Dagan Receives 2005 Robert E. Horton Medal

PAGE 75

Gedeon Dagan was awarded the Robert E. Horton Medal at the 2005 Fall Meeting Honors Ceremony, which was held on 7 December, in San Francisco, Calif. The medal is given for outstanding contributions to hydrology.

Citation

I am proud to introduce Gedeon Dagan, Emeritus Professor at the Tel Aviv University [Israel], as the recipient of the 2005 AGU Robert E. Horton Medal. Gedeon's contributions redefined the science and the practice of subsurface hydrology in a period spanning the past three decades, having been a major player in, if not the originator of, some of the most significant breakthroughs in this field. As a result of his work in particular, the entire discipline experienced a major transformation toward a more solidly theoretical Earth science.

Gedeon Dagan has contributed fundamental advances to stochastic modeling of a broad range of natural phenomena related to subsurface hydrology. On an occasion like this, it is impossible to do full justice to the impact of his work; therefore I will merely enumerate some of the areas of his more important contributions:

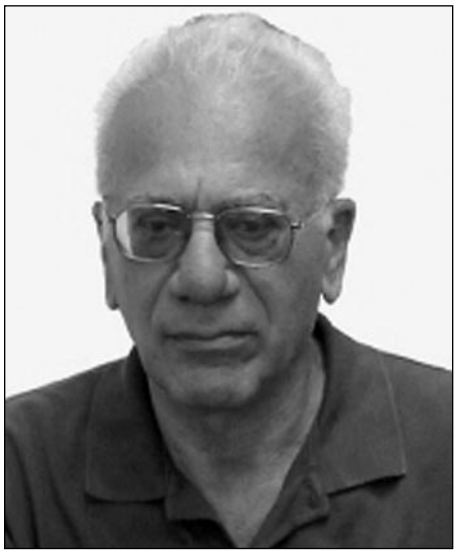
Fig. 1.

The statistical characterization of aquifers and soil properties, including the description and identification of the relevant aquifer features ruling flow and contaminant transport in the subsurface; the prediction of spreading of solutes in heterogeneous aquifers, where his Lagrangian model has become a classic tool and a reference to all the other theoretical formulations developed since its appearance; effective properties of subsurface systems, with Gedeon's classic results on the effective conductivity of heterogeneous media; travel time analysis of transport, which was given a strong scientific foundation by Gedeon in the early 1990s, shedding new light in the way transport processes were modeled at that time; the general idea of effective spreading, where the interplay between the pollutant and the heterogeneity length scales plays a crucial role in the transport dynamics; nonuniform flow toward wells in heterogeneous formations, which is an extremely complex and still quite unexplored topic; and water and contaminant dynamics in highly heterogeneous porous formations, going beyond the linear theories of transport and moving into the fascinating world of nonlinear, highly complex systems.

Breadth and depth are the main features of Gedeon's work, jointly with rigorous methods, the relevance of the issues addressed, and the cultural bridges among different disciplines. The vastness of Gedeon's knowledge and of his scholarly pursuits is demonstrated by his extraordinary publication record. It pleases him very much to be included, and we much admire his inclusion in the International Scientific Institute (ISI) Highly Cited Researchers short list, indeed a major achievement among the many recognitions he has received, among which the Stockholm Water Prize has a unique place.

Gedeon's enthusiasm and energy make him an extremely important resource to students and scientists who have benefited, and continue to benefit, from his activity. The many students and colleagues who had the opportunity to meet and work with Gedeon recognize the most distinctive features of his character, like his brilliant mind, his creativity, his generosity in sharing ideas and knowledge with younger persons, his advice, and his restless devotion to truth and excellence in research.

In summary, Gedeon's outstanding scientific and engineering contributions, his enthusiasm for learning, his capability to cross frontiers and open new boundaries in hydrological research, and his fresh creativity merging knowledge from different disciplines have put him at the very top of the scientific enterprise. Gedeon's drive to excel



and his enthusiasm for research are examples that rarely find equals. Gedeon Dagan is certainly most deserving of the recognition carried by the highest distinction that AGU grants to hydrologists, the Robert E. Horton Medal.

—ALDO FIORI, Universitá di Roma Tre, Italy

Response

Thank you very much, Aldo, for your wonderful citation. Although it overstates my achievements, I know it is a sincere expression of friendship that emerged from a long and fruitful collaboration.

It is customary to devote such a reply to thanking all those who have helped me and made possible this recognition of my work. I thought I may rather use the occasion of addressing a distinguished audience of members of different AGU sections to talk briefly about hydrology. I therefore thank collectively my family, and first of all my wife, Ora, who is present here, and the many friends and colleagues I have acquired during my career.

My first thesis is that hydrology is one of the oldest professions in the world. This reflection was caused by accident, like many other discoveries, due to a visit to a fascinating archeological site in Israel, at Tzipori, near Nazareth. This was a flourishing town during the Roman and Byzantine periods. One of the interesting and enigmatic remnants dug up recently is a beautiful mosaic called 'The Nile Festival,' which dates from the Byzantine period, fifth century. It portrays a legendary Nile populated by different beasts, an Amazon, and the detail shown in Figure 1, which depicts in a symbolic manner the construction of a Nilometer. This is a marked pillar that served to measure quite accurately the level of the Nile.

The first Nilometers and mention of their level records go back to the third millennium B.C. and even earlier. The fertile Nile valley made possible the existence of the ancient Egyptian civilization. The readings

were used by the hydrologists of the Pharaohs (persons of high standing, most probably priests) in order to predict periods of drought or floods, both detrimental to agriculture. In turn, these analyses and predictions were employed in order to fix the level of taxation of the population and the storage policy.

My second thesis is that ancient and modern hydrology share a common ground. Thus, there are four constituents of ancient hydrology that are shared by the modern one:

- Hydrology is a quantitative discipline. It deals with data and with mathematical analysis.
- Hydrology is an applied science. The motivation and aims were related to the needs of society.
- Hydrology deals with prediction under uncertainty. The ancient hydrologist had to use sophisticated time series analysis in order to predict occurrence of extreme events.
- Hydrology is intertwined with economic, political, and social issues. Predictions had a serious impact on the sustainability and well-being of society.

My work on contaminant transport by groundwater, which takes place in an environment of a complex spatial structure that calls for analysis by advanced tools, shares these four ingredients with ancient hydrology.

Thank you for your patience in following this condensed story about hydrology over a span of 5000 years.

—Gedeon Dagan, Tel Aviv University, Israel