

sent article to inquire into the origin of the symbols employed in the modern arithmetic. These symbols may be divided into three groups—symbols of number, symbols of operation, and symbols of relation. Only the first is here presented.

#### SYMBOLS OF NUMBER.

The Arabic notation traces back its lineage to India. The designation Arabic, as a descriptive term, is a misnomer. The Arabs never claimed the honour of the invention. Europeans received their knowledge of these numerals from the Arabs and too hastily concluded that the latter people must have been the inventors. The Arabs themselves, however, acknowledged that they were indebted for them to India. In this verdict investigators concur with entire unanimity. An old system of numerals is known to have been in use in India in the early part of the third century, B.C. The origin of these numerals is obscure but their forms are preserved on inscriptions of that date. The forms of the later Indian numerals, to which the modern system directly traces its source, are clearly derived from the earlier system. The earliest known example of a date written in the modern system, with place-value, and the zero, belongs to A. D. 738. There is, however, some evidence tending to prove that it was in use, alongside the old system, two centuries before that time. There is no proof as yet that the completed modern system was used before the sixth century, A. D.

Thus much, then, in the genealogy of the nine digits is undisputed: They come to us from India and trace their forms directly to the later, and ultimately to the earlier Indian system. To what then do these characters owe their present *form*? Were they arbitrary signs called into

existence for this very purpose or were they borrowed from some other art or science where they had previously served a different purpose, and *adapted* to their present use? To this question various answers have been given. Some have seen in them the pictures of the different combinations of the fingers of the two hands in the act of symbolizing the successive numbers which the digits represent. To justify this theory they point to the symbol for *one* which in all systems not purely alphabetic seems a clear imitation of the single outstretched finger. And, indeed, six or eight, or any other number of fingers selected from the two hands may be so arranged as to throw a shadow not wholly unlike these digits respectively. Another theory was held by Gatterer. He imagined that he had found an alphabet in Egyptian manuscripts, nine of whose letters were the nine digits now in use. Another theory supposes that the forms of the nine digits were built up, as it were, out of angles which afterwards lost their corners and became cursive by use. This theory was suggested by the proficiency of the early mathematicians in geometry, which deals largely with angles. And since the science of geometry is older than that of arithmetic, it is not impossible that angles should have been employed for the representation of numbers. A fourth theory seeks to construct the respective digits out of as many horizontal and perpendicular strokes as there are units in these digits. This was undoubtedly suggested by the convenient and universal use of the straight line for keeping tally.

All the above theories, however, seem far-fetched and improbable. For their proof they draw very freely upon the imagination. They depend upon a quasi theory of evolution whose links are largely missing. They are here reproduced because