FEATURE

THE HOUSE THAT CLIVE BUILT

— a tale of hard times, AI and clever telly

Clive Sinclair, the electronics innovator who gave us the ZX80 computer and the first small practical calculator, is in trouble. Not that his Sinclair Research and Metalab 'think tank' haven't a bundle of bright new ideas. They do. Problem is, there are some lemons too.

IN THE CITY OF LONDON, the financiers who make and break industry around the world, are scrutinizing Clive Sinclair again. The Sinclair empire is in trouble, reeling under shocks from several quarters. Talk is that Clive may be willing to sell his share of the business, or at least accept a less than majority shareholding.

The news is all of a piece. Around the world, the entrepreneurs who set up their businesses with nothing more than an idea and enormous amounts of energy are giving way to the grey-faced men in the pinstripes. Jobs and Wozniack are out of Apple — the new man is an IBM clone. At Atari and Commodore, accountants today muse on how to increase market share. In England, Sinclair holds on by the skin of his teeth.

Trouble in paradise? Why does Sinclair, businessman of the year, knight of the realm, need £15m? There are a few reasons: the recession, the downturn in pc business, bad judgement even. The fundamental reason is that the entrepreneur, the man with his eye on the main chance, the risk taker, will always have the dice stacked against him.

So, why would anyone want to invest in a company with trouble? Bail out an unhorsed knight? For that, there are a couple of reasons.

Firstly, he has an impressive track record of innovation. He started out selling radios and other electronic trinkets by mail order. He hit the jackpot when he produced the first small practical calculator. His Executive sold for £79 ($160) and seemed absurdly cheap. He hit upon the idea of multiplexing the display in order to save power, size and thus money.

Then he launched the ZX80, the first real computer to sell for under £100 ($200). It's difficult, now, to remember the significance of the ZX80. But for millions of people around the globe it opened up the world of computers. It only had 1K of RAM, and an absurd keyboard, but it was the first programmable device many people ever touched.

Developments quickly followed: the ZX81, then the Spectrum and finally the

ULTRA MINI TV

One of the most remarkable products to come out of Sinclair Research in the last few years has been the Flat Screen TV. It's being manufactured at the Timex plant in Dundee using a Sinclair design automatic plant. Sales are just starting to get under way in the UK.

The mini TV measures just 14 x 8.9 x 3.18 cm. According to Sinclair publicity it's 25 per cent smaller and only one-third the weight of an average paperback book. The screen measures 5 cm across, and battery power will put a picture on it for 15 hours continuously.

It took Sinclair Research £4m and six years to come up with the Flat Screen TV. Much of the time was taken up with just a few revolutionary components.

Heart of the system is the flat screen. More accurately, it's a folded cathode ray tube (CRT) and it's this that makes it possible to package the TV in a tiny box. In a conventional TV, an electron gun spurts electrons at the screen when the electrons are excited by the potential on the cathode. The beam is made to scan from left to right and up and down by varying the potential on a set of deflection plates. Modulation of the intensity of the beam creates the pattern we see on the screen.

With a folded tube however, it is neccessary to make the electron beam bend around a 90 degree corner. This causes all kinds of problems. For a start, the deflection of the beam resulting from a typical sawtooth wave applied to the deflection plates will be non-linear.

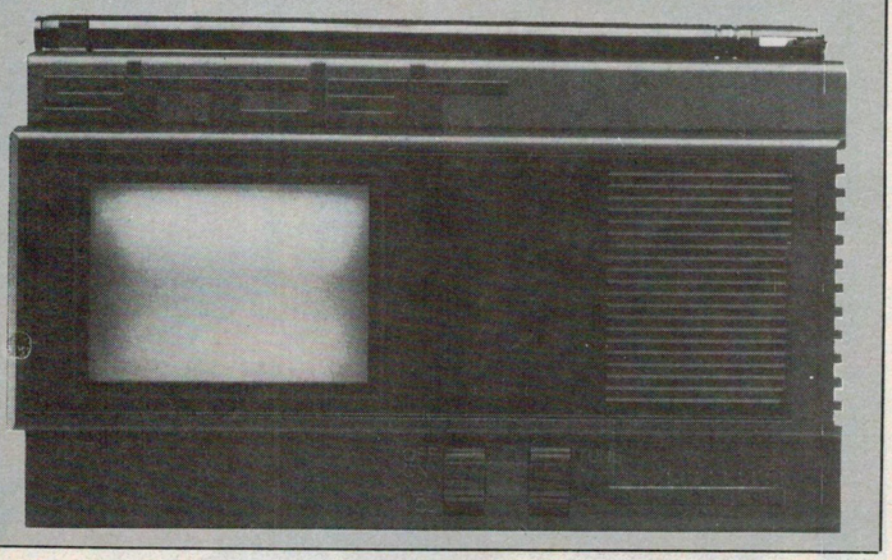
The problem was solved in co-operation with Ferranti, which developed a special integrated circuit to generate the complex waveforms necessary to scan the screen. This IC also uses digital techniques to monitor automatically the video and audio circuitry and to adjust the local broadcast standards.

According to Sinclair Research, the tube winds up with half the volume, relative to screen size, of a conventional tube. Just as importantly, it uses only one-third to one-tenth the power. However, the picture is up to three times brighter than normal. One reason for this super brightness is that one does not view the reverse of the screen, as is normally the case. In the folded CRT, the viewer sees the front of the screen, where the electrons actually strike the phosphors. This is done by fitting a clear window in the side of the tube, through which you look at the screen.

The tuner is also little short of miraculous. It measures just 31 x 23 x 11 mm. Sinclair used surface mount devices and hybrid components to achieve a power saving of 90 per cent over conventional circuits. It can configure itself for almost any standard except SECAM. So it can operate in a 525 or 625 line mode, and adjust for different audio carrier frequencies.

The biggest question, however, is: what is it good for? You obviously can't sit and watch it the way you would an ordinary TV. According to the Sinclair publicity, the way to do it is to treat it in much the same way as you would a book. It's ideal at the breakfast table, or in bed, or perhaps on the train. After using it for half an hour or so I can say that the biggest problem seems to be orienting the aerial for good reception. When the screen is as small as this one you need to get it right. Marginal ghosting makes it unwatchable.

In fact, for my money it's a bit too small, but maybe with a bit of practice one would get used to it. There are certainly advantages in being able to watch TV whenever and wherever you like. Rumour has it that Sinclair is developing a version with a similar sized package, but a screen twice as big. That should really be a winner.



QL, Sinclair's so called quantum leap in computing. All were, in some way or another, revolutionary products.

Not that he has always been successful. A low cost multimeter and a digital watch both turned out to be dead ends. The C5, his revolutionary new electric bike, looks set for the same expensive fate.

Unfortunately, the heady days are over. No computer company heavily engaged in personal computers is looking particularly rosy right now, and Sinclair is no exception. The down turn in demand for PCs has hit all manufacturers hard. It especially hit hard at a company that is also trying to recoup a multi-million dollar investment in an electric bike no one wants.

But they're an optimistic lot at Sinclair. And it would be hard not to be, doing exciting work based in some of the most picturesque countryside in Britain. Here, secreted away behind the hedgerows of rural Cambridgeshire, you can find Sinclair Research, and the so called think tank, "Metalab". And if you want to dig behind the headlines and get a feel for the strength of the company then this is the place to come.

Metalab was launched with a great deal of hullabaloo two years ago as a place where the best scientists in Britain could exploit ideas that might otherwise go abroad. The idea pushed by the publicity machine was that this would be a place for the best scientists to work with the best equipment and no financial constraints to produce whatever their hearts' desired.

In fact it was somewhat less than that. Clive Sinclair had a very precisely mapped out program for the future, and wanted brains to make it real. His plan: to develop some of the key technologies that will be needed to make Artificial Intelligence (AI) work.

Of the various projects, the closest to fruition is wafer scale technology. To understand what this involves, consider that integrated circuits are made by etching a pattern onto wafers of silicon. These wafers are typically four inches across (sometimes six inches). In conventional technology a single wafer will contain a host of individual circuits. At the end of the manufacturing process the wafer is cut up and the individual bits, each containing a single circuit, are encased in plastic to become the familiar IC we all know and love. ▶

THE C5

Sinclair claims the C5 is a completely new form of personal transport. It is certainly unique. Sometimes it's called a car, sometimes a bike; Sinclair Vehicles, the maker prefers to call it a personal electric transport.

Whatever it's called, it has one seat and three wheels, an electric motor and a set of peddles, a boot to put the shopping in, headlights, tail lights, a battery and a rather fancy looking body. The credentials are impressive. Lotus cars designed the chassis, British Aerospace designed the body. AB Automotive, which designs Jaguar dashboards, also did the instrumentation for the C5. Construction and servicing (in the UK) is by Hoover. The electromotive system is the result of over 10 years work by Sinclair.

The target market for the C5 is young people, as a safer alternative to motorized two wheelers, housewives as a shopping transport and urban commuters. The range is about 32 kilometres and running costs about equivalent to 1000 miles per gallon. Cost in the UK is about £399.

The motor is made by Polymotor, a Philips subsidiary that specializes in electric motors for the aerospace industry. It has been specially tailored for the C5 battery. The battery was developed by Oldham for the project, and is described as being a "supremely efficient" version of a lead acid battery. It only weighs 15 kg and delivers 35 Ah. It has been designed to withstand 'deep cycling' effects, ie, continual discharge followed by recharge. It takes eight hours to recharge.

The drive system is ultra simple, consisting of an epicyclic gearbox with reinforced nylon cogs. This drives one of the rear wheels. There is no regenerative breaking. When power is not supplied to the wheel the craft simply freewheels. This goes against the grain of most electric car designs, which use the breaking energy of the car to recharge the battery. However Sinclair Vehicles designers obviously thought the increase in complexity not worth the gains in battery life.

Whether the C5 is any good in a technical sense, the British public seems to be giving it the big thumbs down (it hasn't been offered for sale overseas yet). The press has been almost universally damning, describing it as unsafe and lacking in power and range. During the months since its launch Sinclair Vehicles has been steadily revising the size of this year's production run downwards. From predictions of a six figure market by 1985, it looks as though it will be lucky to reach four.

Whether there is any objective truth in the criticisms is hard to know. It's difficult to imagine it could be more unsafe than the motorbikes that massacre adolescents with such bloodstained regularity. And range: well in the city there must be a huge market of people whose daily movements do not total more than 32 km. As for speed, a little less of it might not be a bad thing. No doubt such thoughts have passed through Sir Clive's mind as well. Oh but the public is fickle.

Working on a wafer scale implies treating an entire wafer as single IC. The problem with this method in the past has always been the unreliability of the manufacturing process. For a variety of reasons manufacturing is not one hundred per cent reliable. Nothing like it. This is not a real problem in conventional technology, since all the circuits are tested on the wafer, and when it is cut up, only the good ones are used.

But it is a problem working at wafer scale. One error means the loss of the entire thing. Economics simply do not allow the creation of large areas of silicon like this. Sinclair Research has developed a mass storage device that consists of half a million identical memory cells. At power up, logic on the wafer forces a formatting routine. This routine systematically tests every location on the wafer for errors. When it finds one it steps around it. The logic circuits then ensure that no data is stored in these locations. Owing to the pattern formed during the formatting routine, the technique is called the Katz spiral. (Ivor Katz is one of the Metalab crew.)

The Katz spiral will result in a bulk storage add-on for the Sinclair QL with 500K capacity by the end of the year. Development plans call for the eventual use of 1.5 μm NMOS and finally micron size bipolar technology to produce a mass storage unit of around 7 or 8 Mbytes. According to Richard Cutting, who heads up Metalab, the device will probably sell for around £500 in the UK.

The significance of all this to AI is that Sinclair is developing techniques that will allow designers to store large numbers of circuits on a single wafer. One idea doing the rounds: it would allow them to develop a wafer consisting of perhaps 300 cells, each containing a processing unit and surrounded by some RAM. Such a design would appear to be ideal for parallel processing.

No one is quite sure yet how parallel processing would work, at least on this large a scale, but the idea is clear enough. The individual processors would each be assigned some particular task which they could do at the same time, instead of sequentially, as is required at the moment. One task identified at Sinclair for this type of technology is speech recognition.

According to Sinclair, the scenario is that one of the prime requirements for a fifth generation machine is the ability to interface naturally with the machine. Throw away keyboards and throw away rigorous logic as well. Speech recognition replaces the keyboard. To a limited extent this has already been done experimentally. Problem is that processing time is so slow it has little value. It takes so long because

the CPU has to compare each of the words in the memory with the received word and react accordingly.

Obviously, if the vocabularly is of any size this process is too slow for practical use. With parallel processing though, things could be speeded up immensely. Then you could supply each processor with only two or three words, perhaps only with one, and they could all carry out a test on their word at the same time. The result, almost instantaneous word recognition.

Metalab is also doing some work on graphics and pattern recognition that will probably use the same type of parallel processing technique. In any event, the feeling is that this is a core technology of the future, and the company is determined not to be left behind.

Another bit of the AI picture that is being put together at Metalab is something called "Natural Language". This is another problem, like speech recognition, that affects the way in which we interact with computers. The idea here is that, at present, we require a very formal, and unnatural, language to communicate with a computer. Even if computers could be taught to recognize speech, the computers of today would be incapable of understanding an input unless it was worded in very carefully constructed sentences. In fact it would be just like reading a program out aloud.

Sinclair would like to achieve a situation where the operator could instruct the computer in a far less formal manner. In fact a manner more akin to normal everyday speech. This is a natural language. It's difficult to know what this means in terms of nitty gritty programming techniques, except to say that the key concept seems to be that a program must be seen as a sequence of logical concepts. The task then is to teach the computer to recognize when one of these concepts is invoked, and how it is strung together with others.

Sinclair's strategy in the market place is to try and be pre-eminent in a few specialist areas of artificial intelligence. If past experience is any guide they will be the cheap areas, the areas where the common man first gets acquainted with the next generation of computers. How long to wait? According to Richard Cutting, by the end of the decade there will be significant breakthroughs. He predicts usable voice recognition by 1990 at least. How will it be packaged? What about a talking home doctor, as in "Hey, RSD2 I feel lousy, prescribe a pill". Another idea from Cutting: the home lawyer. He, or it, would be a walking compendium of advice on everything you wanted to know about your rights and obligations, but were too broke to pay for.

Whether or not ideas such as these are sufficient to pull Sinclair out of the sticky place into which he has fallen is hard to say. In spite of everything demand for the QL still grows apace, and a string of new devices seem to be assured at least for the next decade. But there have been an awful lot of lemons in the past. Maybe less in the future?

Stop Press:
London, 24 June — Clive Sinclair has left the board of Sinclair Research. The new chairman is Robert Maxwell. Maxwell, with heavy publishing interests, has bailed the company out in return for the chairman's seat. Sinclair retains rights to the C5 bike, although production has been halted. ●