



Robin Milner

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.

Accumulator need not be clear on entering or leaving the subroutine (in B's)

20*. Closed A subroutines

q

A

p

the cue.

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

Accumulator must be clear on entering

when the machine enters the subroutine after obeying

A Great Realisation

'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?

The City University Years, 1963–68

‘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

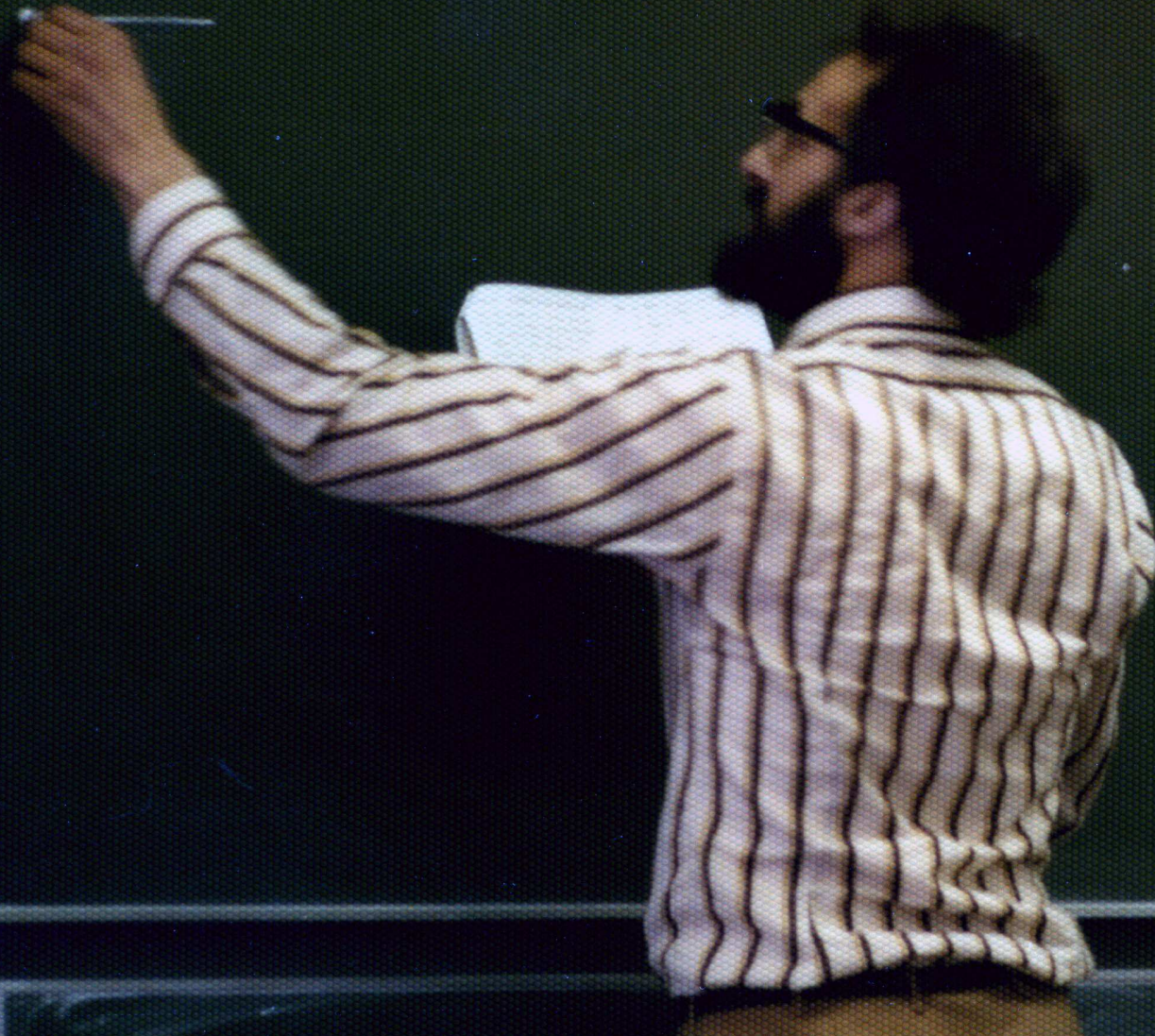
...

Bigraphical Categories. CONCUR 2009

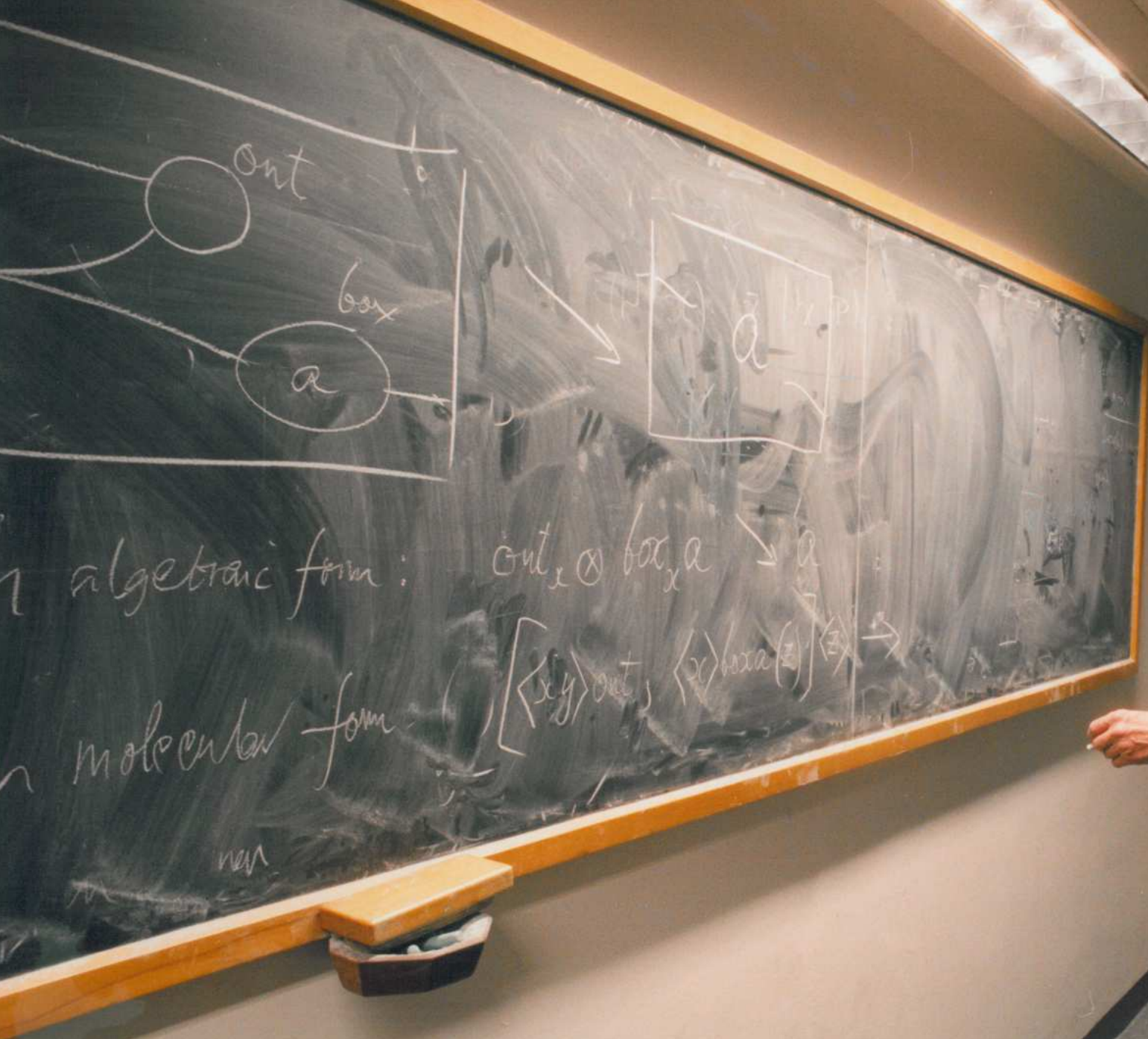
- 1968–1971 University College, Swansea. SRA with Cooper
- 1971–1973 Stanford University. RA with McCarthy
- 1973–1994 (age 39-60) University of Edinburgh
- 1995–2001 University of Cambridge (HoD 96-99)
- 2001–2010 University of Cambridge (Emeritus)

$$\rho \llbracket p \rrbracket_m = m' \quad \text{iff} \quad p, M \xrightarrow{*} m', M'$$

Lemma 5









Computation is Interaction

Underlying idea :

COMPUTING is a special case
of COMMUNICATION

So : Don't add communication
primitives to computing

Instead : Seek comm. 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.

Interaction



