Elements of Interaction
‘what you might call a fast-track education’

- won scholarship to Eton
  ‘...and he found it so beautiful that we found it beautiful, too’
  ‘You learn that it’s natural to spend all night thinking about a mathematical problem, rather than going to sleep.’
- (two years in the army)
- won scholarship to Cambridge: Maths Part II Class 1 1956

[thanks to Martin Berger for these quotes]
INTRODUCTION TO PROGRAMMING
FOR THE EDSAC

A supplement to
"The Preparation of Programs for
an Electronic Digital Computer"
by Wilkes, Wheeler and Gill
(Addison-Wesley Press, 1951)
Note The order $Z F$ shown as punched on the tape to go into $(\theta+r)$ is overwritten, before it is reached, by the action of the order in $(\theta+0)$. As pointed out in Section 15 (Note (i)) something must be punched on the tape to go into $(\theta+r)$; the advantage of punching $Z F$ is that if, as a result of some error on the part of the programmer, the order $Z F$ does not get overwritten, the machine will stop at once. This could happen if the subroutine were not called in correctly.

20*. Closed A subroutines

$q A p$ the cue.

the order $A p$ is the address of the storage location or itself is placed (the corresponding tape entry on $A p F$ or $A p \theta$ according as $p$ is an absolute or

Accumulator must be clear on entering

then the machine enters the subroutine after obeying
‘I regarded programming as really rather inelegant. You’d write one instruction after the other, and it was all rather arbitrary. It seemed to me that programming was not a very beautiful thing. So I resolved that I would never go near a computer in my life!’
How do we get here from there?

Cambridge: Moral Sciences Part II Class 2.1 1958

professional musician?

school teacher?

programmer?
‘And there I had a kind of double life: I taught maths to engineers, which was very routine, but I also began to get interested in AI. I was particularly interested in CPL, a programming language inspired by Christopher Strachey, which eventually led via BCPL to C which everyone knows.’

‘while there, I formed a deep interest in automata theory, programming languages, artificial intelligence and the relationship of logic with computation.’

Met Strachey, Burstall, Landin, Park, Paterson, Scott.

Married Lucy, had three children
A Flowering of Creativity, 1968–2010

Equivalences on program schemes, 1969
Proving compiler correctness in a mechanised logic, 1972
Processes; a mathematical model of computing agents, 1973
A metalanguage for interactive proof in LCF, POPL 1978
...
Bigraphs and transitions, POPL 2003
...
Bigraphical Categories. CONCUR 2009

1968–1971 University College, Swansea. SRA with Cooper
1971–1973 Stanford University. RA with McCarthy
1973–1994 (age 39-60) University of Edinburgh
1995–2001 University of Cambridge (HoD 96-99)
2001–2010 University of Cambridge (Emeritus)
Lemma 5

\[ P[I_{m}m = m'] \iff P_{3}M \implies m_{n_{2}}, M' \]
Computation *is* Interaction

Underlying idea:

**Computing is a special case of communication**

So: Don't add communication primitives to computing

Instead: Seek communication primitives which underlie computing
‘We should make clear that we aspire not only to make things work but to have a science, an academic body of knowledge.’

**WHAT IS SOFTWARE SCIENCE?**

*The study of the math, structure of complex dynamic systems.*

**WHAT IS A PROGRAM?** *(OR DIAGRAM)*

*A description of such a system.*

**WHAT IS A GOOD DESCRIPTION?** *(TEXTUAL OR DIAGRAMATIC)*

*One whose phrases or subdiagrams stand for things which play a part in the system — whose grammar or composition reflects the way in which this part is played.*