



## Department of Biology

The College of Arts + Sciences | Indiana University Bloomington



### About Tracy M. Sonneborn (1905–1981)

Aside from a few years at Johns Hopkins University, where he received a Ph.D. degree, Tracy Sonneborn spent his entire career at IU. His devotion to the study of *Paramecium* established him as the world leader in biology and genetics of protozoa; indeed it is no exaggeration to say that he founded the modern era of study in these areas.

One of his major contributions was in demonstrating that preexisting structures in cells can repeatedly determine the patterns of new structures through many generations. Although recognized as an important exception to Mendelian inheritance and a critical element in prion diseases, the mechanism of structural inheritance in biology is not yet fully understood. “Whatever the final outcome of studies of these phenomena, he must take his place among the most brilliant and devoted experimentalists in the history of biology and a true giant, like no other, in the field of protozoan research,” John Preer, Distinguished Professor of Biology.

With precision, thoroughness, and infectious enthusiasm—Tracy Sonneborn also contributed unstintingly to teaching at Indiana University. In spite of the many attempts to entice him away, he remained loyal to IU, finding here the environment he thought was best.

To honor his contributions to science and his outstanding career, Tracy Sonneborn’s friends and colleagues initiated the Sonneborn Lectureship. This is the 34th lecture in the series.

To learn more about Dr. Sonneborn, read John Preer’s essay and 2006 commentary in *Genetics* 172:1373–77.

## Tracy M. Sonneborn Lecture

### Spatial organization of biological functions— A single-molecule review of bacterial cell division

Jie Xiao, Ph.D.

Professor of Biophysics and Biophysical Chemistry  
Johns Hopkins School of Medicine

Wednesday, November 8, 2023  
4:00 p.m. • Myers Hall 130

My laboratory focuses on developing novel single-molecule imaging tools in live cells to probe various aspects of microbial cellular processes. We are broadly interested in understanding how the molecular constituents of bacterial cellular processes are spatially organized and what essential functions such an organization conveys. In this talk, I will discuss our recent work on the structure, function, and dynamics of the bacterial cell division machinery. Using single-molecule imaging in live *E. coli* cells, we first illustrated the structural organization of the bacterial cytokinesis ring formed by the tubulin homolog FtsZ protein. We next found that FtsZ uses its GTP hydrolysis to power treadmilling dynamics and function as a linear motor to transport sPG synthase enzymes evenly along the septum to ensure smooth, symmetric septum formation. We discovered that the activity of these enzymes is spatially regulated through their differential coupling to two distinct tracks along the septum. Through structural investigations, we provided molecular details of how the core division complex activates the essential sPG synthase complex. Our work point opens new directions to study the precise spatial coordination and regulation of the large ensemble of cell division proteins.

Hosted by Malcolm Winkler, Distinguished Professor of Biology • Refreshments served prior to seminar

Support for this lecture has been provided by the Sonneborn Lecture Fund and the IU Department of Biology. Learn more about the Tracy M. Sonneborn Lecture Series at <https://go.iu.edu/1SCv>.



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### Past Lectures

2016	Jasper Rine	1997	Randy W. Schekman
2013	Eric F. Wieschaus	1996	Lucy Shapiro
2011	Joseph G. Gall	1995	Gerald M. Rubin
2011	C. David Allis	1994	Christine Guthrie
2010	Tian Xu	1993	Christiane Nüsslein-Volhard
2009	Terry L. Orr-Weaver	1992	Melvin I. Simon
2007	David Baulcombe	1991	Elizabeth H. Blackburn
2006	J. Richard McIntosh	1990	Thomas R. Cech
2005	Cynthia Kenyon	1989	Ira Herskowitz
2003	Sharon Long	1988	Franklin Stahl
2002	Philip Hanawalt	1987	David Botstein
2001	David Prescott	1986	Mark Ptashne
2000	Elliot Meyerowitz	1985	David S. Hogness
1999	John Kilmartin	1984	Gerald R. Fink
1998	James Forney, Eric Meyer, Meng-Chao Yao, John Preer	1983	Philip Leder
		1982	Donald D. Brown
		1981	Charles Yanofsky