Water covers 70 percent of the Earth's surface, but only a fraction is fresh

August 25 2015

A composite image of the Western hemisphere of the Earth. Credit: NASA

Fresh water—connecting and sustaining all aspects of life on Earth, including food and energy—is in great danger. Moreover, scientists are worried not only about fresh water; they worry that we are not worried enough about fresh water, especially in light of growing concern over recent events, such as the prolonged California drought. The current Special Issue Section of *Technology and Innovation* - Journal of the National Academy of Inventors has a special section devoted to fresh water and the challenges it faces from us and from the changing environment.

"As the global population expands, climate change, overexploitation of water resources, pollution, and economic growth are impacting the availability of water," said Vimal Chaitanya, vice president for research and professor of mechanical engineering and chemical and materials engineering at New Mexico State University, and Frederic Zenhausern, professor of basic medical sciences and radiation oncology at the University of Arizona College of Medicine and director of the Center for Applied Nanobioscience and Medicine at the University of Arizona, in a lead-off editorial. "As a result, society faces an unprecedented challenge to advance science and develop appropriate technological innovations to ensure water security," they conclude.

The authors spell-out the bad news:

- A human population of 10 billion by the end of the century.
- One billion people already suffer deficiencies in water access.
- Water that could be used for drinking is contaminated with microbial toxins, viral infections, and chemicals, such as pesticides and manufacturing wastes.

Given this context, the current T&I issue reports on "innovative solutions" to these problems because, as Chaitanya and Zenhausern assert, "there is a growing need for developing more sensitive analytical

techniques, in particular when related to measuring biological responses, but also simpler and affordable methods for monitoring the quality of water sources. More importantly, these developments will require implementing regulatory standards and sharing common international practices for a more comprehensive approach to water management across geo-political and economic regions."

They cite advances in human epidemiology, bioassay platforms, and nanobiotechnologies as having "opened new avenues" for better understanding and monitoring of bioactivities and for transforming the availability of better and safer water treatments.

The editorial authors review the studies and articles in the Special Issue Section, starting with the article by Liz Felter (IFAS extension faculty in commercial horticulture at the University of Florida), et al, "It's Going to Take More Innovation than Technology to Increase Water Conservation Practices," a study that examines the perceptions of homeowners in Orange County, Florida who have automated irrigation systems and the roles of "social marketing," barriers, and peer pressure in implementing water conservation.

A paper by Donald Haynie (associate professor of physics at the University of South Florida), "Biodegradable Foams and Films: From Purified Proteins to Aqueous Feedstocks of Designed Polypeptides," suggests that using an approach that includes food foams and edible films using new composition and fabrication formulations could provide both environmental benefits and "comparably favorable" potential for commercial success.

The General Section of T&I: 17.1 includes a variety of topics. Daniel Hunter (U.S. Patent and Trademark Office), in his submission "Patent Prosecution Highway - Fast Track Examination of Applications," discusses a way to facilitate work sharing between intellectual property

offices by reducing duplication of work when patent applications are filed in multiple countries.

Dean F. Martin and Autumn S. Thompson (Distinguished University Professor Emeritus at the University of South Florida and student assistant, also at USF) write on Jonas Kamlet, a pioneer in chemistry, using Kamlet's correspondence with his collaborators. The article, "Traits and Roles of Jonas Kamlet, Pioneering Chemistry Consultant, as a Guide to Contemporary Inventors," can serve as a guide to success for a new generation of inventors.

A review of the development of and advances in "telesurgery" technology, particularly as it relates to otolaryngology, is provided by Alisha R. Bonaroti and K. Paul Boyev (medical student at the Morsani College of Medicine at the University of South Florida and director of the Division of Otology/Neurotology/Lateral Skull Base Surgery, also at USF). The authors include recommended future uses for telesurgery in "A General Survey of Telesurgical Advances in Otolaryngology."

Finally, A. Alan Moghissi, (president of the Institute for Regulatory Science) et al, look at the ethical requirements of science and research as related to policy development in "Ethical Requirements of Application Science in Policy Including Regulations."

Provided by University of South Florida