

# Princeton University

Honors Faculty Members  
Receiving Emeritus Status



**May 2012**

The biographical sketches were written by  
colleagues in the departments of those honored.

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# James Riley Broach



One of the founding members of the Department of Molecular Biology, James Broach is a pioneer of modern molecular approaches to the study of the model organism *Saccharomyces cerevisiae*, better known as bakers' or brewers' yeast.

After completing undergraduate studies at Yale University in 1969, Jim was awarded a Ph.D. in 1973 from the University of California-Berkeley for studies with the renowned biochemist Bruce Ames. For his doctoral work, Jim made the fundamental discovery that translation was necessary for the transcription of the genes involved in histidine biosynthesis in *Salmonella*. This marked the beginning of a long career concerned with the mechanisms of genetic regulation, which he continued after transferring his attentions from bacterial cells to the simple eukaryote yeast.

After brief postdoctoral stints first with R.K. Mortimer at Berkeley, and then with R.F. Gesteland at Cold Spring Harbor Laboratory (CSHL), Jim was a staff scientist at CSHL from 1977-79. At CSHL, he was part of the famous "yeast group," which unraveled the basic mechanism of mating-type switching, a major paradigm for how cells with the same genetic material attain very different specialized states. He was also instrumental in developing recombinant DNA approaches to yeast, helping to make it a major model organism. In addition to being a member of the group that constructed the first library of yeast genes, Jim pioneered the molecular characterization of the endogenous yeast "2-micron" plasmid. Because it is present in many copies in each cell, this plasmid has been adapted as a vehicle for genetic cloning experiments, allowing the ready over-expression in yeast of any gene placed in it. Along the way, Jim helped characterize and ultimately proved the very clever method by which the plasmid is amplified to achieve high copy number. The site-specific recombination

system at the heart of plasmid amplification has since been adapted for use in many other multicellular model organisms.

From CSHL, Jim went to the State University of New York-Stony Brook. Here he began a very fruitful collaboration with Michael Wigler, to study the function of the yeast version of the human ras oncogene. This was one of the earliest uses of yeast for targeted studies of conserved genes of human medical importance. Although the specific functions of ras in humans and yeast proved to be somewhat different, ultimately this led to further far-reaching studies to understand the mechanism of growth control — how do cells monitor and regulate the accumulation of mass prior to cell division? Jim went on to disentangle the complex pathways of nutrient assimilation, focusing mainly on glucose, but more recently expanding into nitrogen and other basic requirements.

After promotion to associate professor at SUNY Stony Brook, Jim was recruited by Arnie Levine and Tom Shenk to join the nascent molecular biology department at Princeton in 1984. At Princeton, Jim has continued to study complex problems in genetic regulation at many different levels. These include the transcriptional repression of the “silent” copies of the mating-type genes, the mechanism by which the silent copies are recombined into the active site, the downstream regulatory targets of the ras genes, and the regulation and functions of the protein phosphatases. More recently, he has been adapting genomic methods to understand the network of glucose and nitrogen signaling, the changes that cells undergo as they enter quiescence and the effects of chromatin remodeling and modification on transcription.

Jim, who has written more than 150 scientific papers, is clearly one of the influential leaders in the field of yeast molecular biology. His highly influential review articles cover his areas of expertise, and he also was a co-editor of six volumes from CSHL describing the molecular and cellular biology of yeast. The “yeast books” became the bibles of the field.

After promotion to professor in 1986, Jim has held various leadership positions at Princeton. He served as associate director of the Lewis-Sigler Institute for Integrative Genomics from 2001-08, and has

been associate chair of molecular biology from 2004 onward. Outside of the University, Jim has also taken on many leadership roles. He served as an editor or associate editor for several journals, including *Cell* and *Molecular and Cellular Biology*. He has organized numerous scientific conferences at Princeton and elsewhere. He reviewed grants for several National Institutes of Health study sections and served as chair of both the Genomics Study Section and the Genomics, Computation and Technology Study Section. He serves on the advisory boards of the Institute for Advanced Study and the nation's Food and Drug Administration, and is a trustee for the University of Medicine and Dentistry of New Jersey.

Although Jim is retiring from Princeton, he is taking on new challenges as chair of the Department of Biochemistry and Molecular Biology at Penn State Hershey and as director of the Penn State Institute for Personalized Medicine. His responsibilities will be to help translate the significant advances learned in yeast genomics to the burgeoning field of personalized medicine.

Jim Broach has been not only a valued colleague, but also a thoughtful friend and adviser. His encyclopedic knowledge is legendary. He is well known for pausing in mid-sentence, eyes gazing upward in thought about the thornier aspects of a question — an action referred to as “broaching” among his former students. We will miss him.