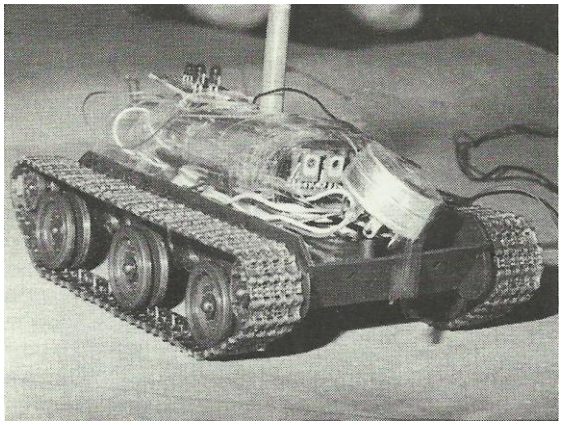
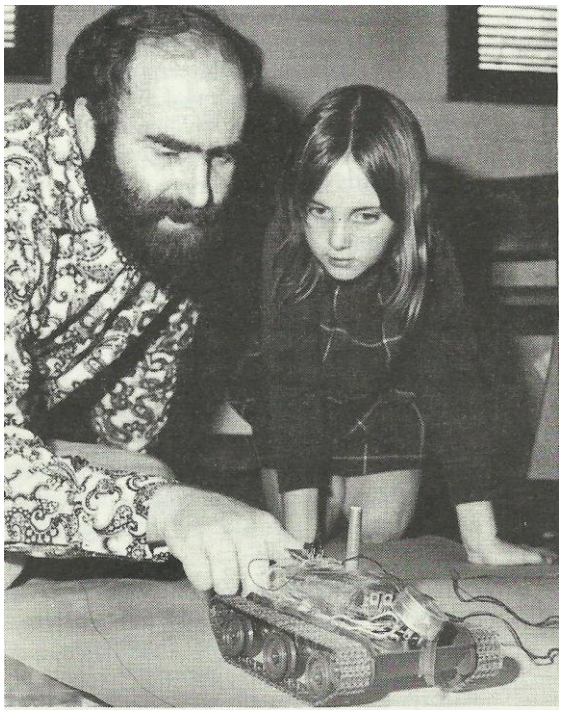


Anti-maths Syndrome Under attack



The "I was never any good at maths" syndrome is only all too familiar. Soon to spearhead an attack on its causes will be what sounds a rather fearsome foursome – *Zonky, Wham, Croc* **and** *PlusMinus . . .*

. . . .who are related to a new research project being carried out at La Trobe University, code named *Oznaki . . .*

. . .which, in turn, is seeking research students with an honours degree in mathematics, computing, theoretical physics, development psychology, and, preferably, a Dip Ed as well . . .

. . .all of which is aimed at helping to devise for the toddlers of Oztralia a whole new computer language.

All of which may not yet be crystal clear, so read on

The story starts with Dr Harvey Cohen, a senior lecturer in the department of applied mathematics who has a passion for spreading the message of maths.

In 1972 he produced for first and second year university maths students a clever booklet illustrated by University artist Rosemary Vujakovic, entitled *What G killed Ned Kelly and other problematical dragons*, in which he related abstract mathematical ideas to interesting and topical problems. This lead to the writing of a second book called "*A Dragon Hunter's Box*".

But obviously in order to instil a greater awareness of mathematical principles and to overcome that mental block which many people have about maths, one needs to start much earlier.

Computer Language

It is for this reason Dr Cohen and My Rhys Francis, a postgraduate student have developed a special computer language for children – called *Oznaki* and a series of computer controlled robots – called cybernetic toys. These have been named *Zonky, Wham, Croc* etc.

"I call them mini robots for mini mathematicians" Dr Cohen said: "And the system enables young tots, - I've had them as young as three and a half on some trials – to actually write simple computer programs."

The name of the computer language, *Oznaki*, is Polish for the word sign, and its first two letters, if you appreciate Dr Cohen's passion for playing on words, also stand for the first syllable of our fair land – the way she's sometimes pronounced.

The prototype of this system was a cybernetic language developed at the Massachusetts Institute of Technology, where Dr Cohen spent his sabbatical leave last year. There, Dr Cohen said, children directed the motion of a more cumbersome and less sophisticated robot called a Turtle by connecting it to a time shared computer.

Several prototype toys and programs have already been developed at La Trobe, and recently Dr Cohen advertised for two more research students to help work on the project. In the past few months he has also spoken about the system at mathematical and education seminars at the University of Queensland, James Cook University and at Flinders University, South Australia.

In the past the hardware needed to control the robots was large and expensive and had to be linked to a computer, a facility beyond the wildest dreams of pre-school centres and primary schools.

"But an exciting aspect is that developments in integrated circuit technology now make it possible to design controller modules which will be able to stand alone and should be available at modest cost to most Australian schools."

Although the prototype system shown in the accompanying photo still uses the University's PDP-10 computer, Dr Cohen is currently developing his "wizard's Box". This will incorporate all the computer power needed and have a simplified keyboard more suitable for children than the rather business-like teletype keyboard.

He estimated that such a control unit for *Zonky* could be manufactured for less than $200.

Exactly how do these toys teach maths? Dr Cohen explains: "Normally children first encounter algebra at high school and find such statements as "Let X equal the unknown" difficult and abstract. "Yet by using these toys children learn to manipulate symbols such as X and Y with confidence. To them, these symbols are not abstract – because the child has told the robot that X or Y stands for a string of commands.

"The method is sample and the pupil unconsciously learns basic mathematical ideas in a fun atmosphere. At his first lesson, the pupil learns to give *Zonky* simple instructions by punching out a program with minimum instruction from a teacher."

For *Zonky*, for example, the basic commands are (**F**) for forward, (**B**) for backwards, (**R**) for right and (**L**) for Left. While performing these movements it can also be ordered to honk (**H**), alight its light (**A**), sound the tune Jingle Bells (**J**) and trace its movements on a piece of paper. Further once a sequence of movements and activities has been selected, a 'program' of say **2F4J3AR** can be named **X** and be remembered by the toy and activated by pushing a special button. If the child pushes **2X** on the keyboard, *Zonky* will go through these manoeuvres twice."

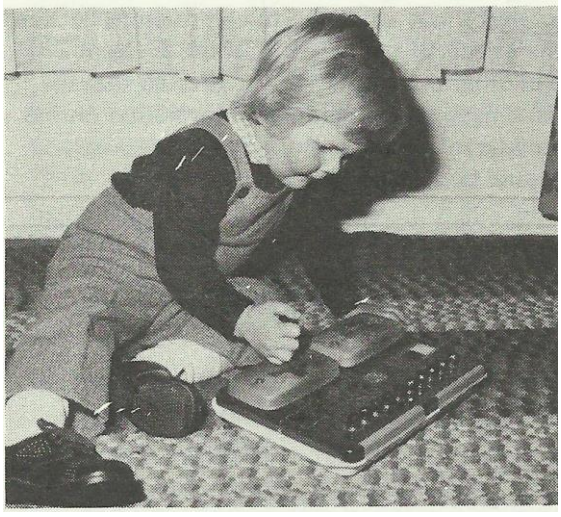
Zonky is designed to help teach maths to children from about five years and upward, as are *Wham*, an illuminated checker board and *Croc*, a crocodile, whose eyes light up when it is programmed to be stung by a mosquito. This last toy was designed with the help of Rod Caulfield, buildings branch.

For the toddler – aged two to three – Dr Cohen has devised *PlusMinus* which is a simple electronic adding and subtracting machine featuring an electronic number display and bright lights which flash on and off as the child either hits an add or subtract button.

Said Dr Cohen: "Children usually first learn to count 1, 2, 3 parrot fashion and only later learn to associate a symbol – a number – with a definite number of things. With this toy they really learn what the number symbols 1, 2, 3 up to 9 and plus and minus symbols mean."

A more advanced version of this toy using negative number buttons as well is currently being designed by Dr Cohen.

"Playing" with PlusMinus, the introductory toy.



The above proclamation of the objectives of the *Oznaki Project* was published in the La Trobe University Record, Vol 9 No 7 December 1975. In the text above there is no indication that the *Wizard Boxes* to be developed by the Project were to be microprocessor based – to be what in the 1970's were termed microcomputers. There is a significant story here – *Oznaki* was launched and funded at a critical period.

Dr Cohen was an invited participant in a DARPA-funded "loud thinking workshop" held at MIT in December 1975.. The participants in this workshop included Seymour Papert and Marvin Minsky, of MIT AI Lab, Daniel Bobrow of BBN (Bolt, Beranek and Newman of Boston), members of Herbert Simon's group from Carnegie Mellon University, Stanford AI people, and others who were exploring AI and cognition by "loud thinking" methodologies. Enroute to the Loud Thinking Workshop Dr Cohen visited the world's second computer store which had just opened at 1265 El Camino Real, Palo Alto. There he learnt of a prototype microcomputer to be manufactured by a start-up to be called Polymorphic Systems. This microcomputer – the **Poly88**- had similar architecture to the world first microcomputer – the **MITS Altair** – even having the same "s-100 bus" for card add-ons – but unlike the Altair was contained in a box with just two switches – an ON/OFF switch and a Reset Button. Integral to the **Poly-88** was an operating system in ROM, and for output a visual display module (**VDM**), which displayed 16 lines of 64 ASCII characters or one of 128 programmable graphic characters. The **VDM**, which Cohen saw operating in an **Altair** – had just the graphic capabilities – other than colour – needed for the *Oznaki Project*, which was thenceforth recast as a microcomputer based project. In fact *Oznaki* was the first education project anywhere that was microcomputer based. On his return to La Trobe after the MIT Conference Cohen directed funds awarded by the Education Research and Development Committee towards the purchase of **Poly-88** microcomputers – the first of which arrived as a kit in March 1976. As an addendum to this story, in the same store he learnt of the Poly-88, Dr Cohen saw the very two issues of the first PC magazine , *Byte*, and took these copies with him to the MIT Conference. He found at Boston that many had heard of Moore's Law – but none were aware that on the West Coast what we now see as the PC age had begun. And Dr Cohen lost the first issue of *Byte* to the eager readers at MIT.

The initial grant awarded by the ERDC appeared sufficient to employ a research assistant, and Dr Cohen thought of Radia Perlman, whose button-box logo developed in the MIT LOGO Group, had greatly inspired *Oznaki*.[1] A transpacific phone call was made to MIT to talk to Radia – to encourage her –to apply. But she was not interested. It is ironic that later on – following her PhD, Radia went on to develop the Spanning Tree Protocol that is intrinsic to the Internet, and today Radia is often referred to as the Mother of the Internet.

[1] Radia developed a "Button Box" where in lieu of the Logo command "FD 100" the young user might enter two keystrokes "F 1"; Cohen recognised that by reversing the sequence a pure form of algebra would be involved – just "2F".