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The Development of the Slide Rule

A Research Paper

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By
Robert BRAY

The Development of The Slide Rule

I. John Napier

1. Logarithms
2. Napier's Bones

II. Edmund Gunter.

1. Logarithmic scales
2. Early computations

III. William Oughtred

IV. Other contributors

1. Robert Blissaker
2. Amédée Mannheim
3. Peter M. Hoget
4. William Cox

The Development of The Slide Rule

Although the slide rule has been used extensively in business, industry, and science only in recent years, it is not a modern invention. Since the slide rule is a mechanical device whereby the logarithms of numbers may be manipulated, the slide rule of today was made possible over three and one-half centuries ago by John Napier, Baron of Merchiston in Scotland. In 1594, Napier privately communicated his results to Tycho Brahe, a Danish astronomer, but did not publicly announce his system of logarithms until 1614. Napier set forth his purpose with these words:

"Seeing there is nothing (right well beloved Students of Mathematics) that is so troublesome to mathematical practice, nor doth more molest and hinder calculators, than the multiplications, divisions, square and cubical extractions of great numbers, which besides the tedious expensive consumption of time are for the most part subject to many slippery errors, I began therefore to consider in my mind by what certain and ready art I might remove those hindrances." 1

In 1620 Edmund Gunter, Professor of Astronomy at Gresham College, in London constructed a logarithmic scale, consisting of anti-logarithm markings whose distances were proportional to the logarithms of the numbers indicated, and mechanically performed multiplications and divisions by adding and subtracting segments of this scale with the aid of a pair of dividers.

¹H.W. Leach, P.E. & George C. Beakley, P.E. Ph.D. The Slide Rule and Technical Problem Solving, (New York: The Macmillan Company, 1964), p.47.

By developing sliding logarithmic scales, Gunter had modified and further developed an earlier multiplying and dividing device of Napier's, known as Napier's Bones or Napier's rods, developed in 1617 by John Napier.¹

As early as 1621 William Oughtred constructed and used two of these Gunter's scales, sliding by each other, to do away with the need for dividers in the operations of multiplication and division. The lines were used in both the straight and circular forms. Oughtred's two scales were the forerunners of the C and D scales, the basic scales on practically all slide rules from that time on.

The first known slide rule in which the slide worked between parts of a fixed stock was made by Robert Bissaker in 1654. Others were due to the enterprise of Seth Partridge (1657), Henry Coggeshall (1677)--a slide in a two-foot folding rule adapted to timber measure--and Thomas Everard (1683) for gauging purposes. The usefulness of the slide rule for rapid calculation became increasingly recognized especially in England, during the 18th century, and the instrument was made in considerable numbers with slight modifications.

Improvements in the direction of increased accuracy in graduation were initiated by Matthew Boulton and James

¹Howard Eves, An Introduction To The History Of Mathematics, (New York: Holt, Rinehart, & Winston, 1964), pp. 249, 250, 267-268.

Watt from about 1779 in connection with calculations in the design of steam engines at their works at Soho, Birmingham.

In 1859 Amédée Mannheim, a French artillery officer, invented what may be considered the first of the modern slide rules. This rule had scales on one face only and although it was quite simple is basically of a type still made and designated by his name. The arrangement of the scales in the Mannheim rule is basically the same still used in the great majority of rules made in the 20th century. This rule, which also brought into general use a cursor, or indicator, was much used in France, and after about 1880 was imported in large numbers into other countries. Up to this period the rule had been constructed usually of boxwood and occasionally of brass or ivory, but a great improvement was introduced in 1886 by Dennert & Pape in Germany by dividing the scales on white Celluloid, which gave a much greater distinctness in reading. This material was later almost universally adopted, and the slide rule attained a great degree of perfection.

In 1815 Peter M. Roget invented his "log-log" slide rule for performing the involution and evolution of numbers. The fixed scale, instead of being divided logarithmically, is divided into lengths which are proportional to the logarithm of the logarithm of the numbers indicated on the scale, and the C and D scales are still divided logarithmically.

Before 1890 slide rules were made only in England, France, and Germany, but at that time an invention by William Cox led to the manufacture of rules in the United States. This invention introduced a revolutionary construction providing for scales on both the front and back of the slide rule. An indicator with glass on both sides made it possible to refer to all the scales on both sides of the rule simultaneously.

Many refinements in both scale arrangements and mechanical constructions have been made since that time. The decade from 1940 to 1950 saw further developments of slide rules on both faces. Most important of these improvements was the arrangements of scales, both trigonometric and log-log, so that they operate together and at the same time maintain a consistent relationship to the basic C and D scales. This arrangement gave added speed and flexibility to the solving of many problems, simple and complex alike, since it produced solutions by continuous operation, without the need of intermediate readings.¹

¹"Slide Rule," Encyclopedia Britannica, William Benton(pub), Vol. XX, 1961 printing, pp. 796-797.

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