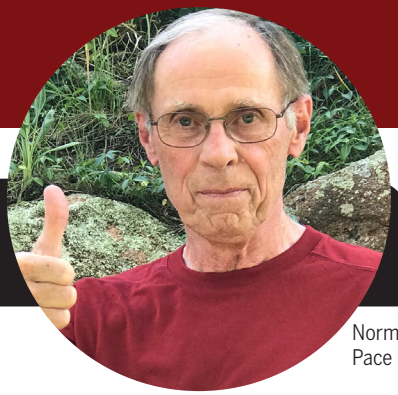
Department of Biology

The College of Arts + Sciences | Indiana University Bloomington



Norm Pace

Norman R. Pace Lecture

Wed., Feb. 22, 2023 • 3 pm • Biology Bldg. 009

Colleen Cavanaugh

Colleen M. Cavanaugh, Ph.D.

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Modern mysteries in microbial symbioses: Missing enzymes, absentee guts, and a (not so secret) guiding principle

Microbial symbioses are ubiquitous in nature, significantly influencing the ecology, physiology, and evolution of the partners, with the whole being greater than the sum of the parts. Given the diverse metabolic capabilities of bacteria, nutritional symbioses are particularly prevalent, allowing the partners to occupy otherwise unavailable ecological niches. Symbioses between chemosynthetic bacteria and marine invertebrates, widespread in deep-sea hydrothermal vents and reducing sediments, are rare examples of animals that are virtually independent of photosynthetic primary production. Due to difficulties in both the maintenance of symbiotic organisms in culture and the inability to genetically manipulate them, studies of chemosynthetic symbionts rely heavily on the molecular approaches pioneered by Dr. Norman Pace.

I will present a brief history of the discovery of chemosynthetic symbioses and the Pace Lab's first identification of uncultivated symbiotic bacteria using rRNA gene sequences, heralding the advent of molecular microbial ecology! I will discuss insights gleaned from our studies on symbiont transmission strategies—infecting the next host—and an alternate Calvin Cycle. The molecular "leap" Pace made from cultures to uncultivated symbionts set the stage, which has now come to fruition, for the exploration, identification, and characterization of microbes in any habitat; e.g., soils, sediments, aquatic environments to the unseen multitudes of the human microbiome.

The giant tubeworm, *Riftia pachyptila*, with anemones and mussels colonizing a deep-sea hydrothermal vent site. These mouthless and gutless tubeworms live in symbiosis with chemosynthetic bacteria who feed them internally.

The **Pace lecture series** (established in 2018) honors IU alumnus (BA '64 Bacteriology, with honors) and former Professor and Distinguished Professor of Biology (1984 to 1996) Norman R. Pace, one of the world's most influential biologists. Pace revolutionized microbial ecology in ways that allowed the "unseen 99 percent" to be revealed. He is known for his groundbreaking research in biochemistry and in microbial ecology and evolution. He has been a pioneer and leader in two very different fields: (1) he co-discovered catalytic RNAs, and (2) he was a pioneer in developing the methods and philosophy of sequence-based studies of microbes in their natural environments, ushering in the age of metagenomics and microbiome research.