornbake Library.
adequate for research. Computer time was obtained outside the University on machines, one of which was an IBM-7090.

Scientists in the Institute for Fluid Dynamics and Applied Mathematics were also using computers. The Fluid Dynamics group's work included the problem of waves in a plasma, structure of shock waves and other computations. The Applied Mathematics group (together with the Mathematics Department) developed an extensive theory for finding eigenvalues of boundary value problems for partial differential equations.

A large project within the Chemistry Department dealt with the analysis of crystallographic structures.

The Social Science Departments were conducting statistical studies using various computers. The College of Agriculture had a number of efforts including one from the Department of Animal Husbandry on genetics effects in poultry breeding.

The Engineering Departments had numerous projects. These were done on the IBM-1620 computer within the Engineering College and using outside computers.

In the School of Medicine on the Baltimore campus, several statistical studies of problems in Psychiatry and Obstetrics and Gynecology were using various computers as were other medical activities on that campus.

There were several computers on the College Park campus:

1. An IBM-1401 auxiliary satellite computer used for administrative work.
2. An LPG 30 computer used for space research in the Department of Physics.
3. An IBM-1620 computer in the College of Engineering used both for research and teaching.

None of the three computers was particularly useful for research or scientific computation. The IBM-1401 was used for administrative work and was essentially used as a printer. The LPG 30, although considered as 'general purpose,' and used for space research, was hardly adequate for scientific computation. The IBM-1620 was used in the College of Engineering for some limited work in research, and for assembly language coding in the course EE 131, Electronic Digital Computers, (see Section 1.3.2). Hence, effectively, there was no computer support for research on campus until a centralized computer facility was started and an IBM-7090 was acquired in 1963 (see Section 1.4.2).

1.3.2 Computers and Education

In addition to the above computing activities, courses concerning computers were being introduced in various departments: Mathematics, Electrical Engineering, Business Administration, and Chemical Engineering.

The first course that discussed the use of computers for calculations was taught in the Fall 1948 semester by Dr. Harry Polachek, who was a part-time Associate Professor in the Mathematics Department. Dr. Polachek\(^7\) worked at the Naval Research Laboratory and was responsible for their computing activities. He taught a course, Numerical Analysis Math 135 for undergraduates, and a course, Advanced Numerical Analysis, Math 235. Part of the course was devoted to computational issues. The catalog description for Math 135 that describes computational issues reads,

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\(^7\)Jack Minker sent a letter to Dr. Polachek in October, 2002 asking about any remembrances he may have had of the courses he taught at Maryland. Unfortunately, in a response received from Dr. Polachek's daughter, Mrs. Linda Brokaw, he learned that Dr. Polachek died February 23, 2002. Dr. Polachek worked at the Naval Research Laboratory on mathematical and computational solutions to Naval problems. In the early 1950s he was Chief, Applied Mathematics Division, Naval Ordnance Laboratory, White Oak, Maryland, which acquired, housed and utilized, the second computer owned by the U.S.Navy. He received the following awards: U.S. Navy Meritorious Civilian Service Award, 29 December 1951; U.S. Navy Distinguished Civilian Service Award, 3 November 1960; and the Department of Defense Distinguished Civilian Service Award, 19 April 1961.
Survey of high speed calculators; applicability of numerical techniques. Evaluation of errors in extended calculations; round-off and truncation errors. 

On a final examination for Math 235 he asked the following question,

In a recent article in the Bulletin of the AMS (Nov. 1947) J. von Neumann and H. Goldstine define the concepts of digital computers and pseudo-operations. Discuss these concepts, and prove in detail the following inequalities. 

Dr. Polacheck was intimately familiar with computer developments and, although there is no record of what he taught, it is clear from the catalog description above, and the question he asked on the final examination on Math 235, that he discussed computational issues for digital computers in his courses. He apparently also taught the first computer course on numerical analysis at Maryland. 

Perhaps the earliest course on programming was introduced by the Mathematics Department in the spring 1955 semester (January 1955). The course, Math 156, Programming for High Speed Computers was taught by Assistant Professor David M. Young, Jr. After his Ph.D. at Harvard, where his thesis advisor was Professor Garrett Birkhoff, he worked at the Aberdeen Proving Grounds (APG) for a year and then taught at the University of Maryland from 1952-1955. Dr. Young's course was primarily about numerical analysis. The students would take field trips to APG to use the Ordvac computer on which they did programming projects in machine language—Fortran did not become available until 1956. There were about 30 students in the course. He was assisted by Charles H. Warlick, who was a graduate student at Maryland and had previously worked with Dr. Young at APG.

The catalog description for Math 156, Programming for High Speed Computers, read,

Prerequisite - Math 21 (Calculus) or equivalent

General characteristics of high-speed automatic computers: logic of programming, preparation of flow charts, preliminary and final coding; scaling, use of floating point routines, construction and use of subroutines; use of machines for mathematical operations and for automatic coding. Each student will prepare, and if possible, run a problem on a high speed computer.

The Electrical Engineering Department hired a lecturer, Dr. Yaohan Chu, to teach the first hardware-oriented courses on campus. Dr. Chu became a Professorial faculty member of the Electrical Engineering Department and the Computer Science Center in the 1960s. In the fall 1957 semester (September 1957), he taught the first course, EE 130, Electronic Analog Computers. No analog computers existed on campus at that time. The analog computer course was offered only twice, as the course on digital computers that he introduced in 1958 was more popular. He taught from his own notes, since no text existed on the subject.

The catalog description for EE 130, Electronic Analog Computers, read,


Dr. Young is very well-known for his work in numerical analysis and spent most of his career at The University of Texas at Austin becoming the Ashbel Smith Professor of Mathematics and Computer Sciences. In addition, he was the Director of the Computation Center, 1958–1970, and the Center for Numerical Analysis, 1970–1999. Some of his honors include Fellow of the American Association of the Advancement of Sciences and the ACM Award for Outstanding Contribution to Computer Science, 1990.

Personal e-mail correspondence from David R. Kincad to Jack Minker, 8/29/02. Dr. Kincad talked to Dr. Young as requested by Minker and sent the information to him. The email is contained in the Minker list of emails concerning the history of the Department in the Minker collection in the University of Maryland Archives, Hornbake Library.

Dr. Warlick also spent most of his career at The University of Texas at Austin and became the Director of the Computation Center, 1970–1996.
Prerequisites - EE 101 (Engineering Electronics), Math 64 (Differential Equations for Engineers)

Principles of electronic computers of the analog type. Analog computing components, operational amplifiers, d-c amplifiers, instrument servos, multipliers, and function generators.

The course, EE 131, Electronic Digital Computers, introduced by Chu in the spring 1958 semester (January 1958), was the first course on campus to teach the organization of digital computers. Dr. Chu does not recall the number of enrollees in the first offering, but estimates that there may have been about 20-30 students. There were no suitable text books available and so he started to write a digital computer design book in 1960 which was published two years later by McGraw Hill. The first course covered mostly logic design and later, additionally, when computers became available on campus he introduced the students to assembly language programming. The students used an IBM-1620 computer which was installed in a separate room under the direct control of the Dean of Engineering.

The catalog description for EE 131, Electronic Digital Computers, read,

Principles of electronic computers of the digital type. Digital computer operations, basic computing and control circuits, logical design, arithmetic unit, memory systems and control units.

Shortly after, there were a number of directly computer-related courses introduced in several departments, some of which are as follows:

1. Business Administration 101, Integrated Data Processing for Internal Control, a bridge between accounting principles and the handling of large columns of data in business and government operations.


4. Chemical Engineering 100, Seminar, consisted of lectures and laboratory periods and introduced students to the principles of electronic computing and especially the use of the IBM-1620.

All of the above courses numbered between 100 and 200 were upper level undergraduate and lower level graduate courses. In addition to these courses, several departments incorporated computers into their courses: Mathematics, Economics, Business Administration, Chemical Engineering, Electrical Engineering, Physics, Public Administration, Agriculture, Education, Psychology, and Sociology.

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12In a personal e-mail from Dr. Chu to Jack Minker on August 29, 2002, he discussed both courses, EE 101 and EE 103, contained in the Minker emails regarding the Department history in the University of Maryland Archives, Hornbake Library.