COMPUTING AT BELL LABS

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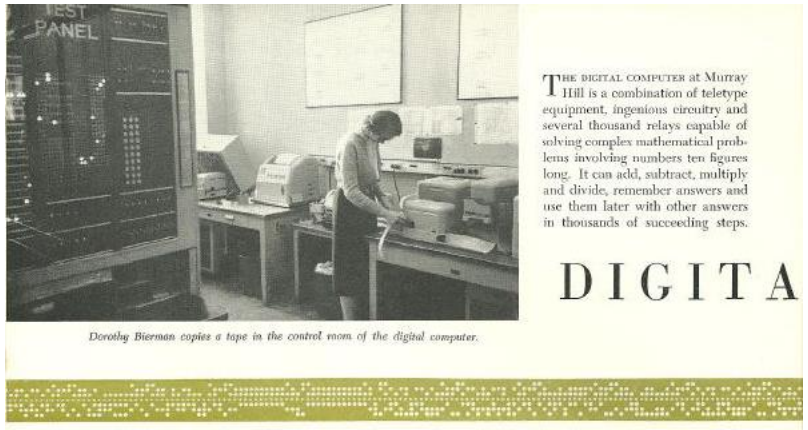
Alcatel·Lucent

EARLY HISTORY: COMPUTERS FROM TELEPHONE RELAYS



The Bell Labs Model IV (~1946)

George Stibitz

"It can add, subtract, multiply and divide, remember answers and use them later …"

Claude Shannon with "Theseus" (1950)

A Symbolic Analysis of Relay and Switching Circuits, MIT Masters' thesis, 1937

Boolean Logic = Relay Circuits

THE BIRTH OF UNIX

Unix (1969-71)

Ken Thompson and Dennis Ritchie

"… a system around which a fellowship can form."

"… the size constraint has encouraged not only economy but a certain elegance of design."

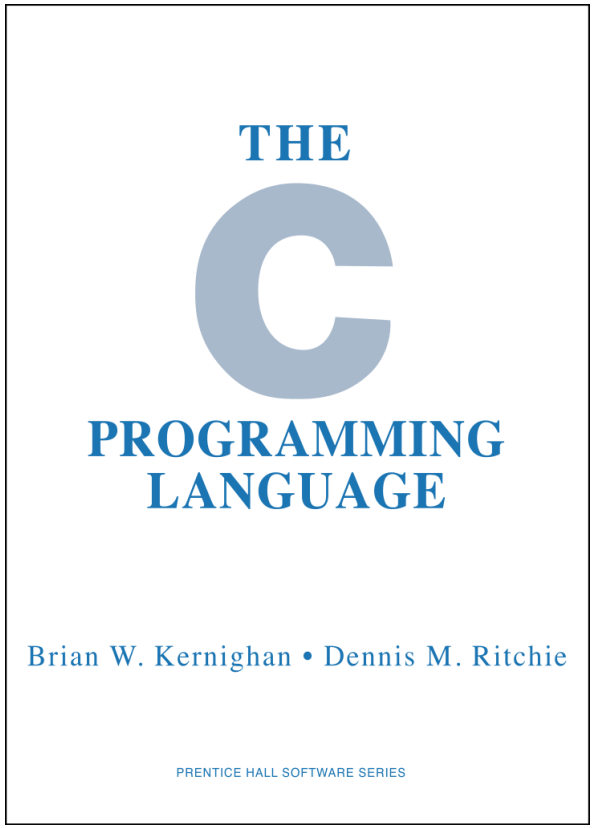
Unix (1970s)

An explosion of creativity

"Little languages" and software tools with enduring influence

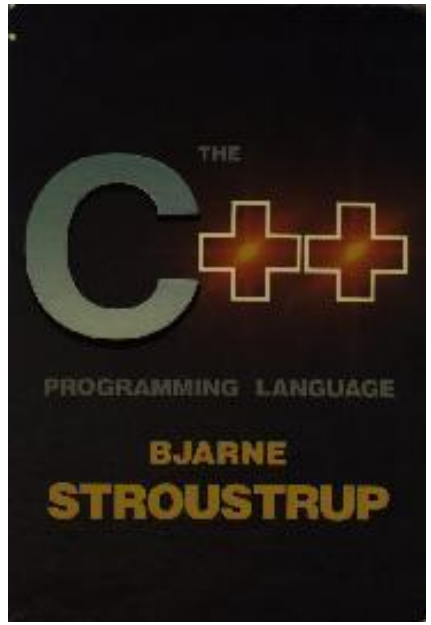
```
make   awk    grep
lex    yacc   sed
troff  eqn     S
```

C, C++, AND S



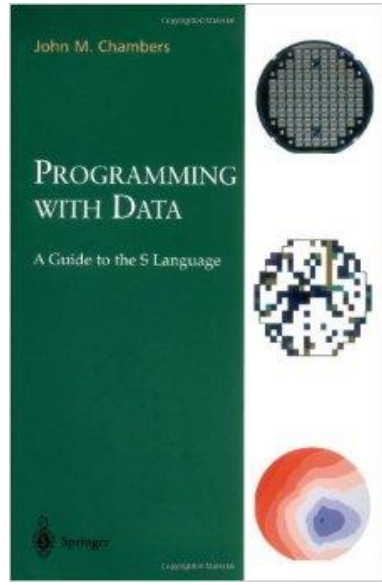
C (1969-73) Dennis Ritchie

"C is quirky, flawed, and an enormous success."



C++ (1979-83) Bjarne Stroustrup

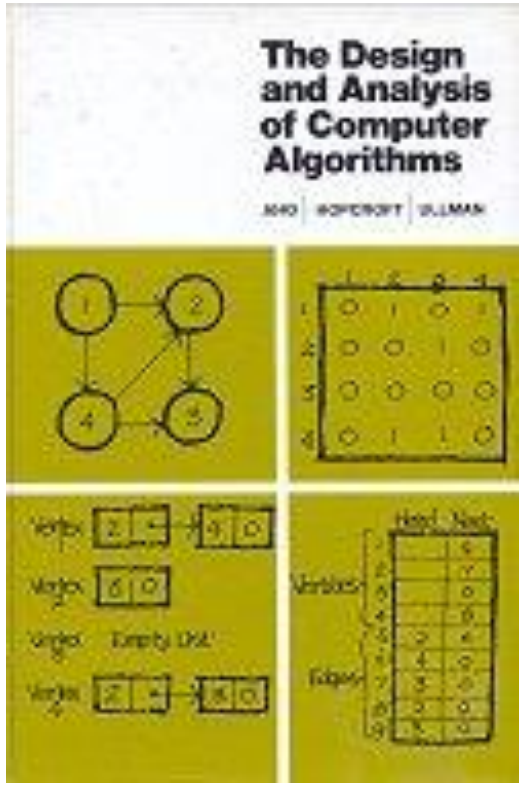
"When I joined I was basically told to "do something interesting" … "

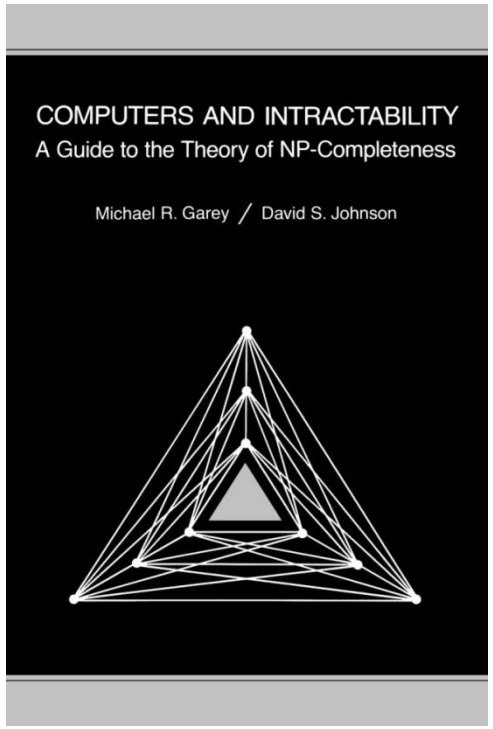


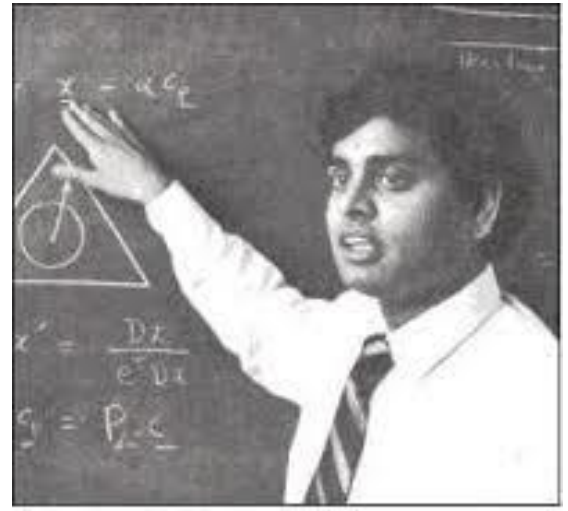
S (1976-) John Chambers

"We were concerned to support serious data analysis… "

ALGORITHMS







Karmarkar: Interior-Point Linear Programming (1984)

Highly Influential Books

Aho-Hopcroft-Ullman

Garey-Johnson

OFFSHOOTS

Distributed Operating Systems
Plan 9 (1989 -)

Functional Programming: Standard ML of New Jersey (1989 -)

Quantum Computing

Shor, Willet, Grover (1994 -)

Formal Verification: SPIN and COSPAN (1980-)

THE SECRET

"The management principles here are that you hire bright people and you introduce them to the environment, and you give them general directions as to what sort of thing is wanted, and you give them lots of freedom. Doesn't mean you always necessarily give them all the money that they want. And then you exercise selective enthusiasm that is one of Bill Baker's favorite phrases. You exercise selective enthusiasm over what they do. And if you mistakenly discourage or fail to respond to something that later on turns out to be good. If it is really a strong idea it will come back."

-- Sam Morgan, 1989

INTO THE FUTURE

- Safe and secure software
- Mixing cloud and network computation
- Analytics-driven, adaptive computing
- Data Science
- The consequences of ubiquitous bandwidth
- …

Bell Labs

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