ARCHITECTURE

In everyday use, the word *architecture* refers not only to the aesthetics and physical form of a building, but its internal function as well, though it may be the former that immediately springs to mind. In computer terminology, the term refers solely to the *internal* structure and functioning of the machine. The architecture of a microprocessor is primarily defined by the nature of its internal registers and the way in which they can interact with each other, though it can also refer to the way in which that chip is constructed from layers of semiconductor materials. Furthermore, when applied to a microcomputer as a whole, the architecture is a description of the chips contained in that system, and the way in which the available memory space has been allocated to different processing functions. From the user's point of view, those machines with a common architecture are also capable of extensive compatibility in terms of both their hardware and software.

ARRAY

Many computer terms have quite sensible origins in plain English, and *array* is no exception. We might talk about an array of lights on a dashboard, or something being 'in disarray'. An array is a collection of terms with something in common that are arranged in some orderly fashion, usually in the form of a grid with rows and columns. In computing we are mostly dealing with data, and an array of data is the computer equivalent of a table. If it is a two–dimensional table then that simply means that it takes two variables or indexes to specify the piece of data that you want. But computers are equally happy with a one–dimensional array (sometimes called a 'dimension' because in BASIC it is defined by a DIMension statement) which is just like an ordinary list of values.

Non-mathematicians have difficulty grasping the idea of an array of items extended to more than three dimensions, but while some home computers stop at two, others would allow collections of data that needed as many as 13 specifications to uniquely define a single entry.

The word *array* is sometimes found in computer hardware specifications, too. Some years ago a great deal of research was being done into the Distributed Array Processor, a device that featured a collection of conventional processors connected into one large grid, so that far more data could be processed simultaneously.

ARTIFICIAL INTELLIGENCE

To many people the whole concept of an intelligent machine is a contradiction in terms. Surely, they feel, computers cannot think, they merely process information that has been fed to them by a human being, and according to a processing procedure (the program) determined by a human being.

However, programs with some learning capacity have been around for some time now, including chess programs that after playing a vast number of games will always beat the programmer. Other programs are self-modifying, to the point that if you were to list the code after several runs, it might have become unrecognisable. Whether such tricks constitute intelligence is hotly debated but there is certainly a large academic community devoted to research into the field, now generally known as AI.

The accepted theoretical test for an intelligent machine was proposed by the British mathematician Alan Turing in the 1950s. A man is placed in a room that features two teletype machines — one communicating with a second man, the other with the machine undergoing the test. If, having put whatever questions he liked, of whatever kind, the first man was unable consistently to state which teletype communicated with the second man, and which with the computer, then there would be no grounds for stating that the machine was not intelligent.

ALAN TURING (1912-1954)

Most of the fruits of research into AI have been very limited in application, but have included speech and visual pattern recognition, as well as *expert systems*. The latter attempt to model a particular field of expert knowledge, such as diagnosing respiratory diseases or predicting the location of oilfields.

Within AI there are two distinct approaches. The 'top-down' approach attempts to imitate what we would call intelligent behaviour (such as the handling of language) on standard computers. The 'bottom-up' camp, however, argue that we will never be able to emulate the human brain's function using this type of hardware. The latter are trying to develop the electronic equivalent of the neuron (from which our brains are constructed). These devices, when connected together to form a large network, show a tendency to learn from the environment in which they are situated, in a fashion not dissimilar to the way in which we learn.