

A human computer

As a little light relief from the welter of information on machines in this issue of CERN COURIER, and to restore man's ego in the face of electronics, it is a pleasure to tell the story of a human computer. He is Mr. William Klein who has been a member of the Theory Division at CERN since November 1958.

William Klein has been recognized as a calculating prodigy since his early school-days and has entertained audiences for many years with his exhibitions of lightning speed in the manipulation of numbers. Multiplication of any five figure numbers takes a few seconds; even the calculation

$$1388978361 \times 5645418496 = \\ 7841364129733165056$$

he did completely in his head in sixty four seconds. (This involves twenty five multiplications each of two two-digit numbers and twenty four additions of four-digit numbers — forty nine operations in all.) Division, addition, subtraction, powers, roots, logarithms and factors come with equal facility.

Behind this extraordinary ability lies a phenomenal memory for numbers and phenomenal speed in mental arithmetic. If he is called upon to analyse the route by which he arrived at his almost immediate result, he has rarely in fact followed the standard sequence of calculations which a computer would follow, but has taken a series of short cuts. His basic armory includes, for example, knowing by heart the multiplication tables up to 100×100 , all squares up to 1000×1000 , logarithms of all numbers less than 150 (to five decimal places) and all prime numbers less than 10 000, in addition to an enormous number of odd facts about numbers which can slice a difficult problem in half.

A little story will illustrate this. While at the British Business Exhibition in 1953, he visited the Friden stand and asked for a demonstration of their new 'root' machine. The operator offered 'Lets try all the fives' and fed in 555555555555. Before he could press the button for the result, Klein said '745356 should be about right'. The operator nearly collapsed when 745355.9924

came out. William Klein had obviously not been through the laborious process of working out the square root conventionally but had remembered that 0.5555... is the decimal fraction for $\frac{5}{9}$ for which the square root is $\frac{1}{3}$ root 5. Knowing root 5 and dividing by 3 gives the answer very simply.

He can also give the day of the week corresponding to any date in history, and knows the date of birth and death of some hundred composers. One of his favourite feats of memory is to call on an audience for a number going up to say 24 digits and to recite them half an hour later, forwards or backwards, having done some dozens of intricate calculations in the meantime.

Up to the present time, no machine has been programmed to exhibit the sort of intellectual skill that William Klein brings to computation.



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William Klein in action at a special 'lecture' arranged for vacation students at CERN on 22 August.