

# **Maturation of Computer Science Research and Education at the University of Maryland:**

**Evolution of the Department of Computer Science  
from 1979 through 2006**

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# **Maturation of Computer Science Research and Education at the University of Maryland: Evolution of the Department of Computer Science from 1979 through 2006**

## **Abstract**

This report traces the evolution of the Department of Computer Science from 1979 through the end of 2006. In 1979 the department was growing, approaching over 2000 undergraduate majors. This report describes how this crush of students was handled, followed by other significant events in the history of the Department, such as the creation of the Institute for Advanced Computer Studies, moving into the A. V. Williams Building, creating its own computer laboratory, as well as the creation of various centers and institutes that helped further its growing research reputation. At the end of 2006, the Department had close to 50 faculty members, was nationally ranked, and was ranked one of the highest departments on the University of Maryland campus.

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# 1. Introduction

## 1.1. 1940 through 1979

In an earlier report [Minker04], Jack Minker described the beginnings of computing on the University of Maryland College Park campus. From a few scattered activities during the 1940s and 1950s, computing really got started in 1962 with the hiring of Dr. Werner Rheinboldt as Director of the newly-formed Computer Science Center. September 1965 saw the introduction of 6 courses in the then fledgling field of computer science and a Master of Science degree program was created in the Computer Science Center in September 1967, followed shortly by a PhD program in September 1969. Maryland was already making a name for itself in the research areas of numerical analysis with Dr. Rheinboldt and Dr. Jim Ortega, picture processing with Dr. Azriel Rosenfeld and artificial intelligence with Dr. Jack Minker.

In the early 1970s, due to growing demand for an undergraduate degree in Computer Science (both nationally and locally in College Park), the research and educational activities of the Computer Science Center were moved to an academic unit, so a Department of Computer Science was created within the newly formed Division of Mathematics, Physical Sciences and Engineering (MPSE) in 1973 that included those components of the CSC. The Department of Computer Science accepted its first undergraduate Computer Science majors in August 1974. Jack Minker was first permanent chair of the department from 1974 through July 1979 (Figure 1.1).

The 1970s saw tremendous growth in the Department of Computer Science – from its first MS graduate in 1969 to 92 BS, 33 MS and 9 PhD degrees in the 1978-79 academic year.<sup>1</sup> As described in [Minker04], by 1978 student enrollment “increased by over 1,200 (37%) and undergraduate majors by 400 (270%)” yet “faculty F.T.E. count decreased by two positions.”

Research within the Department grew from a few outstanding researchers to world-class research groups. Azriel Rosenfeld ran his renown computer vision laboratory, Laveen Kanal was an expert in pattern recognition and Hanan Samet, in geographic data bases, all joined the AI group. Although the number of numerical analysts within the department was small, the Department was able to hire Dr. Pete Stewart and Dr. Dianne O’Leary in the 1970s. In addition, the University had a large numerical analysis group, mostly affiliated with the Mathematics Department in the Institute for Fluid Dynamics and Applied Mathematics (IFDAM). The software engineering group started to take shape with the hiring of Drs Basili, Gannon, Hamlet, and Zelkowitz during this period, and at the end of the 1970s, Dr. Ben Shneiderman moved to Computer Science from the Information System Management Department. Shortly thereafter, Ben started his Human Computer Interaction Laboratory (HCIL). The systems area took shape with the hiring of Ashok Agrawala in 1971 and Satish Tripathi in 1978.

With these changes, the reputation of the Department grew. An outside review panel of the Department in 1978 ranked it around 15th among all Computer Science Departments. A 1978 survey of 71 PhD-granting institutions by Dr. Richard Conway of Cornell University [Conway78] ranked Maryland



**Figure 1.1. Dr. Jack Minker, first chair of the Department.**  
(Photo by B. Shneiderman, 1980)

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<sup>1</sup> Department of Computer Science, University of Maryland, Annual Report – 1978/1979.

14th and 16th in quality of graduate faculty according to 2 different criteria. The department acquired funding for its first large computer (a D.E.C. VAX 11/780) in 1979 and Maryland became an important node on the relatively new ARPANET, forerunner of today's Internet.

Dr. Minker did an admirable job, given the faculty and financial constraints he had to deal with. But the growing importance of information technology in the world and the growing demands for computer science courses required changes in the University and Department during the 1980s and thereafter. That is the focus of this present report – as we move this history forward from 1979 to 2006.

## 1.2. Overview of 1979 to 2006

To a great extent, we can organize the history of the Department into 4 eras:

- *Creation and explosive growth.* This covers the initial years of the Department, already discussed in [Minker04], through the early 1980s.
- *Recognition.* This covers the period during the 1980s, when the department gained recognition for its quality both on this campus and internationally. This led to greater resources, more faculty, more space to house those faculty, and the creation of the Institute for Advanced Computer Studies (UMIACS) as a computer science research activity of the University.
- *Consolidation.* The period from 1989 through 1999 represents a consolidation of the tremendous growth of the 1980s. The department was still evolving, but was not forced to react to every external event, which allows new changes to occur in a more orderly manner.
- *The future.* This covers the period from 1999 through the end of 2006 when Dr. Larry Davis was (and still is) Chair. Since this is being written in early 2007, why do I call the period since 1999 “the future?” As I hope this report will show, the Department at the University of Maryland, as well as the field of Computer Science, is undergoing a change and it is still too early to know the impact and effects of the changes that have occurred since around the year 2000.

For the most part, we can discuss these changes by looking at the department chairs during each of these periods: Dr. Raymond Yeh from 1979 through 1981 and Dr. Richard Austing as Acting Chair from 1981 to 1982 represent the explosive growth era. Dr. Victor Basili from 1982 through 1988 represents the recognition phase of the department's development. Dr. Satish Tripathi from 1988 through 1995 and Dr. John Gannon from 1995 through 1999 represent the maturation phase. Finally, Dr. Larry Davis from 1999 through 2006 represents the beginning of the future development of the Department.

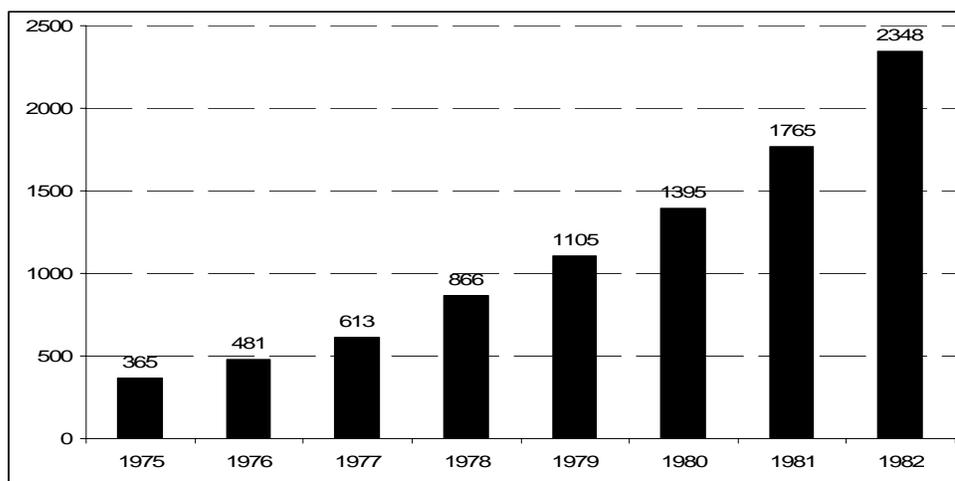


Figure 2.1. Computer science enrollment – 1975-1982.

**Disclaimer:** This report is meant to provide the reader with as complete a history as possible of the development of the Department over the period 1979 through 2006. As much as possible, all details are verified with written historical records. However, some of the details are the results of interviews with several of the participants who helped shape this history. As any good psychologist will tell you, oral histories are notorious for containing errors and inaccuracies. As much as possible, these are minimized in this report, but undoubtedly, this author’s recollection of what may have happened may differ from others. I take responsibility for all such errors.

## 2. Explosive growth – 1979-1982

### 2.1 The 1978 environment



**Figure 2.2. Computer and Space Science Building. Original home for Department of Computer Science.**

As given in [Minker04] the situation in the Department in 1978-79 was not what you would call “peaceful.” The graduate student population was hovering over 200 graduate students and the number of undergraduates Computer Science majors grew from 0 in 1974 to 1105 at the start of the 1979-80 academic year (Figure 2.1), and more than doubled to 2348 only 3 years later. The department was in very cramped space in the Computer and Space Science Building (CSS) (Figure 2.2) and due to a poor state economy that year, the University was in a hiring freeze. There was fear that due to the needs of the Business School, faculty lines, including one from Computer Science, might have to be transferred. With 30 tenure track faculty,<sup>2</sup> that represented (including graduate students) about 45 students per faculty member. For Spring 1979 the 36 undergraduate courses had a total enrollment of about 2600 students, or over 70 students for each faculty and instructor in the department. Faculty course loads were two courses per semester and each class was extremely overcrowded.

For most of the 1970s, hiring of faculty was almost always at the Assistant Professor level. However, when Dr. Minker said that he would step down as chair during the summer of 1979, the Department decided to go outside the university in its search for a new department chair.

### 2.2 Dr. Raymond Yeh: 1979 – 1981

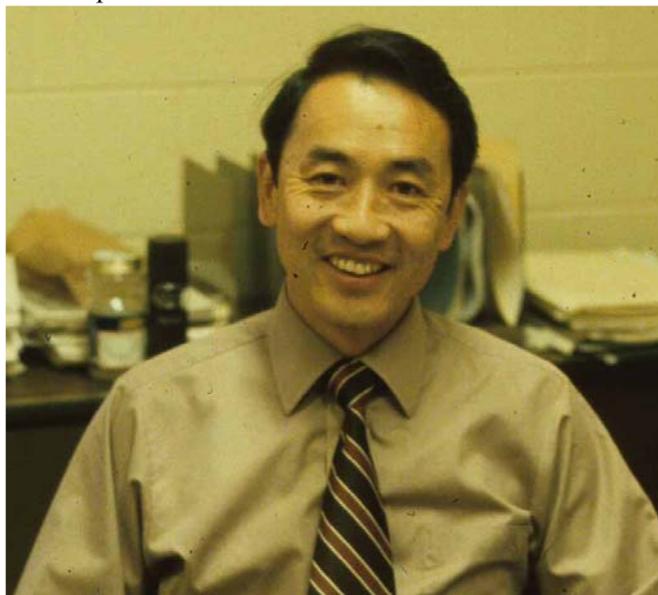
Dr. Raymond (Ray) Yeh, from the University of Texas, was soon on the “short list” of potential candidates, and most faculty, especially the software engineers (Dr. Victor (Vic) Basili, Dr. John Gannon, Dr. Richard (Dick) Hamlet and Dr. Marvin (Marv) Zelkowitz) were thrilled to have a chair from their own research area.

An interesting anecdote in the hiring of Ray Yeh occurred during his interview visit to campus on February 19, 1979. Yeh arrived during the weekend of February 17th at the University’s Adult Education Center,<sup>3</sup> just before a snowfall of 18.7 inches, third largest snowfall in Washington DC history, fell on the city on the 18th. On Monday, February 19th nothing moved. For one of the very few times during the 1970s, the University was closed. In order not to lose Ray as chair, Dick Hamlet, who lived in Ellicott

<sup>2</sup> Faculty memo: J. Minker, Chair – “Space” June 19, 1979

<sup>3</sup> Called the Inn and Conference Center, today

City (in Howard County), took his 4-wheel drive Range Rover, picked up Marv Zelkowitz in Columbia, John Gannon in Silver Spring, and Vic Basili, who was living in Lanham at the time, and all 4 traipsed to the campus to meet with Dr. Yeh.



**Figure 2.3. Dr. Raymond Yeh. Second permanent chair of the Department – 1979 - 1981.**

In addition, he was running his own consulting company, which he started in Austin, as well, and the demands of running a business and being a full-time department chair got to be too much for him. One had to go. So after only two years, in 1981, Ray resigned as chair of the Department. After stepping down as chair, Ray left the university and returned to Austin, Texas to run his company.

Ray, however, left a lasting legacy, that served the Department well in the future. As a new department, overflowing with students, with a lack of space and an insufficient number of faculty, the faculty felt constrained by the rules of the University. Ray taught us that we didn't have to live that way. As we grew to 1765 computer science majors by 1981 (Figure 2.1) (7% of the undergraduate population on campus, but only 2% of the faculty), it was up to the university to accommodate us – not the other way around. If we needed to spend more to fulfill our mission, then going in the “red” with our budget at the end of the year was not only necessary but acceptable.<sup>4</sup>

One such example – For the Spring semester 1980, the Computer Science Center, in a budget crunch, limited class accounts to only 66% of the amount allocated in the previous semester, up to a maximum of \$5,000 per class. This was after some of our larger classes used over \$20,000 in computer time the previous year, and, of course, we were still growing by 30% a year in student enrollments). Ray refused to accept these limits and we merrily charged computer time as necessary.<sup>5</sup>

Ray “discovered” the University of Maryland Foundation, a fund-raising organization affiliated with the University of Maryland. Corporate funds given to the Department through the Foundation could be spent on a number of worthwhile activities. This also allowed the Department and some faculty to roll over funds from one year to the next. Ray also wanted to create an Advisory Board of local industry leaders in order to provide corporate leverage in support of computer science on those running the

In spite of his “chilly” reception in College Park on February 19th (or perhaps because of it), Ray accepted the position and moved to this campus in August of 1979 to become the second permanent chair of the department (Figure 2.3).

Dr. Yeh was chair for only 2 years, and his relationship with faculty was often stormy. It was not a comfortable time within the Department with him as chair, but in hindsight, his having come to College Park was an extremely valuable learning experience for the fledgling department, and the achievements that occurred during the era following his tenure as chair could probably not have been accomplished without the experiences we gained with him as chair.

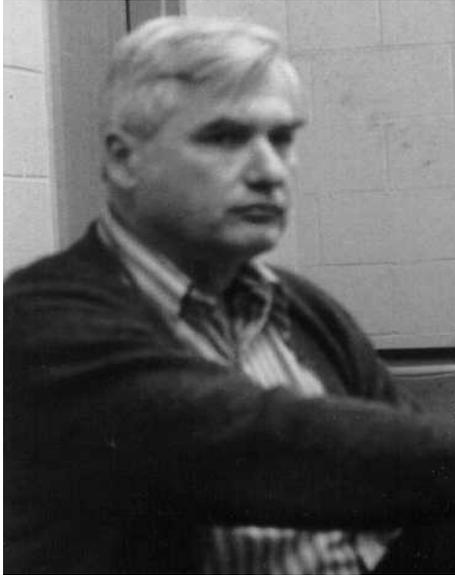
He generally was closed about his ultimate plans. Faculty did not know what he wanted to do and they sometimes resented the actions he undertook. If he had an overall plan, he did not reveal it to others; suspicions about him grew.

<sup>4</sup> Faculty meeting minutes, September 5, 1980.

<sup>5</sup> Memo to Computer Science Center Director John Menard from R. Yeh, Chair – “Policy on Educational Use of Computers” January 23, 1980.

University. Ray basically showed the Department not only how it could survive in a tight bureaucracy, but if done correctly, could even thrive there.

### **2.3 Dr. Richard Austing: 1981-1982**



**Figure 2.4. Dr. Richard Austing.**  
(Photo by B. Shneiderman)

When Dr. Yeh resigned as Chair, Dr. Richard Austing (Figure 2.4) was appointed Acting Chair, while a decision on appointing a permanent chair was being made. Dick was chair for one year from August 1981 through August 1982. Previously he had been the director of the Education Office since the early 1970s since the Department was created and even before that when Computer Science was part of the Computer Science Center.

During this time, the undergraduate enrollment was still climbing – close to 2000 student enrollments. Departmental Education meetings often discussed ways to limit enrollment, such as requiring at least a minimal C grade in every course and limiting class enrollment to be within room limits. But nothing officially was done, and the situation continued to get worse.

## **3. Recognition – 1982 - 1988**

### **3.1 Dr. Victor Basili: 1982-1988**

After the mixed success of Dr. Yeh as Chair, the University decided to stay within the current faculty for the next departmental chair. Dr. Victor Basili became Chair in August, 1982. Because of the growing size of the department – in terms of students, research funding, and faculty – management of the department was more complex and the task was distributed across several individuals. Vic Basili appointed two Associate Chairs: Dr. Marvin Zelkowitz was appointed as Associate Chair for Education, and was in charge of the undergraduate and graduate programs. Dr. Larry Davis was appointed as Associate Chair for Administration and Research and was in charge of the research and physical facilities of the Department.

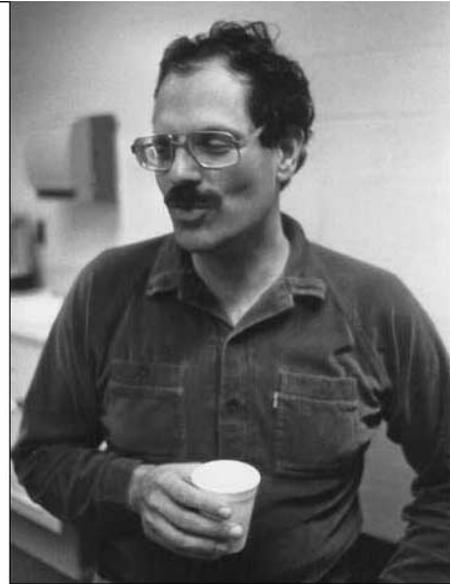
Marv Zelkowitz was Associate Chair for 3 years and was later replaced by Dr. Harold Reiter, a visiting faculty member, in 1985 for a year and then by Austing in 1986. Zelkowitz returned as Associate Chair for Facilities in 1986 for one year to oversee the move into the new building (Section 3.4). Davis was Associate Chair for 3 years until he became UMIACS director in 1985 (Section 3.3). He was replaced by Dr. Nick Roussopoulos in 1985 and by Dr. Dianne O’leary in 1986.

One of Vic’s more important changes was to create a position of an administrative director for the Department. This person would have the day to day oversight of administrative details, from personnel issues, to payroll, to space, to interfacing with the myriad of other offices within the University. Basili hired Cindi Hale as the first Director of Administration. She was a principal reason sanity returned to the Chairman’s office with Cindi being able to interact with other units on campus without Vic’s direct involvement.

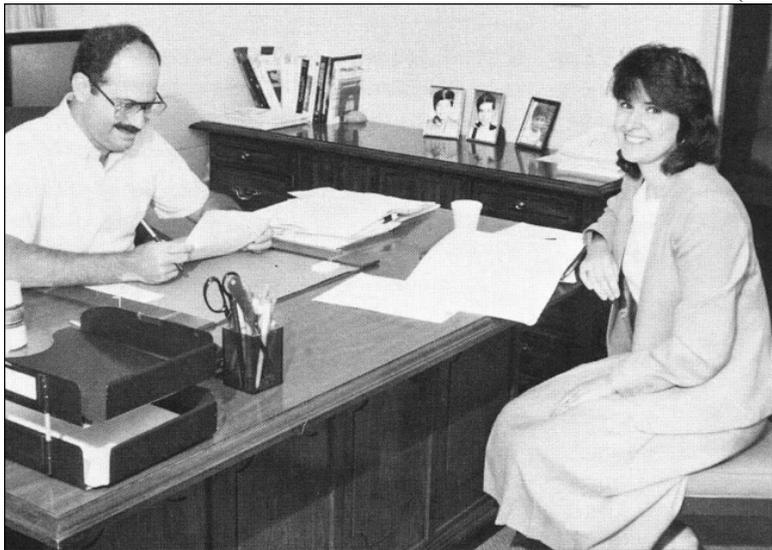
As Associate Chair for Education, I also want to acknowledge the fantastic efforts of Sally Heikkenan, who was Education Office Secretary during the first half of the 1980s (Figure 3.1(d)). She not only knew how to run that office, but interacted well with students who came to see me and was well-liked by all.



**(a) Chairman Victor Basili** (Photo by B. Shneiderman)



**(b) Associate Chairman for Education Marvin Zelkowitz** (Photo by B. Shneiderman)



**(c) Associate Chairman for Administration and Research Larry Davis with Director of Administration Cindi Hale**



**(d) Education Office Secretary Sally Heikkenan**

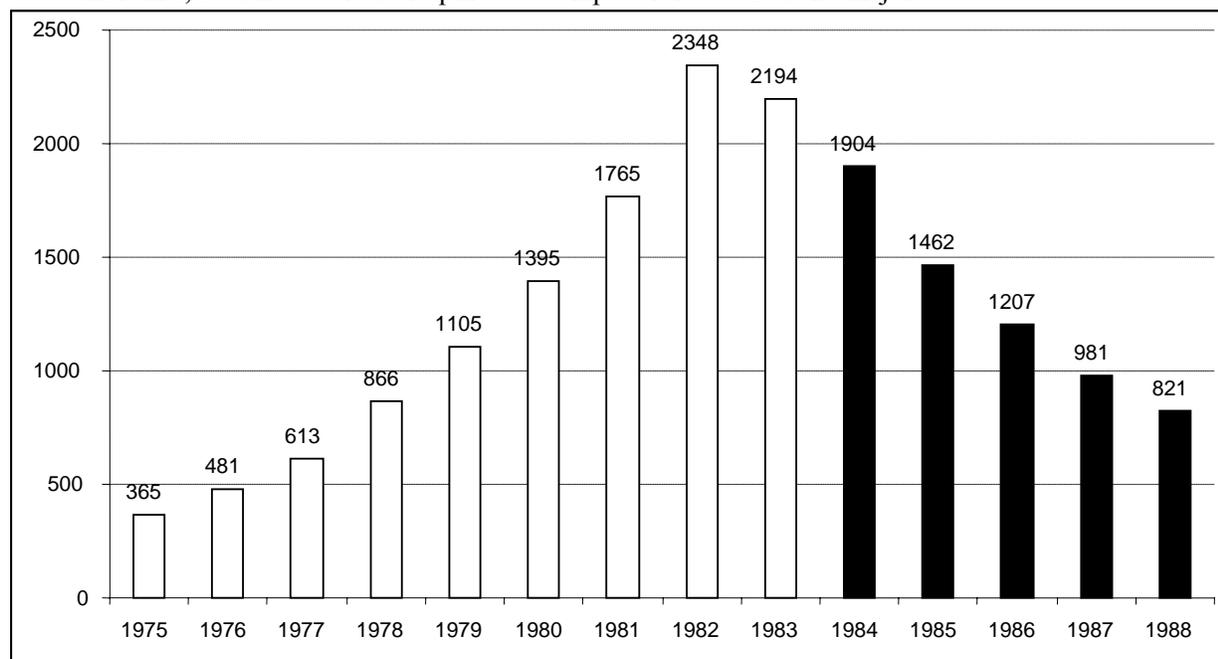
**Figure 3.1. Computer Science Department Administration – 1982**

## Education

**Crisis management:** By fall 1982 the number of student majors grew to 2348 or over 9% of the undergraduate students in the College Park campus with only 30 faculty and 9 (mostly part time) instructors (or only 2% of the total University faculty).<sup>6</sup> Something had to be done!

During the Summer of 1982 Dr. Basili developed a plan for handling the crushing load of students:

1. The Department would apply for a restricted major in Computer Science. It is against University policy to deny students the ability to major in any field they wanted, but if there were unavoidable constraints, students could be required to compete for access to the major.



**Figure 3.2 Effects of a restricted major limits enrollment beginning in 1984.**

2. In the meantime, there would be an allocation policy for admittance to courses. Before Fall 1982, with so many students enrolled, all courses were filled to capacity before everyone could register. Students with the most credits registered first. Since they could then drop courses several times with no adverse consequences, they would often take an overload and then drop the “hard” ones.<sup>7</sup> This meant that students with fewer completed credits would be locked out of all courses. And of course, almost all students took more than 4 years to finish due to not having access to the courses needed for the major. The plan defined for Fall 1982 consisted of:
  - a. Students could register for freshman through junior (100-300 level) courses. Anyone could register for a single senior-level 400-level course. Students with 3.0 (B) grade point averages could register for two 400-level courses.
  - b. About 20% of the seats were reserved for special cases. Permission of the Associate Chair for Education was needed to get an additional course from this set-aside group of seats.
  - c. With this plan, everyone would be guaranteed one 400-level course, and most seniors would be able to get two courses. Anyone could graduate in 4 years if they didn’t drop a course. Students would no longer be eligible to register for 3 or 4 courses and then drop several later in the semester.

<sup>6</sup> 1982 Annual Report, Department of Computer Science. Faculty in 1982 consisted of professors A. Agrawala, W. Atchison, V. Basili, Y. Chu (joint with EE), H. Edmundson (joint with Mathematics), L. Kanal, H. Mills (part-time), J. Minker, A. Rosenfeld (CSC Research professor), G. Stewart and R. Yeh. Associate professors were R. Austing, L. Davis, J. Gannon, R. Hamlet, D. O’Leary, H. Samet, B. Shneiderman and M. Zelkowitz. Assistant professors were M. Elsanadidi, B. Jacobs, D. Nau, D. Perlis, J. Reggia, G. Ricart (joint with CSC), N. Roussopoulos, A. U. Shankar, C. Smith, S. Tripathi and M. Weiser.

<sup>7</sup> University rules changed a few years later limiting the number of times a student could drop a course.

The magnitude of the crisis was not apparent until the first day of classes. Upon arriving at my office at 9am on the first day of classes, I found the line of students wanting permission (step 2.b above) stretching at least 200 feet long, and the chaos didn't subside until late in the afternoon. Most students were allowed to take one additional course, but the level of anxiety was quite high that day. A better plan was needed by the next semester.

Needless to say, students, especially seniors who needed several courses to graduate, didn't like the new plan, and the University administration wasn't too keen on it either. As a compromise to Assistant Vice Chancellor for Academic Affairs, Dr. Richard Jaquith, we lowered the GPA for allowing a second course to 2.9. However, we were able to keep this basic structure and after several discussions with University officials, the Department did work out a restricted major program. Because of the various delays, coordination with the community colleges in the state governing transfer students (i.e., the "articulation agreements") and other factors, the plan didn't become operational until February 15, 1984,<sup>8</sup> but the effect was to put a cap on Computer Science enrollment to the limits we could handle adequately (Figure 3.2). This chart is somewhat deceptive since beginning in 1984 most freshmen and sophomores were classified as premajors and only became majors in their junior year after meeting minimal requirements. In addition to the numbers indicated by Figure 3.2, there were perhaps another 500 to 600 premajors.

The number of degrees offered by the department continued to grow. The peak year was 1985-1986 when 241 BS, 48 MS, and 11 PhD degrees were awarded.

**Educational activities:** The first year of Basili's tenure as Department Chair was taken up with the problems of students and getting the University to agree to a restricted major for the Department. By the second year attention could be placed on other educational concerns.

**CF-Pascal:** As part of the plan for the restricted major, the freshman Computer Science courses were redesigned. Spearheaded by Dr. Harlan Mills, Vic Basili, John Gannon, and Richard Hamlet identified a subset of Pascal called CF-Pascal. This was Pascal using only character and file data types, and essentially made programming in CF-Pascal equivalent to programming a Turing machine [Mills89]. This became the basis for Computer Science I – CMSC 112. In 1984 Marv Zelkowitz, as part of the IBM Fulcrum award (See Section 3.2), obtained a laboratory of 20 IBM PCs. A syntax directed editor was developed for CF-Pascal, called SUPPORT, and this environment was used in CMSC 112 during 1986-87 [Zelkowitz84]. CF-Pascal was used for about 6 years until the freshman course changed again in 1989.<sup>9</sup> Pascal became the basic language, which later became C++ and finally Java as the freshman programming language.

**PhD comprehensive exams:** In order to obtain a PhD degree, the Department, as do most graduate programs in the U.S., requires a graduate student to first take several courses and then pass a comprehensive exam. Afterwards, the student takes an oral exam on a PhD proposal, and if passed, is advanced to candidacy. Finally, the student defends the dissertation and, if passed, is awarded the PhD degree. This general plan is never perfect, so periodically, the graduate education program had been changed to fix some inherent problem in the previous structure.

In the 1970s (as described in [Minker04]) the original comprehensive exam consisted of two parts:

1. Part I (also called the Qualifying Exam) consisted of 3 exams on 3 undergraduate courses – Operating systems, Languages, and Data structures.
2. Part II consisted of 4 exams on 4 graduate courses – Theory, Numerical Analysis, Information processing (e.g., AI) and Systems.

The concept was that part I ensured that the student had an adequate undergraduate preparation in computer science and part II of the exam would be "comprehensive" and cover all basic graduate computer science material. But by 1974 the landscape had changed. There were now numerous

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<sup>8</sup> 1983-1984 Annual Report, Department of Computer Science

<sup>9</sup> Report to CMSC Education Committee from the Committee to Review CMSC 112/113, January 1989

undergraduate programs in Computer Science and most new graduate students were arriving with BS degrees in CS. That made part I of the exam superfluous, and it was dropped.

Changing part II of the exam proved to be a difficult decision, which became known as the “M out of N issue.” Should a graduate student know all of basic computer science and be required to take all of the comprehensive exams (i.e.,  $M=N$  and what is the value of  $N$ ), or has the field become too complex and students need to master only a subset of the available topics (i.e.,  $M<N$ )? The eventual decision, beginning with the Spring 1975 exams, was the “3 out of 5 rule,” where students had to take and pass 3 out of the 5 available exams. Programming languages (which evolved into software engineering over the next few years) was added to the previous set of 4 exams.

Exams were given each semester and students only put their code numbers, not names, on the exam books. Exams had 2 passing levels – an MS and a PhD level. The MS level would be an appropriate level for students taking the non-thesis option for an MS degree, but PhD students needed a PhD pass. If the student failed, all 3 exams needed to be retaken at a later time.

But many students would pass only 2 exams, and then fail one of those 2, while passing the third, during the next exam period. By our rules, this was a failure. The Department allowed students, if they failed the exam, to appeal their failures. This appeal syndrome was so strong that students (and faculty) often planned their comprehensive exam strategy on how to appeal, rather than how to pass the exam in the first place. Because of this fear of the comprehensive, students delayed as long as possible taking the exams. Rather than being merely a checkpoint on the way to an advanced degree, the comprehensive was seen as a huge milestone to overcome.

In June 1984 the graduate education requirements were modified (again) to fix these problems.<sup>10</sup> The comprehensive exam for the non-thesis option for the MS degree was dropped in favor of a course requirement, so an MS passing level on the comprehensive exam no longer had any meaning. PhD Students took 3 exams after one year in the program. They were given their grades and allowed one week to challenge any score. After a week, passing levels were set. The hope was this would minimize appeals and encourage students to get through the exam process quicker.

This new structure lasted all of 2 years. Problems with this mechanism were:<sup>11</sup>

1. The one year rule turned out to be unwieldy. The graduate school admitted students for both the MS and PhD program, even though the Department didn't care about the distinction. What about students who wanted an MS degree, but then decided they then wanted a PhD? They would apply and be readmitted, resetting their “clock” to take the exam. Part-time students were at a distinct disadvantage here.
2. The one-week regrading period destroyed the anonymity of the student, a concept that was part of the process since the beginning of the PhD program in 1969.

During the Fall of 1986 the rules were again changed. The exam was based on a reading list instead of just courses:

“A student may prepare for the examination by completing appropriate courses from the basic core of the graduate program and by studying the references on the comprehensive examination reading list. A copy of the reading list may be obtained from the CMSC Graduate Office.

“The exam in each area will cover about 2/3 of the syllabuses of two courses. Ordinarily, one will be at a 400-level core course and the other a 600-level core course; but in no event will more than one 600-level course be required. The syllabuses will confine themselves to a few standard references, preferably textbooks and survey articles.”

The exam rules were “simplified” in that students had to take a first exam before the 4th semester in the program, and once started, the student had 3 semesters in which to pass 3 exams, although this 3 semester limit could be extended for certified emergency situations. At least 2 exams must be taken each

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<sup>10</sup> Changes in graduate program memo by M. Zelkowitz, Associate Chair, June 13, 1984

<sup>11</sup> Comprehensive exam memo by Hanan Samet, September 24, 1986

time, unless the student only had one more to pass. Each exam could be taken at most twice; no more than 6 exams total. The appeal process was also built into the system.

Each semester the faculty would meet and discuss all students who have taken their required exams and decided who passed the comprehensive process. Thus passing the comprehensive exam requirement was not because of passing 3 exams, but by a vote of the entire faculty. For the most part passing 3 exams was sufficient, but in some instances the faculty passed students who failed to pass all 3 exams. This moved the Comprehensive Exam even further away from the original concept of being comprehensive in all 4 computer science areas. Now students had to demonstrate competence to a group of faculty with the exam providing some of the input data needed to make that determination.

**PhD preliminary examination:** After passing the Comprehensive Exam, a student must also pass an oral examination based in part on a dissertation proposal, which admits the student into PhD candidacy. The comprehensive exam was supposed to test basic computer science knowledge. That is, the exam was supposed to test knowledge obtainable from approximately one year of graduate study. But in order to move on to PhD candidacy the student had to first:

- Demonstrate advanced competence in the general area of the proposed dissertation research, and
- Demonstrate that the proposed research topic (based upon a dissertation proposal written by the student) is a viable one for a PhD.

The oral exam was designed to test for both attributes.

This dual nature of the oral exam has always been ambiguous in the Department. Was the oral an exam on advanced topics of computer science with a dissertation proposal thrown in, or was it an exam based upon a dissertation proposal with some advanced topics thrown in? There were some faculty who believed in each interpretation.

In 1987, the Department tried to clarify the role of the oral exam.<sup>12</sup> The oral exam would be governed by a prospectus written by the student. It would define a research topic (i.e., the dissertation proposal) that would be the basis of the PhD dissertation and would also identify 3 related areas, as defined by a reading list, that the student was expected to have detailed knowledge about.

The examination itself would consist of 3 parts. In the first part the student would present a talk on the dissertation proposal. Part 2 would be questions based solely upon this proposal. Part 3 would be questions based upon the topics on the prospectus reading list. Passing the oral exam was based upon all 3 parts.

In spite of the new rules, it is this author's opinion that the situation didn't really change. Some exams were based upon the dissertation proposal, while others had a stronger emphasis on the background reading list.

## Research

Although handling the onrush of students was a major problem in 1982, the research program in the department continued to flourish. In 1982 the department supported 38 teaching assistants and 85 research assistants were supported on grants. The faculty greatly expanded during this period, mostly due to the creation of UMIACS (See Section 3.3). Dr. Howard Elman joined the numerical analysis group, Mark Weiser joined the software engineering group, and Jim Hendler, Dana Nau, Don Perlis, and Jim Reggia all joined the AI faculty. Dr. Larry Davis, a former University of Maryland Ph.D. was brought back from the University of Texas as an Associate Professor in the vision area. The Department expanded into database research with the hiring of Dr. Nick Roussopoulos in 1981, who previously was at the University of Texas with Ray Yeh, Christos Faloutsos in 1985 and and Timos Sellis in 1986, and a respectable theory group was formed with the addition of Dave Mount, Bill Gasarch and Carl Smith.

By the end of the 1980s, the software engineering group achieved worldwide recognition with the research of the Software Engineering Laboratory (Section 3.5) and the database group, led by

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<sup>12</sup> Revised proposal for new rules for preliminary examinations, Dana Nau, September 24, 1987

Roussopoulos, was breaking into the “top 10” among such groups in academic departments. The systems area with Agrawala and Tripathi attracted additional faculty, such as I. V. Ramakrishnan and A. U. Shankar.

Dr. Azriel Rosenfeld started his Center for Automation Research (CfAR) in the CSC which merged his Computer Vision Laboratory, which he started in 1964 with other vision activities. Dr. Ben Shneiderman moved his Human Computer Interaction Laboratory as a laboratory within CfAR (See Section 3.5). Dr. Laveen Kanal started his Machine Intelligence and Pattern Analysis Laboratory (MIPAL). This was organized in 1982 with the goal to study search and decision processes. In addition, in 1983 the Department received a \$4.3M NSF Coordinated Experimental Research grant, which created the Parallel Computation Laboratory. (See Section 3.5 for further details on these activities.) Research activities in AI, expert systems, theory of computation, numerical analysis, systems and data base systems were all growing.

Dr. Basili also created the first Department Advisory Board, a concept first proposed by Dr. Yeh. The goal was to invite a group of influential computer experts from the Washington DC area who could both give advice to the Department and also help promote the department to others. The initial Advisory Board in 1982 consisted of:

- Mr. James Burrows, Director, Institute for Computer Sciences and Technology, National Bureau of Standards (Now the National Institute for Standards and Technology)
- Mr. J. Kenneth Driessen, Vice President, Federal Systems Division, IBM
- Mr. Seymour Jeffery, Manager of Special Projects, TRW
- Mr. Robert Hench, Vice President and General Manager, Engineering Department, GE
- Dr. John J. Martin, Vice President and General Manager, Advanced Technology Center, Bendix Corporation
- Mr. John Pearson, Vice President of Engineering, Westington Electric Co.
- Mr. John J. Quann, Deputy Director, NASA Goddard Space Flight Center
- Mr. James O. Roberson, Secretary, Department of Economics and Community Development, State of Maryland
- Mr. Jack M. Scanlon, Vice President, Western Electric Co.
- Mr. K. Speierman, Director for Telecommunications and Computer Science, National Security Agency

Dr. Basili also created an Industrial Associates Program (IAP) in 1983. Companies could join at 2 levels. For \$10,000 companies would be invited to all departmental colloquia and would get recognition for their contributions. For \$50,000, in addition to recognition, they would be permitted to send an employee to the University for a year to work cooperatively with a faculty member of their choice. Of this \$50,000, the department took about \$10,000 to cover the expenses like other IAP members, and the other \$40,000 was placed into a University Foundation account for use by the faculty member for research



**Figure 3.3. Although he accomplished much during his term as Chairman, Vic Basili always felt that he failed to secure an endowed chair for the department. Here he is trying a chair that he found in Singapore in 1988.** (Photo by M. Zelkowitz)

expenses. The IAP enabled the department to fund colloquia speakers and pay for events not normally covered by the state-supported budget, such as dinners for faculty and invited guests. It gave the Department some leverage in managing its expenses. This foundation funding also gave faculty some flexibility in buying research equipment. It made life more bearable as a faculty member.

Two other significant events occurred during Dr. Basili's tenure as Chair. These were the creation of the Institute for Advanced Computer Studies (UMIACS) and the moving of Computer Science out of the Computer and Space Science Building into A. V. Williams. These are covered in more detail in Sections 3.3 and 3.4, respectively.

## End of the 1980s

**Twentieth Anniversary celebration:** March 1987 saw the 3-day Twentieth Anniversary of Computer Science at Maryland celebration. Monday, March 9<sup>th</sup> was Education Day, where the department played host to some 1000 high school students from the area. Tuesday was University Day, which opened the department to visitors from the College Park campus, as well as visitors from elsewhere. Wednesday was Industry and Government Day, which focused on the Department's role in servicing industry and government. The celebration ended with a banquet at Martin's Crosswinds in Greenbelt, hosted by Drs. Basili and Agrawala.

Guest speakers at the event included:

- Dan McCracken, well-known author and past president of the Association for Computing Machinery
- Dr. James Yeh, PhD graduate of the Department and from IMS in Rockville, MD
- Dr. Jim Browne from the University of Texas, Austin
- Dr. Lee Osterweil, PhD from Electrical Engineering at Maryland professor at the University of Colorado (now at University of Mass.)
- C. Gordon Bell from the Directorate of Computer Science and Engineering at NSF
- Gerald W. Ebker, president of IBM Federal Systems Division

In the summer of 1987, after 5 year, Dr. Basili believed he had accomplished as much as he could as Chair. The number of faculty rose from 30 to 44, the restricted major was working to keep student enrollments manageable, teaching loads for most faculty were reduced from 2 courses to 1 course a semester, the Industrial Associates Program and the use of Foundation accounts increased flexibility in funding activities, UMIACS (Section 3.3) was created as a related research institute, and additional space would be available when the Department moved into the A. V. Williams Building in 1987. Dr. Basili also doubled the size of the administrative staff with a larger business office and larger education office to handle the larger grant budgets and increased number of students. Salaries rose to almost competitive levels and the Department was ranked 13<sup>th</sup> in a 1983 National Academy of Sciences ranking of PhD-granting computer science programs, including 6<sup>th</sup> among state university programs and in the top 10 in number of publications by faculty. There was not much more he felt he could do. However, he was persuaded to stay as Chair one more year to oversee the move into the new AVW building, and he resigned as Chair on June 30, 1988.



**Figure 3.4. Univac 1108 mainframe console. Note 12" tape reels in background. Contents of about 3,000 such reels can now fit on a single 150GB 3.5" disk.**

### 3.2 Computing and Departmental Laboratory



**Figure 3.5.** This 300 bps acoustic coupler modem was the main faculty device for connecting home terminals to the Univac 1108 mainframe in the 1970s. (Photo by M. Zelkowitz)

machines – the 1106 and 1108. Both were time sharing systems where users connected via modems and terminals (Figure 3.5) and shared the resources of a single processor. (In the early 1970s, punched cards were still being used for input, but those disappeared in favor of terminals by the end of the decade.)

The 1970s saw the introduction of mid-sized machines – often called departmental servers. The Digital Equipment Corporation (DEC) VAX 11/780 was probably the most popular. There were also small minicomputers, such as the DEC PDP 11. The microprocessor market began in 1977 with the Apple II computer, but that was considered mostly an educational machine for the public school market. Microprocessors in industry weren't considered viable as "real" computers until the IBM PC in 1981.

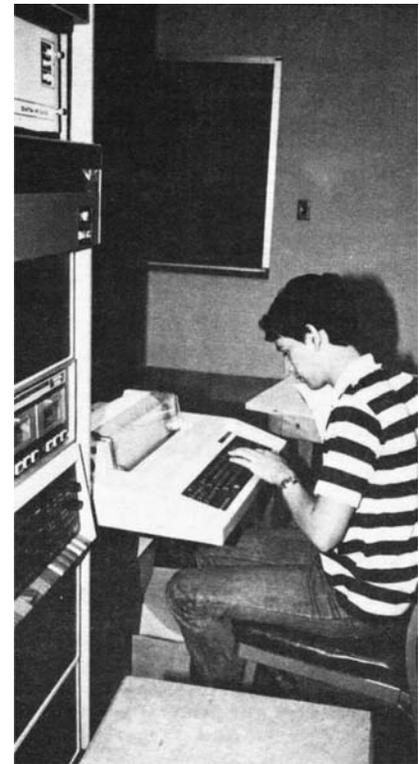
The first Computer Science computer was a PDP 11/45, purchased by Dr. Laveen Kanal in 1972 for his pattern recognition research (Figure 3.6). When the Department of Computer Science was created out of parts of the CSC in 1973, the PDP 11/45 moved to the Department.

Spring 1972 saw the first minicomputer course in Computer Science. While waiting for the arrival of the department's first PDP 11, DEC loaned the Department a PDP 8i minicomputer for the semester. The 8i was a processor with 4K 12-bit words. (Today it wouldn't even classify as a device controller, but in those days you were thrilled to have any computing device.) During the Spring semester, Marv Zelkowitz and 20 graduate students were in CMSC 818B – Minicomputer Systems – investigating the properties of the 8i.

By 1974 the Department also acquired a PDP 11/45 for instructional use (mostly for the operating system courses) and during the 1974-75 academic year an additional PDP 11/40 for instructional use was purchased. A smaller PDP 11/03 was purchased in 1976 [Budd76]. All 3 PDP 11s were single user machines; the larger ones had connections to the University's

When the research and academic program in computer science began in the early 1960s, all activities were centered in the Computer Science Center (CSC). By 1970 a Univac 1108 mainframe computer was the main research computer on campus (Figure 3.4). In 1972 a Univac 1106 was added as the main instructional computer. In 1976 the 1106 was replaced by the Univac 1100/41 (a single processor upgraded 1108) and in 1978 by an 1100/42 (a dual processor version). And in 1982, both machines were replaced by a larger two-processor 1100/82. Until the mid-1980s, the Computer Science Center provided the major research support for computing on campus, and today the Office of Information Technology (OIT), the successor to the CSC, still provides most of the instructional computing support on campus.

By the mid-1970s, there were generally 4 classes of computers on campus. The CSC ran the large mainframe



**Figure 3.6.** First department DEC PDP 11/45

mainframe 1108 and 1106 machines. The instructional PDP 11/45 had 48K bytes, a 5MB disk and a Canberra 2020 cassette tape system with 3 tape drives. Input was an ASR 33 teletype and a Printronix line printer was the main output device.

Purchasing computer equipment during this period was especially painful for the Department. Based upon a state law passed by the Maryland General Assembly in 1968 and enacted in October 1969, the University had to undergo the infamous “BB-4” process<sup>13</sup> for authorizing all computer purchases. State approval was needed for all purchases, whether from state funds or grant funds. This added months to the approval cycle of any hardware or software purchase, and approval was not always granted. For example, in 1975 Basili, then an assistant professor, had a one year NASA grant. In January he submitted a request for a terminal. By December at the end of the grant period it still hadn’t been approved! If not approved by the end of the year, the money for the terminal (hence the terminal itself) would be lost. With some intervention by University officials (e.g., Dr. Victor Medina, head of the Contracts and Grants office), approval was eventually obtained and the terminal arrived 2 or 3 months later, after the grant that was going to use it ended.<sup>14</sup> This process lasted almost 15 years, but by 1984 the University was granted its own authority to approve such purchases and buying electronic equipment got much easier.

In 1979, because of a \$150,000 NSF equipment grant secured by Jack Minker, the Department bought its first larger machine – a DEC VAX 11/780 computer, named mimsy, which was installed on June 20, 1980 (Figure 3.7).<sup>15</sup> Because of existing grants with Department of Defense agencies, the Department was allowed to be on the still DoD-only ARPANET, and Maryland.ARPA soon made its appearance. The year 1980 is when email arrived in the Department. The Internet and the umd.edu domain didn’t exist until the mid-1980s when DARPA ceased to fund ARPANET and the network became more commercial.



**Figure 3.7. Department VAX 11/780 installed in 1980.**

Dr. Yeh’s contribution to the computing environment was the introduction of the workstation to this mix of machines. In 1979 he acquired a Sun 1 workstation and over the next 2 years he and other faculty acquired several Sun 2 workstations, the standard computer science department machine nationally during the 1980s. After using Univac equipment, a machine with a very small academic base, for research during the 1970s, those of us involved in implementation research felt empowered to finally be working with machines, such as the VAX and Sun, which other researchers knew about and used.

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<sup>13</sup> BB-4 was the name of the state form which had to be filled out for each computer purchase.

<sup>14</sup> In [Minker04] there are several other examples of the BB-4 process in action.

<sup>15</sup> Department newsletter “Printout”: Department of Computer Science Newsletter (6)2, April 1980.

Around 1980 the Laboratory began to install Xerox Star<sup>16</sup> workstations and the Department was a major user of the Star. The Star came out of Xerox Palo Alto Research Center and included windows, a GUI interface, a mouse, and WYSIWYG editing. (It was on a visit to PARC when Steve Jobs conceived of the Apple Macintosh.) However, as most know, Xerox didn't know how to market the Star and the GUI interface was dominated by Apple Macs for many years. Due to Xerox's lack of development of their workstation, Star usage in the Department dropped and the machine disappeared a few years later.

A 1983 NSF Coordinated Experimental Research (CER) grant added two VAX 11/750s, smaller machines similar to the 11/780 – tove and gyre. Gymble (a Pyramid 90x) soon followed.<sup>17</sup> This is discussed more fully in the following section on the Laboratory for Parallel Computation. Gifts and grants soon added to the growing hardware. In 1984 Burroughs Corporation donated an XE/550 and 2 Burroughs B/25 workstations (essentially PCs) valued at \$247K. A Data General Eclipse MV/10000 valued at \$350K was given to the Department as well as 2 Hewlett Packard HP/150 workstations (essentially PCs with dot matrix printers) valued at \$24K.<sup>18</sup>



**Figure 3.8. Ann Arbor Ambassador terminal to VAX**



**Figure 3.9. First IBM PC/XT and printer bought for departmental office in 1984 at a cost of \$5700.** (Photo by M. Zelkowitz)

The size of the lab now required more than a graduate TA to manage. Basili, as Chair, wanted a more permanent laboratory staff – the lab was becoming more complex and more important to faculty research to leave its management to an ever changing set of students. The staff was increased, as well as the introduction of the “VAX tax” to pay for it. Dr. Ashok Thareja, former student of Dr. Agrawala, became the first full-time Department Laboratory Director in August 1984. Dr. Steve Kogge was hired as the first full-time laboratory technician. When he wasn't scuba diving in the Red Sea he could be found stringing wires in the lab connecting the various machines together.

During the early 1980s the major user interface to the VAX machines was the “glass teletype,” a green monitor with a 24 lines by 80 columns display. The Ann Arbor Ambassador was the department standard (Figure 3.8), and in 1981 such monitors cost \$2400 apiece!

In 1984 a \$6M Advanced Educational Program equipment grant from IBM was the start of a continuing trend away from a centralized computer supported by the CSC. Approximately 10% of the PCs awarded to the University under Project Fulcrum, as it was called, went to Computer Science faculty:

- Ben Shneiderman was awarded several machines for software for CMSC 434 (Human Factors). This equipment grant, along with funding from the U.S. Department of the Interior, enabled Shneiderman to develop TIES (The Interactive Encyclopedia System), which was used by the U.S. Holocaust Memorial Museum as an interactive database tool for visitors to the museum.

<sup>16</sup> <http://xeroxstar.tripod.com/>

<sup>17</sup> The source of these names should be obvious.

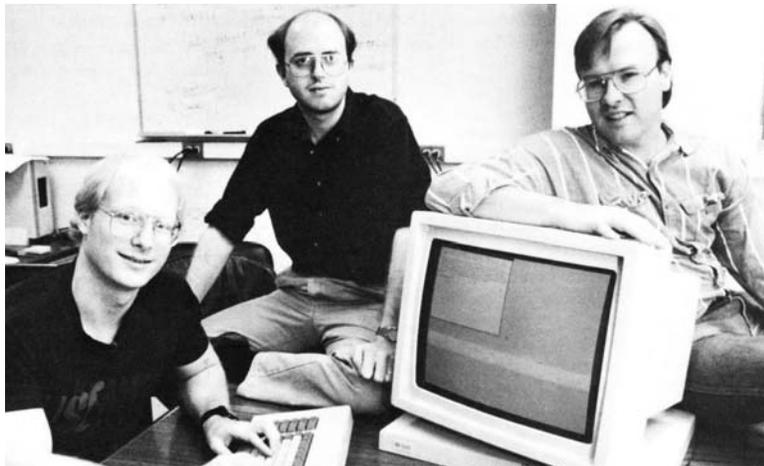
<sup>18</sup> Annual Report 1984-1985, Department of Computer Science

- John Gannon and Vic Basili were awarded four machines for software development for CMSC 435 (Software Engineering).
- Ashok Agrawala was awarded several machines for use in CMSC 412 (Operating Systems).
- Marv Zelkowitz was awarded about 20 machines for use in the freshman Computer Science sequence CMSC 112-122 (Computer Science I and II), described earlier in Section 3.1.

During the latter half of the 1980s, IBM PCs, as well as a few Apple Macs, started to infiltrate faculty offices, although the Sun workstation was the dominant standard. Ben Shneiderman was one of the first users of PCs for education and research, buying a PC in 1982 or 1983. In 1984 the Department bought the first 2 PC/XTs for department use (Figure 3.9). Those machines had 640K memory, 10MB disks, a low resolution color CRT, an 80 column dot matrix printer, and cost \$5700 each. (In 2007, a PC with 80GB disk, 512MB memory 17" LCD monitor and color printer now costs about \$600!) Today (early 2007) it is mostly a matter of personal preference which machine to use – Sun workstations, PCs running Linux, PCs running Windows and Macs all coexist on the Department network.

When UMIACS was created, the decision was made to share resources in a common laboratory. This has worked reasonably well, but not always effectively. In 1988 the Department Laboratory staff consisted of 3 permanent staff members – Steve Kogge for hardware support, and Pete Cottrell and Chris Torek for software support (Figure 3.10). UMIACS had Steve Miller and Neal Vanderlipp for support.<sup>19</sup>

The Department began to rely on its own laboratory for much of its research needs. A large staff was needed to guarantee support services. In order to pay for this, a charging algorithm was developed in 1986. Originally called the “VAX tax,” it has evolved into the current CALF (Computer Access Laboratory Fee) charge for which all users of the Departmental laboratory must pay. This charge has been approved by the Office of Sponsored Programs (now Office of Research Administration and Advancement) and is added as a budget item on all grants. The original idea was to charge each grant about 8%-10% of its budget to support the laboratory.<sup>20</sup>



**(a) Software experts Chris Torek, Steve Miller (UMIACS) and Pete Cottrell. Neal Vanderlipp (See Figure 3.13) was also with UMIACS.**



**(b) Steve Kogge handled hardware issues.**

**Figure 3.10. Laboratory staff in 1988.**

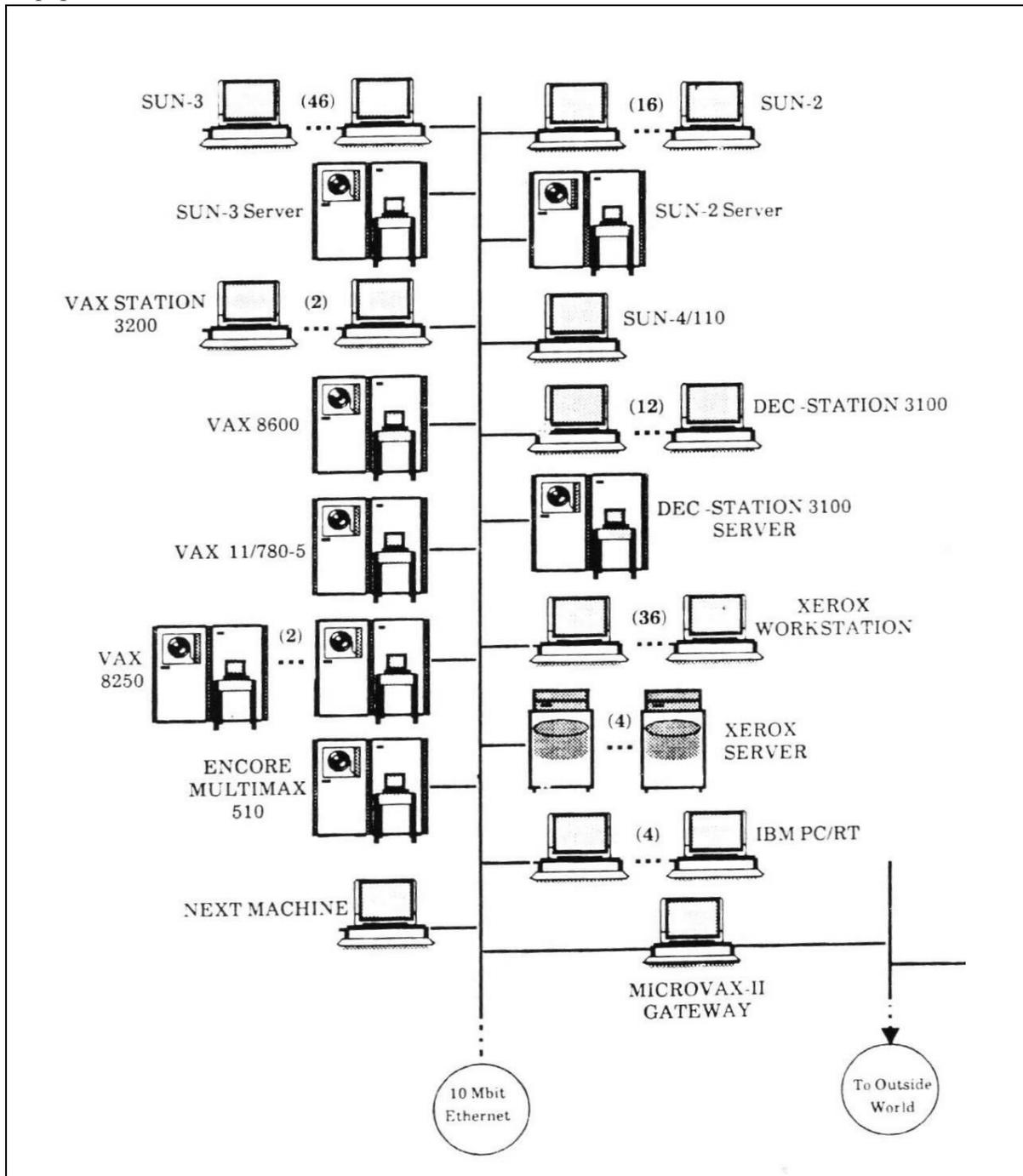
The initial proposal for the CALF was an annual payment of \$1500 for each faculty user, \$1000 for each graduate student, and \$500 for each staff member.<sup>21</sup> Unfunded faculty would have the fee paid out of departmental state funds, others out of grant funds. The current (2006) charge is approximately \$375 per

<sup>19</sup> CMSC Computer Workstation Plan, Marvin Zelkowitz, Associate Chair, June 14, 1988

<sup>20</sup> New Lab Charging Policy, Mark Weiser, Laboratory Director April 4, 1986

<sup>21</sup> Report regarding research lab costs, Satish Tripathi, Acting Chair, March 15, 1989

quarter for every user. By 1989 the annual laboratory budget (maintenance of equipment plus support staff salaries) was approximately \$400K. An additional \$150K to \$200K was spent per year on equipment.



**Figure 3.11. Department Computer Laboratory. 1989.**

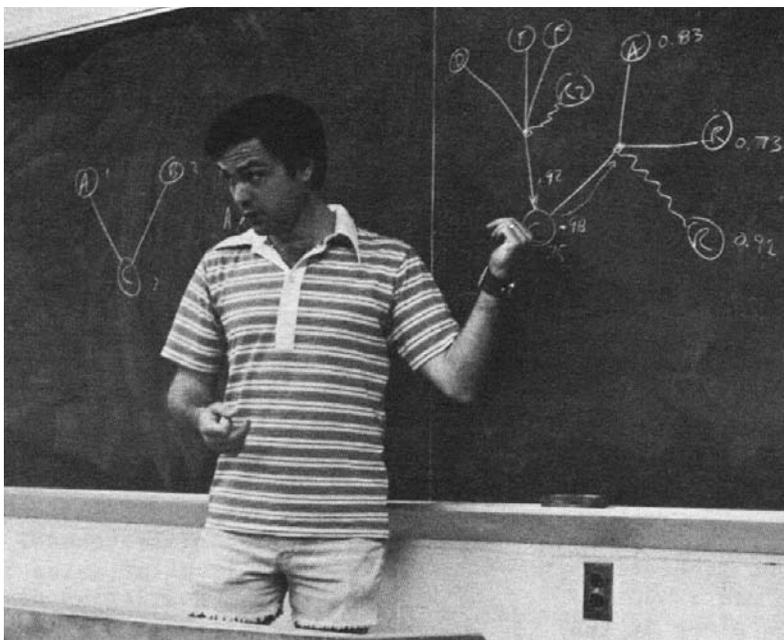
Over the next few years, additional machines were purchased and all departmental research needs for computing was handled by the department's laboratory (Figure 3.11). Mimsy was upgraded to a VAX 11/785, brillig was a new VAX 8600, and tove and gyre were now VAX 8250s. Berkeley Unix (BSD 4.2, and later BSD 4.3) was the major operating system used on the VAXes. In June 1988 total investment in the laboratory was \$4M and included 4 DEC VAXes, 1 Eclipse MV/10000 and a Pyramid 90x. There

were 59 Sun workstations and 40 Xerox workstations and 8 others. There were 58 PCs, 9 Macintoshes and 4 other desktop machines. There were still 100 terminals in use, 60 of these being Ann Arbors.<sup>22</sup>

But by the early 1990s, Sun workstations became the dominant computing resource in the department, gradually replacing the larger VAX machines. A further change began in the late 1990s, when PCs executing Microsoft Windows, Apple Macs, and several PCs running Linux, were replacing the larger machines and many of the Sun workstations.

## Laboratory for Parallel Computation and Z-MOB

Around 1980 Dr. Charles (Chuck) Rieger (Figure 3.12) designed a computing system to run as a network of processors. The initial design consisted of 256 Z80A processors. Each contained 64K memory, linked together on a “conveyor belt” (a 48-bit wide slotted ring architecture), as packets of information were passed from one processor (or “moblet”) to another. This “mob of Z80s” soon became known as Zmob. The system is programmed and controlled by a host VAX 11/780 computer. An Air Force Office of Scientific Research grant was obtained for building the basic Zmob hardware.



**Figure 3.12. Dr. Chuck Rieger.**

One of Dr. Basili’s early realizations (after addressing the crush of student majors) as Chair was that to be a top department, we needed more equipment. The VAX 11/780 (mimsy) in 1980 was a good start, but was insufficient. We needed terminals on every desk, additional machines like mimsy and a laboratory under our own control. Computers were our technology and if we couldn’t have and control our own machines, our research in this area would always be hampered.

In 1982 Basili organized a proposal team, consisting of Agrawala, Minker, Rosenfeld, Stewart, and Weiser. They met and came up with the idea of a parallel computation laboratory, using some of the ideas in Zmob as a starting point. A Coordinated Experimental Research (CER) proposal was written to NSF, and in 1983 it was funded as a 5-year \$4.3M grant. This grant greatly expanded the departmental laboratory, purchasing machines tove, gyre and gymble, as discussed earlier.

PRISM, under the direction of Minker, was the core of the CER project. It was conceived as the software system designed to run on Zmob, and was run as a simulator on the VAX. It used Horn clause logic (similar to the design of Prolog) to implement AND/OR parallelism. Users could specify the number of problem solving machines (i.e., moblets) to use, the number of database machines to use, and the number of machines to handle executable procedures. Statistics were collected to determine how effective the search strategy was. Users could also run PRISM in a sequential Prolog-like manner.

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<sup>22</sup> CMSC Computer Workstation Plan, Marvin Zelkowitz, Associate Chair, June 14, 1988



**Figure 3.13. Dr. Agrawala and Neal Vanderlipp with one of the Zmob boards.**

the need to move the hands off the keyboard in order to control the screen. Several variations were built and tested on Sun workstations, but the concept never became fully operational. Unfortunately for the Department, Weiser soon left for a research position at Xerox Palo Alto Research Center and this activity soon ended.

### **3.3 UMIACS**

In 1983 the Department of Defense issued a Request for Proposals (RFP) for a “software engineering institute” (SEI), which would be a Federally Funded Research and Development Center (FFRDC) affiliated with a university, which would provide support for research in software engineering to the U.S. military. Federal funding would initially be on the order of \$20M per year. After much deliberation, Dr. Basili and the other software engineering faculty in the Department decided to write a proposal to try and get this new SEI to be located at the University of Maryland. The NASA Software Engineering Laboratory (Section 3.5) since 1976 had given the Department experience in large scale software development and gave the Department’s software engineering group recognition in the industrial world, so submitting such a proposal seemed a realistic option. We all realized that if we did win this proposal, the Department would be greatly changed due to this one activity which would affect all departmental affairs. It certainly would have a big impact on the software engineering faculty, who would have positions in this new institute. The Department teamed up with IITRI, a defense contractor, to write the proposal.

Winning a proposal such as this requires in addition to technical competence, political and economic clout. The University, in conjunction with a developer who owned land at the intersection of routes 301 and 50 near Bowie, Maryland, designed a building for this institute. A proposal was written and submitted. Although given high marks on its technical content, the University lost the competition to Carnegie Mellon University, and the SEI was located near the CMU campus in Pittsburgh.

But the loss of the SEI was not a total loss. The “surprise” of Maryland doing so well technically, coupled with the recently released National Academy of Science’s ranking of Maryland as number 13 among Computer Science programs led some to push for further state support of Computer Science. The National Security Agency was about to build a Supercomputer Center and there was support for it to be in

Maryland at the site of the previously proposed Maryland SEI affiliated with the University of Maryland. K. Speierman, a member of the Department Advisory Board, with connections to Governor Harry Hughes of Maryland, lobbied for increased state support of the Department as its contribution to the Supercomputer Center. To the surprise of many, the state responded.

In the 1986 budget, the state created a University of Maryland Institute for Advanced Computer Studies (UMIACS) with 30 faculty lines and an initial \$500K budget, growing to \$3M by 1988. During the Spring of 1985 a committee, chaired by Dr. Jack Goldhaber, Dean of Graduate Studies, met and made recommendations on how UMIACS should be organized. Department faculty on the committee were Ashok Agrawala, Jack Minker, Azriel Rosenfeld, and Marv Zelkowitz (as Acting Chair while Basili was on sabbatical that year). Other committee members consisted of professors R. A. Bell, L. D. Davisson, William L. Fournery, David Sparks, and Claude E. Walston.

A major discussion topic for the committee was the word “studies” in the title instead of “science” in “Institute for Advanced Computer Studies.” The Department wanted UMIACS to be within the Department, while others wanted UMIACS to be campus-wide. University of Maryland President John Toll had a vision of a computer institute patterned after Princeton’s Institute for Advanced Study, so a university-wide concept was adopted for UMIACS. The major conclusions of the Goldhaber committee were:<sup>23</sup>

- UMIACS will be part of the Division of Mathematical and Physical Sciences and Engineering, with the director having a tenured or affiliate appointment in Computer Science.
- Dr. Larry Davis will be Acting Director. (He shortly thereafter became permanent director and led UMIACS for 9 years.)
- At least 1/3 of the Institute’s Advisory Board will be members of the Computer Science Department. (The Advisory Board was never created. Instead, UMIACS created a faculty council of some of its members.)
- “Membership in UMIACS, both permanent and temporary, should reflect the special relationship between the Department of Computer Science and the Institute.” Approximately 2/3 of the temporary appointments in the Institute should be faculty from Computer Science. Membership was available to any faculty member within the state university system, but it was expected that essentially all members would be from the College Park campus. (Basili, Stewart, Minker and Joseph Ja’Ja’ from Electrical Engineering were given permanent appointments in UMIACS. All others had renewable temporary appointments. Most faculty in Computer Science have had continuing appointments in UMIACS since its founding.)
- In 1989, after 3 years of operation, UMIACS will be reviewed to see how it is operating.

Losing the SEI competition may have been the best thing to happen to the Department! As a final anecdote to this story, NSA did build their Supercomputer Center in Maryland near Bowie. However, their requirements for security clearances for working at the site prevented any long-standing cooperation with the Department, and such cooperation never materialized.

In the late 1980s Dr. Basili also wrote a proposal to locate the Software Productivity Consortium (SPC), an organization funded initially by 14 aerospace manufacturers, near the University. In this case, there was support by both Maryland and Virginia state governments. However, the initial director of SPC chose a location near Dulles airport in northern Virginia for its location (i.e., the weird building with the slanted roof by the Dulles Access Road near the airport).

UMIACS presented a great opportunity to the Department. With many new state supported research lines, faculty could have half-time research appointments and thus teaching loads could be dropped to only 1 per semester. But the creation of UMIACS during the Spring of 1985 posed a new set of problems. There was fear by Basili and others in the Department that if we didn’t fill many of these 30 new lines, they might disappear or be reallocated to other departments. The 1984-86 academic years probably saw the greatest hiring spurt for any Computer Science department anywhere.

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<sup>23</sup> UMIACS memo, William E. Kirwan, University President, August 25, 1985

In 1985, the Department hired: Amihood Amir, Howard Elman, Christos Faloutsos, Richard K. Furuta, William Gasarch, James Hendler, Pankaj Jalote, Clyde Kruskal, Leo Mark, Beverly Sanders, and P. David Stotts, Jr. In 1986, the Department hired Yiannis Aloimonos, Scott Carson, Gregory F. Johnson, Brigitte Plateau, James Purtilo, Dieter Rombach, and Timoleon K. Sellis. That's 18 in 2 years!

Recruiting for faculty became chaotic. In order to hire 18 you have to interview about 4 times that number, and prime recruiting season is only 3 months from early February through late April. So we had the problem of interviewing 30 to 40 faculty candidates over an 8 to 10 week period. Said Acting Chairman Larry Davis:<sup>24</sup> "We will 'restrict' interviews to 3 per week!" The creation of UMIACS and the massive hiring spurt gave a sense of excitement to the Department. It encouraged new Ph.D.s to come here so our success rate in hiring new faculty was quite high.

As discussed earlier, the great increase in student majors coupled with a rising research budget led to a crisis in space. Where to put everyone? Adding 18 faculty in 2 years only compounded this problem. One interesting anecdote – I was Acting Chair during the Spring 1985 semester when Basili was on a sabbatical leave. I was the one who gave the offer letter to Jim Hendler. Several years ago Jim mentioned that when he asked for more money, I said "no." When he asked for more equipment, I said "no." Whatever he wanted, I said "no." Yet he came anyway. I was just glad that he didn't think of asking for an office. If I had to say no to that, I doubt he would have come. He did get an office, but just barely. We were just breaking at the seams. But that is the story of the next section.

### **3.4 Space and MRB**

Since the late 1970s, space for faculty and graduate students had been at a premium in the Computer and Space Science (CSS) Building. But by the early 1980s, this was becoming critical. With the increasing demand for Computer Science courses (discussed earlier in Section 3.1) the number of faculty was slowly growing and there was a growing need for teaching assistants (e.g., from 17 in 1977 to 38 in 1982). The lack of space for Computer Science made the headlines in the *Washington Post*.<sup>25</sup> Finally in 1984 the university was going to act – a new wing was to be constructed on the Computer and Space Science Building and the Department would expand into that. In 1986 planning money was allocated for designing the addition, with construction to start one to two years later. Finally by the early 1990s, the Department would have additional space. (Such planning was still 7 to 9 years after the immediate needs in 1984, but at least there was some action on the space problem.)

The year 1985 saw the creation of UMIACS (Section 3.3). So in addition to the Department's space needs, UMIACS added to the crush. In order to alleviate some of the crushing space problems, in 1985 the Center for Automation Research moved out of CSS. This freed up 3,478 square feet of space, which was given to the Department and UMIACS. In addition 1,810 square feet of space in Physical Education, Recreation and Health (PERH) (i.e., the "north gym" next to the newer Eppley Recreation Center) was also given to the Department, for a net gain of 4,895 square feet. Total space needs for the combined Department/UMIACS came to 23,701 net assignable square feet (NASF).<sup>26</sup> In addition, a temporary classroom building, with 4 classrooms, was built on a corner of the space now occupied by the Kim Engineering Building, across the street from A. V. Williams. The 4 classrooms, adequate but not in prime locations, and the approximately 20 offices given to Computer Science and UMIACS in CSS certainly helped.

The space in PERH posed a problem. Almost 2,000 NASF was too valuable real estate not to use, but what to do with it? The space consisted of approximately 6 offices, but no windows. Part of the Department Laboratory was moved there to save lab space in CSS. With computing moving from the hands-on era to remote connections via terminals and workstations, there was less need for the lab to be

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<sup>24</sup> Minutes of February 8, 1985 faculty meeting

<sup>25</sup> "U-Md. Limit On Computer Classes Draws Complaints From Blacks," *Washington Post*, April 13, 1983.

<sup>26</sup> Memo from Provost Frank Kerr, July 30, 1985.

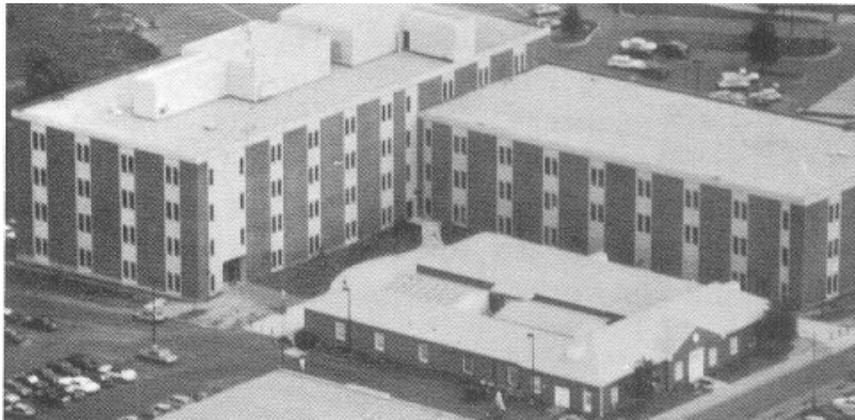
co-located with the Department. A second proposal offered by the software engineering faculty (Basili, Gannon, Weiser and Zelkowitz) (Figure 3.14) was to move the software engineering group as a whole to that space. Plans were drawn up and the move was seriously considered.



**Figure 3.14. Software engineering professors Mark Weiser, Vic Basili, John Gannon, Marv Zelkowitz considered moving to the North Gym in a space crunch.**

Led by Mr. John Menard from the MPSE Provost (now a Dean) office, the campus came up with a mechanism to self-finance a new building of approximately 84,000 NASF. The original name was Modular Research Building (MRB), and the concept was that units, having their own space refurbished, would move into MRB as a temporary home (Figure 3.15) and then move back to their old space. Because of the temporary nature in the building's occupants, the layout would be generic. There would be standard halls, with offices of mostly 2 sizes – 138 NASF and double offices with 265 NASF. This building, not going through state appropriations, could be built quickly – in less than 2 years. Once the MRB concept was proposed, that space seemed like a perfect solution to the UMIACS space problem, and hence the Department space problem.

Giving UMIACS space in MRB helped, but the Department still needed more space than was available in CSS. The MPSE Division proposed that along with UMIACS and the Engineering College System Research Center, parts of the Department move to MRB.<sup>28</sup> Chairman's Office, Business Office, Mainframe lab, along with faculty in software engineering,



**Figure 3.15. AVW building, before Engineering addition.** (Photo by Jim Hendler, Pilot Gregory Johnson<sup>27</sup>)

<sup>27</sup> Professor Gregory Johnson was an amateur pilot. Every chance he had, he would drive to a local airport, rent a plane, fly to Montgomery Airpark, buy a candy bar from the vending machine there, and fly back.

<sup>28</sup> Plan for Apportioning Computer Science Department Space to the Modular Research Building, October 6, 1986

database, and artificial intelligence, containing 22 faculty. But that meant that faculty in systems, theory and numerical analysis would remain in CSS.

Department faculty were not so pleased with this proposal and protested to Dr. Bob Dorfman, Acting Dean.<sup>29</sup> Most faculty had both Department and UMIACS appointments. Splitting faculty into CSS and MRB space did not seem viable. CfAR was already in a distant location. After lobbying for many months, the university reluctantly agreed to let UMIACS and the Computer Science Department co-locate in MRB, with CfAR nearby. The decision was that this would be temporary, moving back to the expanded CSS when the CSS addition was completed. Once we were all housed in MRB, the move soon became permanent since the logic of having all computer science activities – CfAR, UMIACS and the Computer Science Department, as well as the Systems Research Center – co-located was irrefutable. The only downside to this was that this decision to allow Computer Science to stay in MRB was made after the designs of the building were final. Thus changes to space to best meet the Department’s needs could not be accommodated.

While the building was under construction, A. V. Williams, a Washington builder, came to the University with a gift of \$15M. Looking for a building without a name, the University administration soon came to MRB, and it was quickly renamed the A. V. Williams Building (AVW) during the final stages of construction in 1987.

The building cost approximately \$14.4M, and the Department moved in during January 1988 between semesters. First to move was the Department Lab,<sup>30</sup> formerly situated in PERH. Once those machines were moved, faculty offices were moved and workstations were installed in offices. Although the building had been prewired for Internet, the wiring was incorrect, and the building contractor had to come back and fix it all. Everything was not fully functional until the end of March. Beginning August 2000 and lasting throughout the fall semester, the building was again rewired for high speed Internet. By this time the Department handled its own research computer network, OIT handled student classroom use with clusters of workstations and also managed everything “inside the walls” by providing the infrastructure connecting various university labs together and connecting the campus to the Internet.

In the initial space allocation, the Education and instructor offices were on the first floor and faculty offices were on the fourth and half of the 3<sup>rd</sup> floor. UMIACS occupied most of the second floor. I was Associate Chair for Facilities during this year, and it was my job to allocate office space. The goal was to keep research groups together. The basic algorithm used was that a senior professor would choose an office, and then the other faculty in that research area would get offices nearby. Based on this process, the software engineering and language faculty took the north east side of the 4<sup>th</sup> floor, the Chairman and Business offices took the northwest part of the floor, and systems took the southern part of the 4<sup>th</sup> floor. AI took the



**Figure 3.16. UMIACS Interaction Room.**

<sup>29</sup> Letter to Bob Dorfman from Jack Minker, Chair of meeting between faculty and Dorfman, October 9, 1986

<sup>30</sup> Annual Report, Department of Computer Science, 1987-88.

southern part of the 3<sup>rd</sup> floor along with numerical analysis and theory took the north corridor of the 3<sup>rd</sup> floor. The western part of the 3<sup>rd</sup> floor was the database group.<sup>31</sup> To a great extent, that arrangement is still true today.

When the Department moved into AVW, all faculty and most supported graduate students had their own workstations (generally Sun or DEC workstations); however, not all graduate students did. The Department set up one laboratory for general graduate student use, which became known as the junkfood lab since each machine was named after a different snack food (e.g, chocolate snacks like milkyway and snickers for Sun workstations, and chips like doritos for DEC workstations).

When UMIACS first moved into AVW, for the first time computing activities had sufficient space. (This situation lasted only a few years, however.) UMIACS took one of their laboratory rooms and made it into an informal meeting room, called the Interaction Room, and filled it with a set of quite bizarre looking chairs (Figure 3.16). But as computing research increased over the next few years, space again became an issue and the Interaction Room was turned into a room for GRAs.

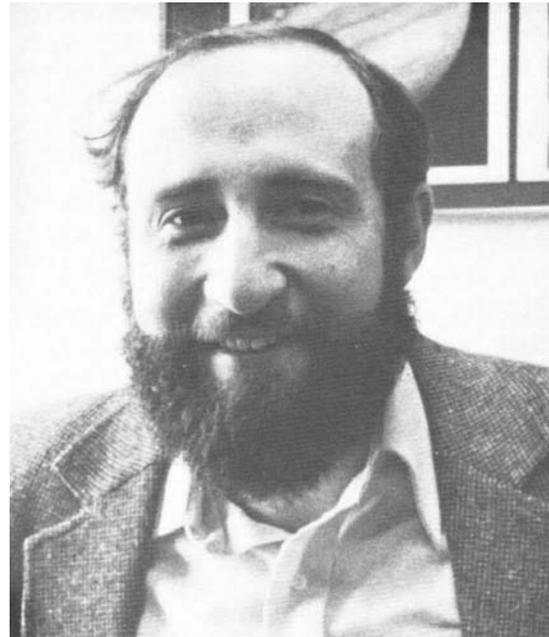
In 1992 an addition (AVW II) was built onto AVW doubling the space in the building. The building was now in the shape of a U (unless you are a mathematician where it was considered to be in the shape of a  $\pi$ ). The Department of Electrical and Computer Engineering and the CMPS dean's office moved into AVW, as well as CfAR. Unfortunately in spite of all this increased space, the Department got very little new space in the new wing.

### **3.5 Laboratories**

#### **Human Computer Interaction Laboratory (HCIL)**

In 1983, Dr. Ben Shneiderman (Figure 3.17) of the Department created the Human Computer Interaction Laboratory (HCIL), which became one of the 3 laboratories of the Center for Automation Research. This was an interdisciplinary activity involving faculty in Computer Science, psychology, faculty from the Colleges of Education and Information Studies (formerly Library and Information Services) as well as the Systems Research Center (now the Institute for Systems Research). The goal has been to work on the theory and design of interactive systems. A basic tenet of Dr. Shneiderman's research has been that when a user interface is well designed with predictable interactions, then learning times are short, performance is rapid, and error rates are low.

The HCIL was one of the most visible activities in the Department in the 1980s (and through today as well). An early project was The Interactive Encyclopedia System (TIES). This formed the basis for a retrieval system used by the U.S. Holocaust Museum for allowing visitors to the museum to look up information on a PC. HCIL has also worked with the



**Figure 3.17. Dr. Ben Shneiderman, founder of HCIL.**

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<sup>31</sup> I had fear that allocating offices would lead to “space wars” among the faculty. The process must have worked reasonably well since few complained about their new office location and almost no one knew there was actually a rational plan used to allocate this space.

U.S. Department of Justice, Library of Congress, Smithsonian Institution, as well as numerous other agencies and corporations.

HCIL was also responsible for Hyperties, a hypertext system, where links to documents were embedded in the document itself. A similar idea was used later by Tim Berners-Lee in the development of the web-based Uniform Resource Locator (URL) of the Hypertext Markup Language (HTML) and is the basic process used by the web to locate documents.

As part of a reorganization in 1996, when CfAR (see following item on CfAR) became part of UMIACS, HCIL became a separate laboratory within UMIACS. Ben remained HCIL director until 2000, when Dr. Ben Bederson became director.

In 2006, Dr. Allison Druin became director. When Allison joined the University as an assistant professor in the College of Information Studies in 1997, she brought a new dimension to HCIL. Her research interest is in technology for children, from pre-school up through around 10 years old. She has been working on the classroom of the future using embedded and wireless technology, and she has gained visibility with her “Children as design partners” program, where children from 7 to 11 work on designing effective technologies for themselves.

### Center for Automation Research (CfAR)



**Figure 3.18. Dr. Azriel Rosenfeld of CfAR.** (Photo by B. Shneiderman)

Dr. Azriel Rosenfeld (Figure 3.18) joined the Computer Science Center of the University in 1963, shortly after the CSC was created by Werner Rheinboldt in 1962. In 1964 he organized the Vision Laboratory in the CSC and his research in picture processing and vision was soon recognized as being among the best in the world. In approximately 40 years he published over 30 books and almost 600 journal research papers,<sup>32</sup> a number far exceeding any current faculty member of the Department.

In 1983 the Center for Automation Research (CfAR) was created as an autonomous unit of the University. It was created by joining three independent laboratories:

- The Computer Vision Laboratory (CVL), which Rosenfeld started in 1964 became the dominant part of CfAR. The director of the CVL was Dr. Larry Davis replacing Rosenfeld, who became director of CfAR. In 1986 Dr. Yiannis Aloimonos became CVL director.
- The Human Computer Interaction Laboratory, created by Dr. Shneiderman, became a unit of CfAR.
- The Robotics Laboratory, with head Dr. Jackson Yang, of

the Mechanical Engineering Department, became a third unit of CfAR.

In 1985 CfAR moved out of CSS because of severe space shortage and moved into a building near the present AVW. Around 1994 when plans for the addition to AVW were developed, CfAR moved to the Asphalt Institute building so that their previous home could be demolished to make room for the AVW II addition.

In 1996 CfAR was merged into CMPS and the CfAR director reported to the dean of the college. Several years later, CfAR became a laboratory within UMIACS. At that time, HCIL became an independent laboratory within UMIACS.

Initially, CVL had a separate link to the CSC Univac 1108 computer (Figure 3.19), but by the late 1970s it acquired its own VAX 11/780. By 1988 this grew to two VAX 11/785 computers. Other

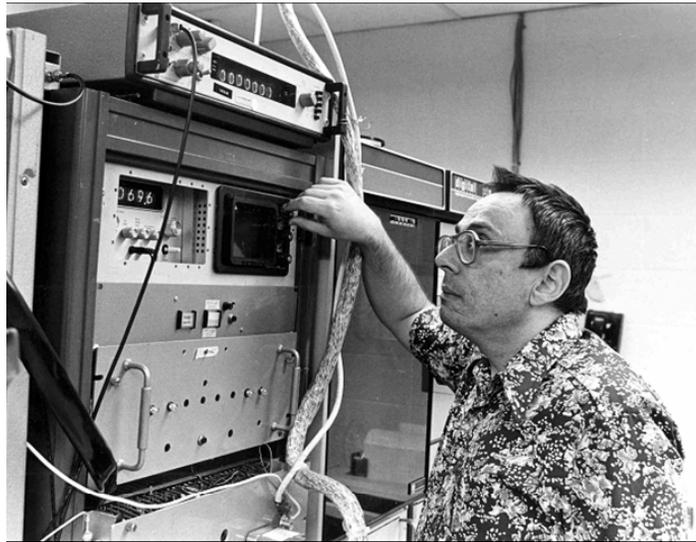
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<sup>32</sup> <http://www.cfar.umd.edu/~ar/>

hardware it has used in the past included Symbolics LISP machines, Sun workstations, a Warp systolic array and a Connection Machine.

At the present time, Dr. Rama Chellappa is the director of CfAR, and CfAR consists of the following four laboratories:

1. Computer Vision Laboratory (CVL) - Dr. Aloimonos is the current director with 6 other Computer Science and 2 Electrical and Computer Engineering professors as members. CVL is the largest of the CfAR laboratories, and as given earlier, has a history extending back to 1962. The research of Professor Aloimonos is devoted to the design and analysis of real-time systems that possess perceptual capabilities, for both explaining animal vision and designing seeing machines. “Dr.



**Figure 3.19. Dr. Rosenfeld with his computer connection to the Univac 1108.**

- Rosenfeld’s research on digital image analysis (specifically on digital geometry and topology, and on the accurate measurement of statistical features of digital images) in the 1960’s and 1970’s formed the foundation for a generation of industrial vision inspection systems that have found widespread applications from the automotive to the electronics industry. His research has also been directly integrated into many defense electronics systems (target recognition and guidance systems), remote sensing systems, and biomedical image analysis systems for automated diagnostic procedures and medical research. ... Rosenfeld also made important contributions to mathematics, and founded the subfield of fuzzy digital geometry.”<sup>33</sup> Rosenfeld’s research, with significant contributions by the later directors Davis and Aloimonos, helped scores of PhD graduates over the past 30 years make Maryland a household word – at least in the computer vision arena.
2. Graphics and Visual Informatics Laboratory – GVIL is directed by Computer Science professor Dr. Amitabh Varshney. The mission of GVIL is to improve the efficiency and usability of visual computing applications in science, engineering, and medicine. The scope of this laboratory's research covers design of algorithms and data structures for reconciling realism and interactivity for very large graphics datasets, rapid access to distributed graphics datasets across memory and network hierarchies, and study of the influence of heterogeneous display and rendering devices over the visual computing pipeline.
  3. Keck Laboratory for the Analysis of Visual Motion - The Keck Laboratory, run by Larry Davis, was established in 1997 through a grant from the Keck Foundation. The Laboratory explores fundamental problems in the recovery of three dimensional models of human movements.
  4. LANGUAGE AND Media Processing Laboratory – LAMP is run by Dr. Amy Weinberg of the Linguistics Department (and UMIACS) and Dr. David Doermann of UMIACS. The natural language group focuses on several areas of broadscale multilingual processing, e.g., machine translation, scalable translingual document detection, and cross-language information retrieval. The media analysis group is focused on providing tools and techniques for access to large heterogeneous

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<sup>33</sup> <http://www.cfar.umd.edu/~ar/>

databases of multimedia information objects. LAMP has 9 affiliated faculty, of which Larry Davis and Bonnie Dorr are from Computer Science.

## Software Engineering Laboratory (SEL)

In 1976, Dr. Vic Basili and Dr. Marvin Zelkowitz started a research activity supported by the Flight Dynamics Branch of NASA Goddard Space Flight Center, which became known as the Software Engineering Laboratory (SEL) (Figure 3.20). Its goal was to improve software development practices at NASA by studying and collecting data from actual mission software development at the Goddard Space Flight Center in nearby Greenbelt, Maryland. Over its 26 year lifetime, over 250 research papers were published by SEL faculty and graduate students. It won many awards, including being the first recipient of the Software Engineering Institute-Computer Society Software Process Achievement Award in 1994. The SEL was the first large-scale software development group that could quantitatively demonstrate the cost-effective impact of a technology. Experiments were run testing development technologies such as inspections, cleanroom, Ada, object oriented design and the result showed the quantitative impact of those methods. Using the SEL as a laboratory, Basili was able to develop his Goals Questions Metrics (GQM) and Quality Improvement Paradigm (QIP) models and foster a science of empirical software engineering.

The SEL was probably the single most important research project that gave Maryland a name in software engineering beginning in the late 1970s. It was due to experience with the SEL that led to the 1983 proposal for locating the Software Engineering Institute in Maryland. As stated previously, although that proposal was lost, it ultimately led to the creation of UMIACS.



**Figure 3.20. SEL directors.** (Back row: Jerry Page (Computer Sciences Corporation), Frank McGarry (NASA/GSFC), Marvin Zelkowitz (Univ. of MD); Front row: Rose Pajerski (NASA/GSFC), Vic Basili (Univ. of MD), Sharon Waligora (CSC))

Because of its longevity, at one point we had to reapply for a new grant, since the existing grant number was so old, the NASA computers couldn't handle it any longer.

Because of the SEL, Dr. Dieter Rombach joined the Department in 1982 initially as a post-doc and later as an Assistant Professor. This led to the development of the Fraunhofer Center, which is described later.

The SEL existed until 2002. But due to a NASA-wide reorganization in December of 1997, the SEL was under different management. NASA didn't know what they had and what role the SEL could (and had) played in improving software development at Goddard. The neglect in supporting computer science

research led ultimately to the final closing of the SEL at the University of Maryland. The situation with the SEL parallels the evolution of CESDIS, another NASA center, which Dr. Ray Miller describes so eloquently in Section 4.2 of this report.

## 4. Maturation – 1988 – 1999

After the tremendous growth in the department's size, stature, and space during the 6 years from 1982 through 1988, the next few years focused on a consolidation of those changes.

### 4.1 Dr. Satish Tripathi: 1988-1995

After the resignation of Vic Basili as Chair, the University again thought about going for a new hire and an outside chair for the Department. Dr. Satish Tripathi was appointed as Acting Chair for the year and a search for a permanent chair was started. Dr. Raymond Miller, then a professor and formerly the Director of the School of Information and Computer Science at the Georgia Institute of Technology was contacted and was interested in coming to the University of Maryland. However, during this same time period, the Department and the nearby NASA Space Flight Center were in negotiations to create a Center of Excellence in Space Data and Information Science (CESDIS). Dr. Miller decided to come, but as director of CESDIS. (See the following section on a more detailed history of CESDIS.) Because of the job that Dr. Tripathi had done as Acting Chair, in the summer of 1989 he was made permanent chair of the Department for the next 5 years.

The crisis in the undergraduate education program faced when Dr. Basili became Chair was clearly over. The number of majors in the Department was dropping:

Year	1986	1987	1988
Premajors	508	411	343
Majors	822	642	352
<b>Total</b>	<b>1330</b>	<b>1053</b>	<b>893</b>

Aside from completing the courses required of pre-majors, a grade point average of only 2.8 was needed to now become a major in Computer Science.<sup>34</sup> The selective admission policy<sup>35</sup> for becoming a major was soon dropped.



**Figure 4.1. Dr. Satish Tripathi.**

- \$10K to reduce load from 4 to 3.

After the explosive growth of the faculty from 1985-87 and the effects of the decrease in majors that occurred in the same period, a more formal set of rules were needed to govern faculty teaching loads. Tripathi instituted the following policy:<sup>36</sup>

1. Normal teaching loads were set at 4 courses per year.
2. New faculty would have a teaching load of 2 per year during their first 2 years and 3 per year for the following 2 years.
3. Faculty with research appointments (e.g., had appointments with UMIACS or otherwise demonstrated that they were conducting research) had their teaching loads reduced by the per cent of research (e.g., a 50% UMIACS appointment would teach 2 courses per year).
4. In order to cover our teaching requirements, faculty could teach a seminar no more than once every 4<sup>th</sup> course.

Within these guidelines, faculty could buy out of courses using external funds at the following rate:

<sup>34</sup> Minutes of Educational Affairs Committee, March 11, 1988

<sup>35</sup> The “restricted major” concept on the campus was changed to a “selective admission” concept in the mid-1980s.

<sup>36</sup> Revised teaching load and course buy out policy, Satish Tripathi, Acting Chair, May 8, 1989

- \$15K to reduce load from 3 to 2.
- \$20K to reduce load from 2 to 1 course.

The graduate comprehensive exam rules were again changed. Rather than a separate comprehensive exam, students had to achieve a certain grade point average in a predefined set of courses. Students must complete 10 courses within the first 6 semesters in the program covering at least 3 research areas.

Computer education on campus was changing. The era of the large mainframe was clearly over. A set of microprocessor-based computer laboratories, with strange acronyms, were starting to spring up all over campus. In 1991, the Department in conjunction with the Computer science Center opened an OWL (Open Workstation Laboratory) room with DECstation 3100 computers. Dial-in service to the campus were to WAM (Workstations at Maryland) laboratories. The Engineering College created the GLUE environment giving engineering students a common environment across a set of workstations. The Computer Science Center gradually changed its focus from one of providing computer services to one of providing telecommunications to the various microprocessor-based laboratories that were springing up all over campus. Its name changed to AITS (Academic Information Technology Services) and later to its current name OIT (Office of Information Technology).

By 1992 the Department administrative offices were added to the departmental laboratory structure. In this case Apple Macintosh computers were the standard. However, after about 10 years, these were replaced by PCs running Microsoft Windows.

In 1993 Cindi Hale left the Department for a promotion to the Dean's office in the College of Behavioral and Social Sciences. She left a big hole in the administration of the Department in making it run smoothly for about 10 years. She is now (in 2007) Assistant Dean for Administration and Finance in the college. Satish hired Mary Saffell to replace Cindi.



**Figure 4.2. Cindi Hale, 2006.**

Satish, unfortunately, was hampered during much of his 7 years as chairman because of the poor state economy at that time. Although research funding was increasing, the state funded portion of the Departmental budget was fairly flat. Faculty raises were few, and some staff lines had to be given back to the administration. In spite of fiscal constraints, the Department continued to do well. Eight faculty won prestigious NSF Presidential Young Investigator (PYI) awards. The PYI was predecessor to the current CAREER award. Research funding continued to increase. In 1994 there were 48 teaching assistants and close to 150 graduate research assistants supported by Department and UMIACS research grants.<sup>37</sup>

At the end of the 1994-1995 academic year, Tripathi resigned as chairman. Some thought that Satish was only fulfilling an obligation when he became chair, so many were surprised that shortly after he stepped down as chair, he left the University and became Dean of the Burns College of Engineering at the University of California – Riverside.<sup>38</sup> Since then, after several years he is now Provost at the large State University of New York at Buffalo (SUNY Buffalo) campus.

## **4.2 Center of Excellence in Space Data and Information Science**

In 1988, NASA Goddard Space Flight Center, in conjunction with the Department of Computer Science, created a Center of Excellence in Space Data and Information Science (CESDIS). The arrangement was that NASA would pay 50% of the salary for the Director and the director would be a professor of Computer Science at the University of Maryland, who would spend 50% of his time working for

<sup>37</sup> Annual Report 1993-1994, Department of Computer Science.

<sup>38</sup> Email from Chair Dr. John Gannon to faculty, September 19, 1996.

CESDIS. In 1988 Dr. Ray Miller, formerly a professor at Georgia Tech, was hired (Figure 4.3). The following description of CESDIS is an excerpt from the memoirs written by Dr. Miller:<sup>39</sup>

“Before arriving in Maryland on April 1, 1989 I made numerous visits to Maryland to start establishing CESDIS. With the help of USRA [University Space Research Association] I interviewed candidates for the head administrative position for CESDIS, hiring Nancy Campbell who had considerable administrative and budget experience from previous positions. Nancy thus became the first CESDIS employee, and remained with CESDIS for its complete life. She was primarily responsible for setting up the initial CESDIS facilities at NASA Goddard, hiring the administrative staff and keeping in touch with both USRA and NASA. I say that she was the first employee of CESDIS since she was full-time with CESDIS, whereas I was officially employed by the University of Maryland as a Professor, and my contract with USRA provided the funds for my half-time position as CESDIS Director. A call for proposals for CESDIS had been initiated by [Dr.] John Hopcroft [of Cornell University, who was acting in the interim as CESDIS director] before my hiring, and these proposals were being received from numerous universities. We established an evaluation procedure for these proposals, filtering out the 10 to 12 that seemed most promising, and then along with [NASA/GSFC Chief Information Officer] Milt Halem and some others from NASA and USRA we selected four for our initial funding. Milt Halem originated the concept of CESDIS, got the initial funding from NASA, and CESDIS was housed in his NASA Directorate at Goddard. Thus, with our initial funding from NASA we started our research program with projects at George Washington University, Duke University, North Carolina University and Stanford University. Also, we had funding for two Assistant Professors at Maryland to work with CESDIS part time, both for research and support of our program. The four projects consisted of the development of a scientific data visualization system at George Washington, an image pattern recognition system for interactive analysis and visualization at UNC, a parallel data compression of space and earth data project at Duke, and a computationally assisted analysis of auroral images system at Stanford. Even though there were several other very worthy proposals, the funds that were given were not sufficient for added proposal funding. CESDIS funding did provide me with some GRA support and we also had some monies to start a seminar series, conduct some workshops and initiate a technical report series. These provided additional connections and awareness for CESDIS between university computer science and NASA. To provide oversight and advice we also established an advisory board of about six well-known computer scientists to meet at least once a year.”

“We attempted to get the members of our four funded projects to spend periods of time with us at NASA Goddard during our first summer of operation in 1989, to carry out their research and interact with NASA scientists. We had hoped that this would establish fruitful interactions, but we ran into a major problem. We did not have a research facility set up for them. I had been assured that there were NASA computers that would be available for our CESDIS researchers, but this was not the case. There were very few UNIX workstations at Goddard then, and they were already being used by the NASA researchers full time. Thus, our CESDIS summer visitors could not use them for their research without inconveniencing



**Figure 4.3. Dr. Ray Miller, hired as professor and director of NASA/CESDIS**

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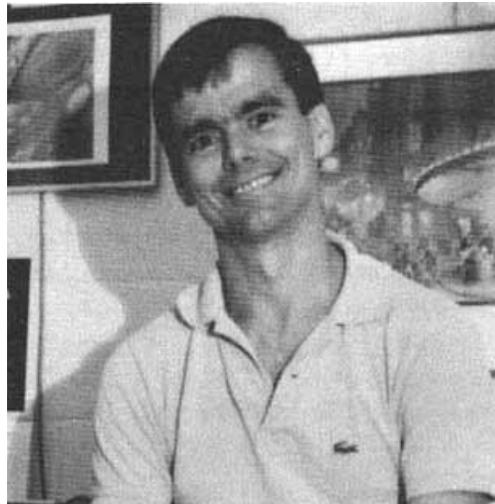
<sup>39</sup> <http://www.cs.umd.edu/special-events/miller-workshop/memoirs.pdf>

exactly those NASA researchers who would be our best contacts. For this reason we had only very short visits that First summer, but learned our lesson in that we would need to establish our own laboratory to be effective. We lobbied for more space to set up this laboratory, purchased attractive workspace separators, installed a group of UNIX workstations and got them connected to the Internet. This then allowed us at Maryland to spend more time at our CESDIS facility, as well as provide access to research machines for the four projects.” ...

“The CESDIS activities continued to require much of my time in addition to my professorial activities. As time progressed CESDIS supported NASA in many ways that only indirectly related to computer science research. Continuous NASA funding for CESDIS proved very difficult to achieve, thereby causing CESDIS funding to be very uneven and unpredictable. This made it very difficult to plan ahead or even maintain the funding for our initial projects. Some of these projects were not renewed after their initial grants ended, and no new calls for proposals were sent out. Although we still had some computer science research going on, as well as a very strong support activity for NASA's participation in the interagency high performance computing and networking initiative, I could not develop any research collaboration with the NASA Goddard networking activities and my networking and protocol research. Thus, somewhat after five years as the founding Director of CESDIS, I decided to resign and become a “plain old professor” again, this time at Maryland. I was not interested in simply managing a service organization that had little computer science research, connections to university computer science research, or to the networking areas of my research. CESDIS continued on for a second five years under a new Director, but it never reached the potential I had hoped for.”

Dr. Yelena Yesha of the University of Maryland Baltimore County became its new director after Ray resigned as director.

### **4.3 Dr. John Gannon: 1995-1999**



**Figure 4.4. Dr. John Gannon**

Dr. John Gannon (Figures 4.4 and 4.5) took over as Chair in August 1995 when Tripathi resigned. The state economy was in better shape and Department budgets were better than they had been for several years. The number of CAREER (and PYI) awards rose to 18.

Demand for undergraduate Computer Science degrees was again on the rise. After leveling off from the hectic heights of the early 1980s, the number of majors stabilized around 1000 during the late 1980s and early 1990s. But now the demand was rising again, to around 2100 majors by the year 2000 – a foreshadowing of what several years later in 2001 would be called the “dot-com bubble” of 1999. In addition, the Electrical and Computer Engineering department (ECE) established a computer engineering major, where students have to take a certain number of Computer Science courses putting a strain on faculty loads and class sizes rise to meet the demand.

Research grants continue to increase. By 1998 TAs number around 50 and GRAs supported by the Department and UMIACS now number around 150 – over 200 supported graduate students. There were about 190 workstations in the Department, and UMIACS has about 150 others. Vendors included Sun, DEC, IBM and SGI.<sup>40</sup>

At the education level, the Electrical and Computer Engineering Department was creating an undergraduate degree in Computer Engineering. This program was administered by ECE, but would

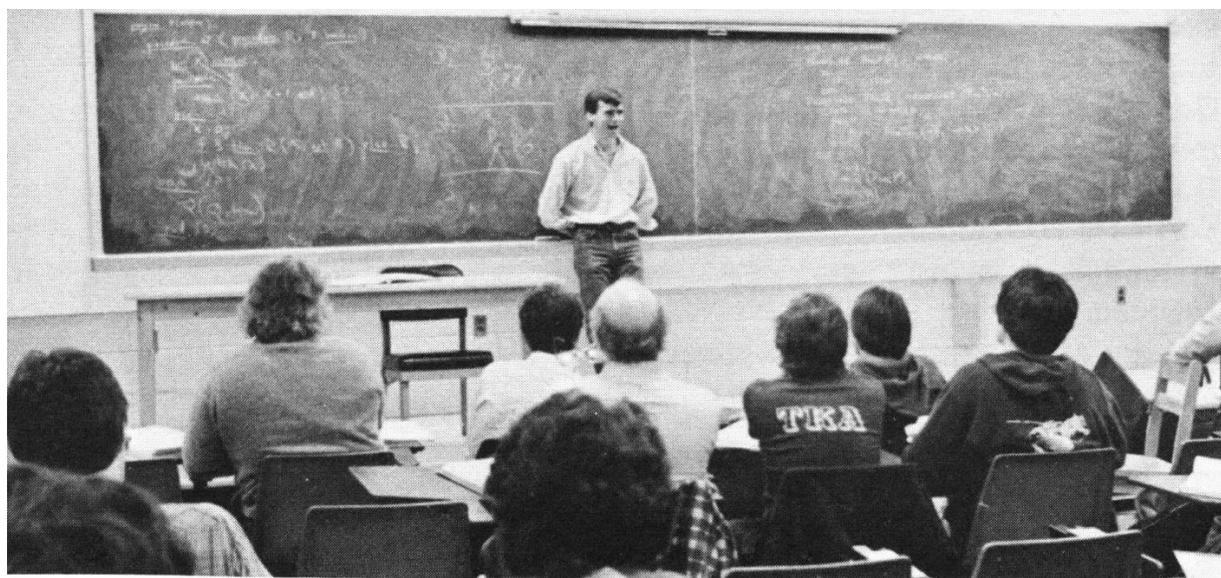
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<sup>40</sup> Annual Report 1997-1998, Department of Computer Science

require students to take several required Computer Science courses. The proposal was submitted to the University for approval in the Spring of 1997. The plan was to have a cap of 200 students in the program, but it soon grew to over 500. This causes an additional problem as student enrollments in computer science again rose at the end of the 1990s, but by 2005 the CE majors provided a base of students the Department now needed. This program continues through 2006 and has about 500 CE majors. Gannon was also instrumental in getting the campus to authorize the new classroom building – the Computer Science Instructional Center (which is described in Section 5.2).

But he never got to see the results of his efforts. Just as summer was about to start, John Gannon unexpectedly died in his sleep on Saturday morning, June 12, 1999. John had a congenital heart defect, and for those who knew him, he willingly told them that his operation when he was young was one of the first of its kind. It was not known how long he would survive. People knew that he could pass away at almost any time, but when it actually did happen, it was a sudden shock and loss to all. John was missed by everyone.<sup>41</sup> A scholarship fund has been set up in his name, and donations are still welcome.<sup>42</sup>

After a short time, Dr. Larry Davis was appointed as Chair. (Larry had been director of UMIACS from its inception in 1985 until 1994. I guess he didn't quite have his fill with administrative duties.)



**Figure 4.5. Dr. Gannon liked to teach and was well-liked by students.**

#### ***4.4 Masters program in Software Engineering***

The Washington DC area is surrounded by a large well-educated workforce. There are hundreds of thousands of federal workers here as well as many government and industrial, technology centers. Organizations like NIST, FDA, NIH, NASA, NSA, and many other acronyms hire technically trained employees and many of these employees are eager to obtain advanced MS and PhD degrees.

The University has always been eager to tap into this demand and offer services to these people. Two such programs have affected the department: (1) The ITV program of the Engineering College, and (2) A masters program in software engineering.

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<sup>41</sup> I still have in my office about 2000 of the almost 3000 abandoned and lost golf balls John and I found when we went jogging every day at lunchtime on the University golf course.

<sup>42</sup> <http://www.cs.umd.edu/department/obituaries/gannon.shtml>

**Instructional Television (ITV).** In the 1980s the Engineering College broadcast a set of classes to locations around the state, which installed the proper receiving equipment. Run by Dr. Arnold Siegal, ITV broadcast from a small building behind the Engineering building, which contained two classroom/studios and a broadcasting control room. Each studio contained several cameras and projection equipment, as well as two-way voice (telephone) communication with the offsite locations. Once the equipment was installed in a site, the logic was that offsite students could watch the lectures, take the exam, and pay tuition. The income from this tuition would come at no cost other than the capital cost of the broadcast equipment.

Interest in computer science was very high in 1983-85 and the Engineering College wanted to also broadcast several computer science classes. (Remember, that was the era when the Department was being crushed by 2300 undergraduate majors.) We reluctantly agreed and for several years we broadcast about 2 graduate classes a semester over ITV.

The ITV program was never popular or successful in Computer Science. For one thing, we didn't see it as "free." Classes were booming in those days. ITV students only added to the overburdened load of the TAs in the courses. Faculty had extended hours when they had to be available for office hours so students could call in. Also remember, that while the Internet was starting to grow in that period, there still was no Web. The Web didn't arrive until the early 1990s.

Dr. Basili, chair when ITV started, negotiated an agreement where ITV would pay for additional TA support for the Department; however, it took several years before the ITV program made good on partial payment of these funds. Faculty were concerned that we had to turn students away from on-campus classes due to the large number of majors, yet ITV students could enter classes relatively unprepared and not up to the standards of our on-campus graduate students. There was also suspicion that exams at these remote locations were not proctored up to the standards we wanted for on-campus exams.<sup>43</sup> The final event that broke Computer Science's agreement with the ITV program was the introduction of the National Technological University (NTU). NTU was a national consortium of courses similar to the campus ITV program, and the Engineering College wanted to join the NTU consortium. This would mean a great increase in the number of remote students attending each class. The faculty voted 19-0 that faculty participation in NTU would be purely voluntary, and the ITV program would have to subsidize the Department for any increased costs (e.g., more TAs, additional course materials, telephone charges) associated with participation in NTU. Department participation in ITV quietly fizzled away over the next few semesters.

**Masters in Software Engineering.** With the many technically-oriented agencies in the area, University administrators looked at the large number of potential evening students that were not being serviced, and several times inquired if we could offer an evening master's degree program in software engineering. They especially looked at the large evening MS program run by the Johns Hopkins University at the Applied Physics Laboratory in Howard County, and wanted "a piece of the action."

Several times, from 1979 until such a program was instituted in 1995, the MS in Software Engineering issue was proposed. Each time it was studied, our response was who would pay the huge costs for faculty to teach in the evening, for laboratory equipment students could use, and TA support for help in the classes? Each time the response was silence, and the idea was dropped. As discussed below, 1995 was a special circumstance.

The first time the idea arose was in 1979 when Dr. Yaohan Chu proposed such a program.<sup>44</sup> At the time the undergraduate program was starting its early 1980s growth and the Department was just swamped with students and insufficient resources to handle this increased load. As given in the previous paragraph, none of the financial issues could be resolved and the idea died at that time.

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<sup>43</sup> Memo to Dr. A. Seigel on ITV and NTU programs by Marvin Zelkowitz, Acting Chairman, April 17, 1985

<sup>44</sup> Memo to Education Committee: M.S. Degree in Software Engineering by Yaohan Chu, January 12, 1979.

Several times, while Dr. Basili was chair from 1982 through 1988 the concept of an evening masters in software engineering program was again brought up. Each time we prepared a brief concept paper with a proposed budget. Each time we never heard again from the plan once the budget was mentioned.

In 1987 the idea came up again. This time the University owned a facility on Shady Grove Road in Gaithersburg, and the idea was to have an evening program situated there. A budget was prepared:<sup>45</sup>

Capital expenses for workstations, PCs, terminals, printers	\$142,000
Annual costs for maintenance, communication, hardware upgrades, software	75,840
Personnel costs for admissions secretary, administrator (1/2 time faculty appointment) TAs	140,400
Operating costs (office expenses, copying)	35,000
<b>Total first year costs</b>	<b>\$251,240</b>

The assumption was that 130 students would take a total of 340 classes per calendar year (fall, spring, summer) and pay about \$800 tuition per course. That would mean that the shortfall of \$81,240 would have to be paid from non-program funds. This shortfall was never addressed.

In May of 1988 the campus formally proposed<sup>46</sup> to offer a set of academic programs at Shady Grove. The critical criterion, with respect to the Department's involvement, was "All off campus educational programs should be run on a self-support basis." The Department's 1987 plan was modified and in February 1989, Department Acting Chair Tripathi submitted a new plan<sup>47</sup> with a budget this time of \$134K for laboratory capital costs, \$225K annually for faculty to teach 12 courses per year and \$100K for administrative costs associated with administering the program, handling admissions to the program, etc. for a total first year cost of \$459K. It was assumed that a permanent (part-time) director and secretary would be needed to administer this program.

The idea would be for the degree to be a terminal professional degree in software engineering and to have some of the courses taught both in College Park in the late afternoon (e.g., starting at 5pm) and at the Shady Grove center. The initial Department response was criticized since too many of the courses would be taught on campus rather than at Shady Grove, and the budget was too high. A new reduced budget was prepared<sup>48</sup> showing capital costs for a laboratory would now be \$67K, annual administrative costs would be \$139K and faculty and TA costs to cover 10 classes per year would be \$157K, or a total of \$363K first year startup costs. Given the high price tag, the idea never got beyond the planning stages.

The concept again arose in the fall of 1993; this time by University College, an administratively and financially separate part of the University System of Maryland. University College was going to add such a master's program, and wanted to do it jointly with the campus. Again the issue of funding arose, but we believed we had to cooperate this time to at least gain academic control over the program. Meetings were held throughout the 1993-4 academic year in planning a program. On September 29, 1994 the Chair's office received, a draft agreement from the Dean's Office:<sup>49</sup> "Draft memorandum of understanding between the University of Maryland University College [(UMUC)] and the University of Maryland at College Park [for a] Master of Software Engineering [(MSE)]," which described an agreement for the College Park campus and University College, to jointly offer an evening program in software engineering.

<sup>45</sup> Proposed Evening Program budget by M. Zelkowitz, July 6, 1987

<sup>46</sup> Report of the Shady Grove Planning Committee to Provost W. E. Kirwan, May 31, 1988.

<sup>47</sup> Memorandum to Dean R. Dorfman on Response to Shady Grove Budget Request by S. Tripathi, Acting Chair, February 2, 1989.

<sup>48</sup> Professional degree – MS in software engineering: Proposed budget, October 30, 1989.

<sup>49</sup> Draft memorandum of understanding between the University of Maryland University College and the University of Maryland at College Park : Master of Software Engineering, September 24, 1994.

The agreement, which eventually was worked out, would be for the Department to teach 4 courses per year at Shady Grove and UMUC would teach 5 to 8 courses per year. A curriculum was developed, where some of the courses were the province of the Department, while other courses were the domain of UMUC. The acronym MSWE (Master in Software Engineering) was created and two classes were created by the Department. One was MSWE 607 (Software lifecycle methods and techniques), which was a variation on the undergraduate CMSC 435 (Software Engineering) and the second was MSWE 609 (A quantitative approach to engineering software), which was a variation on CMSC 735 (A quantitative approach to engineering software). Other 400 and 600-level CMSC electives were also to be offered in the evening to fulfill the elective requirements of the program. Expenses for the program would rise from \$650K in 1995-6 when the program was to start and grow to \$690K by the 1999-2000 academic year. Revenue, on the other hand, would grow from \$296K to \$870K by 2000, finally showing a profit by 1998-99.

In the fall of 1995 the program started.<sup>50</sup> While a few courses were taught at Shady Grove, the predominant ones by the Department were taught on campus from 7-10 pm once a week. The program lasted approximately 6 years, and unfortunately was never very successful. The problem was whose students were these MSE students? When the students were registered for a class taught by UMUC staff, the University had no record of them. Thus library privileges and computer access had to be negotiated each semester. Dr. Jim Purtilo became the Department's MSE liaison, and constantly had to negotiate for access rights with the campus for these students. When they were taking Department MSWE classes, UMUC didn't feel responsible for them. The Department also believed that UMUC used very low admission standards for admitting students. While some of the evening students were outstanding, others were marginal. In one email I sent to the software engineering faculty after I taught my first MSE course, I stated in part:<sup>51</sup>

"1. Most of the students are serious about their studies and want to complete the program.

They took the course seriously and tried to do well. I had the 46 students break up into 15 groups of 3 and I was quite surprised when all 15 completed their projects. I never had such a success rate in the day program. Of course some of the projects were better than others, but all executed.

2. HOWEVER, enthusiasm and ability are not always correlated. Some of the students clearly do not belong in the program. One student had an economics background, never programmed, and only took one C course, yet was declared ready for the program by UMUC.

I spent one day discussing formal methods and gave a simple Hoare-like proof. The class panicked over that. They still talk about that one lecture with dread."

The jointly administered program never ran smoothly. Finally, there was a "divorce" and the Department of Computer Science stopped teaching in the program after the 2000-2001 academic year.

## ***4.5 Fraunhofer Center for Experimental Software Engineering***

Dr. Dieter Rombach, who arrived on campus in 1982 as a post-doc to Dr. Victor Basili and was appointed as an assistant professor in 1986, was given an offer he couldn't refuse in 1992 - a full-professorship with a significant research budget at the University of Kaiserslautern in Kaiserslautern, Germany. For the previous 10 years he was part of the Department's software engineering group and spent much of his research time working on research issues with the Software Engineering Laboratory.

When Dieter returned to Germany, he and Vic were looking for ways to continue to collaborate. In 1994 he started a research program in Kaiserslautern that was modeled after the NASA SEL. It was then that Dieter learned about the Fraunhofer Gesellschaft,<sup>52</sup> a large research organization in Germany with

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<sup>50</sup> Annual Report, Department of Computer Science, 1995-96

<sup>51</sup> Email to software engineering faculty from M. Zelkowitz, May 13, 1998.

<sup>52</sup> [www.fraunhofer.de](http://www.fraunhofer.de)

approximately 60 institutes, 13,000 employees, and an annual budget of over 1 billion euros. In 1996 he was given the opportunity to create the Fraunhofer Institute for Experimental Software Engineering in Kaiserslautern, as one of the institutes that are part of the Fraunhofer Gesellschaft. He became its director, a position he still holds today.

In 1994, several of the Fraunhofer institutes wanted to have operations in the United States. Rather than setting up separate corporations for each of them, an umbrella organization, Fraunhofer USA,<sup>53</sup> was created as a not-for-profit corporation headquartered in Ann Arbor, Michigan (since relocated to a suburb of Detroit).

Beginning in the fall of 1996, Vic, working with Dieter, negotiated with the State of Maryland's Department of Business and Economic Development (DBED) and the University to create the Fraunhofer Center for Experimental Software Engineering, Maryland, as one of the centers in Fraunhofer USA. Some state funding was secured,

and along with base funding from Fraunhofer Gesellschaft in Germany, about 30% of the Fraunhofer Center's budget is covered by a stable funding source. The rest must be covered by contracts and grants.

In November 1997 the Fraunhofer Center obtained space on the third floor of the Ag/Life Sciences Surge building<sup>54</sup> and began operation with Basili as Executive Director and Zelkowitz as Co-Director. A formal dedication was held on February 25, 1998 when an official Memorandum of Understanding between the University and the Fraunhofer Gesellschaft was signed (Figure 4.6).

The Fraunhofer Center's original goal was to duplicate the success of the Software Engineering Laboratory across multiple organizations. This grand vision never materialized, but it has been successful in the technology transfer of software process improvement across multiple organizations. The Fraunhofer Center has several contracts with corporations and federal agencies. It has been a collaborative organization on several NSF and NASA grants with the software engineering group of the Department.

In April 2000 the Fraunhofer Center moved off campus into an office building on Hartwick Road in College Park. Zelkowitz resigned as co-Director in 2002 and Basili resigned as Executive Director in 2005. Currently it has about 20 employees (about 15 Full-Time Equivalents), about a \$2.5M annual budget. Dr. Rance Cleaveland of the Department is the current Executive Director.



**Figure 4.6. Ribbon-cutting ceremony opening the Fraunhofer Center in College Park. (From left to right: Secretary of DBED Jim Brady, Dieter Rombach, Vic Basili, and Dirk Polter of Fraunhofer Gesellschaft).**

## 4.6 Research

The Department was a leading player in the Computer Science research world for all of the 1990s. Adam Porter joined the software engineering group, a separate programming languages group started to evolve around Bill Pugh and the Human Computer Interaction group saw the addition of Ben Bederson and Allison Druin (as an affiliate department member). Systems grew with the additions of Richard Gerber,

<sup>53</sup> [www.fraunhofer.org](http://www.fraunhofer.org)

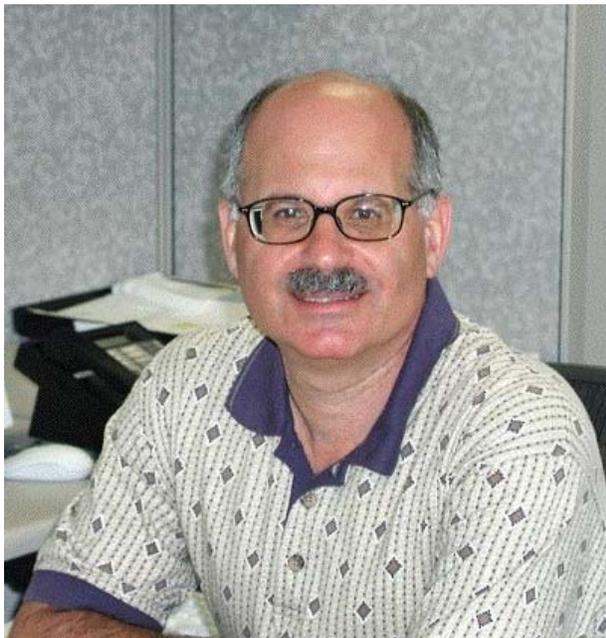
<sup>54</sup> This building has been renamed the Biomolecular Sciences Building, and the space is currently occupied by Dr. Steven Salzberg of the Department and the Center for Bioinformatics and Computational Biology.

Jeffrey Hollingsworth and Pete Keleher. Bonnie Dorr added a natural language component to the AI group and Michael Franklin was an addition to the Database group. Pete Stewart was awarded the F. L. Bauer prize in 1998. The AI, Vision, Numerical analysis, Software Engineering, Database, and Systems groups were all consistently ranked at or near the top ten in their area according to the various surveys and rankings that came out during the decade. The Department as a whole generally ranked between 12th and 14th out of the roughly 130 Ph.D. degree granting programs in computer science in the U.S. and Canada. The Theory group was also starting to gain a reputation with the addition of Dr. Samir Khuller joining Bill Gasarch, Carl Smith and Dave Mount.

## 5. The Future

Since 1999 there have been several changes in how Computer Science is perceived both on the campus and internationally. This change is still underway so it is not yet clear what the end result will be. For this reason, this chapter, entitled “The Future,” really began about 7 years ago when Dr. Larry Davis became Chair.

### 5.1 *Dr. Larry Davis: 1999-2006*



**Figure 5.1. Dr. Larry Davis, sixth and current Chair (at the end of 2006) of the Department.**

Larry Davis (Figure 5.1) took over as Acting Chairman soon after John Gannon’s tragic death. The position soon became permanent, and he was still Chair at the end of 2006. Larry was immediately confronted with the resignation of Mary Saffell as Director of Administration. On July 19, 1999 Pat Ipavich replaced her as the new, and current, Director of Administration.

**Education.** When Dr. Davis took over as Chair, Computer Science was again an active academic department with student enrollments topping 2000 majors. There was need for more space, especially in the need for new classrooms. In 2002 the new Computer Science Instructional Center with 10 new classrooms opened. That is discussed separately in the next subsection of this report.

In 2004, the rules for graduate coursework again were changed. Students now had to take seven 600-800 level courses covering at least 5 areas with no more than 2 in any one area. The grades must be at least 5 A’s and the rest B’s.

Courses could be any course certified by the faculty member teaching the course that it qualified as such a course and that it consisted mainly of lectures with exams and a final (e.g., no seminars). At least two other graduate courses had to be taken with at least a B grade in each. A tenth 1-credit course on how to conduct research was also added.

One major change is that each spring about 4 hours are spent by the entire faculty discussing all graduate students. Those who are not making satisfactory progress are identified in order to help them get on track to finishing their degree program successfully in a reasonable amount of time.

As this is being written in early 2007, the education situation is again changing. Computer Science enrollments are dropping again. Fall 2006 enrollments are down to 615 majors.<sup>55</sup> There seems to be widespread fear among high school students that all information technology jobs are being outsourced to India. Although our graduates have no trouble in getting positions when they graduate, that perception has caused enrollments to drop greatly. The department needs to start looking at ways of advertising its products. Unlike the 1980s when majors from other departments had to be turned away, the goal needs to be to attract these students.

Several activities are trying to address aspects of this problem:

1. The introductory courses in computer science, through the junior level 311 (systems) and 330 (programming languages) courses have been revised over the past 3 years.
2. A Computer Science minor was introduced, under the direction of Dr. Jim Purtilo, Associate Chair for Undergraduate Education. It is too new to see the impact, but so far only a relatively small number of students are interested.
3. An initial proposal was submitted to create a 5 year BS/MS program. This would allow students to complete their MS degree in 5 years by allowing a minimal number of courses count for both degrees, according to University policy. As this is being written, this program is still in development.

The drop in enrollment so far has not materially impacted the Department financially. As part of the state Maryland Applied Information Technology Initiative (MAITI) from 1999 to 2003, significant funds were given to the Department to fund the huge increase in students at that time. A total of approximately \$1.7M was given over a 5 year period, reaching a high of just over \$600,000 in each of 2001 and 2002.<sup>56</sup> As the number of students has dropped, much of this funding has been withdrawn. But this has so far not affected the Department's basic state budget for faculty and teaching assistants.

**Research.** The faculty mix continued to evolve and improve. Michael Hicks, Jeff Foster and Atif Memon joined the Programming Languages and Software Engineering Field Committee (renamed from the Software Engineering Field Committee due to the increased emphasis on languages). Francois Guimbretiere joined Ben and Ben (Bederson and Shneiderman) in the HCIL. Bill Arbaugh added expertise on security to the systems group and Jonathan Katz's work on cryptography was an important addition to the theory group. An expertise in graphics was due to Amitabh Varshney and Aravind Srinivasan was an important addition to the theory group. Pete Stewart added to the recognition of the Department by being elected to the National Academy of Engineering in 2004.

Research funds were increasing (a good thing). But that meant that the number of supported GRAs and post-docs was also increasing (a good thing as well), which meant that more space was needed to house them (not such a good thing). Beginning in the summer of 2001 most of the large GRA office space was renovated with modern, but compact, cubicles, thus increasing the density of GRAs, and hence, the number of GRAs per office.<sup>57</sup>

Research is still the strong suit for the Department. During Davis' tenure as chair, the Maryland Information and Network Dynamics (MIND) Lab was created (Section 5.3) as well as the Center for Bioinformatics and Computational Biology (CBCB) (Section 5.4). The faculty is well-known and each year the department is regularly rated among the top 10 to 15 graduate programs in Computer Science.

It was not the goal of this report to discuss every activity that existed within the Department of Computer Science, but to highlight those activities believed to have the most impact on the evolution of the Department. Some of the associated centers and institutes are mentioned in this report, but not all of them are explored in detail. At the end of 2006 the names of all the laboratories and centers associated with UMIACS (and generally with departmental faculty members) include the following:

- **CfAR** - Center for Automation Research

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<sup>55</sup> Larry Davis, "State of the Department," April 23, 2007.

<sup>56</sup> Self-study report, Computer Science Department, 2003. <http://www.cs.umd.edu/review/>

<sup>57</sup> Email on Space Allocations within the Department by Pat Ipavich, May 25, 2000.

- **CBCB** - Center for Bioinformatics and Computational Biology
- **CDIG** - Center for Digital International Government
- **CHESS** - Center for Human Enhanced Secure Systems
- **CLIP** - Computational Linguistics and Information Processing
- **CVL** - Computer Vision Laboratory
- **DSSL** - Distributed Systems Software Laboratory
- **FCMD** - Fraunhofer Center at Maryland
- **GLCF** - Global Land Cover Facility
- **GVIL** - Graphics and Visual Informatics Laboratory
- **HCIL** - Human Computer Interaction Laboratory
- **KECK** - Keck Lab for the Comp. Modeling of Visual Movement
- **LAMP** - Language and Media Processing Laboratory
- **LCCD** - Laboratory for Computational Cultural Dynamics
- **LPDC** - Laboratory for Parallel and Distributed Computing
- **MIND** - Maryland Information and Network Dynamics Lab
- **PIRL** - Perceptual Interfaces and Reality Laboratory

Several of these are discussed elsewhere in this report.

On December 31 2006 the Department reached the following size:

1. 49 tenure track faculty
2. 23 affiliate appointments
3. 1 adjunct appointment
4. 4 professor emeritus appointments
5. 5 lecturers
6. 1 instructor

**Outreach.** The department has always taken part in outside activities (Figure 5.2) in order to increase interest in computer science (and in coming to the University of Maryland). Two current activities include:

**1. High School Programming Contest:**

Patterned after the programming contests run by the Association for Computing Machinery (ACM), each year teams of students are invited to the College Park Campus for a day where they compete for solving several programming tasks in a limited amount of time. While the teams are working on their solutions, their advisors are given talks about the University of Maryland. In 2006, 35 teams from the area competed, with a similar number expected in 2007. Dr. Chau-Wen Tseng is the current faculty member running the program.

- 2. Java Passport Program.** Each semester Nelson Padua Perez lectures to students of all ages about computer science (and Latin dances). Almost 250 students are expected to be involved for the spring 2007 program and it is supported by an annual \$15,000 grant from the Provost's office. Again the goal is to increase interest in computer science.



**Figure 5.2. Vic Basili and Nick Roussopoulos talk to PhD alumnus Bill Bail at 2003 College Alumni Day.** (Photo by M. Zelkowitz)

## 5.2 Infrastructure

Since 2000 several changes and additions have been made to the facilities available to the Department. This includes the new computer science classroom building and several changes within the AV Williams building itself.

### Computer Science Instruction Center (CSIC)

In 1999 enrollments were again close to 2000. With a larger faculty but with fewer students than in 1982, the problem was not as severe as in the previous decade, but the situation was not good. Classroom space was becoming a big problem. The department had three classrooms in the CLB temporary building (built in the mid-1980s) across the street from AVW), since 2 of the smaller rooms were combined into one several years previously. But the Kim Engineering building was to be shortly built on the site of CLB, meaning those rooms would soon disappear. The Department also used classrooms all over the northeast sector of the campus, but the loss of CLB would be hard to replace.

On May 18 1999, a meeting was held between Brenda Testa of the Department of Facilities Planning and Greg Geoffroy, John Osborn, Judy Broida, David Falk and Ron Lipsman on the subject of a new classroom building for Computer Science.<sup>58</sup> The need was obvious and the (unrealistic) parameters for the building were set as follows:

- The building had to be built for a budget of \$5M.
- This price also included expenditures for AV equipment in the building.
- The building would be a stand-alone building, with no connections to AVW.
- The Office of Professional Studies (OCEE) would have 4 of the 10 classrooms until the Fulbright International Center was built and then Computer Science would get all 10 classrooms.<sup>59</sup>
- Planning would begin in FY 2000 (beginning July 1, 1999) and the building would open in January 2001.

On July 19, 1999<sup>60</sup> the Department received the news that the University's Board of Regents authorized the construction of this Computer Science Instructional Center (CSIC), which would be built just south of the AVW building (Figure 5.3). It would contain 10 classrooms, a WAM laboratory, approximately 15K NASF in public space, with a target completion date of January 2001, later changed to March 2002. Classrooms would have ceiling-mounted projectors in each room, two in the main lecture hall, and computers connected to the Internet in each room. Student desks would have electrical power and the building was one of the first on campus to have wireless Internet installed. The budget, at \$5M was unrealistic, so it gradually was increased over the next few months to just over \$8M. Faculty also wanted a direct connection to AVW, so after a few months a connecting bridge on the 3rd floor between CSIC and AVW was added to the plan.

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<sup>58</sup> Email from Brenda Testa, Department of Facilities Planning, May 19, 1999.

<sup>59</sup> As far as I can tell, a separate building for this center has never been built and all 10 classrooms were dedicated to computer science from the beginning.

<sup>60</sup> Email from Vicki Brewer, Dean's Office to faculty, July 19, 1999

The Charles E. Smith Construction Services was the winning bidder and construction was approved on September 1, 2000, with a planned 17 month construction cycle. The campus committee met almost weekly discussing issues such as given 10 classrooms, how big would they be given the budget we had available? The final design was that each floor would have a large classroom (120 seats in the first floor, 90 seats on floors 2 and 3) and there would be 7 other classrooms of 30 to 50 seats each. How big (or small) should the one computer lab be? One stumbling block was “white board or chalkboard?” Faculty opinions on this were divided. The final solution was that first and third floor classrooms would have whiteboards and second floor classrooms would have chalkboards. The largest room on each floor would have both. It was hoped this would satisfy everyone.



**Figure 5.3. Computer Science Instruction Center opened in 2002.**

Jeff Hollingsworth was the main departmental representative to the building committee, often walking around with his hardhat on. Bill Pugh was also a representative to the design committee working on CSIC. Tim Falkinburg, Director of Facilities for the Deans Office, managed the activity. From Summer 2001 until the building opened in 2002, Marv Zerkowitz, while Hollingsworth was on sabbatical leave, was a Department representative. (As you can see by the dates, the building opened about 6 months after initially planned. But a 3 year design and build cycle was still much faster than the University’s normal construction cycle.)

The building opened for limited use during the summer of 2002 on July 15<sup>61</sup> in order to test the AV systems that were installed (Figure 5.4). The building was fully occupied for the Fall 2002 semester. A



**Figure 5.4. (Left) First class using CSIC on July 15, 2002. (Right) Dr. Sharat Chandran (visiting lecturer), Dr. Jeffrey Hollingsworth, and Mr. James Maybury, Undergraduate Program Coordinator prepare for the first class in CSIC. Note: the building AV system was not yet ready, and so a portable projector was used.** (photo by Jordan Landes).

<sup>61</sup> Email on First Class is meeting in CSIC by Jeff Hollingsworth, July 15, 2002.

formal dedication of the building occurred on October 23, 2002 with Maryland Governor Parris Glendenning in attendance.

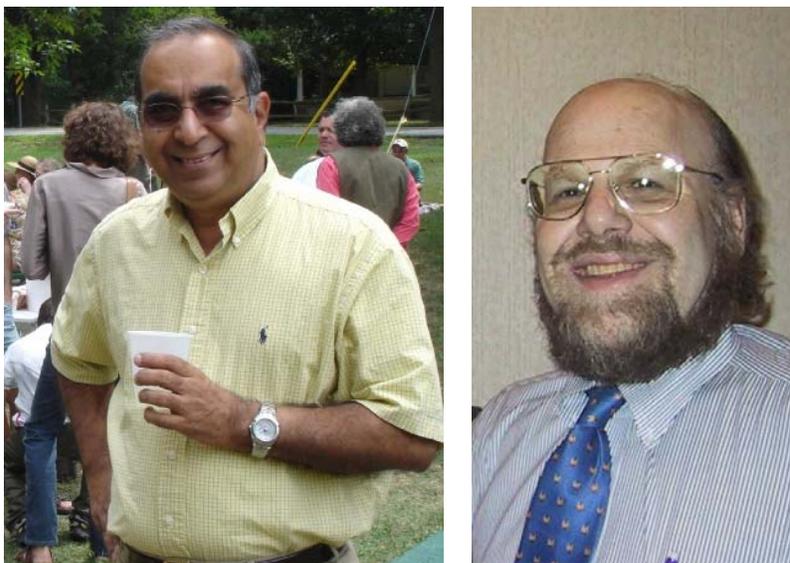
The construction, planned to cost over \$8M, ran over budget – as probably should have been expected. The four story building would have classrooms only on the first 3 floors, while the fourth floor would remain vacant, pending its allocation to some later research group. The goal was to raise most of the cost of construction by selling rights to name various parts of the building. Some of the classrooms were named, based upon donations by various corporations. The name of the building is still available!

The Department fought for several years to obtain the vacant space on the fourth floor of the building for additional Computer Science office space, but ultimately the Dean decided to give the space to the Center for Scientific Computation and Mathematical Modeling.

## Other Infrastructure Changes

**Grid Room:** Jeff Hollingsworth established an advanced video-conferencing facility in room 3450, the Grid Room. Using 4 video cameras and a blank wall projecting 3 PC desktops, interactive meetings can be run with other users, all visible on windows projected onto one of the desktops. Common files, such as PowerPoint presentations, can be viewed by all simultaneously. This room has been used successfully by several research groups working collaboratively with faculty at other universities as well as by students using the facility for the Ph.D. defense.

**Space renovation:** Graduate student and staff lounges have been redesigned. While the Department has 36,947 square feet of space in AVW,<sup>62</sup> that is not enough to hold the still-growing department. Plans are in place to unfortunately again split the Department. The Center for Bioinformatics and Computational Biology is already not in AVW and the Human Computer Interaction Laboratory is to move out of AVW into new space in Hornbake, the former undergraduate library building, in 2007. But this will free up some needed space for other research groups and graduate students. The University has initial plans for a new building for computer science, but these so far are preliminary and are projected to be at least 7 to 10 years away.



**Figure 5.5. Dr. Ashok Agrawala (left) and Dr. Jim Hendler (right) of the MIND Laboratory.** (Left photo by B. Shneiderman)

## 5.3 Maryland Information and Network Dynamics Laboratory

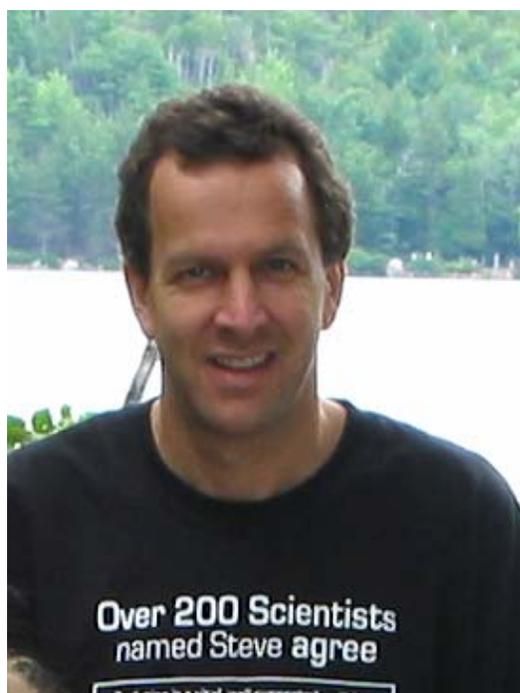
The Maryland Information and Network Dynamics Lab (MIND) is an initiative of the University of Maryland, which collaborates with private industry and government agencies to foster new, large-scale computer science projects in the areas of wireless networking, information services, information-centric

<sup>62</sup> Self-study report, Department of Computer Science, 2003.

applications, networking infrastructure and information assurance and security. It was created by Ashok Agrawala and Jim Hendler in 2002 as its two principal Department faculty (Figure 5.5). Space being non-existent on campus, it is located in an office building along Route 1 in College Park about ¼ mile north of the AVW building. Research topics of the MIND Lab include:

- Rover – A scalable location-aware computing environment
- DRACO – Providing the necessary communications and system support for first responders to an incident under a variety of conditions.
- MINDSWAP – Investigation of cutting edge technologies for the next generation of the World Wide Web. Some of the work includes ontology visualization and creation, photo markup, reasoning, and distributed trust systems.

## 5.4 Center for Bioinformatics and Computational Biology



**Figure 5.6. Dr. Steven Salzberg, Director of CBCB.**

The most recent research focus in the development of the Department was the emphasis in building a research program in bioinformatics. In 1998 the University Administration made the decision to build a program in biosciences. The college asked UMIACS (and to a lesser extent the Department) to come up with a proposal.<sup>63</sup>

“The creation of a cross-disciplinary Computational Biosciences Laboratory is proposed within the University of Maryland Institute for Advanced Computer Studies (UMIACS) as part of a campus-wide initiative to enhance computational biology and bioinformatics. The specific goals of this laboratory will be:

-- to bring together faculty in the biological sciences with faculty in computer science, mathematics and engineering to undertake collaborative research/funding efforts;

-- to provide infrastructure support for campus faculty doing advanced computational bioscience research, particularly in the form of high performance computing;

-- to facilitate recruitment of new faculty in fundable, high-growth areas of computational biosciences, through their joint appoints in UMIACS and an appropriate department (e.g., computer science, cell and molecular biology);

-- to foster new educational initiatives related to computational biosciences for undergraduate and graduate students and faculty; and

-- to establish mutually-beneficial cooperative arrangements with other regional centers of computational bioscience.”

It was assumed that the new laboratory would be part of UMIACS as the only unit on campus with the computing resources needed to support such research.

Late in 2003 the University created the Center for Bioinformatics and Computational Biology (CBCB), joint with the College of Life Sciences, and it was administered by UMIACS. In the fall of 2003, preliminary requirements for a BS degree in Bioinformatics were discussed,<sup>64</sup> but the current

<sup>63</sup> Email from Dr. Jim Reggia to faculty, September 29, 1999.

<sup>64</sup> Education Committee Minutes, October 3, 2003.

proposal was viewed as light on upper division Computer Science courses. Dr. Chau-Wen Tseng has been offering several 800-level graduate seminars on bioinformatics.

In May 2005, Dr. Steven Salzberg (Figure 5.6), senior director of bioinformatics at The Institute for Genomic Research (TIGR), was hired as Horvitz Professor of Computer Science and as Director of CBCB. In the summers of 2006 and 2007, Drs. Mihai Pop and Carl Kingsford (respectively) were hired as Assistant Professors in Computer Science in this area, and in the fall of 2006, Dr. Najib El-Sayed was hired by CBCB with a tenure home in Cell Biology and Molecular Genetics. CBCB also has several other faculty from the life sciences area. Although new, it already has an active research program in genome research.

## 5.5 Endowed professorships

The Department never had any endowed professorships – a limitation that makes recruiting top faculty more difficult. But that is slowly changing. Three named Chairs are now available for honoring faculty.

***Phillip H. and Catherine Horvitz professorship.*** Phil Horvitz, a 1975 graduate in computer science developed his General Data Systems into a successful company. GDS's largest customer is the U.S. State Department's Passport Office, where GDS's software is being used to modernize the process of obtaining passports. In appreciation of his experiences in College Park, Mr. Horvitz in 2004 has given \$900K to fund this professorship. One of the classrooms in the CSIC was named the Horvitz classroom in honor of this gift.

***The Jack & Rita G. Minker Professorship.*** Dr. Jack Minker, long time professor and first chair of the Department who retired in 1998, endowed a graduate fellowship in honor of his wife Rita, who had died of breast cancer in 1988 (Figure 5.7). In 2006, at Minker's instruction, the remaining funds given for the Minker fellowship was converted into the Jack and Rita Minker Professorship. The professorship honors Rita Minker's early contributions in computer science and to Jack's contributions to the Department, to his research in artificial intelligence, and in his support of human rights for scientists. At present, the Department is raising an additional \$150K in order to fully fund the professorship.



**Figure 5.7.** Jack and Rita Minker (around 1978). (Photo by M. Zelkowitz)

**Darnell/Kanal Professorship.** Christopher Darnell, whose business was quantitative investment management, met Dr. Laveen Kanal (Figure 5.8) in 1981. Mr. Darnell, called Dr. Kanal and came to College Park to visit with him and discuss ways in which Dr. Kanal's approaches toward pattern recognition could be used in the financial markets. Needless to say, the approach was successful. In appreciation for Dr. Kanal's free advice and time he spent with Mr. Darnell, Mr. Darnell and his employer (Grantham, Mayo, Van Otterloo & Co. LLC) have pledged to provide donations from 2006-8 to support this professorship.



Figure 5.8. Dr. Laveen Kanal.

## 5.6 Back to the future

Since 2000 there has been a change in Computer Science, both on-campus and internationally. “Hot research areas” which were dominant in the past, are no longer the driving force. Much of the growth in the Department during the past 30 years occurred because of the reputation of its research groups in such areas as artificial intelligence, vision, numerical analysis, databases, and software engineering. While still very recognized groups internationally, they are no longer the “hot topics” of the field. Areas such as Security, Nanotechnology, Electronic games, Scientific computing, and Bioinformatics research are the luminaries.

There is also a downturn in the number of Computer Science majors since the recent high in 2002. But this year there is about a 20% increase in freshman majors. Is this a one-year anomaly or the start of a new upturn? It is too early to tell.

Computer Science is still a young academic discipline and is still rapidly evolving. Changes are always needed. According to this author, issues within the Department still needing resolution, which I assume the writer of the next history in a decade or two can comment on, include:<sup>65</sup>

1. The current drop in Computer Science undergraduate majors needs to be addressed. Is the Department “selling” the right product? What we called Computer Science in 1979 may not be what is needed today. What has been and will be the impact of the Computer Engineering major, a joint program between Computer Science and ECE, administered by the ECE Department? We can't be complacent and just continue what we have been doing since it was successful in the past.
2. The drop in enrollment is sometime attributed to the fear of having jobs “outsourced” to India and other places with less expensive but trained work forces. But anecdotal information says that this fear is unfounded – computer science jobs are available and some companies report an inability to hire CS graduates. This year the number of new freshman majors rose by 20% from about 80 to just over 100 – not a big rise, but perhaps the start of a trend, which would be the third wave of majors since the Department was organized in 1973.
3. The graduate program in Computer Science again needs tinkering – or perhaps an overhaul. The comprehensive exam concept needs a drastic review. From the system in 1970 where every graduate student took four 3-hour exams based upon the same four graduate courses, we now have a system where students take any one of 5 or 6 courses to fulfill one of the five required core areas out of the 7

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<sup>65</sup> It would be interesting to see how well my predictions are about the important issues and whether these are even concerns 10 to 20 years from now.

defined areas (Artificial Intelligence, Computer Systems, Database Systems, Software Engineering - Programming Languages, Scientific Computing, Algorithms and Computation theory, Visual and Geometric Computing), leading to well over 10,000 different paths through our core graduate program of study. That does not seem to me to be a “core” concept and the entire process appears to me to be chaotic.

4. Although individual faculty have well-defined research programs, the Department does not have a consistent vision. But is one even needed? In the last external department review in 2003, the External Review Committee commented:<sup>66</sup> “At present, the Department operates as a set of loosely collaborating small-group projects. Although this model has proven very successful, it is unlikely to propel the Department into the very top tier of computer science departments. The committee believes a department-wide strategic plan is critical if Maryland is to continue improving its national ranking and achieve its lofty goals.”
5. The research model for funding research seems to be changing. This may be outside of the control of the Department, but the Department needs to adapt to it. Funding of research still seems to be available and faculty are now generally well funded, but traditional sources like NSF grants are becoming harder to obtain. This author feels fortunate that most of his career was the period from 1970 to 2007 when federal funding in Computer Science was fairly plentiful and relatively easy to get. It is not clear that this is true any longer and faculty will need to be more creative to get funding in the future.

## 6. Conclusion

The Department of Computer Science has undergone a great transformation since 1979. In 1979 it was a Department with too many students, insufficient budget, space, faculty and computer resources. In the 28 years since, the Department moved into the new AVW building, added a classroom building next to it, grew the faculty to almost 50, and the student load has dropped considerably. New research areas have been added. However, the areas that made the Department well-known – AI, Databases, Numerical Analysis, Software Engineering, Systems, Programming Languages, Theory – are all still strong. UMIACS has become a recognized institute, which is an important component of Computer Science research. The Center for Bioinformatics and Computational Biology is the newest addition in research directions for the Department.

The Department is regularly rated as a top department. In the most recent rankings, in the 2006 *US News and World Report* rankings of colleges and universities, the Department ranked:

	Among all schools	Among public schools
Entire Department	13	6
Artificial intelligence	9	5
Programming languages	15	6
Computer systems	16	9
Theory of computing	22	8

Just as this report is being printed, a new ranking of research publications shows that the University of Maryland is second only to MIT [Ren07]. The research impact of the Department is still very strong.

Computer science is an exciting field as mainframes, first minicomputers, then microprocessors, the World Wide Web, computer games and wireless telephony are totally changing society. It is exciting to be part of that change. And I expect the Department of Computer Science to remain a part of that evolution. But as Doc Brown says at the end of the movie *Back to the Future III*, when shown a blank piece of paper that originally contained a message when brought back from the future: “It means your

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<sup>66</sup> Report of the External Review Committee of the Department of Computer Science, July 2003.

future hasn't been written yet. No one's has. Your future is whatever you make it. So make it a good one."

## Acknowledgments

The author is indebted to the following individuals who helped provide some of the details contained in this history:

- Victor Basili
- Larry Davis
- Bonnie Dorr
- Michael Hicks
- Jeffrey Hollingsworth
- Ray Miller
- Jack Minker
- Harold Reiter
- Steven Salzberg
- Ben Shneiderman

Repeating a comment from the beginning of this report. - there was no intention to slight anyone in the Department, but not all 150+ faculty who have been in the Department in the past or are still in the Department today are mentioned in this report. But all of their efforts make up part of this history. I tried to include only those activities most important in building and evolving the reputation and capabilities of the Department.

In addition to the achievements of the faculty mentioned in this report, Computer Science faculty have been involved in organizing thousands of conferences, workshops and other meetings, have been editors of many of the journals in the field, and chaired and been members on many influential committees that have helped define computer science these past 30 years. There is no way to mention even a small part of this list. Suffice it to say, that is what is expected of a department that wants to consider itself a top department.

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## Appendix A. Timeline

DATE	EVENT
February 1962	Computer Science Center formed with Dr. Werner Rheinboldt as first director
September 1967	MS degree in Computer Science created
September 1969	PhD in Computer Science created
August 1973	Department of Computer Science created in Division of Mathematics, Physical Sciences and Engineering (MPSE)
August 1974	BS degree in Computer Science created and Dr. Jack Minker becomes the first permanent Chair of the Department,
July 1979	Dr. Jack Minker steps down as chair of Computer Science
<b>See [Minker04] for additional details through July 1979.</b>	
August 1979	Dr. Raymond Yeh hired from the University of Texas as new department chair
June 20, 1980	Department acquires its first large computer – a DEC VAX 11/780. Maryland becomes Maryland.ARPA on ARPANET.
August 1981	Dr. Yeh resigns as chair and Dr. Richard Austing appointed as Acting Chair for one year.
August 1982	“High water mark” of 2348 students enroll in Computer Science courses
August 1982	Dr. Victor Basili becomes Chair. Dr. Marvin Zelkowitz and Dr. Larry Davis become Associate Chairs.
Summer 1983	NSF Coordinated Experimental Research (CER) grant adds several VAX machines to the departmental laboratory. 128 node Zmob is installed.
Summer 1983	National Academy of Science report ranks Department 13 <sup>th</sup> among PhD-degree granting institutions
1983	Human Computer Interaction Laboratory begins operations. The Center for Automation Research is created as an independent center within MPSE and consists of the Computer Vision Laboratory, HCIL and the Robotics Laboratory.
February 15, 1984	Restricted major puts limits on admission to undergraduate program
June 1984	Comprehensive exam requirements for PhD changed so that only failed exams would need to be retaken. Non-thesis MS degree dropped; only thesis option remained for MS degree.
Summer 1984	IBM Project Fulcrum award adds many IBM PCs to educational program.
August 1984	Dr. Ashok Thareja becomes first full-time Department Laboratory Director.
August 1985	UMIACS is created with Dr. Larry Davis as first director.
August 1985	Dr. Nick Roussopoulos becomes Associate Chair for Administration and Dr. Harold Reiter becomes Associate Chair for Education.
Fall 1985	CfAR moves out of CSS, easing some space problems, to a building near the present AVW, then to the old Asphalt Institute building when the CfAR building was demolished to make room for the addition to AVW.
1985-1986	Because of UMIACS, Department hires 18 faculty over 2 years
July 1986	MPSE Division becomes the College of Computer, Mathematics, and Physical Sciences (CMPS) during a campus reorganization. Engineering spun off as a separate college.
August 1986	Dr. Richard Austing becomes Associate Chair for Education, Dr. Dianne O’Leary becomes Associate Chair for Administration and Dr. Mark Weiser becomes Associate Chair for Facilities
August 1986	Dr. Mark Weiser becomes Acting Director of the Department Laboratory and is later replaced by Dr. Murray Berkowitz as Laboratory Director.
September 1986	Plans are made to move UMIACS and part of the Department into the new MRB. This is the first step in relocating the Department elsewhere from CSS.
September 1986	Temporary classroom building CLB opens on site of current Kim Engineering Building relieving severe classroom shortage somewhat.
March 9, 1987	Department celebrates 20 years (since the start of the MS program) of computer science education in College Park
Spring, 1987	Pete Cottrell becomes Laboratory Director

August 1987	Dr. Marvin Zelkowitz becomes Associate Chair for Facilities
January 1988	Computer Science and UMIACS move into AVW.
August 1988	Dr. Satish Tripathi appointed Acting Chair of the Department. The position became permanent chair in August 1989.
April 1989	Dr. Ray Miller became Director of the NASA Center of Excellence in Space Data and Information Science.
Summer 1992	Addition is built to AVW doubling the space in the building. Building is now in the shape of a U (unless you are a mathematician where it is considered to be in the shape of a $\pi$ ). Electrical Engineering and the CMPS dean's office move into AVW, as well as CfAR. Department gets very little new space in new wing.
May 1993	Mary Saffell becomes Director of Administration, replacing Cindi Hale, who became Assistant to the Dean for the College of Behavioral and Social Sciences.
September 1993	Course-based comprehensive replaces "Comp Exam."
1995	Last VAX is shut down and all computing handled by workstation-sized machines.
August 1995	Dr. John Gannon becomes Department Chair.
September 1995	Master in Software Engineering program started with University College. The Department's involvement with the program lasted until 2001.
Fall 1995	Brad Plecs becomes Director of Computing.
1996	Dr. Jack Minker awarded University of Maryland President's Medal.
1998	Dr. Pete Stewart is awarded the Bauer prize.
June 12, 1999	Tragically, John Gannon, Department chair, dies in his sleep from a congenital heart problem.
July 1999	Dr. Larry Davis becomes sixth permanent Chair of the Department.
July 1999	Pat Ipavich becomes Director of Administration for the Department
Fall 2000	Engineering starts a Computer Engineering major in conjunction with Computer Science Department. Number of majors again tops 2100 plus 500 computer engineering majors.
April 2001	Groundbreaking occurs for the new Computer Science Instructional Center classroom building. Building opens in Fall 2002.
May 2004	Dr. Pete Stewart elected to the National Academy of Engineering.
Spring 2004	Philip H. and Catherine Horvitz professorship created.
May 2005	Dr. Steven Salzberg hired as first director of Center for Bioinformatics and Computational Biology and as holder of the Horvitz Professorship.
Spring 2006	Dr. Jack Minker receives the Allen Newell Award for 2005 from the ACM and AAAI.
Fall 2006	Dr. Pete Stewart honored as Distinguished University Professor
Fall 2006	Both the Jack and Rita G. Minker Professorship and the Darnell/Kanal Professorship announced.

## Appendix B. Faculty Timeline through 2006

The following is a list of faculty and instructor appointments to the Computer Science Center and Department of Computer Science from 1962 through the end of 2006. The data from 1962 through 2002 updates the list compiled by Jack Minker that appears as appendices 3 and 4 in [Minker04].

### B.1 Faculty (Professors, Instructors, and Lecturers)

#### Year 1962, Computer Science Center

• **Werner C. Rheinboldt**, Scientific Computing

- Ph.D.: University of Freiburg, 1955
- Research Assoc. Professor and Director Computer Science Center, February 1962-1963
- Research Professor and Director Computer Science Center, and Research Professor Inst. Fluid Dynamics, 1963-1965
- Research Professor Inst. Fluid Dynamics, 1963-1978
- Research Professor of CS and Applied Mathematics, 1968-1978
- Andrew W. Mellon Professor of Mathematics, University of Pittsburgh, 1978-2000
- Andrew W. Mellon Professor Emeritus, University of Pittsburgh, 2000
- Vice President for Publications, Society for Industrial and Applied Mathematics, 1976
- President-Elect, Society for Industrial and Applied Mathematics, 1976
- President, Society for Industrial and Applied Mathematics, 1977-1978
- Fellow, American Association for the Advancement of Science, 1984
- Chairman Board of Trustees, Society for Industrial and Applied Mathematics, 1985-1990
- Special Creativity Award in Computer Science, National Science Foundation, 1986
- Alexander von Humboldt Senior Distinguished Scientist Award, 1988 A. von Humboldt Foundation, Germany
- Award for Outstanding Contributions to Computer Science, Association for Computing Machinery, 1990
- University of Pittsburgh, The President’s Distinguished Senior Research Award, 1991

• **John P. Menard** (\*\*), Scientific Computation

- BA: St. Michael’s College, 1954
- Assistant Director Computer Science Center, 1962–1964
- Associate Director Computer Science Center, 1964–1973
- Acting Director Computer Science Center, 1965–1966
- Instructor, Computer Science 1965–1977

- Director, Computer Science Center 1973–1982
- Administrative Director to the Provost/Dean, MPSE/CMPS, 1982–1994
- Assistant to the President, 1985–1994
- Retired 1994

• **Charles J. Mesztenyi**, Scientific Computation

- M.S., Mathematics, Syracuse University, 1962
- Senior Research Programmer, 1962-199?

• **Abraham Sinkov**(\*), Cryptology

- Ph.D.: George Washington University, 1933
- Mathematical Consultant (Part Time), and Associate Professor Mathematics, 1962-1964
- Inducted into the National Security Administration “Hall of Honor”, 1999 (see URL: [www.nsa.gov/honor/sinkov.html](http://www.nsa.gov/honor/sinkov.html))
- (Dr. Sinkov retired in 1962 as Director of Research at the National Security Agency. He had also lectured in the Mathematics Department, and taught the course, Math 156, Programming for High Speed Computers from 1959-1964)

• **Earl J. Schweppe**, Data Structures

- Ph.D.: University of Illinois, 1955
- Lecturer, 1962-1963
- Research Assistant Professor, 1963-1965
- Associate Professor, 1965-1968 (Accepted Position as Chair of Department of Computer Science, University of Kansas)

• **James D. Chappell**

- M.S.: Columbia University, 1954
- Instructor, 1962-?

#### Year 1963, Computer Science Center

• **Richard H. Austing**(\*\*), Numerical Analysis, Computer Science Education

- Ph.D.: Catholic University of America, 1963
- Research Assistant Professor 1963-1965
- Assistant Professor 1965-1973
- Associate Professor, 1973-1994
- Acting Chairman, Department of Computer Science, 1976(July)-1977(Jan)1980(July)-1981(Jan); 1981-1982
- ACM Outstanding Contribution Award 1983
- Founding Fellow, ACM, 1994

- ACM Special Interest Group on Computer Science Education (SIGCSE) Award for Lifetime Contributions, 1997
- Co-editor, Curriculum '78: Recommendations for the Undergraduate Program in Computer Science, A Report of the ACM Curriculum Committee on Computer Science
- Co-editor, Recommendations for Master's Level Programs in Computer Science. A Report of the ACM Curriculum Committee on Computer Science
- Co-editor, A Model Curriculum for Doctoral-Level Programs in Health Computing, A Report of the ACM Committee in Curriculum for Health Computing Education
- Co-editor, Recommendations and Guidelines for an Associate Level Degree Program in Computer Programming, A Report of the ACM Committee on Curriculum for Community and Junior Colleges
- Co-editor, Computing Curricula Guidelines for Associate-Degree Programs: Computing for Other Disciplines. A report of the Two-Year College Computing Curricula Task Force. The Association for Computing Machinery (ACM)
- Co-editor, Computing Curricula 2001 Computer Science. Final Report. The Joint Task Force on Computing Curricula IEEE Society and ACM.
- Assistant Dean, University of Maryland University College (UMUC), 1994-1998
- Retired October, 1998

• **George E. Lindamood**

- MA: University of Maryland, 1964
- Research Programmer, 1963-1965
- Instructor, 1965-1971

• **Azriel Rosenfeld(\*\*)**, Computer Vision

- DHL: (Rabbinic Literature), Yeshiva University, 1955
- Ph.D.: (Mathematics), Columbia University, 1957
- Research Associate Professor (Part Time), 1963-1964
- Research Associate Professor, 1964-1966
- Research Professor, 1966-1983
- Research Professor and Director, Center for Automation Research, 1983–2001
- Director, Center for Automation Research, 1983-2001
- Distinguished University Professor, 1995-2001; Emeritus, 2001-
- Bernard Revel Memorial Award in Arts and Sciences, Yeshiva College Alumni Association, 1964
- Fellow, Institute of Electrical and Electronics Engineers, 1972; Life Fellow, 1996
- Dr. Tech. (hon.), Linkoping University, Sweden, 1980
- President, International Association for Pattern Recognition, 1980-2
- Corresponding Member, National Academy of Engineering of Mexico, 1982

- Fulbright grant (for research at Hebrew University and Bar-Ilan University, Israel during August-October 1982); awarded March 22, 1982, declined May 27, 1982
- Emanuel Piore Award, Institute of Electrical and Electronics Engineers, 1985
- IEEE Computer Society Meritorious Service Award, 1986
- President's Award, SME Machine Vision Association, 1987
- Fellow, Washington Academy of Sciences, 1988
- Scientific Achievement Award, Washington Academy of Sciences, 1988
- K.S. Fu Award, International Association for Pattern Recognition, 1988
- Foreign Member, National Academy of Science of the German Democratic Republic, 1988–1992
- Founding Fellow, American Association for Artificial Intelligence, 1990
- IEEE Standards Medallion, 1990
- Imager of the Year Award, Electronic Imaging International, 1991
- Founding Fellow, Association for Computing Machinery, 1994
- Founding Fellow, International Association for Pattern Recognition, 1994.
- Dr. Tech. (hon.), Oulu University, Finland, 1994
- Harry Goode Memorial Award, IEEE Computer Society, 1995
- Norbert Wiener Award, IEEE Systems, Man, and Cybernetics Society, 1995
- K. Bowyer and N. Ahuja, eds. Advances in Image Understanding—A Festschrift for Azriel Rosenfeld, IEEE Computer Society Press, Los Alamitos, CA, 1996
- Information Science Award, Association for Intelligent Machinery, 1998
- Third Millennium Medal, IEEE, 2000
- Dr. Humane Letters (hon.), Yeshiva University, New York, NY, 2000

**Year 1964, Computer Science Center**

• **James M. Ortega**, Numerical Analysis

- Ph.D.: Stanford University, 1962
- Research Assistant Professor, 1964-1966
- Associate Professor (Jointly with Inst. Fluid Dynamics and Applied Mathematics) 1966-1969
- Professor (Jointly with Inst. Fluid Dynamics and Applied Mathematics and the Department of Mathematics), 1969-1973
- Director and Founder, Institute for Computer Applications in Science and Engineering (ICASE), 1973-1977
- Professor and Head, Mathematics, North Carolina State, 1977-1979
- Charles Henderson Professor, University of Virginia, 1979-1998

- Chair, Applied Mathematics and Computer Science, 1979-1984
- Associate Dean, Engineering, 1980-1982
- Chair, Applied Mathematics, 1984-1989
- Director, Institute for Parallel Computation, 1990-1993
- Chair, Computer Science, 1993-1996
- Professor Emeritus, University of Virginia, 1998-

• **Chan Park**, Applications

- Ph.D.: University of Maryland, 1969
- Research Programmer, 1964-1968
- Post Doctoral Fellow, 1968-1969
- Assistant Professor, 1969-1972
- Visiting Lecturer (part-time), 1976-1989

• **Robert G. Glasser**(\*), Scientific Computation

- Ph.D.: University of Chicago, 1954
- Lecturer 1957-1961, Physics Department
- Visiting Professor (part time) 1961-1965, Physics Department
- Associate Professor (Joint with Physics Department), 1965-1973
- Professor, 1973-1975, Joint with Physics Department

• **Edmund M. Glaser**, Physiology

- Ph.D.: Johns Hopkins University, 1960
- Research Associate Professor (Joint with Physiology, University of Maryland, Baltimore), 1964-1973

• **John L. Pfaltz**, Discrete Mathematics

- Ph.D.: University of Maryland, 1969
- Senior Research Programmer, 1964-1968
- Assistant Professor, U. Maryland, 1968-1970

**Year 1965, Computer Science Center**

• **James F. Williams**

- MA: University of Maryland, 1965
- Instructor, 1964?-197?

• **James C. Owings**, Theory of Computing

- Ph.D.: Cornell, 1966
- Assistant Professor, 1966-1973 (Joint with Mathematics)

• **David Lorge Parnas**, Computer Systems

- Ph.D.: Carnegie Institute of Technology, 1965
- Assistant Professor, 1965-1966

• **Abraham Tal**, Numerical Analysis

- Ph.D.: Carnegie Institute of Technology, 1965
- Visiting Research Assistant Professor, 1965-1967

• **James S. Vandergraft**(\*), Numerical Analysis

- Ph.D.: University of Maryland, 1966
- Research Associate, 1965-1966

- Assistant Professor, 1966-1973

- Associate Professor, 1973-1975 or 1976

**Year 1966, Computer Science Center**

• **William F. Atchison**(\*), Computer Science

- Education, Computers and Society
- Ph.D.: University of Illinois at Urbana/Champaign, 1943
- Professor and Director Computer Science Center, 1966-1973
- Professor, Computer Science, 1966-1988,
- Acting Chair, Department of Computer Science, 1973-1974
- Professor Emeritus, 1988-1998
- Chairman, ACM Curriculum 68 Report
- ACM Distinguished Service Award, 1973
- IFIP 1974 Special Award in Appreciation for Services as Chairman of WG 3.1 1968-1974
- Chester Morrill Memorial Award from the Chesapeake Division of the Association for Systems Management, 1975
- ACM Special Interest Group on Computer Science Education (SIGCSE) Award for Outstanding Contributions to CS Education, 1981
- Distinguished Alumni Award from Georgetown College for work in Computer Science and Mathematics, 1982
- Founding Fellow, Association for Computing Machinery, 1994

• **Yaohan Chu**(\*\*), Computer Systems

- ScD: Massachusetts Institute of Technology, 1953
- Lecturer, Electrical Engineering, 1956-1966
- Professor, (Joint with Electrical Engineering), 1966-1990
- Professor Emeritus, 1990
- President, Chinese Language Computer Society, 1976-1986
- Meritorious Service Award, Chinese Language Computer Society, 1988
- Lecturer, IEEE Distinguished Visitors Program, 19??
- Lecturer, ACM Lecturer Program, 19??
- US Representative, IFIP Technical Committee 10 on Digital System Design
- US Patent No. 2,996,137, Automatic Radar Guided and Computer Controlled Vehicles
- US Patent No. 2,187,227, Packing Technique for Microelectronic Circuits
- US Patent No. 3,230,355, Matrix Logic Computer
- US Patent No. 3,251,041, Computer Memory System

**Year 1967, Computer Science Center**

• **Harold P. Edmundson**(\*\*), Theory of Computing

- Ph.D.: University of California at Los Angeles, 1953
- Professor, Joint with Mathematics Department, 1967-1991

– Emeritus, 1991-

• **Laurence Heilprin(\*)**, Library Science  
– Ph.D.: Harvard University, 1941  
– Professor 1967-1973, Joint with Library Science

• **Jack Minker(\*\*)**, Database Systems and Artificial Intelligence  
– Ph.D.: University of Pennsylvania, 1959  
– Visiting Member, 1967-1968,  
– Associate Professor, 1968-1971  
– Professor 1971-1998  
– Professor Emeritus 1998-  
– First Chair Department of Computer Science 1974-1979  
– Vice-Chairman, Computer Science, Committee of Concerned Scientists (CCS) 1974-  
– ACM Outstanding Contribution Award, 1985  
– Fellow, American Association for the Advancement of Science (AAAS), 1989  
– Founding Fellow, American Association for Artificial Intelligence (AAAI), 1990  
– Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1991  
– Founding Fellow, Association for Computing Machinery (ACM), 1993  
– University of Maryland Presidential Medal, 1996  
– Distinguished Scholar-Teacher Award, University of Maryland, 1997-1998  
– Founding Editor-in-Chief, the Journal of the Theory and Practice of Logic Programming (TPLP), 2000  
– Inducted as Fellow Academy for Excellence in Education and Teaching (AETL), 2002  
– Allen Newell award from ACM/AAAI, 2006

• **Victor B. Schneider**, Programming Languages  
– Ph.D.: Northwestern University, 1966  
– Assistant Professor, 1967-1970

#### **Year 1969, Computer Science Center**

• **Edward S. Deutsch**, Picture Processing  
– Ph.D.: University of London, 1969  
– Visiting Assistant Professor, 1969-1974 ???

• **Elliott D. Feldman**, Theory of Computing  
– Ph.D.: Stevens Institute of Technology, 1969  
– Assistant Professor, 1969-1974

• **Patrick E. Hagerty**, Computer Systems  
– Ph.D.: Syracuse University, 1969  
– Assistant Professor & Assistant Director for Systems, CSC, 1969-1974

• **Michael Hanani**, Programming Languages  
– Ph.D.: Northwestern University, 1969  
– Assistant Professor, 1969

• **Robert G. Voigt**, Numerical Analysis  
– Ph.D.: University of Maryland, 1969  
– Visiting Assistant Professor, 1969-1971

#### **Year 1970, Computer Science Center**

• **Victor R. Basili**, Programming Languages, Software Engineering  
– Ph.D.: University of Texas at Austin, January 1970  
– Assistant Professor 1970-1975  
– Associate Professor 1975-1982  
– Professor 1982-2007  
– CS Dept Chair: 1982-1988  
– Executive Director, Fraunhofer Center 1998–2004  
– IEEE Computer Society Outstanding Paper Award (with R. Reiter, Jr.), IEEE Transactions on Software Engineering, May 1981  
– IEEE Meritorious Service Certificate, IEEE Computer Society, October 9, 1985  
– NASA Group Achievement Award -NASA/Gamma Ray Observatory (GRO) Dynamics Simulator Ada Experiment Team, May 1989  
– Productivity Improvement and Quality Enhancement Award, NASA/GSFC, the "Cleanroom" Software Team, June 14, 1990  
– Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1990  
– ASM Award, October 1991  
– IEEE Meritorious Service Certificate, 1987-1992  
– Second Distinguished Alumnus Award, Department of Computer Science, University of Texas at Austin, Austin, TX, 1993  
– CRA -Computing Research Association Honor Award Plaque, August 10, 1993  
– IEEE Computer Society Award for Software Process Achievement, August 24, 1994  
– NASA Group Achievement Award, May 30, 1996.  
– IEEE Computer Society, Society of Golden Core, June, 1996  
– Washington Academy of Sciences, for Outstanding Contributions to Mathematics and Computer Science, May 14, 1997  
– Fellow, Association for Computing Machinery (ACM), 1997  
– Outstanding Research Award, 2000, ACM SIGSOFT (Special Interest Group on Software Engineering)  
– IEEE Computer Society 2003 Harlan D. Mills Award  
– Laurea Honoris Causa in Ingegneria Informatica, Università Degli Studi Del Sannio, Benevento, Italy, 2004  
– Doctor Honis Causa in Natural Science, Fachbereich Informatik der Technische Universität Kaiserslautern, Germany, 2005

• **Laveen Kanal(\*\*)**, Pattern Recognition  
– Ph.D.: University of Pennsylvania, 1960

- Professor, 1970-1996
- Professor Emeritus, 1996–
- Fellow, American Association for the Advancement of Science (AAAS), 1972
- Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1972
- Fellow, International Association of Pattern Recognition (IAPR), 1994
- Fellow, American Association for Artificial Intelligence (AAAI), 1992
- King-Sun Fu award, IAPR, 1992
- Contributions to Science Award, Sigma Xi UMD Chapter, 1996

- **W. Michael Lay**, Systems
  - Ph.D.: Ohio State University, 1972
  - Instructor 1970-1972
  - Assistant Professor, 1972-1976

- **Michael McClellan**, Symbolic Computation
  - Ph.D.: University of Wisconsin, 1971
  - Instructor, 1970-1971
  - Assistant Professor, 1971-1977

- **Martin Milgram**, Graph Theory
  - B.S., Brooklyn College, 1953
  - Lecturer, 1970-1972

#### **Year 1971, Computer Science Center**

- **Ashok Agrawala**, Computer Systems
  - Ph.D.: Harvard University, 1970
  - Assistant Professor, 1971-1976,
  - Associate Professor, 1976-1982,
  - Professor 1982-
  - Affiliate Professor, ECE
  - Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1991
  - Outstanding Invention of Year 2000, University of Maryland, 2001
  - Director, Maryland Information and Network Dynamics Laboratory (MIND), 2001-

- **Ronald M. Baecker**, Computer Animation
  - Ph.D.: Massachusetts Institute of Technology, 1969
  - Visiting Assistant Professor, 1971-1972

- **Richard G. Hamlet**, Theory of Computing Programming Languages, Software Engineering
  - Ph.D.: University of Washington, 1971
  - Assistant Professor, 1971-1977
  - Associate Professor, 1977-1984

- **Robert Noonan**, Programming Languages
  - Ph.D.: Purdue University, 1972
  - Assistant Professor, 1971-1977

- **Marvin V. Zelkowitz**, Software Engineering
  - Ph.D.: Cornell University, 1971
  - Assistant Professor, 1971-1975
  - Associate Professor, 1975-1990
  - Professor, 1990-2007
  - Associate Chair for Education, 1982-1985
  - Acting Chair, 1985
  - Associate Chair for Facilities, 1986-7
  - Co-Director Fraunhofer Center 1998-2002
  - Golden Core Member, Computer Society, 1996
  - Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1997
  - Distinguished Service Award 2000, ACM SIGSOFT (Special Interest Group on Software Engineering), 2000
  - Chief Scientist, Fraunhofer Center, 2002-

#### **Year 1972, Computer Science Center**

- **George J. Fix (\*)**, Numerical Analysis, Numerical Solution of Partial Differential Equations
  - Ph.D.: Applied Mathematics, Harvard, 1968
  - Associate Professor, joint with Institute for Fluid Dynamics and Applied Mathematics, 1972-1973

- **David Milgram**, Picture Processing
  - Ph.D.: University of Maryland, 1973
  - Instructor, 1970-1973

- **David L. Mills**, Computer Systems
  - Ph.D.: University of Michigan, 1971
  - Assistant Professor, 1972-1977

- **Roger Nagel**, Picture Processing
  - Ph.D.: University of Maryland, 1976
  - Instructor, 1970-1976

- **Gordon VanderBrug**, Instructor
  - Ph.D.: University of Maryland, 1977
  - Instructor, 1971-1976

#### **From 1973 on, all appointments are to the Department of Computer Science.**

#### **Year 1973, Department of Computer Science**

- **Matthew Hecht**, Theory of Computing
  - Ph.D.: Princeton University, 1973
  - Assistant Professor, 1973-1977

#### **Year 1974, Department of Computer Science**

- **Charles J. Rieger, III**, Artificial Intelligence
  - Ph.D.: Stanford University, 1974
  - Assistant Professor 1974–1979
  - Associate Professor 1979–1982
  - Adjunct Professor 2003–
  - Computers and Thought Award of the AAAI, 1975
  - Visiting Associate Professor, MIT AI Laboratory, Spring semester 1976

- Co-founder, Chairman, and CTO, SCION Corporation, 1977–1984
- Co-founder and CTO, Vidar Systems Corporation, 1984–1987
- Co-founder and CEO, Image Machines Corporation, 1987–1999
- Co-founder and CTO, eQuorum Corporation, 1999–

- **Gilbert W. (Pete) Stewart**, Scientific Computing
  - Ph.D.: University of Tennessee, 1968
  - Associate Professor 1974-1976
  - Professor 1976–
  - F.L. Bauer Prize, 1998
  - Elected to National Academy of Engineering, 2004
  - Distinguished University Professor, 2006

#### **Year 1975, Department of Computer Science**

- **John D. Gannon(\*)**, Software Engineering
  - Ph.D.: University of Toronto, 1975
  - Assistant Professor 1975-1980,
  - Associate Professor 1980-1988
  - Professor 1988-1999
  - Chair, Department of Computer Science 1995-1999
  - Distinguished Scholar-Teacher, University of Maryland, 1993-1994

- **Virgil D. Gligor**, Computer Systems
  - Ph.D.: University of California at Berkeley, 1975
  - Assistant Professor, 1975-1980

- **Chul Kim**, Theory of Computing
  - Ph.D.: Pennsylvania State University, 1975
  - Assistant Professor 1975-1980

- **Harlan D. Mills(\*)**, Software Engineering
  - Ph.D.: Iowa State University, 1952
  - Visiting Professor (Part Time) 1975-1987
  - Adjunct Professor, 1987-1995
  - Chairman, NSF Computer Science Research Panel on Software Methodology, 1974-77
  - U.S. Representative for Software at the IFIP Congress, 1977
  - Chairman, Computer Science Panel, U.S. Air Force Scientific Advisory Board, 1986

- **Hanan Samet**, Visual and Geometric Computing
  - Ph.D.: Stanford University, 1975
  - Assistant Professor 1975-1980,
  - Associate Professor 1980-1986
  - Professor 1986–
  - Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1990
  - Fellow, Association for Computing Machinery (ACM), 1995
  - Fellow, International Association of Pattern Recognition (IAPR), 1996

#### **Year 1976, Department of Computer Science**

- **C. Dianne Martin**
  - M.S.: Computer Science, University of Maryland, 1971
  - EdD: The George Washington University, 1987
  - Acting Director, Education Office 1976-77
  - Lecturer 1976-1983

- **Pamela Zave**, Programming Languages
  - Ph.D.: University of Wisconsin, 1976
  - Assistant Professor, 1976-1981

#### **Year 1977, Department of Computer Science**

- **John Privitera**, Programming Languages
  - M.S.: Stevens Institute of Technology, 1972
  - Ph.D.: Cornell University, 1981
  - Instructor 1977-1980

#### **Year 1978, Department of Computer Science**

- **Lawrence Dowdy**, Computer Performance Evaluation
  - Ph.D.: Duke University, 1977
  - Assistant Professor, 1978-1981

- **Rachelle S. Heller**, Computer Science Education and Advising
  - M.S.: University of Maryland, 1972
  - Ph.D.: University of Maryland, 1985
  - Lecturer, 1978-1985
  - Award of Excellence, Society of Technical Communication, 1986 1987
  - Recognition of Service Award .ACM. 1990.
  - Leo Schubert Award for Excellence in College Teaching, Washington Academy of Science, June 1994.
  - Professor of the Year for 1995-96, Engineer’s Council, George Washington University, June, 1996
  - Adam Chair Visiting Professor, United States Military Academy, Spring, 2001

- **Barry Jacobs**, Database Systems,
  - Ph.D.: Courant Institute, 1975
  - Assistant Professor, 1978-1984

- **Dianne O’Leary**, Numerical Analysis and Scientific Computing
  - Ph.D.: Stanford University, 1976
  - Assistant Professor 1978-1982, Joint with Institute for Physical Science and Technology 1978-1981
  - Associate Professor 1982-1988, Joint with the Institute for Advanced Computer Studies 1985-1988
  - Professor, 1988- Joint with the Institute for Advanced Computer Studies 1988-
  - Distinguished Alumna Award, Purdue University 1993
  - ACM Fellow, 2006
  - ACM Distinguished scientist, 2006

- **Satish K. Tripathi**, Computer Systems
  - Ph.D.: University of Toronto, 1979
  - Lecturer 1978-1979
  - Assistant Professor 1979-1983
  - Associate Professor 1983-1988
  - Professor 1988-1997
  - Chair, Department of Computer Science, 1988-1995
  - Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1997
  - Fellow, AAAS 1997
  - Dean of the College of Engineering at the University of California, Riverside, 1997–2004
  - Provost, State University of New York at Buffalo, 2004-

#### **Year 1979, Department of Computer Science**

- **Michael Brodie**, Database Systems,
  - Ph.D.: University of Toronto, 1978
  - Assistant Professor, Information Systems Management 1979
  - Assistant Professor 1979-1984
- **Dana Nau**, Artificial Intelligence
  - Ph.D.: Duke University 1979
  - Assistant Professor 1979-1984
  - Associate Professor 1984-1994
  - Professor 1994–
  - Professor, Institute for Systems Research
  - Affiliate Professor, Mechanical Engineering
  - National Science Foundation Presidential Young Investigator Award, 1984
  - Fellow, American Association for Artificial Intelligence (AAAI), 1996
- **Ben A. Shneiderman**, Human Computer Interaction
  - Ph.D.: State University of New York at Stony Brook, 1973
  - Associate. Professor 1979-1989
  - Professor 1989-
  - Professor, Institute for Systems Research
  - Honorary Doctorate of Science, University of Guelph, Canada, 1995
  - Director, Human-Computer Interaction Laboratory, UMIACS 1983-2000
  - Fellow, Association for Computing Machinery (ACM), 1997
  - Fellow, American Association for the Advancement of Science (AAAS), 2001
  - Making a Difference Award, 2001 ACM SIGCAS (Special Interest Group on Computers and Society)
  - Lifetime Achievement Award, 2001 ACM SIGCHI (Special Interest Group on Human Computer Interaction)

- **Mark Weiser(\*)**, Computer Systems

- Ph.D.: University of Michigan, 1979
- Assistant Professor 1979-1984
- Associate Professor 1984-1987

- **Raymond T. Yeh**, Theory of Computing
  - Ph.D.: University of Illinois, 1966
  - Professor and Chair, Department of Computer Science, 1979-1981

#### **Year 1981, Department of Computer Science**

- **Larry S. Davis**, Computer Vision and High Performance computing
    - Ph.D.: University of Maryland, 1976
    - Associate Professor 1981-1986
    - Professor 1986-
    - Associate Chair, 1982-1985
    - Head, Computer Vision Lab, CfAR 1981-1986
    - Acting Director, UMIACS 1985-1987
    - Director, UMIACS 1987-1994
    - Acting Chair, Computer Science, 1999-2000
    - Chair Department of Computer Science, 2000–
    - Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1995
    - Fellow, International Association of Pattern Recognition (IAPR), 2002
  - **Mohamed Y. Elsanadidi**, Computer Systems
    - Ph.D.: University of California at Los Angeles, 1981
    - Assistant Professor 1981-1983
  - **Nicholas Roussopoulos**, Database Systems
    - Ph.D.: University of Toronto, 1977
    - Assistant Professor 1981-1985
    - Associate Professor 1985-1991
    - Professor, 1991-
    - Professor, Institute for Systems Research
    - Member, Space Science Board Committee on Data Management and Computation, 1985-1988
    - Member, Advisory Board of the Air Force VSHIC program on "Engineering Information Systems," 1986-1989.
    - Elected Member of the Board Trustees of the VLDB Endowment 1990-1996
    - Emeriti Member of the Board Trustees of the VLDB Endowment, 1996
    - Recipient of the "10 Year Award for the most influential paper of VLDB 1987," International Conference on Very Large Databases, August 1997.
    - Fellow, Association for Computing Machinery, 2001.
    - Keynote Speaker at the Second Greek Symposium on Data Base Management, Athens, September 4-5, 2003
- #### **Year 1982, Department of Computer Science**
- **Donald Perlis**, Artificial Intelligence
    - Ph.D.: New York University, 1972 (Math)
    - Ph.D.: University of Rochester, 1981 (CS)

- Assistant Professor 1982-1988
- Associate Professor 1988-1997
- Professor, 1997-

• **James A. Reggia**, Artificial Intelligence

- MD: University of Maryland at Baltimore, 1975
- Ph.D.: University of Maryland, 1981
- Assistant Professor, Neurology, Univ of Maryland at Baltimore (UMAB), 1979–1984
- Assistant Professor 1982-1987
- Associate Professor, Neurology, UMAB, 1984–1989
- Associate Professor 1987-1993
- Professor, 1993–
- Research Professor of Neurology, UMAB, 1993–
- Fellow, American Academy of Medical Informatics, 1984.
- National Science Foundation Presidential Young Investigator Award, 1985

• **Glenn Ricart**, Computer Systems

- Ph.D.: University of Maryland, 1980
- Assistant Professor 1982-1991
- Associate Professor 1991-1995
- Director Computer Science Center, 1982-1995
- Assistant. Vice Chancellor Academic Info. Tech., 1992-1994
- Distinguished Alumnus, Dept. of CS, 2002

• **Carl Smith(\*)**, Theory of Computing

- Ph.D.: State University of New York at Buffalo, 1979
- Habilitation, University of Latvia, 1993
- Assistant Professor 1982-1987
- Associate Professor 1987-1996
- Professor, 1996–2004
- Outstanding Performance Award, National Science Foundation 1988
- Fulbright Scholar, 1997
- Foreign Member, Latvian Academy of Science, 1999

**Year 1983, Department of Computer Science**

• **Rodrigo J. Fontecilla**, Numerical Analysis

- Ph.D.: Rice University, 1983
- Assistant Professor 1983-1990

• **I.V. Ramakrishnan**, Theory of Computing

- Ph.D.: University of Texas at Austin, 1983
- Assistant Professor 1983-1985

• **A. Udaya Shankar**, Computer Systems

- Ph.D.: University of Texas, 1982
- Assistant Professor 1983-1989
- Associate Professor 1989-1999
- Professor, 1999–

**Year 1984, Department of Computer Science**

• **David M. Mount**, Theory of Computing

- Ph.D.: Purdue University, 1983
- Assistant Professor 1984-1990
- Associate Professor 1990-1999
- Professor, 1999–

**Year 1985, Department of Computer Science**

• **Amihod Amir**, Theory of Computing

- Ph.D.:
- Assistant Professor, 1985-1991

• **Howard Elman**, Numerical Analysis

- Ph.D.: Yale University 1982
- Assistant Professor, 1985-1990
- Associate Professor 1990-1996
- Professor 1996–
- National Science Foundation Presidential Young Investigator Award, 1989-1994

• **Christos Faloutsos**, Database Systems

- Ph.D.: University of Toronto, 1985
- Assistant Professor, 1985-1991
- Associate Professor 1991-2000

• **Richard K. Furuta**, Hypermedia, Electronic Publishing, Digital Libraries

- Ph.D.: University of Washington, 1986
- Assistant Professor, 1985-1993

• **William Gasarch**, Theory of Computing

- Ph.D.: Harvard University 1985
- Assistant Professor, 1985-1991
- Associate Professor 1991-1998
- Professor 1998–

• **James Hendler**, Artificial Intelligence

- Ph.D.: Brown University, 1985
- Assistant Professor, 1986-1992
- Associate Professor 1992-1999
- Professor 1999–2006
- Chief scientist, Information Systems, DARPA, 2000-2001
- Professor, Tetherless World Research Constellation, Rensselaer Polytechnic Institute, 2007-
- Fulbright Scholar, 1995
- Fellow, American Association for Artificial Intelligence (AAAI), 1999
- Member, Air Force Science Board, 1999–2002
- AAAI Expository Writing Award, 2000
- Exceptional Civilian Service Medal, presented by the US Air Force, October 9, 2002

• **Pankaj Jalote**, Software Engineering

- Ph.D.: University of Illinois at Urbana-Champaign, 1985
- Assistant Professor, 1985-1991

- **Clyde Kruskal**, Theory of Computing
  - Ph.D.: New York University, 1981
  - Assistant Professor, 1985-1988
  - Associate Professor 1988–

- **Leo Mark**, Database System Architecture, Database Systems
  - Ph.D.: Aarhus University (Denmark), 1985
  - Assistant Professor, 1986-1992

- **Harold Reiter**, Mathematics
  - Ph.D.: Clemson University
  - Assistant Professor of Mathematics, University of North Carolina at Charlotte, 1972-1977
  - Associate Professor of Mathematics, University of North Carolina at Charlotte, 1977-1982
  - Visiting Assistant Professor, 1982-1983
  - Visiting Associate Professor, 1984-1986
  - Associate Chair for Education, 1985-1986
  - Associate Professor and Professor of Mathematics, University of North Carolina at Charlotte, 1986-2006

- **Beverly Sanders**, Computer Systems
  - Ph.D.: Harvard, 1985
  - Assistant Professor, 1985-1988

- **Paul David Stotts, Jr.**, Programming Languages
  - Ph.D.: University of Virginia, 1985
  - Assistant Professor, 1985-1991

#### **Year 1986, Department of Computer Science**

- **John (Yiannis) Aloimonos**, Computer Vision,
  - Ph.D.: University of Rochester 1987
  - Assistant Professor 1986-1992
  - Associate Professor 1992-1998
  - Professor, 1998–
  - National Science Foundation Career Award, 1990

- **Scott Carson**, Computer Systems
  - Ph.D.: University of Virginia, 1986
  - Assistant Professor 1986-1992

- **Gregory F. Johnson**, Software Engineering
  - Ph.D.: University of Wisconsin, 1983
  - Assistant Professor 1986-1990

- **Bonnie Kowalchack**, Software Engineering
  - MS: University of Maryland, 1985
  - Instructor 1986-1988

- **James Purtle**, Software Engineering
  - Ph.D.: University of Illinois at Urbana-Champaign, 1986
  - Assistant Professor 1986-1992
  - Associate Professor 1992–

- **Dieter Rombach**, Software Engineering
  - Ph.D.: Computer Science Department, University of Kaiserslautern, Germany, 1984
  - Assistant Professor 1986-1992
  - National Science Foundation Presidential Young Investigator Award, 1990
  - Professor, University of Kaiserslautern, Germany, 1992-
  - Director, Fraunhofer Institute for Experimental Software Engineering, 1996-

- **Timoleon K. Sellis**, Database Systems
  - Ph.D.: University of California at Berkeley, 1986
  - Assistant Professor 1986-1992
  - Associate Professor 1992-1993
  - Presidential Young Investigator Award, 1990

#### **Year 1987, Department of Computer Science**

- **Gwen Kaye**, Computer Science Education and Advising
  - M.S.: University of Houston at Clear Lake, 1981
  - Assistant Lecturer, 1987-1988
  - Instructor, 1988-1990
  - Advisor/Counselor for Graduate Students, 1990-2004

#### **Year 1988, Department of Computer Science**

- **Sarit Kraus**, Artificial Intelligence
  - Ph.D.: Hebrew University, 1989
  - Post Doctoral Fellow, UMIACS and CS, 1988-1990
  - Adjunct Assistant Professor during academic year and visiting Assistant Professor during the summer, 1990-1995
  - Adjunct Associate Professor during academic year and visiting Associate Professor during the summer 1995-2001
  - 1997-1998: Visiting Associate Professor
  - Adjunct Professor during academic year and visiting Professor during the summer 2001–
  - Computers and Thought Award of the AAI, 1995
  - Fellow, American Association for Artificial Intelligence (AAAI), 2002
  - IBM faculty award, 2001

- **Raymond E. Miller( \*\*)**, Theory of Computing
  - Ph.D.: University of Illinois at Urbana, 1957
  - Professor, 1988-2002
  - Director CESDIS 1988-1993,
  - Professor Emeritus, 2002–
  - Fellow, American Association for the Advancement of Science (AAAS), 1990
  - Fellow, Association for Computing Machinery (ACM), 1997
  - Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1969
  - IBM Invention Award, First Plateau, 1966
  - IBM Invention Award, Second Plateau, 1980

- IEEE Computer Society, Outstanding Contributions Award, 1985
- Computing Sciences Accreditation Board Distinguished Contributions, 1990
- IEEE Computer Society Golden Core Member, 1996
- IEEE Third Millennium Medal, 2000
- ACM Distinguished Service Award, 2003

- **William Pugh**, Programming Languages
  - Ph.D.: Cornell University, 1988
  - Assistant Professor, 1988-1994,
  - Associate Professor, 1994-2001
  - Professor, 2001–
  - National Science Foundation Presidential Young Investigator Award, 1991
  - Packard Fellow, 1991

- **Kenneth Salem**, Database Systems
  - Ph.D.: Princeton, 1989
  - Assistant Professor, 1988-1994
  - CS Dept. Award for Teaching Excellence, 1990

#### **Year 1989, Department of Computer Science**

##### **. Michelle Hugue**

- Ph.D.: University of Maryland, 1989
- Lecturer, 1998-

- **Venkatramana (VS) Subrahmanian**, Artificial Intelligence
  - Ph.D.: Syracuse University, 1989
  - Assistant Professor, 1989-1995
  - Associate Professor, 1995-2000
  - Professor, 2000–
  - Director, UMIACS, 2004-
  - National Science Foundation Career Award, 1992-1998
  - Maryland Distinguished Young Scientist Award, Maryland Science Center, Maryland Academy of Science, 1997

#### **Year 1990, Department of Computer Science**

- **Charles Lin**, Lecturer
  - M.S.(Electrical Engineering): University of Maryland, Park, 1993
  - M.S. (Computer Science): University of Maryland, College Park, 2001
  - Lecturer, 1998–

- **Jan Plane**, Computer Science Education
  - M.S.: University of Wisconsin, Milwaukee, 1989
  - Instructor, 1990–

#### **Year 1991, Department of Computer Science**

- **Richard Gerber**, Real Time Systems
  - Ph.D.: University of Pennsylvania, 1991
  - Assistant Professor, 1991-1996

- Associate Professor 1996-2001
- National Science Foundation Young Investigator Award, 1993

- **Adam Porter**, Software Engineering
  - Ph.D.: University of California at Irvine, 1991
  - Assistant Professor, 1991-1998
  - Associate Professor, 1998–2007
  - Professor 2007-
  - National Science Foundation CAREER Award, 1995
  - Deans Award for Teaching Excellence, 1995

#### **Year 1992, Department of Computer Science**

- **Bonnie J. Dorr**, Natural Language Processing and Artificial Intelligence
  - Ph.D.: Massachusetts Institute of Technology, 1990
  - Assistant Professor, 1992-1998
  - Associate Professor 1998-2005
  - Professor, 2005-
  - Affiliate Professor, Linguistics
  - Post Doctoral Fellow, UMIACS, 1990-1992
  - National Science Foundation Young Investigator, 1993-1997
  - Alfred P. Sloan Research Fellow, 1994-1996
  - Maryland Distinguished Young Scientist, 1996
  - National Science Presidential Faculty Fellow, 1997-1999

- **Samir Khuller**, Theory of Computing
  - Ph.D.: Cornell University, 1990
  - Assistant Professor, 1992-1997
  - Associate Professor 1997–2005(?)
  - Professor 2005(?)–
  - National Science Foundation Career Award, 1995
  - Dean’s Award for Excellence in Teaching, Univ of Maryland 1996
  - Lilly Teaching Fellow 1997–1998

- **Joel Saltz**, High Performance Computing
  - MD: Duke University, 1985
  - Ph.D.: Duke University, 1986
  - Associate Professor 1992-1997
  - Professor, 1997-2001
  - Director High Performance Systems Software Laboratory, 1997-2001

- **Alan Sussman**, High Performance Computing
  - Ph.D.: Carnegie Mellon University, 1991
  - Research Associate, 1992-1997
  - Assistant Research Scientist, 1997-2001
  - Assistant Professor, 2002-2006
  - Associate Professor 2006-

#### **Year 1993, Department of Computer Science**

- **Michael J. Franklin**, Internet-scale Distributed Database Systems, Mobile and Pervasive

Computing, DBMS Architecture and Performance Evaluation

- Ph.D.: University of Wisconsin, Madison, 1993
- Assistant Professor 1993-1999
- Associate Professor 1999-2001

**Year 1994, Department of Computer Science**

- **Jeffrey Hollingsworth**, Computer Systems,
  - Ph.D.: University of Wisconsin, Madison, 1994
  - Assistant Professor 1994-2000
  - Associate Professor 2000–2006
  - Professor, 2006-
  - Affiliate professor, Department of Electrical and Computer Engineering
  - National Science Foundation Career Award, 1997

- **Peter J. Keleher**, Computer Systems
  - Ph.D.: Rice University, 1995
  - Assistant Professor 1994-2001
  - Associate Professor 2001–
  - Affiliate Professor, ECE
  - National Science Foundation Career Award, 1996

**Year 1995, Department of Computer Science**

- **Evan Golub**, Computer Science Education
  - Ph.D.: University of Maryland, 1999
  - Instructor, 1993-1995
  - Lecturer, 1995–
  - Lilly-CTE Fellow 2002-2003

- **Chau-Wen Tseng**, Software Engineering and Programming Languages,
  - Ph.D.: Rice University, 1993
  - Assistant Professor 1995-2001
  - Associate Professor 2001–
  - National Science Foundation Career Award, 1996

**Year 1996, Department of Computer Science**

- **Larry Herman**, Computer Science Education
  - M.S.: University of Maryland, 1990
  - Instructor 1996–

**. Nelson Padua-Perez**

- MS: University of Maryland, 1996
- Lecturer 1996-

**Year 1997, Department of Computer Science**

- **Benjamin B. Bederson**, Human-Computer Interaction,
  - Ph.D.: New York University 1992
  - Assistant Professor 1997-2004
  - Associate Professor, 2004-
  - Director, Human-Computer Interaction Laboratory, 2001–2006

- **James Glenn**, Computer Science Education and Advising
  - Ph.D.: University of Maryland -College Park, 1998
  - Lecturer, 1997-2000

- **Leana Golubchik**, Computer Systems
  - Ph.D.: University of California, Los Angeles, 1995
  - Assistant Professor, 1997-2001
  - Associate Professor 2001-2002
  - National Science Foundation Career Award, 1996-2001
  - Member of IFIP WG 7.3, elected 2000

**Year 1998, Department of Computer Science**

- **Sudarshan S. Chawathe**, Database Systems,
  - Ph.D.: Stanford University 1999
  - Assistant Professor 1998-2005
  - National Science Foundation Career Award, 2000

**Year 1999, Department of Computer Science**

- **Samrat (Bobby) Bhattacharjee**, Computer Systems,
  - Ph.D.: The Georgia Institute of Technology 1999
  - Assistant Professor 1999–2005
  - Associate Professor, 2005-
  - Affiliate Professor, Electrical and Computing Engineering, 1999–
  - NSF Career Award, 2001
  - Sloan Fellowship, 2004

- **James J. Maybury**, Computer Science Education and Advising
  - M.S.: University of Maryland, 2002
  - Lecturer, 1999-2001
  - Advisor/Consultant, Undergraduate Education, 2001

**Year 2000, Department of Computer Science**

- **William Arbaugh**, Computer Security,
  - Ph.D.: University of Pennsylvania 1999
  - Assistant Professor 2000–2006
  - Associate Professor 2006-
  - Signals Intelligence Medal (for significant technical accomplishment. First time the award given to member of the Research organization), NSA, 1996
  - Science and Technology Award, NSA, 1997
  - Louis W. Tordella Award (for excellence in cryptography), NSA, 1997
  - IBM University Partnership Award, 2000
  - IBM University Partnership Award, 2001

- **Steve Scolnik**, Lecturer
  - M.S. Computer Science: University of Maryland, 1979
  - M.S. Meteorology: MIT, 1974
  - Lecturer, 2000-

- **Amitabh Varshney**, Computer Graphics and Scientific Visualization
  - Ph.D.: University of North Carolina at Chapel Hill, 1994
  - Associate Professor 2000–2006
  - Professor, 2006–
  - National Science Foundation Career Award 1995
  - Honda Research Initiation Award 1997
  - IEEE Visualization Technical Achievement Award, 2004

#### **Year 2001, Department of Computer Science**

- **Michael Hicks**, Programming Languages, Distributed Systems
  - Ph.D.: University of Pennsylvania, 2001
  - Assistant Professor, 2002–
  - Affiliate Professor, ECE, 2005–
  - NSF Career award, 2004

- **Atif M. Memon**, Software Engineering
  - Ph.D.: University of Pittsburgh, 2001
  - Assistant Professor 2001–2007
  - Associate Professor 2007–
  - NSF Career award, 2005

- **Aravind Srinivasan**, Algorithms and Theory of Computing
  - Ph.D.: Cornell University, 1993
  - Associate Professor 2001–2006
  - Professor 2006–

#### **Year 2002, Department of Computer Science**

- **Lise C. Getoor**, Artificial Intelligence
  - Ph.D.: Stanford University 2001
  - Assistant Professor 2002–
- **Francois Guimbretiere**, Human Computer Interaction
  - Ph.D.: Stanford University, 2002
  - Assistant Professor 2002–
- **Liviu Iftode**, Computer Systems,
  - Ph.D.: Princeton University, 1998
  - Assistant Professor, 2002–2003
  - NSF Career Award, 2002–2007
- **David Jacobs**, Computer Vision
  - Ph.D.: MIT, 1992
  - Associate Professor 2002–
- **Jonathan Katz**, Cryptography, Theory of Computing
  - Ph.D.: Columbia University, 2002
  - Assistant Professor 2002–
  - NSF Career award, 2005

- **Alan Sussman**, Parallel and distributed scientific applications

- Ph.D.: Carnegie Mellon University, 1991
- Research Associate 1992–1997
- Assistant Research Scientist 1997–2001
- Assistant Professor 2002–2006
- Associate Professor, 2006–

#### **Year 2003, Department of Computer Science**

- **Leila De Floriani**, Visual and geometric computing
  - Ph.D.: University of Genova, Genova, Italy
  - Professor 2004–
  - Fellow, IAPR

- **Jeffrey Foster**, Programming Languages and Software Engineering
  - Ph.D.: University of California at Berkeley, 2002
  - Assistant Professor 2003–
  - NSF Career Award, 2004

#### **Year 2004, Department of Computer Science**

- **Ramani Duraiswami**, Visual and geometric computing
  - Ph.D.: Johns Hopkins University, 1991
  - Assistant Professor 2004–2007
  - Associate Professor 2007–

- **Neil Spring**, Networks and operating systems
  - Ph.D.: University of Washington, 2004
  - Assistant Professor 2004–

#### **Year 2005, Department of Computer Science**

- **W. Rance Cleaveland II**, Software engineering
  - Ph.D.: Cornell University, 1987
  - Professor 2005–
  - Executive and Scientific Director, Fraunhofer Center, 2005–
  - Member, IFIP WG 2.2
  - NSF Young Investigator Award, 1992
  - ONR Young Investigator Award, 1992
- **Amol Deshpande**, Databases
  - PhD: University of California, Berkeley, 2004
  - Assistant Professor 2005–
  - NSF Career Award

- **Steven Salzberg**, Bioinformatics
  - PhD: Harvard University, 1989
  - Horvitz Professor of Computer Science, 2005–
  - Fellow, AAAS
  - Director, Center for Bioinformatics and Computational Biology, 2005–

#### **Year 2006, Department of Computer Science**

- **Vibha Sazawal**, Software Engineering
  - PhD: University of Washington, 2005
  - Clare Booth Luce Assistant Professor 2006–

- **Mahai Pop**, Bioinformatics, genomics, computational geometry and computer graphics
  - PhD: Johns Hopkins University, 2000
  - Assistant Professor 2006--

## ***B.2 Adjunct and Affiliate Appointments***

### **. John Baras**

- Ph.D.: Harvard University, 1973
- Professor, Electrical and Computer Engineering and Institute for Systems Research
- Affiliate Professor, Department of Computer Science
- Fellow, IEEE, 1984

### **. Alexander Barg**

- Ph.D.: Russian Academy of Science, 1987
- Professor, Electrical and Computer Engineering and Institute for Systems Research
- Affiliate professor, Department of Computer Science and Applied Mathematics and Scientific Computation

### **. Rajeev Barua**

- PhD: MIT, 2000
- Assistant Professor, ECE, 2000-2006
- Affiliate Assistant Professor, 2000-
- Associate professor, ECE, 2006-

### **. Shuvra Bhattacharyya**

- Ph.D.: University of California, Berkeley, 1994
- Assistant Professor, ECE, University of Maryland, 1997-2001
- Associate Professor, ECE, 2001-2006
- Professor, ECE, 2006-
- Affiliate professor, Computer Science, 2001-
- NSF Career Award, 1998

### **• Ramalingam (Rama) Chellappa**, Image Processing, Computer Vision and Pattern Recognition

- Ph.D.: Purdue University, 1981
- Professor, Department of Electrical Engineering and UMIACS 1991--
- Affiliate Professor, Department of Computer Science, 1991--
- NSF Presidential Young Investigator Award, 1985
- IBM Faculty Development Award, 1985
- Excellence in Teaching Award, USC School of Engineering, 1990
- Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1992
- Best Industry Related Paper (with Q. Zheng), International Assn. of Pattern Recognition, 1992
- Fellow, International Association of Pattern Recognition, 1996

- Distinguished Faculty Research Fellow, University of Maryland, 1996-1998
- IEEE Signal Processing Society Technical Achievement Award, 2001

### **• Michel Cukier**

- Ph.D.: National Polytechnic Institute of Toulouse, France, 1996
- Assistant professor, Reliability Engineering Program, 2001-
- Affiliate professor, Computer Science, 2003-

### **• Michael Cummings**

- Ph.D.: Harvard, 1992
- Associate Professor, Biology, 2005-
- Associate Professor, Center for Bioinformatics and Computational Biology, 2005-
- Affiliate professor, Computer Science, 2004-

### **• Allison Druin**, Human-Computer Interaction

- Ph.D.: University of New Mexico, 1997
- Assistant Professor College of Information Studies and UMIACS 1998--2004
- Associate Professor 2004-
- Affiliate Professor, Department of Computer Science 2000--
- Lilly-Center for Teaching Excellence Teaching Fellow Award 1999-2000
- Institute of Museum and Library Services (IMLS) Award 2002-2005
- NSF Career Award 2001
- NSF ITR Award 2002-2007
- Outstanding UMD Faculty of the Year Award 2001
- Nominated for a Presidential Commission (National Commission of Library and Information Science), 2003--
- Director, Human-Computer Interaction Laboratory, 2006-

### **. Manoj Franklin**

- Ph.D.: University of Wisconsin, Madison, 1993
- Assistant Professor, ECE, 1998-2004
- Affiliate Professor, Computer Science, 2003-
- Associate Professor, ECE, 2004-

### **• John Grant**, Database Systems

- Ph.D.: Courant Institute, 1970
- Adjunct Associate Professor 1979-1986
- Adjunct Professor 1986-

### **. Satyandra Gupta**

- Ph.D.: University of Maryland, 1994
- Associate professor, Mechanical Engineering and Institute for Systems Research
- Affiliate professor, Department of Computer Science
- NSF Career Award, 2001

-- PECASE Award, 2001

**. Mary Harper**

-- Ph.D.: Brown University, 1990  
-- Research Scientist, Center for Advanced Study of Languages, 2005-  
-- Affiliate professor, Computer Science, 2005-

• **John F. Horty**, Philosophy and Logic  
-- Ph.D.: University of Pittsburgh, 1986  
-- Assistant Professor, Department of Philosophy and UMIACS 1989-1994  
-- Associate Professor, Department of Philosophy 1994-1998  
-- Affiliate Professor, Department of Computer Science 1994-  
-- Professor, Department of Philosophy and UMIACS 1998-  
-- Fellow, National Endowment for the Humanities, 1993-4

**. Jeffrey Huskamp**

-- Ph.D.: University of California, Berkeley  
-- Vice President and Chief Information Officer, Office of Information Technology, 2004-  
-- Affiliate Research Professor, Department of Computer Science, 2004-

• **Joseph Ja'Ja'**, Algorithms and Parallel Computing  
-- Ph.D.: Harvard University, 1977  
-- Associate Professor, Department of Electrical Engineering and UMIACS 1985-1987  
-- Professor, Department of Electrical Engineering and UMIACS, 1987-  
-- Affiliate Professor, Department of Computer Science 1985-  
-- Associate Director for Research, ISR, 1988-1994  
-- Director, UMIACS, 1994-2004  
-- Fellow, Institute for Electrical and Electronic Engineers (IEEE), 1996  
-- Fellow, Association for Computing Machinery (ACM), 2002  
-- 1997 R&D 100 Award by R&D Magazine  
-- Maryland Industrial Partnership Award of Excellence, 1992

**. Jimmy Lin**

-- Ph.D.: MIT, 2004  
-- Assistant Professor, College of Library and Information Studies  
-- Affiliate professor, Department of Computer Science

**. Douglas Oard**

-- Ph.D.: University of Maryland  
-- Associate Professor, College of Library and Information Studies

-- Dean for Research, CLIS  
-- Affiliate Professor, Department of Computer Science

• **Louiq Raschid**, Databases

-- Ph.D.: University of Florida, 1987  
-- Assistant Professor, Smith School of Business and UMIACS 1987-1993  
-- Associate Professor, Smith School of Business and UMIACS 1993-2002  
-- Affiliate Professor, Department of Computer Science 1993-  
-- Professor, Smith School of Business and UMIACS 2002-

**. Philip Resnik**

-- Ph.D.: University of Pennsylvania, 1993  
-- Assistant Professor, Linguistics, 1996-2001(?)  
-- Associate Professor, 2001-  
-- Affiliate Professor, Computer Science

**. Andre Tits**

-- Ph.D.: University of California, Berkeley, 1980  
-- Assistant Professor, Department of Electrical and Computer Engineering, 1981-?  
-- Associate Professor, ECE  
-- Professor, ECE, ?-  
-- Affiliate Professor, Department of Computer Science  
-- IEEE Fellow  
-- NSF PYI Award, 1985

• **Uzi Vishkin**, Analysis of Algorithms, Parallel Computing

-- Ph.D.: Technion, 1981  
-- Professor, Department of Electrical and Computer Engineering and UMIACS 1988-  
-- Affiliate Professor, Department of Computer Science 1988-  
-- Fellow, Association for Computing Machinery (ACM), 1996

• **Amy Weinberg**, Linguistics

-- Ph.D.: Massachusetts Institute of Technology, 1988  
-- Assistant Professor, Department of Linguistics and UMIACS 1988-1995  
-- Affiliate Professor, Department of Computer Science, 1990-  
-- Associate Professor, Department of Linguistics and UMIACS 1995-  
-- co-Director, Laboratory for Language and Media Processing, 2001-2004  
-- co-Director, Computational Linguistics and Information Processing Laboratory, 2001-2004  
-- Associate Director, Neural and Cognitive Science Program

• **Donald Yeung**, Computer Architecture

- Assistant Professor, Department of Electrical and Computer Engineering (ECE) and UMIACS 1998–2004
- Associate Professor, ECE, 2004-
- Affiliate Assistant Professor, Department of Computer Science 1998–
- National Science Foundation Career Development Award, January 2001
- George Corcoran Teaching Award (ECE), June 2000

(\*)—*Deceased*

(\*\*)—*Retired*