
The Kappe Lecture Series

AMERICAN
ACADEMY
OF ENVIRONMENTAL ENGINEERS & SCIENTISTS®

2023

Sharing the
knowledge
of today's
practitioners
with
tomorrow's
engineers and
scientists.

The 2023 Kappe Lecturer

Daniel H. Yeh, Ph.D., P.E., BCEE, LEED AP

University of South Florida

Dr. Daniel Yeh is a professor in the Department of Civil and Environmental Engineering at the University of South Florida and the PI of the Membrane Biotechnology Lab. He is also a visiting professor at NASA Kennedy Space Center and co-founder of the cleantech startup BioReNEW, Inc.



Dr. Yeh's research and teaching interests are in water & wastewater engineering, global water & sanitation, water/energy/food nexus, and life support systems for space travel. Dr. Yeh is keen to communicate and promote environmental engineering to the public and school children through classroom lesson plans, museum exhibits, podcasts, TEDx and Pint-of-Science talks, and late night talk show comedy feature. Dr. Yeh holds degrees from the University of Michigan (BS Natural Resources, BSE Civil Engineering and MSE Environmental Engineering) and Georgia Institute of Technology (PhD Environmental Engineering).

Dr. Yeh is a professional engineer, an AAEEES board-certified environmental engineer, and a LEED Accredited Professional. He is also a Senior Member of the National Academy of Inventors and a two-time recipient of the Excellence in Innovation Award at USF.

EDUCATION

- BSE Civil Engineering, University of Michigan, 1991
- BS Natural Resources, University of Michigan, 1991
- MSE Environmental Engineering, University of Michigan, 1994
- PhD Environmental Engineering, Georgia Institute of Technology, 2000

CREDENTIALS & AFFILIATIONS

- Professional Engineer (Georgia, EnvE)
- Board Certified Environmental Engineer (Water supply/wastewater engineering), American Academy of Environmental Engineers and Scientists (AAEES)
- Leadership in Energy and Environmental Design Accredited Professional, Building Design and Construction (LEED AP BD+C)
- Visiting Professor, Bioregenerative Water Purification, NASA Kennedy Space Center.
- Senior Member, National Academy of Inventors (NAI)
- Member: International Water Association (IWA), Water Environment Federation (WEF), Association of Environmental Engineering and Science Professors (AEESP), WateReuse Association.

AWARDS & RECOGNITIONS

- 2023, Kappe Lecturer, American Academy of Environmental Engineers and Scientists (AAEES)
- 2020, Patents for Humanity Award (for NEWgenerator), US Patent and Trademark Office
- 2020, NASA KSC Sustainable Environmental Awareness (SEA) Award
- 2014, 2019, USF Excellence in Innovation Award, Office of Research and Innovation (university-wide award)
- 2019, NEWgenerator highlighted in MIT Technology Review's 10 Breakthrough Technologies of 2019, as one of the technologies to enable sanitation without sewers
- 2016, Cade Museum Prize for Innovation, Sweet 16 semi-finalist (for ICARUS algae cultivation platform).
- 2015, Reinvent the Toilet Challenge: India, one of six winning teams worldwide (w/ ESS, India)
- 2015 Lettinga Award (for innovation in anaerobic biotechnology), Lettinga Foundation - finalist
- 2014, Cade Museum Prize for Innovation, 1st Place (for NEWgenerator resource recovery machine)

Abstracts of Lectures Offered

Reinventing the Toilet for Global Sanitation: The NEWgenerator Resource Recovery Machine

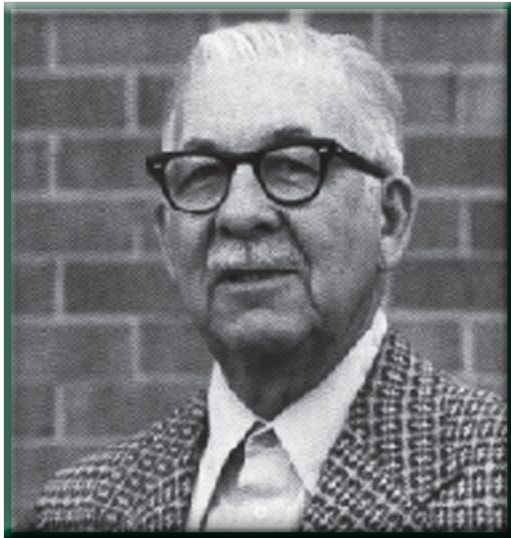
Billions of people worldwide suffer from poor sanitation due to a lack of wastewater infrastructure. With high CAPEX and OPEX, the conventional approach of centralized wastewater treatment plants served by an extensive sewer system is not an option for many communities. A new classification of modular and pre-fabricated non-sewered sanitation systems (NSSS, ISO 30500) has been introduced as an onsite micro-infrastructure alternative. Developed at the University of South Florida, the NEWgenerator is a solar-powered, modular, automated wastewater treatment and recycling system capable of operating independently from grid power, piped water and sewer. The core technology within the NEWgenerator is the anaerobic membrane bioreactor

(AnMBR), capable of handling a wide range of wastewater strengths, intermittent flows, and prolonged shutdowns. The value proposition of the NEWgenerator is that it makes flush toilets possible in off-grid, remote locations. The NEWgenerator was a recipient of the 5th Cade Museum Prize for Innovation and the 2020 USPTO Patents for Humanity Award. This presentation will follow the two-decade journey of the NEWgenerator from concept to development to commercialization, including extended field trials in India (Kerala) and South Africa (KwaZulu-Natal). The presentation will also highlight initiatives to implement the NEWgenerator in disadvantaged communities in the U.S.

From TRL1 to TRL 4: Development of the ICARUS Floating Membrane Photobioreactor for Direct Algae Cultivation in Wastewater

Wastewater has been identified as a sustainable source of water and nutrients for the cultivation of microalgae to produce biofuel and bioproducts. However, wastewater is a relatively “dirty” environment with chemical and biological agents which contaminate crop purity. Further, ubiquitous grazers such as rotifers can decimate crop yields. To address these issues, our team developed a cultivation method termed “Isolated Cultivation of Algal Resource Utilizing Selectivity (ICARUS).” ICARUS is a membrane photobioreactor platform that can be used to cultivate algae monocultures by floating directly on wastewater (e.g., surface of clarifiers) or other impaired water bodies. A bottom membrane panel mediates the

exchange of water, nutrients, and gasses between the wastewater and algae culture, while servicing as a physical barrier between the algal crop and undesirable bioagents in wastewater. Laboratory and field results have shown that ICARUS can achieve a high crop density using wastewater directly as a feedstock, while maintaining crop monoculture purity. Further, as the culture densifies, ICARUS can self-dewater to facilitate crop harvesting. This presentation will chronicle the development of ICARUS from TRL1 proof-of-concept to TRL4 field prototypes. In addition to deployment at municipal wastewater facilities, ICARUS can also be integration with aquaculture operations in a circular economy framework.



**“A man’s debt
to his profession
is to help
those that follow.”**

STANLEY E. KAPPE, P.E., DEE, a successful environmental engineer, believed he owed a debt to the profession that rewarded him so well. During his life, he gave of himself to his university and to his profession through countless hours of volunteer activity. And through this Lecture Series, he continues to share his good fortune with tomorrow’s environmental engineers and scientists.

He graduated from Pennsylvania State University in 1930 with a bachelor's degree in sanitary engineering. He served with the Pennsylvania State Health Department and the U.S. Army Corps of Engineers before joining the Chicago Pump Company as its Eastern Regional Manager in 1935. In 1945, he founded Kappe Associates, Inc., a water supply and wastewater equipment company headquartered in Rockville, Maryland, and continued as its Chief Executive Officer until his death in 1986.

His peers recognized his contributions to the profession by numerous awards, including the AWWA Fuller Award, the WEF Arthur Sidney Bedell Award, the WPCAP Ted Moses and Ted Haseltine Awards, and the AAEEES Gordon Maskew Fair Award. In 1985, Pennsylvania State University named him Outstanding Engineer Alumnus.

Stanley E. Kappe was an activist member and leader in several national and Chesapeake region professional societies. He served as the Executive Director of the American Academy of Environmental Engineers (now the American Academy of Environmental Engineers and Scientists) from 1971 to 1981.



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