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President initiates awards

WASHINGTON

A new program of research awards to the nation's most outstanding and promising young science, mathematics and engineering faculty, initiated by the National Science Foundation at the request of President Reagan, is expected to help universities meet a wide demand for highly qualified personnel for academic and industrial research and for teaching.

The Presidential Young Investigator Awards will provide cooperative research funds (from $25,000 to $100,000 per year for up to five years) to a maximum of 200 young science and engineering faculty each year. "Young" in this case means faculty who are no more than seven years beyond receiving the doctorate degree.

The program is aimed at providing the incentive to remain on campus to those top quality faculty members who would educate the students needed by industry. The program calls for cooperative funding by the industrial sector.

Minimum awards will consist of $25,000 of Foundation funds. To help forge strong links between the academic and industrial sectors, NSF will provide additional funds of up to $37,500 on a dollar-for-dollar matching basis for contributions from industrial sources. The institutions concerned will be responsible for providing full academic year salary for each awardee and arranging for the industrial support.

NSF expects that in the first year up to 100 awards will be made in engineering fields, up to 60 in mathematical and physical sciences, up to 25 in the biological sciences and up to 15 in the astronomical, atmospheric earth, and ocean sciences.

U.S. institutions granting doctorates in fields supported by NSF may nominate outstanding faculty members who have received their doctorates after September 1, 1976 and who hold full-time, regular appointments in tenure track or tenured positions when nominated. Graduate and post-doctoral students who have accepted appointments to such positions may also be nominated.

Individuals nominated may conduct research in any branch of the mathematical, physical, and biological sciences and engineering. NSF will emphasize those fields where there are substantial needs for faculty development.

For further information contact Presidential Young Investigator Awards, National Science Foundation, Room 414, Washington, D.C. 20550; or tel. (202) 357-7536.

WHAT'S INSIDE

GENERAL

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Academy of Sciences cites Mina Rees

Notes public service in math, computer science

WASHINGTON

Dr. Mina Rees, university administrator and noted mathematician, has been awarded the Public Welfare Medal of the National Academy of Sciences for distinguished contributions to the application of science for the public welfare.

She was cited in particular for continuing contributions to mathematics and computer science from the World War II era to the present.

Rees, who is president emeritus of the Graduate School and University Center of the City University of New York, received the award in a special ceremony in Washington.

Considered one of the most prestigious of the National Academy honors, the Public Welfare Medal was established in 1913; the first prizes were awarded to George W. Goethals, builder of the Panama Canal, and to William Crawford Gorgas, who helped eradicate yellow fever in the Canal Zone.

Among other past recipients of the Medal were J. Edgar Hoover, John D. Rockefeller, Jr., David E. Lillienthal, Alan T. Waterman, John Gardner, Leona Baumgartner, and Walter Sullivan.

After receiving her Ph.D. in mathematics at the University of Chicago in 1931 and serving an academic apprenticeship on the faculty of Hunter College, Rees received her initiation into the military applications of mathematics during World War II, when she served as assistant to the chief of the applied mathematics panel of the Office of Scientific Research and Development. For her work, she was honored by both Britain and the United States.

Mina Rees

At the end of the war, the Navy invited her to establish the mathematical research program in the newly created Office of Naval Research. This proved to be a surprisingly effective effort that expanded the horizons of mathematical research in the United States and strengthened programs in mathematics throughout the country.

Her work was recognized in 1962 when the Mathematical Association of America gave her its first Award for Distinguished Service to Mathematics.

Among Rees' activities in Washington, one that proved particularly significant was her participation, on behalf of the Navy, in the government sponsorship that proved critical in the infancy of computers. In addition to providing wide support for university research of basic importance to the emerging computer field, ONR collaborated with the National Bureau of Standards in supporting and directing its program.

The program funded production of the first commercially produced electronic, stored program computer, the Census UNIVAC, which was delivered in 1951 and used in analyses of the 1950 Census data.

When, in 1953, Rees left Washington to become dean of the faculty of Hunter College, she continued her support of the National Bureau of Standards as chairman of the Bureau's advisory committee on mathematics, and was a member of the mathematics division of the National Research Council where she was chairman of the sub-committee on applied mathematics, a subcommittee of the Commission on Survey of Research in Mathematics in the United States, 1954-56.

There followed public service activities for the Department of Defense, for several academic organizations, and for the Ameri-

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At George Washington High School, kids are turned on to computers

The microcomputer lab at George Washington High School in Denver is so much in demand that eager students like these show up as early as 6 A.M. to use it.

Chuck Tucker has just landed another consulting job. Dade County, Florida, wants to implement a user friendly version of Pascal for Atari, which Chuck has developed, in 25 public schools. Chuck has been hired to teach them about it, for a fee of $100/day — and a complete computer system that he will take with him when he enrolls in college next year.

Chuck, who is 17 and a senior at George Washington High School in Denver, is an exceptional achiever. But at George Washington, an inner city public school that has no special admissions requirements,

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At George Washington High School kids are turned on to computers

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kids like Chuck are turning the exception into the rule.

George Washington has an impressive computer facility. Thirty-six of its 38 micros are housed in a bustling computer lab, which is so much in demand that it opens at 6:00 each weekday and stays open Saturdays too.

The curriculum is also impressive. More than one-third of the school's 1,600 students are enrolled in one of seventeen programming courses, all of which are electives. In addition to the programming courses, which focus on business or mathematics applications, there are five courses in which computers are used as a tool. These include three classes in alternative education.

Neither the facility nor the curriculum, however, is sufficient to explain the vitality and enthusiasm which characterize computing activities at George Washington.

The generator of much of the excitement is Dr. Irwin Hoffman, head of the school's computer science department and founder of the first high school computer curriculum in the country. Under Hoffman's leadership, the computer lab has become more than a fine facility for teaching programming and learning via computer. It is also a place where kids do research, develop software, and write documentation, all on a professional level.

Humble Beginnings

It all began in 1960, when Hoffman discovered he had a neighbor who knew how to program. The neighbor was Bob Albrecht, who worked for Control Data Corporation, and who is now known for his several books on Basic.

Albrecht agreed to teach Hoffman and some of his students. "And so," says Hoffman, "every Wednesday night and Saturday morning for more than six months, we all went down to the CDC office, where there was a computer which CDC very kindly let us use."

Response to the course was enthusiastic, and many more students wanted to join. Hoffman asked the Denver School District to establish an official course, but they declined.

From 1961 to 1963 Hoffman held his (still unofficial) course at the University of Denver, where John Skelton let them use free time on the university's Burrough's 5500.

In 1964, the school district established Hoffman's course as an elective, but there was still no computer on the premises. The now official course was held at Denver's Emily Griffiths Opportunity School, a renowned high school for adults. Larry Costa, who was then an electronics teacher at the school, had convinced IBM to give them a flood-damaged, mud-encrusted 1401. Costa, who is now head of all computer activities in the Denver School District, refurbished it himself over a nine month period.

Eventually the school district bought an IBM 1130, which was put on a trailer and sent to each participating school for two weeks a year. Later, the school system bought a mainframe, and six Teletypes were installed at George Washington to communicate with it.

Finally, in the mid-1970's the Teletypes were turned in for Vector Graphics micros. Since then the school has acquired — through donations, research, grants, and government programs — 20 Ataris and 10 Apples.

Curriculum

The formal computer curriculum focuses on three areas: mathematics, business, and alternative education. Computers are also made available to students in other subject areas who are willing to work on their own time. Many art and music students have done very creative work on the computer, without benefit of formal course hours.

Business. There are two semesters of computer business classes, in which students learn to program microcomputers in Basic. Students apply their programming knowledge to trade discounts, alphabetical sorting, and payroll.

Two more business classes — advanced accounting and business machines — teach the use of spreadsheet and word processing software.

Hoffman reports that he and his associates have designed a course, not yet in the curriculum, called "Technical Term Paper Writing." The course will be 18 weeks long — nine weeks of technical word processing and nine weeks of term paper writing. Hoffman says the minute they offer the course, they'll have demand for five classes.

Both the technical writing course and a proposed course in word processing for advanced typists will have to wait until more computers — 30 more at least — are on board.

Alternative education. Computers are also used as a tool to teach slow learners and the perceptually handicapped. A programming class is held for "Hold Youth", the Denver school district's term for kids whose interest, attendance, and achievement level are very poor.

In this alternative education course kids use *Turtle Graphics*, a subset of the beginners language *Pilot*. It is hoped that the uninterested students, by writing their own programs instead of using prepared software, will develop the same pride of accomplishment that other students exhibit.

Altogether 36 microcomputers are housed in the George Washington High School computer facility.

Mathematics. The computer math program at George Washington has four semesters of structured learning. After two years of the program are completed, interested students continue with special research projects dictated by their own interests or the needs of the computer lab and its granting sources.

Computer math courses are considered an adjunct to, rather than a replacement for, the regular curriculum. In order to qualify for admission, students must be concurrently enrolled in either second year algebra or in geometry.

In the first semester, Hoffman teaches what he calls "language literacy." Students learn how to program in Basic, Fortran, and Pascal. For practice in programming, the students, in all three languages, solve systems of linear equations (in two unknowns) and quadratic equations, test the properties of Fibonacci sequences, and test for prime numbers. They also write a program in Fortran which contains functions, subroutines, one and two dimensional arrays, type declarations, and alphabetical and numerical sorts.

In the second semester, they redo that Fortran program in Pascal. They also write Pascal and Fortran programs to find the roots of a polynomial equation by interval halving and solve a system of five linear equations in five unknowns by Gaussian reduction.

Hoffman's second year exposes students to more advanced topics, such as linear programming — which he says is "a wonderful exercise in arrays"— and random disk access programs in Pascal, Fortran, and Basic.

Hoffman finds that users of microcomputers have great interest today in random disk access techniques, mostly because they find that problems are too large to solve completely in random access memory. He gets frequent calls from microcomputer users looking for student freelancers who are familiar with these techniques.

Second year students also learn Forth, a fourth generation language similar to Assembler that "requires the students to think." Students rewrite their old programs in Forth and execute a random disk project in Forth as well.

Irwin Hoffman

Research and Curriculum Development

Advanced students at George Washington are actively engaged in research and curriculum development projects, many of which are tied to grants awarded to the lab or to individual students.

In 1982 the computer lab was awarded a three-year Title VII grant from the federal government to develop computer-based lessons for students who must learn English as a second language. The lab is negotiating with the Colorado Department of Education for a contract to create software for lessons designed by other school districts. On the industry side, Atari in 1982 awarded a grant to develop Forth for the Atari 800 computers. Wadsworth Electronic Publishing Company has contracted with the lab to have software tested. Two software companies are working on a deal for the lab to translate their software for other microcomputers.

Computer programming for the bilingual lessons, the graphics, and the classroom management portions of the Title VII project were done by some twenty-odd students. In the Atari Forth project, students are developing techniques for such sophisticated applications as networking and computer-aided design.

Six students were hired this year to write lessons on the small Commodore for Educare, a software company. Another was hired by a Hold Youth mini research grant to rewrite educational software. One of two students who teach computing at a local elementary school wrote a program which determines who, out of Denver's 65,000 public school students, gets free lunches. Another has worked with a company called Innovative Solutions, writing random disk access programs in CBasic. The student who developed a user friendly version of Pascal also works in Pascal with the research department at the University of Colorado Medical School.

Two students with an interest in music are working on ways to graphically display techniques for computer transposition of music. Another team is working on overlapping screen techniques, which they will apply to two curriculum items — home economics fashion design and the art department's criminal recognition unit.

Random disk access techniques were not being taught to business students, because there was no RDA program which ran on the Microsoft Basic they use. An advanced computer student was given the task of fixing this gap; now all that remains is for the teacher to be taught the techniques.

Course Materials

Hoffman shares the common micro user's frustration with the poor quality of available instruction manuals. He and his students compensate for this by writing their own.

Hoffman claims that their first CPM manual was completed two years before the first book on that operating system was published.

Part of the Atari Forth project this year involved writing an extensive manual for Forth, which includes a tutorial for beginners and an annotated glossary. The student who wrote the manual also designed his own screens, which allow for keyboard input, recursiveness, and random disk access.

In the development of user friendly Pascal mentioned earlier, the manufacturer's original four manuals and four floppy disks were reduced to two sides of one disk and a manual of about 17 pages. Hoffman reports that Atari is planning to distribute the package.

Teacher/Student Crosstraining

In the George Washington computer program, the lines between teacher and student are somewhat blurred, and a sort of intellectual democracy prevails. Teachers in training learn by sitting in the classrooms and taking the computer classes with the students.

Hoffman notes this is the first time in the history of teaching that a classroom teacher can often expect to know less about the subject to be taught than some of the students in the class. Hoffman says, "I could sit and learn from about 15 to 30 of my kids who are experts in their specific areas. In fact, that's what I do on many Saturdays right now.

"The student who wrote the instruction manual on Forth spent some Saturdays this winter doing nothing but teaching me Forth. This semester, he sat in the classroom with me when I taught it.

"The students understand that all this is new, and they don't look down on a teacher simply because that teacher happens not to know something about the subject."

Student crosstraining is also widely practiced at George Washington. To ensure that the expertise acquired by graduating seniors gets documented and the relevant projects completed, Hoffman assigns younger students to work with the seniors and "keep the knowledge from leaving the school."

Hoffman claims that he personally has "about four years worth of learning to catch up on."

Getting Expertise from Industry

Hoffman talked about the shortage of people available for teaching computers and running a computer

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