The Remarkable Career of
Margaret Butler:
From “Computer” to Senior Computer Scientist

presented by
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Margaret Butler: One Woman’s Life in Science
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46 years in Computing, 1945-1991

Margaret (Kampschaefer) Butler was a pioneer in technology, a ground-breaking woman who graduated with a B.S in Mathematics and Statistics in 1944, and followed a fascinating career path in the public sector starting in the earliest days of computers and nuclear energy. One of the early female “computers,” she worked on the first atomic submarine. She also spent time overseas after WW II as an employee of the U.S. military. At Argonne National Laboratory, where she spent many years, Margaret worked with the AVIDAC, ORACLE, GEORGE, UNIVAC, and more, in the formative days of computing. Her experience spanned a technical management track in public service, as Director of the National Energy Software Center, which does R&D for a spectrum of Atomic Energy Commission issues. Margaret was the first woman Fellow at the American Nuclear Society, and is an Honorary Lifetime Member. Margaret draws on decades of success as well as setbacks, to provide a perspective on computer technology and women technologists. This is a story, for all scientists, that deserves to be told... and a celebration of her life, which passed on March 8, 2013...

http://www.semiwiki.com/forum/content/2128-margaret-butler-one-woman%27s-life-science.html
The Remarkable Career of Margaret Butler, Argonne National Laboratory, June 11, 2015

The formative years: 1924-1945

- Margaret Kampschaefer: born March 27, 1924, in Evansville, Indiana
- BS in Mathematics and Statistics, Indiana University, 1944
- Graduate work at U.S. Department of Agriculture Graduate School, University of Minnesota, and University of Chicago

In Evansville with the family pet

Margaret (left) and roommate at Indiana University
Margaret’s early career was thrilling.

1945: Statistician with the Bureau of Labor Statistics in Washington, DC.


Margaret believed in taking calculated career risks and recommended it to others. She believed that work, adventure, and trying out new opportunities help in exploring each person’s own traits, capabilities, preferences, and values.
Margaret began her career at Argonne as a “Computer”

- **1948-1949: Junior Mathematician in the Naval Reactors Division**
  - helped to designing a prototype for the Navy's nuclear submarine reactor

- **Early work as a “Computer”**
  - an individual who performed computations required to solve mathematical physics and engineering problems using
    - slide rules
    - tables of integrals and special functions
    - electromechanical calculators
  - historical info:
    - [http://topsecretrosies.com](http://topsecretrosies.com)
Career excitement at Argonne in 1951

- 1951: Assistant Mathematician in the Reactor Engineering Division
- 1951: Married Jim Butler, a mathematician at Argonne
- Argonne had obtained Atomic Energy Commission funding for construction of a digital computer, or “electronic brain,” in the parlance of the day, to put at its disposal “the most modern means of scientific computation.”

- AVIDAC: based on prototype at the Institute for Advanced Study in Princeton

- Margaret wrote AVIDAC’s interpretive floating-point arithmetic system
  - Memory access time: 15 microsec
  - Addition: 10 microsec
  - Multiplication: 1 millisec

- AVIDAC press: @ 100,000 times as fast as a trained “Computer” using a desk calculator
Early work on computer architecture

Margaret helped assemble the ORACLE computer with ORNL Engineer Rudolph Klein. In 1953, ORACLE was the world’s fastest computer, multiplying 12-digit numbers in .0005 seconds. Designed at Argonne, it was constructed at Oak Ridge.
Quote from Margaret: “It was the best of times!”

- Margaret was a member of the logical design team for GEORGE, the second ANL computer.
- She wrote mathematical subroutines, system software, reactor applications, & utilities for
  - AVIDAC (1949-1953)
  - ORACLE (1950-1953)
  - GEORGE (1955-1956)
  - UNIVAC (1954-1958) – at NYU
  - IBM 704 (1957)
- 1957-1959: Margaret led the Reactor Computing Group

Margaret learned, then taught, computer architecture and programming before there were courses available in any schools on the subjects, as university computer science courses had not yet arrived.
Margaret headed the Applications Programming Section of Argonne’s Applied Mathematics Division: 1959-1965

She developed programming teams for
- reactor physics
- chemistry
- biology
- high-energy physics
- management applications

Back Row:
- Robert L. Logan, Lead of AMD Systems Section
- Wayne R. Cowell, Lead of Digital Computing Center
- David Jacobsohn, Lead of AMD Engineering Section

Front Row:
- Richard King, Applied Mathematician
- Margaret Butler, Lead of AMD Applications Programming Section
- J. Wallace Givens, Director of Applied Mathematics Division (AMD)
Margaret performed research on benchmarking, performance measurement, and image processing

- CDC3600 (1963)
  - When the CDC3600 was delivered, a subroutine library accompanied the machine, but there was no documentation.
- IBM360 (1964-1967)
- CHLOE (1963-1970)
- ALICE (1970)

Margaret founded the Argonne Code Center

First female Fellow of the American Nuclear Society, 1972
Argonne National Laboratory and the Emergence of Computer and Computational Science, 1946-1992

Charles Nelson Yood, Penn State University, Department of History, 2005
• https://etda.libraries.psu.edu/paper/6740/2028

Acknowledgments:
“... At Argonne, I met many interesting, supportive, and friendly people. I would especially like to thank Margaret Butler, a founding member of the Applied Mathematics Division (AMD) in 1957. She willingly submitted to three long interviews, many emails and phone conversations, and donated to me personal materials related to computing. Margaret was also instrumental in putting me into contact with current and retired members of the AMD, including Joe Cook, William Cody, Wayne Cowell, Paul Messina, and Bill Miller, and she also read and commented on my first two chapters. In addition, I would like to thank the aforementioned members of the AMD for agreeing to be interviewed at length and for donating their personal papers to me as well. Gail Pieper was particularly helpful for sharing her office at Argonne with me and for providing encouragement and support during my visits to Argonne. Her knowledge of the history of the AMD, and especially its personnel, was invaluable ... “
Margaret was an influential role model and mentor

- President of Chicago Chapter of the Association for Women in Science, 1982
- Paved the way for Argonne’s
  - WIST Program, established in 1990
    - [https://blogs.anl.gov/wist/](https://blogs.anl.gov/wist/)
  - Science Careers in Search of Women Conference
    - Established in 1988
MCS research leaders: Pushing into the future with cutting-edge mathematics, computer science and computational science

Nicola Ferrier  
Computer Scientist  
Computer vision to control robots, machinery, and devices, with applications in medical systems, manufacturing, and scientific discovery (MAUI, Waggle)  
http://www.mcs.anl.gov/person/nicola-ferrier

Elizabeth Marland Glass  
Bioinformatics Engineer  
Metagenomics, bioinformatics, comparative and evolutionary analysis of metabolic processes, high-throughput analysis of genomes (KBase, MG-RAST)  
http://www.mcs.anl.gov/person/elizabeth-marland-glass

Kate Keahey  
Computer Scientist  
Virtualization, resource management, cloud computing (Nimbus: Clouds for Science and the Ocean Observatory Initiative)  
http://www.mcs.anl.gov/person/kate-keahey

Misun Min  
Computational Scientist  
high-order numerical algorithms for efficient and accurate modeling in accelerator physics, nanotechnology-based applications, and lattice Boltzmann fluid simulations (NekCEM, NekLBM)  
http://www.mcs.anl.gov/person/misun-min
Technical Women in MCS

June 2015

- Julie Bessac, Postdoc
- Zichao (Wendy) Di, Postdoc
- Nicola Ferrier, Computer Scientist
- Elizabeth Marland Glass, Computational Biologist
- Rinku Gupta, Principal Software Development Specialist
- Katherine Heisey, Special Term Appt

- Charlotte Haley, Postdoc
- Kate Keahey, Computer Scientist
- Amanda Lund, Predoc
- Lois Curtfman McInnes, Senior Computational Scientist
- Misun Min, Computational Scientist
- Misbah Mubarek, Postdoc

- Lena Oden, Postdoc
- Navamita Ray, Postdoc
- Carolyn Phillips, Assistant Computational Scientist
- Gail Pieper, Coordinator of Writing & Editing
- Gigi Rohder, Technical Support Assistant
- Hong Zhang, Consultant
Technical Women in ALCF

June 2015

Liza Booker
User Experience Analyst
Advisor to the Director

Laural Briggs
Communications Lead
Technical Devpt Lead

Beth Cerny
Communications Lead
Technical Devpt Lead

Lisa Childers
Deputy Division Director

Susan Coghl
Deputy Division Director

Marta Garcia Martinez
Asst Computational Scientist

Robin Graham
Deputy Associate Lab Director, CELS

Janet Jaseckas
User Experience Specialist

Margaret Kaczmar
User Experience Administrator

Janet Knowles
Principal Software Development Specialist

Janet Knowles
Principal Software Development Specialist

Ying Li
Margaret Butler Postdoctoral Fellow

Preeti Malakar
Postdoc

Avanthi Mantrala
Technical Support Analyst

Jini Ramprakash
User Experience Specialist, Team Lead

Laura Ratcliff
Postdoc

Katherine Riley
Principal Scientific Applications Engineer, Team Lead

Emily Shemon
Nuclear Engineer, Catalyst

Xiao Wang
Web Developer Associate

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Technical Women in Nuclear Engineering

June 2015

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Margaret founded and directed the National Energy Software Center: 1972-1991

Software exchange and information center for DOE and the Nuclear Regulatory Commission

Focus: problems of program interchange and portability
Current snapshot of MCS mathematical software

- **1991:** Margaret retired
- **1993-2006:** Margaret worked as a Special Term Appointee
  - Focus: intellectual property rights, copyright law issues affecting software sharing and technology transfer
- **Ongoing issues in mathematical software**
  - How to make software readily available for application usage, customization, and extension
  - How to design software for performance portability in an era of disruptive architectural changes
  - How to exploit capabilities of emerging extreme-scale architectures for new frontiers of scientific discovery

ScalaGAUSS
Onward and Upward!

Margaret’s motto conveys her passion for computational science – and has inspired countless researchers in the quest for advances in architectures, modeling, algorithms, and software.

Margaret Butler: 1924 – 2013
The Margaret Butler Fellowship in Computational Science

Created in memory of Margaret Butler, a new fellowship at the Argonne Leadership Computing Facility (ALCF) offers computational scientists an opportunity to work at the forefront of high performance computing.

The new fellowship includes a highly competitive salary, moving expenses, and a professional travel allowance. Candidates must have received a recent PhD prior to the beginning of the appointment.
Ying Li – ALCF’s first Margaret Butler Fellow

- University of Southern California, 2014
  - Ph.D., Materials Science
  - M.S., Computer Science

- Focus: Simulations studying hydrogen production and storage for fuel cells and batteries using Mira, the ALCF’s IBM Blue Gene/Q supercomputer

- More info:
Special thanks to ...

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  - *Margaret Butler, One Woman’s Life in Science*,
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