fully realized for some time. Additional long- and short-term hazards result from sea level change and landslides.

Spaceborne InSAR remote sensing techniques have undergone tremendous breakthroughs in precision and measurement capabilities, making them a vital element in forecasting natural hazards. Detailed measurement of surface deformation is essential for understanding plate tectonic processes such as earthquakes and volcanism. Space-based geodetic observations have revolutionized the science of geodesy by providing detailed information about small-scale, and often aseismic, deformation of the Earth's surface. InSAR measures spatially continuous deformation with sub-centimeter accuracy, and has proven to be a key technology used in deformation studies.

Current modeling suggests that accuracies of 1 mm/yr on 50-km horizontal scales, with weekly observations, will be necessary in order to characterize surface deformation for both rapid and slow tectonic and geologic events. However, there are no U.S. or international satellites operating that meet these requirements. The community currently uses data from non-U.S. satellites that have been optimized for other purposes, but provide remarkable illustrations of earthquake faults, glacier motions, and volcanic inflation, demonstrating the value of InSAR.

Though currently unfunded, InSAR is the fourth pillar of EarthScope, a broad U.S. interagency effort to understand and characterize the solid Earth processes contributing to natural hazards and to provide policy-relevant information to agencies such as the U.S. Federal Emergency Management Agency (FEMA) for use in hazard assessment, mitigation, and response. The National Research Council's *Review of EarthScope Integrated Science* (2001) characterized InSAR as "an essential component of the EarthScope Initiative."

NASA's Solid Earth Science Working Group, a blue-ribbon panel of scientists, in its report Living on a Restless Planet (2002), documents a consensus view by the broad solid Earth science community that InSAR is the highest-priority mission for solid Earth science. The report states, "Weekly surface deformation maps from InSAR are the highest priority."

The National Academies, in its *Review of NASA's Solid-Earth Science Strategy* (2004), strongly endorse an L-band InSAR mission as NASA's top solid Earth science priority.

This workshop further reflects the community consensus of the importance of InSAR. The InSAR program discussed at the workshop is also aligned with key recommendations of the Science and Technology Policy Institute report to the Office of Science and Technology Policy, Assessing Federal Research and Development for Hazard Loss Reduction (2003).

Satellite-borne radar sensors continue the millennia-old tradition of human exploration of the Earth and the wider universe. Many unknowns remain even on our own planet, and the launch of every new satellite technology reveals something about our world that was previously not known or not appreciated. Imaging sensors, and InSAR in particular, reveal visually and viscerally processes transpiring on the surface in a way that can be appreciated by scientists and nonscientists alike. A U.S. InSAR program promises exciting new opportunities to pursue scientific questions related to Earth and planetary exploration. InSAR research, technologies, and data will also advance knowledge and enable efficient management of our natural resources from local to global scales.

The InSAR Community Workshop was held 20–22 October 2004, in Oxnard, California.

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—ANDREA DONNELLAN and MARGARET GLASSCOE, Jet Propulsion Laboratory, Pasadena, Calif.; and HOWARD ZEBKER, Stanford University, Calif.

SECTION NEWS

HYDROLOGY

Editor: *Venkat Lakshmi, Department of Geological Sciences, University of South Carolina, Columbia, SC 29208 USA; Tel: +1-803-777-3552; Fax: +1-803-777-6684;* **Section President**, *Rafael L. Bras;* **Section Secretary**, *A. Allen Bradley*

Rubin Receives 2004 Hydrology Award

Yoram Rubin received the Hydrology Award at the 2004 Fall Meeting in San Francisco, California, last December.

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Citation

Yoram Rubin, Professor of Civil and Environmental Engineering at the University of California, Berkeley, is a leading researcher in contemporary hydrology.

Starting in 1987, Yoram has published a considerable body of important articles, primarily in *Water Resources Research*, that have contributed tremendously to the emerging field of stochastic modeling of flow and transport in the subsurface, of which (in the words of Gedeon Dagan's nomination) "he must be viewed as one of its architects." His research dealt with transport of solutes within heterogeneous formations, the solution of the inverse problem, flow modeling, impact of nonstationarity and unsteadiness of mean flow on transport, transport of reactive solutes, risk assessment, flow and transport in the unsaturated zone, or in formations of bimodal structure. Applied mathematical problems, like the generation of random fields, or the upscaling of conductivity and macrodispersivity, need also be mentioned in this context.

Rubin's highly original works have always addressed central problems of hydrologic modeling, on both fundamental and applied levels, as recognized by the considerable impact in the ISI citation index (more than 1000 citations).

While Yoram is one of the few leading contributors to theory, he has played in the last years a unique role in applying stochastic modeling to field problems. This is one of the most pressing needs of contemporary hydrology; while theory has made great headway, there is a serious lag in applying it to real life problems. Such an enterprise requires strong familiarity with theory and with practical aspects. His results in this area are generally seen as a great success.

The coronation of these research activities is the publication of the book *Applied Stochastic Hydrogeology* (Oxford University Press, 2003). The book was recommended in a recent *Eos* review as an "indispensable tool for students and professionals as well."

Yoram Rubin's leading role in hydrologic science is also shown by his recent, ground-breaking work on the use of geophysical field techniques (seismic, ground-penetrating radar) in order to characterize the hydraulic properties of the subsurface. Indeed, one of the main obstacles to analysis and prediction of flow and transport at the field scale is the lack of data on spatial distribution of underlying properties. The use of nonintrusive geophysical methods proves therefore a most promising one, provided the field measurements can be used in a rational manner to identify hydraulic properties. His pioneering article with Gary Mavko and Jerry Harris (WRR, 1992) can be regarded as one of the starting points of a new discipline that has since expanded tremendously. His recent work on characterization of soil properties and moisture content by geophysical methods is of great significance to many areas where the most pressing research demands are perceived, like in agricultural engineering and soil-atmosphere interactions.

Besides advising a large number of graduate students and developing strong international links also through a stream of postdoctoral fellows, Yoram has devoted time and energy to the hydrologic community by serving in various committees, international teaching, and editorships.

For his outstanding contributions to hydrologic science, education, and practice, I am therefore proud to present a most highly deserving recipient of the 2004 Hydrology Section Award, Yoram Rubin.

—ANDREA RINALDO, Università di Padova, Italy

Response

Dear Hydrology Section President Rafael Bras and President-elect George Hornberger, members of the hydrology section executive committee, colleagues, friends, and fellow hydrologists, Thank you all for being here today, and thank you, Andrea, for the nice words.

A few weeks ago, after Rafael called to tell me I would be given this award, I began thinking what it represents. Although it means a great deal to me personally, I realized that it is most significant as a recognition of a scientific journey.

This is a journey that so far, over 20 years, has taken me to new, often unexpected, and always exciting destinations. It is a journey that I could not have made without excellent traveling companions and guides, colleagues, and friends, who teamed up with me, making it possible to accomplish more. This award is for them as much as it is for me.

I would like to mention here quite a few of those who made this journey possible, and to whom I owe my deepest gratitude. This list is long, and still I could not make it as complete as it needs to be, given the time.

First, Gedeon Dagan, my Ph.D. thesis advisor and a longtime collaborator and friend after that, who opened for me the doors into stochastic hydrogeology, and convinced me how fortunate we are to work in science and even be paid a salary for that.

Peter Kitanidis and Al Woodbury, whose pioneering research guided me through the complexities of inverse modeling and geostatistics.

Alberto Bellin, whose keen physical intuition and unrelenting scientific pursuit, and our very long friendship, allowed me to explore transport in heterogeneous media to ever newer depths.

Andrea Rinaldo, a true Renaissance man, equally as comfortable with river networks as he is with neural networks, and as he is with literature, history, and poetry.

Jerry Harris and Gary Mavko, and later on, and to this day, Susan Hubbard, who made my forays into hydrogeophysics possible. Who could have imagined that our subsurface explorations of the bacterial transport experimental site in Oyster, Virginia, would bring us to working in the Napa Valley vineyards, like we do today.

Georg Teutsch, a true science leader and a far-reaching visionary, and Peter Indelman, a brilliant scientist in the great Russian science tradition: both are a source of inspiration for me.

Robert Ritzi, a gifted sedimentologist and hydrogeologist, who showed me that there is much more to variograms than meets the eye.

Doug James underwrote a large chunk of this journey, although he never made it easy. My exchanges with him, especially, and all too often, when he wrote to me the bad news about his funding decisions, remind me of a quote attributed to Newt Gingrich, who once said that while it is true that he was not admitted to Princeton, he nevertheless got such a nice letter declining his application from them that he immediately felt like a Princeton alumnus.

Finally, my students, a few of which are here today: Jinsong Chen, Zhangshuan Hou, Xingyuan Chen. You should know that my meetings with you are the highlights of my days.

There are many others who were and still are close to my heart, and I apologize for not mentioning all of you.

As scientists working in our individual specialties and subspecialities, it can be easy at times to lose sight of the breadth of possibilities that hydrology represents overall. Hence I was grateful to be reminded, during the recent application process for the CUAHSI hydrologic synthesis center, of the myriad lines of inquiry that comprise hydrology.

Stepping back and looking at the breadth and depth of hydrology as a discipline, the other disciplines with which it interacts, and the real and lasting differences it can make in improving the quality of life and environmental stewardship from any number of angles around the globe—all gave me a deepened appreciation of the importance of this work and the esteem in which I hold all of my colleagues who are so dedicated to hydrologic research.

Thank you all for your kind attention.

—YORAM RUBIN, University of California, Berkeley