CHAPTER 25

INDIAN NUMERALS AND CALCULATION IN THE ISLAMIC WORLD

As we saw in the previous chapter, it was indeed the Indians who invented zero and the place-value system, as well as the very foundations of written calculation as we know it today.

These highly significant inventions date back at least as far as the fifth century CE.

However, it was not until five centuries later that the nine basic numerals appeared in Christian Europe.

Another two or three centuries elapsed before zero was first used in Europe, along with the afore-mentioned methods of calculation, and it was later still that these revolutionary new ideas were propagated and fully accepted in the Western world.

Thus the Indian inventions were not transmitted directly to Europe: Arab-Muslim scholars (amongst their numerous fundamental roles) played an essential part as vehicles of Indian science, acting as "intermediaries" between the two worlds.*

Therefore, before we proceed with our history, it is worth knowing a little about the Arabs, in terms of their culture, their way of thinking, their own science and their fundamental contributions to the evolution of science the world over. This will give the reader a clearer idea of the conditions under which this transmission of ideas took place, which led to the internationalisation of Indian science and methods of calculation.

THE SCIENTIFIC CONTRIBUTIONS OF ARAB-ISLAMIC CIVILISATION

In the century following the death of the prophet Mohammed the Islamicised Arabs built up an enormous empire through their conquests. At the beginning of the eighth century CE, the Empire stretched from the Pyrenees to the borders of China, and included Spain, southern Italy, Sicily, North Africa, Tripolitania, Egypt, Palestine, Syria, part of Asia Minor and Caucasia, Mesopotamia, Persia, Afghanistan and the Indus Valley.



F1G. 25.1. Detail of a page from Al bahir fi 'ilm al hisab (The Lucid Book of Arithmetic) by As Samaw'al ibn Yahya al-Maghribi (died c. 1180 in Maragha), a Jewish mathematician, doctor and philosopher from the Maghreb, who converted to Islam [Istanbul, Aya Sofia Library, Ms. ar. 2,718. See Rashed and Ahmed 1972]. This document, which uses "Hindi" numerals to reproduce what is known as "Pascal's triangle", shows that Muslim mathematicians knew about the binomial expansion (a + b)m, where "m" is a positive integer, as early as the tenth century. The author admits that this triangle is not his, and attributes it to al-Karaji, who lived near the end of the tenth century [Anbouba; Rashed in DSB].

^{*} Words preceded by an asterisk have entries in the Dictionary (pp. 445-510).