

Ecological Mimicry and the Design of 21st Century Water Infrastructure

Abstract: Aging infrastructure, expanding water shortages, and greater need for resiliency emphasize the need for a paradigm shift in our approach to water services. When compared to ecological systems, our current water systems appear functionally incoherent, requiring large amounts of energy to maintain disequilibrium. Using ecological systems as a design guide would shift the current focus from centralized treatment for waste reduction and contaminant removal to more distributed (and diversified) approaches based on resource recovery and public health protection. General concepts of ecological design and specific examples of current and alternative approaches will be discussed, including on-going work in the US EPA- Office of Research and Development related to 1) generation of metrics and tools to assess the sustainability of new approaches, 2) testing of new treatment technologies, and 3) assessment of microbial risks associated with new approaches.

Presenter: Jay L. Garland

Title: Division Director

EPA Division: Microbiological and Chemical Exposure Assessment Research Division

EPA Branch: Immediate Office

Professional Background: Dr. Garland worked for over 20 years on NASA's efforts to develop regenerative, closed-loop life support systems, including testing of recycling systems based on plants and microorganisms, before joining EPA's Office of Research and Development in 2011. He has authored over 100 scientific papers on various topics, including methods for microbial community analysis, the ecology of plant-associated microorganisms and the recycling of solid and liquid wastes in plant growth systems. His work is committed to the development of sustainable systems using sound ecological principles and innovative technology.

Education/Training:

- Ph.D. Environmental Science, University of Virginia, 1991
- M.S. Biology (Aquatic Ecology), Virginia Tech, 1985
- B.S. Zoology, Ohio State University, 1983

Professional Experience:

- Division Director, USEPA, ORD, NERL-MCEARD, Cincinnati, OH 2011-present
- Chief Scientist, Biological Program Manager, Dynamac Corporation, Kennedy Space Center, FL 1991-2011

Professional Societies and Affiliations:

- Courtesy Associate Professor, University of Florida Department of Soil and Water Science (2003-current)
- Adjunct Faculty Member, University of Tennessee Center for Environmental Biotechnology (1998-present)
- Visiting Research Fellow, Institute for Environmental Sciences, Amori, Japan. (2005)
- Visiting Professor, University of Buenos Aires (Buenos Aires, Argentina) (2001-present)

- Visiting Professor, National University of the South (Bahia Blanca, Argentina) (2010)
- Guest Professor, University of Innsbruck (Innsbruck, Austria). (2002)
- American Society of Microbiology International Professorship. (2008)

Select Awards and Honors:

- NASA Peer Award for exemplary mentoring NASA Planetary Biology Interns (2005)
- NASA Certificate of Appreciation for setting the highest standard for peer-reviewed publications (2004)
- NASA Space Flight Awareness Honoree for dedication in support of the space program (2003)
- NASA Certificate of Recognition for creative development of technical innovation (2003)
- NASA Certificate of Recognition for creative development of technically significant software (2002)
- NASA Certificate of Recognition for creative development of technical innovation (1999)
- Arch T. Colwell Merit Award (1993) Presented to outstanding papers presented at Society for Mobility Engineering Meetings. Garland et al. (1993) paper was 1 of 12 selected from over 2300 papers published at SAE meetings
- Outstanding Presentation (1991) University of Virginia Environmental Sciences Research Forum. Fred H. Moore Research Fellowship (1991) University of Virginia Environmental Science Dept.,
- NASA Graduate Student Fellow (1988-1991)
- NASA Certificate of Recognition for Technical Innovation (1988)

For more information: <http://www.epa.gov/nerlcwww/staff/garland.html>