

'Foldscope' fame Manu Prakash receives MacArthur 'Genius Grant'

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Assistant professor of bioengineering at Stanford Manu Prakash received the MacArthur "Genius Grant" on Sept. 21 as one of 23 recipients. The grant is awarded annually to residents or citizens of the United States who have shown "extraordinary originality and dedication in their creative pursuits and a marked capacity for self-direction," according to the MacArthur Foundation. It consists of a total of \$625,000 paid over five years, and the recipients of the grant have no particular obligations other than to continue their activities. Individuals are nominated for the award.

Manu Prakash is a physical biologist applying his expertise in soft-matter physics to illuminate often easy to observe but hard to explain phenomena in biological and physical contexts and to invent solutions to difficult problems in global health, science education, and ecological surveillance. His many lines of research are driven by curiosity about the diversity of life forms on our planet and how they work, empathy for problems in resource-poor settings, and a deep interest in democratizing the experience and joy of science globally.

Prakash's projects range from explorations of how shorebirds drink to how a few drops of food coloring can demonstrate highly complex behavior such as chemotaxis, akin to active living matter. His early training and research focused on ideas of physical computation, with a goal of building new computational engines capable of manipulating not just bits of information but also physical matter. One such demonstration involved building a computer out of tiny air bubbles traveling in microfluidic channels. In recent work, Prakash demonstrated a practical implementation of this "water computer," or microfluidic processor, with potential applications in diagnostics and environmental monitoring.

More recently, Prakash has channeled his ingenuity to invent several devices that empower frugal science: these are low-cost, widely accessible, and appropriate for use in low-resource and field settings. Foldscope, a lightweight optical microscope that costs less than a dollar to produce, is assembled from an origami-based folding design from a single sheet of

paper with integrated lenses and electronics. With submicron resolution, Foldscope has already been widely embraced in educational contexts. Prakash has enlisted thousands of volunteers-from medical experts to citizen scientists-to field test Foldscope as he works to refine it for use in public health and biomedical settings. Another recent project is a low-cost, sticker-like microfluidic chip that can collect thousands of nanoliter-volume droplets of saliva from mosquito bites that can be screened for pathogens. The chip would enable rapid, scalable, and low-cost collection of surveillance data that is critical for predicting and controlling mosquito-borne disease outbreaks. With remarkable breadth and imagination, Prakash defies traditional disciplinary boundaries in his coupling of basic research and fabrication of high-capability scientific instruments for widespread use in the field and classroom.

Manu Prakash received a B.Tech. (2002) from the Indian Institute of Technology Kanpur and a Ph.D. (2008) from the Massachusetts Institute of Technology. He was a junior fellow of the Harvard Society of Fellows (2008--2011) prior to joining the faculty of Stanford University, where he is currently an assistant professor in the Department of Bioengineering, a member of the Biophysics Program in the School of Medicine and the Center for Innovation in Global Health, Faculty Fellow of Stanford ChEM-H, and an affiliate member of the Woods Institute for the Environment. He holds numerous patents and his research has been published in such scientific journals as PLoS One, Journal of Experimental Biology, Science, and Nature, among others.