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KAPPE

LECTURE

Series

2021

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with tomorrow's
engineers and
scientists.

The 2021 Kappe Lecturer

David A. Dzombak, PhD, PE, BCEE, DWRE

David Dzombak is the Hamerschlag University Professor and Head of the Department of Civil and Environmental Engineering at Carnegie Mellon University. The emphasis of his research and teaching is on water quality engineering, water resource sustainability, and energy-environment issues. At Carnegie Mellon, he also has served as Associate Dean for Graduate and Faculty Affairs for the College of Engineering (2006-2010), and as Director of the Steinbrenner Institute for Environmental Education and Research (2007-2013).



Dzombak has conducted research in aquatic chemistry; fate and transport of chemicals in water, soil, and sediment; water and wastewater treatment; in situ and ex situ soil and sediment treatment; industrial waste management; abandoned mine drainage remediation; climate change adaptation for infrastructure; water resource sustainability; energy and environment; and other topics. He has published numerous articles in engineering and science journals, and three books.

His professional service activity has included the National Academies Roundtable on Science and Technology for Sustainability (2013-present); the National Academies Roundtable on Unconventional Hydrocarbon Development (2015-2019); the National Academies Water Science and Technology Board (2014-2019); the EPA Science Advisory Board (2002-2016); the DoD Strategic Environmental Research and Development Science Advisory Board (2013-2016); Associate Editor of *Environmental Science & Technology* (2005-2012); Editorial Board of *Water Environment Research* (1993-1998) and *Ground Water* (1991-1993); Chair, Board of Directors, AEESP Foundation (2012-2014); Board of Directors of the Association of Environmental Engineering and Science Professors (1996-1999); chair of committees for the

American Academy of Environmental Engineers and Scientists, American Society of Civil Engineers, and Water Environment Federation; advisory committees for Allegheny County, the Commonwealth of Pennsylvania, and numerous universities and organizations.

EDUCATION

- PhD, Civil Engineering, Massachusetts Institute of Technology, 1986
- MS, Civil Engineering, Carnegie Mellon University, 1981
- BS, Civil Engineering, Carnegie Mellon University, 1980
- BA, Mathematics, Saint Vincent College, 1980

SELECTED HONORS

- Gordon Maskew Fair Award, American Academy of Environmental Engineers and Scientists, 2019
- Distinguished Member, American Society of Civil Engineers, 2019
- Simon W. Freese Environmental Engineering Award, American Society of Civil Engineers, 2014
- Honorary Doctor of Science, Saint Vincent College, 2010
- National Academy of Engineering, Election Class of 2008
- Jack Edward McKee Medal, Water Environment Federation, 2000
- Walter L. Huber Civil Engineering Research Prize, American Society of Civil Engineers, 1997
- Harrison Prescott Eddy Medal, Water Environment Federation, 1993

PROFESSIONAL CERTIFICATIONS

- Registered Professional Engineer, Commonwealth of Pennsylvania
- Board Certified Environmental Engineer, American Academy of Environmental Engineers and Scientists
- Diplomate Water Resources Engineer, American Academy of Water Resources Engineers

Abstracts of Lectures Offered

Climate Change Adaptation and Environmental Engineering: Evolving Practices and New Tools

The climate is changing globally and across the U.S., with different types and extent of change in different regions. Observed changes include sustained deviation from long-term trends in atmospheric temperatures, water temperatures, precipitation amounts, drought duration, storm frequency, wind velocities, snow melt timing, flood frequency and characteristics, permafrost melting, and other phenomena. These changes are affecting civil and environmental infrastructure and leading to demand for modification of infrastructure designs and operations. New approaches are needed in infrastructure design and operation guidelines, codes, and procedures to account for changing climate conditions.

New tools are coming into use in infrastructure engineering for projection of changing climate conditions, especially downscaled global climate model (GCM) products. Depending on the type of engineering application and purpose of required future climate infor-

mation, various climate model projections are being applied and utilized, with different temporal and spatial resolution, type of downscaled GCM products employed, and post-processing methods for calibration of the results to regional and local scale.

This talk will examine the need and challenge of climate change projection in particular locations, the scale at which infrastructure engineering projects take place. Evolving practices and tools will be presented, and demonstrated through some environmental engineering applications. The use of climate projection results from several different GCMs and downscaled products and from an ensemble of multiple GCMs will be explored in the context of the applications. The importance and utility of historical long-term observations for particular locations will also be examined. Opportunities to access, learn about, and exploit these new tools for environmental engineering will be discussed.

Sustainable Mining:

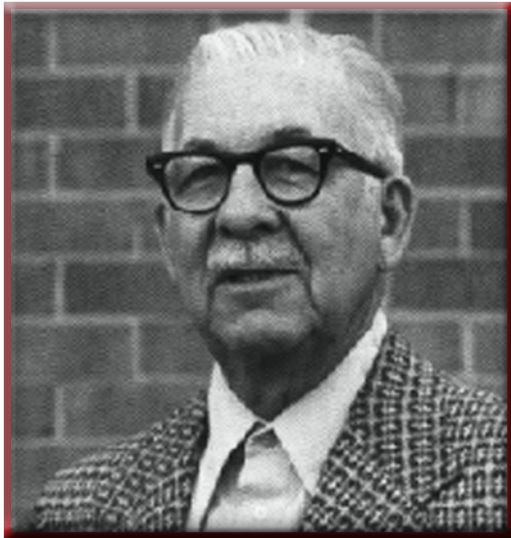
Is It Achievable and Can Environmental Engineering Help Get Us There?

Extraction and processing of fuel and non-fuel minerals from the Earth has a plethora of impacts on land, water, air and ecosystems. Reduction and remediation of these impacts long has engaged environmental engineers in research and practice. Application of sustainability principles to mining is inherently challenging, considering the impacts involved and that mining involves removal of finite resources. However, as demand continues for fuel minerals such as coal and non-fuel minerals such as metals, consideration of environmental sustainability is increasingly being incorporated into development and operation of mines.

This talk will examine the environmental sustainability profiles of fuel and non-fuel mineral mining, and efforts that have been undertaken over the past 30 years to improve these profiles. The talk will focus

on coal and copper mining in the U.S. as important examples of fuel- and non-fuel mineral mining. Current and evolving mining industry practices and related environmental engineering activities will be reviewed. Approaches for assessing the environmental sustainability of mining operations will be presented and applied to the two cases, with consideration of scale from operations at individual sites to system level.

The meaning of sustainable mining will be explored, as will the potential to achieve sustainable mining for fuel and non-fuel minerals. A framework for assessment of sustainability in mining that includes life-cycle metrics will be put forward. Application of the framework to copper will be presented as an example. The role of environmental engineers in advancing the environmental sustainability of mining will be examined with the audience.



**“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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