

# Mohammed Karaji

[al-] Karaji, Mohammed ibn al-Hasan al-Hasib (early 10<sup>th</sup> century AD). The advanced knowledge of the Persians concerning groundwater is demonstrated by a recently discovered book by Mohammed Karaji titled: *The Extraction of Hidden Waters*. This book reveals a profound and exacting technical understanding of groundwater theory and is the oldest known text on the subject. Karaji's knowledge of groundwater, which surpassed that of western scholars 7 centuries later, is in general agreement with modern understanding of the subject. For example, Karaji was familiar with the general concepts of the hydrological cycle. While he never featured the whole cycle as we know it, he records in different passages of his book each individual phase.

Karaji spent most of his life in Bagdad, working mainly as a mathematician. He wrote several books on algebra and geometry which were translated into German during the 19<sup>th</sup> century. These translations introduced Karaji to western scholars where he is now counted with the classical Arabic mathematicians. At an advanced age, Karaji returned to the central highlands of his native Persia. As a means of earning his subsistence, he published *Extraction*.

Karaji and other Persian scholars were familiar with the basic hydrologic, geologic, and engineering principles associated with groundwater. Karaji himself exhibited extensive skills and expertise regarding: (1) the classification of soils, (2) the search for fresh water, and (3) the different types and hydraulic characteristics of aquifers. He pioneered work on the use of plant growth as an indicator of groundwater aquifers, and invented ingenious devices employed in surveying and tunneling. Much of the Karaji's book deals with the techniques of exploring for groundwater, mainly how to dig wells and qanats. The methods he describes are still used in many parts of the Middle East and Asia.

*References:* Pazwash, Hormoz and Gus Mavrigian, 1980, "A Historical Jewelpiece-Discovery of the Millennium Hydrological Works of Karaji," *Water Resources Bulletin*, December, pp. 1094-1096; Nadji, Mehdi and Rudolf Voight, 1972, "'Exploration for Hidden Water' by M. Karaji-Oldest Textbook on Hydrology?" *Groundwater*, September-October, pp. 43-46.