Phyllis A. Fox - vitae

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COMPUTER RELATED PROJECTS (Before Bell)

General Electric Company, Schenectady, NY

1944-45 did hand (i.e. Marchand) calculation

1945-46 ran the differential analyzer (Vannevar Bush type)
This involved working out solution diagrams and
sequences of gear ratios, and then setting up the
problem by attaching gears to shafts using set
screws.
Interesting problems included Ramjet calculations,
and also numerical integration to study the ex-
perimental behavior of captured German V2 bombs.

MIT

1948-54 I decided to try programming a power network (I
had majored in power in my EE B.S.) on the Whirl-
wind computer being designed and built. This
enabled me to suggest useful instructions to be
included in the computer's operations repertoire.
Later I worked full time programming the computer.

New York University AEC Computing Facility

1954-58 was in charge of a group (varying between 6 and 8
people) developing 'service' routines (i.e.
'tools'), editors, debugging routines and
mathematical subroutines for use on the UNIVAC and
later the IBM 704 computers.
Also did numerical analysis research and
programming.

MIT School of Industrial Management

1958-59 was in charge of a group (2 to 5 people) writing
the language 'DYNAMO' used by Prof. Jay W. For-
rester in his Industrial, Urban, World, etc.
Dynamics research. I named the language and designed the
macro/interpreter approach used in implement the
language.

MIT Computing Center

1959-62 wrote the first LISP manual.
with A. A. Goldstein did research in approximation theory.
was a member of the Long Range Computation System Study Committee to decide what MIT's next computer should be. We made a clear recommendation for the new CDC 6000 machine, but they got IBM.

Newark College of Engineering (now NJIT)

1963-73 introduced and taught assorted courses in computer science including numerical analysis, syntax-directed compiling (yes), simulation, etc.
Wrote specs for the new Computer Science Department.

1965-67 obtained NIH two-year grant to do a simulation study of automobile car-following (see publications).

WORK AT BELL LABORATORIES

Fall 1967-March 1969, consultant

Did a comparative study of programs for integrating sets of ordinary differential equations (initial value problem). Penny Crane Crockett worked with me as a programmer. The work was full time in the summer, and then a day a week in the winter. (See publications on this subject 1971 and 1972.)

The PORT Mathematical Subroutine Library

I joined the Laboratories in September 1973 and worked essentially full time developing the PORT library of mathematical subroutines written in portable Fortran.

The first edition of PORT appeared in September 1975. It contained 151 programs of which 47 were documented.

PORT 1 was officially released for licensing April 1976.

The second edition of PORT appeared June 1977. (It had been sent to the printers March 16, 1977.) It contains 550 programs, 125 of which are documented, and there are 41,000 lines of Fortran on the tape containing the library. 700 copies of the 400-page PORT Users Manual were printed initially; these ran out, and 400 more were printed July 1978.

PORT 2 was officially released for licensing October 1977.

PORT has been installed on about a dozen different computer types. It is up on the major computers at Holmdel, Indian Hill, Murray Hill, and Merrimac Valley, and has been installed on a clutch of minis (PDP, VAX, Harris, Data General, etc.) Some 14 universities are using PORT. (See the attached list.)

The first commercial license for PORT has just been obtained by NCAR. They bought one for the CRAY 1, and one for their CDC 7600.

The bulk of the effort in developing PORT has been in producing the documentation. Perhaps 80% or more of the time has been devoted to this effort. Besides the manual, a small blue flyer has been designed and printed (and revised), and an installation guide for people putting up the library has been issued and revised from time to time. The last revision was made to reflect the

The majority of the programs in PORT have been contributed by J. L. Blue, N. L. Schryer and D. D. Warner of Dept. 1274.

fact that the PORT tape is now sent out with a second
file of example problems from the documentation. (See
the work done by the summer student, Jenny Chen.)

Computer benchmarking

April-July 1974 I collected and ran various numerical
programs on the CDC computer, the IBM and Honeywell, in
order to do a comparative study of computational perfor-
mance. This work was done at the request of Mark Roch-
kind.

December 1977-July 1978 I and Dan Warner did additional
benchmarking. See our publication covering the study.

Testing Site for NATS (National Activity to Test Software)

I have acted as the Honeywell testing site for the
EISPACK and LINPACK packages developed at Argonne
National Laboratories. Linda Nelson and Linda Kaufman
have helped in this testing.

Other numerical activities

Have collected and installed various numerical libraries
(in addition to LINPACK and EISPACK), such as IMSL, Har-
well, Brent's Multiple Precision package, etc.

Have consulted on numerical matters with users.

In the Fall of 1977 I ran a sequence of seminars as a
MHCC course on numerical computing. The speakers were
various local experts, such as Blue, Kaufman, Schryer,
and Warner.

Nontechnical activities

Since 1974 I have recruited at MIT at the BS/MS level.
(currently only MS.)

Am a member of the Library Users' Committee.

Current preoccupations

Working with Linda Kaufman on her linear algebra package.
This currently contains 167 programs, and the sparse
lineary equation solvers will add 20 or so more programs.
These programs will be in PORT 3, but may be issued
separately first.

In the field of special functions (the most difficult
from the point of view of portability), I have put up

Brent's Multiple Precision package, which must be used for testing accuracy. A preprocessor called AUGMENT, developed at Wisconsin, has been has been adapted by people there to interface to Fortran programs using Brent's multiple precision, I have asked them for AUGMENT and will put it up when it comes.

✗ I have established a library which will contain special functions to work at least on Honeywell. Some complex double precision elementary functions from the systems library (Book IV) written by Roger Faulkner have been put on the library, and various of Wayne Fullerton's special functions will also be installed. Further special functions written by various groups for the Honeywell computer will also be put on the library, and user reference sheets for the library will be designed and written for each program.

PORT 3 should be issued not only with a file of example programs, but also a file or separate tape of thorough test programs. Many of these exist in various forms, but a uniform and portable method for reading in test data and writing out results needs to be developed, and the test programs revised to conform to the standard.

There has always been a question as to how many programs from the field of statistics should be included in the PORT library. Requests from mini users and others suggest such programs would be very useful. Initial programs for simple mean, median, standard deviation, and perhaps correlation are being considered.

It would be helpful to be able to monitor the use of PORT at least on the Honeywell computer. Hooks to enable this are under consideration.

✗ The end aim of the work in special functions is to study programs and/or techniques with a view to portability.

AFFIRMATIVE ACTION

Summer employees:

1974 - Elizabeth McMahon, worked on testing linear algebra modules

1975 - Valerie Barr, wrote and tested "outer" calling programs for FFTs

1977 - Jenny Chen, checked and verified example programs from PORT documentation

Women in the Work Environment Workshops

Attended a workshop, and then acted as a "trainer" in others

Women and Mathematics (WAM)

The WAM program was started by the Mathematical Association of America (Henry Pollak has played a major role in WAM's success). The idea is to send women mathematicians to speak at high schools, both to act as role models - the women give technical talks - but principally to persuade the girls not to drop mathematics in the tenth grade. Girls traditionally have stopped mathematics and hence closed out 60% - 80% of the careers later open to them. I have been a speaker in the program.

Bell Laboratories Affirmative Action Programs: CRFP/GRPW/SRP

At MIT I am the recruiter for these programs

Cooperative Research Fellowship Program for Minorities
Graduate Research Program for Women
Summer Research Program for Minorities and Women

WRA

Have been a member of the WRA Executive Council since 1974.

TALKS

Talks I have given fall mainly into three categories:

1. Talks on the PORT Library and how to use it.
   Given mainly at Bell Laboratory sites. (The most recent was given December 4, 1978 at Merrimac Valley for a seminar organized by Ming Liou.)

2. Talks on techniques used in PORT and on portability. Given at various meetings and workshops. (The most recent was given October 1978 in Pasadena at a workshop on the Programming Environment for the Development of Numerical Software.)

3. Talks on careers in mathematics and computer science. Given to high school groups visiting Bell Laboratories or at their schools, and also at college seminars.
   Often an affirmative action emphasis is requested, cf. WAM under that category below.

I was a SIAM National Lecturer, 1976-77, and, in that capacity, gave talks at Trenton State, at Bucknell, and at the University of North Carolina, Chapel Hill. SIAM invited me to be a Lecturer again the following year, but I declined due to pressure of work.

PAPERS AND MEMORANDA

MF 78-8231-14 (MF 78-1274-1) with M. E. Lesk,
Producing PORT program reference sheets.

TM 78-8231-3 (TM 78-1274-6) with L. D. Warner,
Benchmarks with a Number-Crunching Emphasis

MF 78-8231-17
DOE Workshop on Mathematical Software Libraries

Installation Manual for PORT Mathematical Subroutine Library,
Version Two, October 1977.

with A. D. Hall and N. L. Schryer,
The PORT Mathematical Subroutine Library.
ACM Trans. on Mathematical Software, Vol.4, No.2
June 1978, Pages 104-126.

with the same authors,
ALGORITHM 528:
Framework for a Portable Library,
same issue, Pages 177-188.

with the same authors,
The Port Mathematical Subroutine Library,
Computing Science Technical Report #47,
Bell Laboratories, May 1, 1977.