Opinion
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Jean-Yves Parlange Contributions in Flow Process Hydrology

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Opinion

Over the past three and a half decades, Jean-Yves Parlange has been a pervasive influence in hydrological science through his elegant mathematical descriptions of flow and transport processes. His analytical methods have yielded great physical insight into these processes alongside testable solutions for numerical modelling and therefore the theoretical means to style experiments and analyse data. He has provided ingenious, intrinsically meaningful solutions for formidable nonlinear models. Not surprisingly, these provide an in depth body of insights into phenomena like water infiltration and run-off. Even as important is his scientific leadership, including his trademark, unselfish generosity together with his seemingly endless ideas. He has helped young and established researchers alike to further their understanding of hydrologic processes.

This special issue of Advances in Water Resources may be a testimony to his leadership, showing how Yves contributions still influence leading edge research as an example, several contributions present new solutions to flow problems, much within the spirit of Yves abiding interest in developing understanding supported the facility of analytical methods. Certainly, this has always been a defining characteristic of his work. Yves career began with an engineering degree from the Ecole Nationale Superieure de l Aeronautique in Paris, after which he moved and received his Ph.D. from Brown University in aerospace engineering in 1962. His interests have always lain in mathematical descriptions of physical flows. In his early years these interests consisted of problems that appear faraway from hydrology, e.g. supersonic flows around pointed wings, the motion of deformable drops and bubbles, and therefore the thermodynamics of physical phenomenon, flame instability and chemical diffusion in laminar flows near flame interfaces.

Topics distant to hydrology may not be a serious turning point in Yves scientific direction occurred in 1969. While perusing literature within the Yale library he happened upon a paper that concerned the analysis of soil water seepage, a drag governed by the strongly nonlinear Richards equation. He quickly became aware that there might be alternative, possibly more efficient ways of approaching this problem. It didn't take long for him to demonstrate that his mathematical talents and penetrating physical insight were compatible to hydrological problems. This discipline has indeed been fortunate as Yves has literally run amok in developing new findings. His contributions cover a good hydrological spectrum including, for instance, thermal exchanges between leaves and therefore the atmosphere, porous media and overland flow in several geometries, and tidal interactions with spring water infiltration. He attacked the pathologically nonlinear infiltration model using integral representations, turning the nonlinearity to his advantage. With this unique approach he obtained parsimonious yet remarkably accurate analytical approximations. These are confirmed time and time again numerically, experimentally and with exact idealised solutions. It's no exaggeration that Yves paradigm was one among the main breakthroughs in infiltration theory within the 20th century.

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