T
HIS YEAR MARKS THE 400TH ANNIVERSARY OF THE INVENTION OF LOGARITHMS by John Napier. For most of that time—indeed, until 1976, when the TI-30 scientific calculator came out at $24.95—students, engineers, physicists, and mathematicians throughout the world relied on Napier's invention by using a slide rule.

Whether you were solving trig problems in high school or helping to hurl astronauts to the moon, the slide rule was your companion. In the early 1970s

CALCULATORS BEFORE THE CPU
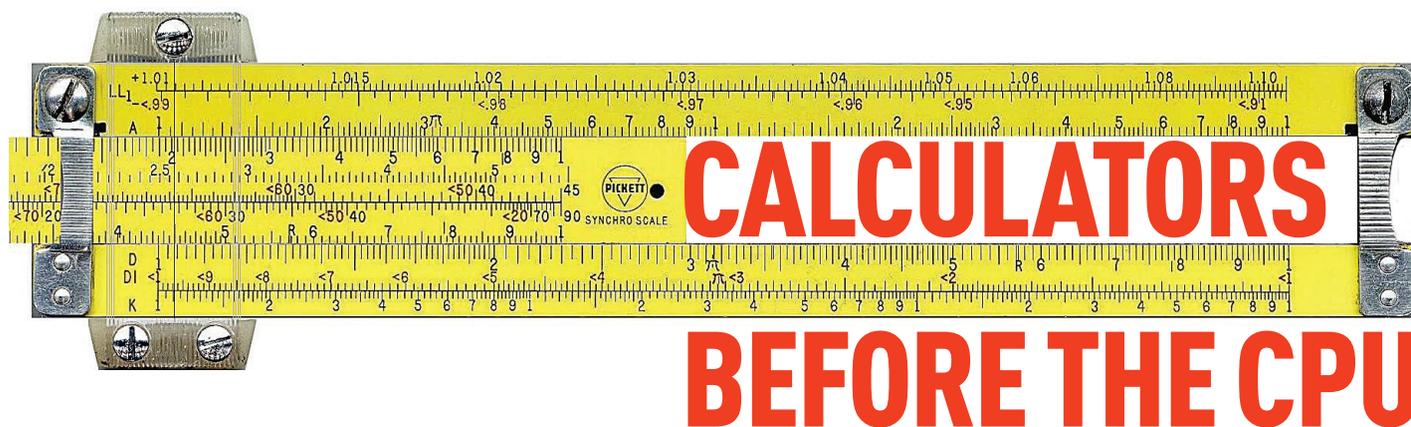
manufacturers in the United States, Japan, and Europe were selling a total of more than a million slide rules a year.

Mathematicians in Europe immediately began to study the tables and embrace the theories that Napier published in 1614. By 1620, Edmund Gunter, professor of astronomy in Gresham College, London, designed a logarithmic "line of numbers." Distances along the line from 1 through 10 were not proportional to the numbers on it, but to the logarithms of those numbers. He engraved it on a stick of wood.

Using a compass, one could add or subtract distances on the scale to find the products or quotients of the numbers.

William Oughtred, an English mathematician and Anglican priest, in 1622 placed two separate Gunter's rules together, side by side, and eliminated the compass with two "sliding rules." The slide rule was born. Oughtred also created "Circles of Proportions," the archetype of the circular slide rule.

Isaac Newton in 1675 described a method for computing cubic equations using three adjacent scales with an overlying hairline. This first rudimentary cursor would not be incorporated into slide rules for another hundred years.

The first technical slide rule was the Soho rule, made of boxwood, defined by James Watt and his associate, John Southern, in the 1790s. The T-shaped slide was captured in the routed well of the stock. Versions with two, three, and four sides were developed to hold scales in reference to each other. Not having a cursor was a big disadvantage.

A key contributor to the standardization of the slide rule was Victor Mayer Mannheim, a French student and later an artillery officer. In 1850, he defined a scale set and by 1890 had made a functional cursor. The "Mannheim Type" remained a template for slide rule design until the end of the slide rule era.

Slide rules were almost unknown in the United States before 1880. It was in 1844 that Aaron Palmer's Computing Scale, an 8-inch diameter circular slide

rule, appeared in Boston, followed by a pocket version. John E. Fuller bought Palmer's copyright in 1846 and adapted the original designs. These instruments were unknown outside of Massachusetts and New York, however.

Wider interest in the slide rule was awakened about 1881, when Edwin Thacher, a bridge engineer, patented a cylindrical slide rule, and Robert Riddell published his book, *The Slide Rule Simplified*. When the Mannheim slide rule migrated to the United States in 1890, William Cox started promoting it in *Engineering News*. He subsequently designed and in 1891 patented (U.S. 460,930) the first duplex engineer's slide rule, which had a wrap-around cursor.

In 1900, only about half of the engineering schools in the United States included the use of the slide rule in their classes. By 1970 every math and engineering student had a slide rule, and by 1980 "slipsticks" were replaced by calculators and personal computers.

But nostalgia will outlive technology. The slide rule still enjoys a continued life as past users, who remember the warmth of celluloid and wood, and the simplicity of calculating with three significant figures, become collectors, and educators introduce the ultimate green calculator to today's students. **ME**

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