

# Grace Hopper

Grace Hopper was largely responsible for the development of high level languages, and identifying the first bug!



COURTESY OF SPERRY LTD

Commander Aiken would often come into the workshop and demand: 'Why aren't you making numbers, Hopper?' After one troublesome breakdown of the computer, when the fault was eventually found to be a moth that had flown in through the open windows and been hammered to death in a relay switch, Grace tersely replied: 'We are debugging the machine!' This first recorded 'bug' was carefully removed from the relay with a pair of tweezers and is preserved at the Naval Museum in Virginia in the log book of the Harvard Mark II. It is glued beside the entry for 15.45 on 9 September 1945.

In the same year another computer, ENIAC (see page 46), was being built by two engineers, John Mauchly and Presper Eckert. After the war, the two men set up their own business to manufacture a commercial version of the machine, and invited Grace to join their team. Her main contribution to the development of this computer, called UNIVAC (UNIVERSAL ACcounting machine), was in creating software for it. And it was during her attempts to construct programs for business use on UNIVAC that Grace first sought out ways to short-cut the need for rewriting certain subroutines that recurred over and over again. By employing what was then considered the remarkable idea that a computer could write its *own* programs, Grace created the first programming language, together with the compiler needed to translate it into machine code. This was given the name 'A-O'. When this compiler was first presented it caused incredulity amongst computer professionals who thought their machines could only perform arithmetic or manipulate symbols. They were amazed to see a computer jump to a subroutine in its library store on encountering an imperative verb at the beginning of what was almost a normal English sentence.

In May 1959, Captain Hopper was invited by the Pentagon to join a working committee that was to attempt to create and standardise a single language for computers in commercial use. In less than a year the committee produced the first version of the Common Business Oriented Language (COBOL). Grace contributed a great deal to the committee's attempt to distil the best aspects of each of the existing languages and thus create a language acceptable to the industry through its sheer quality. It is a measure of the success of the committee's work that COBOL is still one of the most widely used languages today.

## COBOL

COBOL was one of the first programming languages to be written with the intention of making it easily accessible to non-mathematicians. The language encourages the use of generalised procedures written in a narrative style of English, rather than coded routines peculiar to a particular problem.

A program in COBOL is built out of four units. The name of the program, its author, and other reference information comprise the Identification division. Although COBOL programs are intended to be portable (capable of being used on many machines), any details describing the particular computer for which the program was originally written are noted in the Environment division. Since the same data may be used in many parts of the same program, COBOL has a separate Data division. Finally, the procedures that are to operate on the data are listed in the Procedure division.

Computer science is generally regarded as a strictly male preserve. But, increasingly, women are taking their place alongside men, as equals, in the development and application of computers. A woman pioneer of computing was Grace Hopper, whose most significant contributions were in the field of software — she created the first compiler and helped invent the language COBOL. But she was also the first person to isolate a 'bug' in a computer, and successfully 'de-bug' it.

After doing postgraduate work at Yale, Grace Hopper returned to her original university, Vassar, as a member of the mathematics faculty. Here she remained until the age of 39, when she was called up for war service with the Naval Ordinance Computation Project. In 1945, she was ordered to go to Harvard University to assist a physicist, Howard Aiken, in the building of a computer. Aiken had approached IBM in 1937 with the idea of constructing a computer using adapted tabulating equipment. His first computer, although mechanical in design, was successful enough to encourage IBM to invest in an improved model that would use electromechanical relays. The machine that was subsequently developed was known as the Harvard Mark II.

In these early days, machines had to be programmed by rewiring them for each new task. Thus, in the hot summer of 1945, Grace Hopper found herself literally enmeshed in the wiring of the computer. Ballistic computing facilities were urgently needed for the war effort, and