**Department of Biology**
The College of Arts + Sciences | Indiana University Bloomington

# *Inaugural* Norman Pace Lecture

## Mon., May 7, 2018 • 4-5 pm • Myers Hall 130

## Norman R. Pace, Ph.D.

Distinguished Professor Emeritus, University of Colorado-Boulder

## Into the natural microbial world: the beginnings of metagenomics

Metagenomics, the study of environmental organisms through nucleic acid sequences, began in the early 1980s. Previously, all understanding of microbial diversity was based on cultured organisms. But only a small fraction of natural microbial diversity, < 1%, is cultured using standard techniques. Following Carl Woese's recognition that ribosomal RNA (rRNA) sequences could be used to establish a large-scale phylogenetic map of all life, Pace's lab set out to develop the groundwork to explore natural microbial communities by rRNA and other sequences independently of culture. The resulting developments were widely adopted and dramatically expanded our view of microbial diversity and distribution, as will be reviewed. "Metagenomics," obscure not so long ago, has become a driver of microbiology of the 21st century. Much of this work was conducted in Jordan Hall, part of the long legacy of microbiology at IU.

Applications of molecular microbiology in many environments by numerous laboratories have now revealed remarkable and sometimes unexplainable microbial diversity, and every environment presents its own anecdotes. A few of the lab's recent studies of the microbial world that we humans occupy will be reviewed, including who we breathe in our daily working spaces or when we descend into the NYC subway and the organisms with which we share our daily drinking waters and showers. The results highlight significant, but poorly recognized, public health concerns.

Hosted by Jeff Palmer, Distinguished Professor of Biology
Reception in the Jordan Hall atrium following the seminar

**Once I was exposed to the culture of being a lab rat, I was hooked!**
**—Norman R. Pace**

Norm Pace was born and raised in a small farming community in Indiana. While in high school, he spent a summer doing research in an Indiana University microbiology lab. In his own words, "Once I was exposed to the culture of being a lab rat, I was hooked!" Pace graduated from IU in 1964 with a B.A. (with honors) in bacteriology.

Pace was a Professor and Distinguished Professor of Biology at Indiana University from 1984 to 1996, during which time he revolutionized microbial ecology in ways that allowed the "unseen 99 percent" to be revealed. His ribosomal RNA gene sequencing enabled scientists to study, for the first time, the 99 percent of microbes that could not be grown in the laboratory and were thus considered inaccessible for study. This work "blew the door off the microbial world," ushering in the modern age of microbial ecology, including metagenomics and microbiome research. Without it, our understanding of the human microbiome would be years behind where it stands now.

Pace is also celebrated for his revolutionary co-discovery that RNA, like protein, can act in catalysis and thus serve as an enzyme.

Pace received his Ph.D. from the University of Illinois in 1967. He was an Assistant, Associate, and Professor of Biophysics and Genetics at the University of Colorado Medical Center, Denver (1969-84); Professor and Distinguished Professor of Biology and Chemistry at Indiana University (1984-96); Professor of Plant and Microbial Biology, University of California at Berkeley (1996-99); and Professor and Distinguished Professor of Molecular, Cellular, and Developmental Biology at the University of Colorado, Boulder (1999-present).

Pace is an elected member of the National Academy of Sciences and the American Academy of Arts and Sciences. He received the Waksman Award for Excellence in Microbiology, a MacArthur "Genius" award, and the 2017 Massry prize in recognition of his outstanding contributions to the biomedical sciences and the advancement of health. He has received lifetime achievement awards from the American Society for Microbiology, the International Society for Microbial Ecology, and the RNA Society. He has been a key consultant of the National Research Council's Space Studies Board on a variety of issues since the 1980s. A superb and inspiring teacher, both in the classroom and research laboratory, many of his numerous postdoctoral, graduate, and undergraduate trainees are leaders in academia and industry. In keeping with his Hoosier heritage, Pace is also a renowned spelunker: He has explored more than 100 caves and was the 1987 recipient of the Lew Bicking Award, the highest honor that American cave explorers can achieve.

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