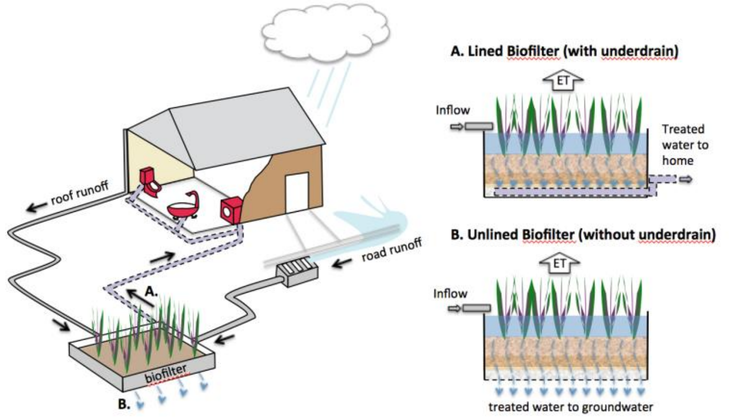
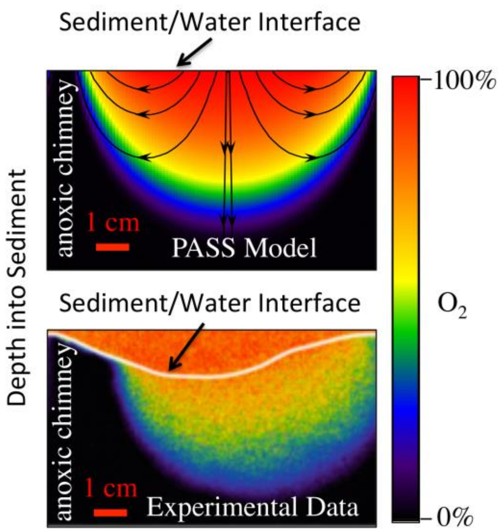
As PI, I have fostered a collaborative and interdisciplinary environment that draws on the collective expertise of engineers, ecologists, hydrologists, and human health scientists. This inclusive leadership style has proved very successful. In the few short years since the project was funded (in late 2012) our PIRE team has published twenty papers, with many more in various stages of submission and revision. Our research output includes a balance of discipline-focused and discipline-spanning "all-hands-on-deck" articles. Some of the latter have appeared in highly competitive journals, including feature articles in the journal *Science* (on opportunities for improving water productivity) and *Environmental Science and Technology* (on a framework for using low impact development to improve human and ecosystem water security). A recent article we published on the Millennium Drought in Southeast Australia (appearing in the new Wiley journal *WIREs Water*) has been written about and featured in various outlets, including newspapers (*The Washington Post*), magazines (*Scientific American, Motherboard*), and radio (*National Public Radio*), to name a few. Our team is preparing a book on urban water sustainability ("The Water Sustainable City: Science, Policy, and Practice" to be published by Edward Elgar, Ltd, UK) and a special issue of *WIREs Water* will be dedicated to our PIRE funded research.



Biofilters are low-energy distributed treatment technologies that capture and treat stormwater (from roofs and roads) using biological and physicochemical processes.

The NSF-PIRE project is a coming together of several research threads I've nurtured over my career, all centered around urban water issues that bear directly on human and/or ecosystem health. These include: (1) filtration and coagulation of particulate contaminants in natural and engineered systems; (2) fate and transport of human pathogens and their indicators in the urban ocean; (3) ecosystem services facilitated by stream sediments, including the "natural treatment" of fecal and fertilizer pollution by in-stream processes; and (4) reconceiving how we build urban landscapes to improve human and ecosystem water security. To support these research threads I have secured funding (totaling >$11.3 million as PI) from a variety of international (Australian Research Council), national (U.S. National Science Foundation, U.S. Environmental Protection Agency, U.S. Geological Survey, National Water Research Institute), state (California State Water Resources Control Board), local (Orange County, City of Newport Beach), and U.C. (University of California Marine Council) sources. With these funds I have supported undergraduate students, graduate students, and postdoctoral researchers. Many of my former students have gone on to rewarding and successful careers after graduating. Of my twelve former PhD students, four are now tenured professors at top-notch research institutions (Stanford University, SUNY Stony Brook, University of Mississippi, Guangju Institute of Science and Technology), several have won prestigious fellowships and/or attained leadership positions (Chair of Civil and Environmental Engineering, National Institute of Health Global Health Fellow at UC San Francisco, Senior Fellow at the Stanford Woods Institute for the Environment, and Vice-President of the American Society of Civil Engineer's Environmental Water Resources

Institute), while others have achieved success in the private sector (Honeywell UOP, Yorke Engineering) or as lecturers at the college (California State University Long Beach) or community college (Moorpark College) level.



Process-based models are being developed to quantify the biogeochemical removal of nutrients in the hyporheic zone of natural and engineered streams.

While I have explored different research topics over the years, the common thread is the use of simple (diagnostic) models to elucidate important environmental processes as informed by laboratory and/or field data. Several examples include ongoing efforts to develop process-based models for nitrate removal in the hyporheic zone of natural and engineered streams, the use of chemical engineering reactor theory to scale-up biofilter performance from laboratory to field scales, and the use of so-called "anomalous diffusion" models to capture reaction and transport of contaminants in engineered and natural systems (ranging from biofilters to estuaries). I am constantly looking for opportunities to improve my research through collaboration with experts in different fields. For example, one of my projects (on nitrate removal in the hyporheic zone of streams) includes chemical engineers (reactor theory), mechanical engineers (direct numerical simulations of turbulent streamflow), hydrologists (groundwater modeling), ecologists (microbiology and sediment biogeochemistry), and social scientists (institutional barriers to the adoption of novel approaches for watershed management). I am also interested in multi-scale phenomenon, as exemplified by another project in which my group is exploring how groundwater hydrology can alter nutrient processing in the hyporheic zone of a stream, thereby linking regional scale processes that affect the state of groundwater (e.g., climate change and urbanization) to local scale biophysical processes (e.g., flow and reaction of nitrate across individual ripples on the bottom of a river) to regional scale water quality (e.g., export of nitrate from a watershed to downstream receiving waters).