

## Comment by the Editor

### *FROM DIGITS TO CENTENNIALS*

In 1946 Iowa celebrates its first hundred years as a State. What is the magic of a century that we note its passing? Moreover, how did man discover that with nine digits and a zero he could represent all possible numbers from one to quadrillions and beyond.

It all started with the fingers, though the toes were sometimes added; so the fact that in English the same word may be used for fingers and toes and for the first nine numbers is no accident. The complete score or tally based on human digits was twenty, whence came the quaint "three score and ten" as the expected span of human life. The Mayas had an elaborate system of numbers based on twenty.

If the fingers alone were used as counters, the unit was ten and from that ten came the science of arithmetic. Fingers came to be represented by lines. The Greeks and Romans used upright lines, I, II, III. The hand, fingers together and thumb out, suggested the V. The scholars of India used horizontal lines, —, =, ≡. Hurriedly written, perhaps in sand, these finally evolved as

1, 2, and 3. The march of the numbers had begun. As early as the third century, A. D., and perhaps before that, the Hindu scholars were using nine digits. Later these were introduced into Europe by the Arabs and we call them Arabic.

Mathematicians in various countries came to think in multiples of ten. Ten tens were a hundred, ten hundreds were a thousand. These were all very well as ideas, but they were difficult to add and subtract. It is easy to write MDCCCXLVI or MCMXLVI but not so easy to subtract one from the other and discover that Iowa is C years old.

The magic key to the new arithmetic was the zero and its use in the formation of a system of numbers in which the digits had place value. Seven is said to be the lucky number, but this should be 10. One might speculate that some wise man, having counted his fingers up to nine may have said in his own language, "once around", and put down a one and a circle. That explanation is, of course, too obvious. No one knows exactly how or when the combination of digits and zeros with place values came into use.

Ancient merchants used counting devices in which small stones, *calculi*, were used in the various columns to represent the ones, tens, hundreds, etc. Today we still "calculate". It would have

been easy to represent the pebbles by digits, but what to do in case there were, for example, seven thousands and two tens but no hundreds and no ones. The Hindus, it seems, used a dot to represent an empty column. Somehow along the path of history, perhaps from the dot, perhaps from the Greek  $\Delta$ , representing ten, the zero emerged. The Hindu word for void was *sunya*. The Arabs made it *as-sifr* or *sifr*. Through the Greek and Italian this came to be the English "zero". Through the Spanish and Old French it came to be "cipher".

The zero came into use about a thousand years before the Declaration of Independence. With its aid any number could be expressed by a simple row of characters. And so, instead of writing MDCCCXLVI, as the Romans did, we now write 1846; for MCMXLVI we write 1946. A one followed by two ciphers means one hundred, no tens, and no ones. It looks easy, but it took mankind a long time to work out the transition from digits to centennials.

RUTH A. GALLAHER