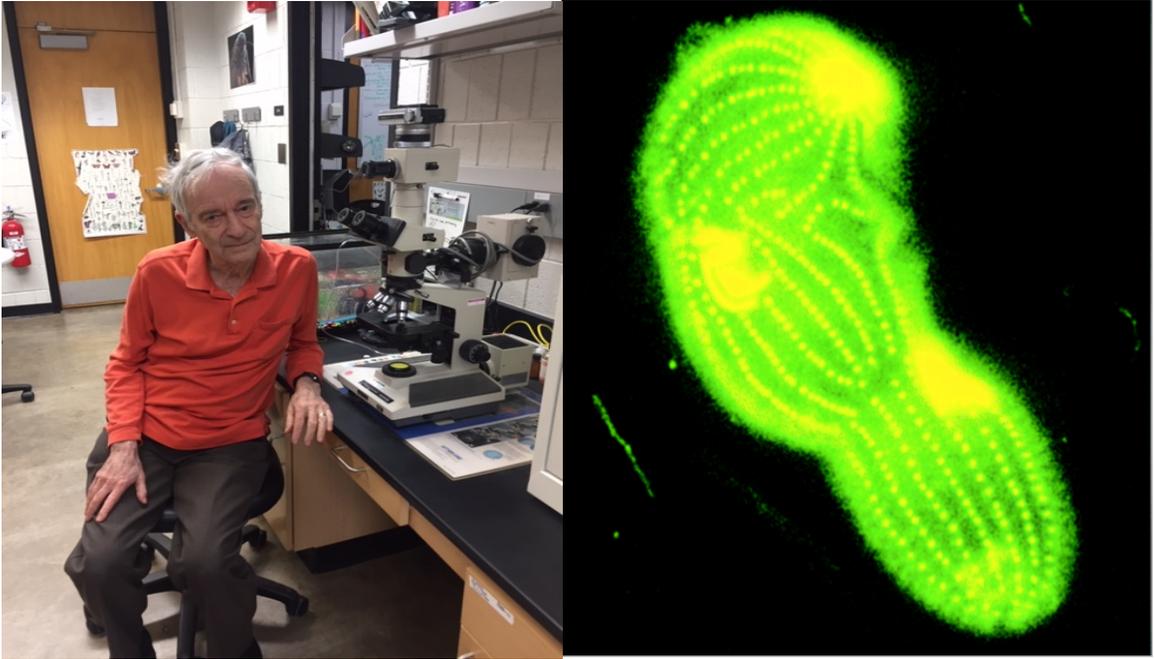


A Carton of Cigarettes Made him into a Protozoologist

A Profile Story of Dr. Joseph Frankel by Tyler Jackson



Left: Dr. Joseph Frankel posing next to a microscope. Right: Front cover of the Eukaryotic Cell journal published by the American Society for Microbiology, showcasing *Tetrahymena* “stuck” while attempting to divide.

The world has countless charms to the naked eye of a human being but none quite like the charm that the naked eye cannot see. What do you mean, you may ask. Dr. Joseph Frankel, retired professor (official title is Emeritus) at the University of Iowa, is fascinated by the beauty of the microscopic world. Joe's goal to become a protozoologist came about from an experience in his youth, when a friend of his father traded a carton of cigarettes for a microscope in post-World-War II Germany, and then gave the microscope to Joe as a gift. While initially fascinated by literature, Joe changed course on his future plans because of this new gift and considered something a little more close knit to nature, specifically the nature of the unseen.

So begins Joe's pursuit of a career in science. Joe attended college at Cornell University and initially registered as a pre-med, which was his father's recommendation. "The one career that people will always need is a doctor." But Joe had other ambitions and was not all that fond of dealing with peoples' problems as much as doctors generally do. After his freshman year, Joe decided to abandon the pre-med track and transitioned over to a straightforward zoology major, and this was his eventual, engraved-in-stone major for the remainder of his undergraduate studies. After graduation from Cornell, Joe sought out more opportunities to study zoology and applied for graduate school at Yale and was accepted as a zoology graduate student, and it took him four years to earn his PhD. It just so happened that Joe also started to work in an ecology lab during these first two years at Yale and tried to merge this with his continuing interest in protozoology. Though this was interesting, the creative research in ecology done at that time in Yale was heavily mathematical, and Joe eventually left this field behind. Joe completed his PhD under a young assistant professor named Earl Hanson (describing him as having "an infectious enthusiasm"), studying protozoan cell-surface patterning, which kicked off Joe's career in developmental protozoology. Joe studied the effects of a UV microbeam, by focusing a small beam of ultraviolet light on a transparent glass plate containing a cell in the middle. Joe would compress the cell to immobilize it, and then use the UV-microbeam to destroy specific external structures, and then see how the damaged structures would regenerate. Joe concluded from this research that the damaged structures were not repaired, but rather were discarded and then reassembled to produce a new structure similar to its damaged progenitor.

As a PhD fresh out of graduate school, Dr. Frankel had a choice between the University of California at Los Angeles (UCLA) or the Biological Institute of the Carlsberg Foundation in Copenhagen for studying protozoology as a Post-Doc. To Dr. Frankel, the choice was pretty obvious, Copenhagen. This lab discovered a method to synchronize cell division in *Tetrahymena*, a ciliated protozoan, which essentially allowed someone to "study a culture of cells like one cell." Dr. Frankel studied the patterning of the cell surface (cortex) as the cell was starting to divide. This was the time that Dr. Frankel began to appreciate the complexity of cellular organization in *Tetrahymena*. After his time conducting research in Copenhagen, Dr. Frankel learned two pieces of advice for graduate students, "work under someone who is well-known, and work in the United States"; the latter advice was more valid at that time (the early 1960's) than in the current era of Skype and instant worldwide communication.

Dr. Frankel joined the University of Iowa as an assistant professor in 1962. He taught an entire introductory zoology course at the University of Iowa for his first year; a couple of years later he and his senior colleague, Norman E. Williams, decided to squeeze it all into one semester, which was a lot to ask from the students. In his early years at the University of Iowa, Dr. Frankel had quite a few graduate students join his research lab. Ray Gavin, one of three African Americans then in the Zoology Department at the University of Iowa, was one of his graduate students. As was characteristic of the 1960's, this was during a time of racial discrimination throughout much of the United States, and this was a major challenge for Ray Gavin. "The department was quite welcoming for Gavin, but the housing situation was difficult for him," Frankel recalled. After receiving his PhD, Dr. Gavin became a professor and then Chairman of the Biology Department at Brooklyn College of the City University of New York.

Dr. Frankel is celebrated for his front-cover publication in the journal "Eukaryotic Cell", published in 2006 by the American Society for Microbiology (as seen below), that people/you can see framed in the Biology building at the University of Iowa. The paper includes contributions that each of the six authors had made in the experiments, findings, and analysis. The paper dealt with the role of the actin gene in cell division of *Tetrahymena*. The main observation was that when cells lacking the principal actin entered division, they completed constriction, but got "stuck" (could not completely divide into two cells). Cells could keep initiating cell divisions though and would end up as large, abnormal bulbous structures. It was concluded that actin was required to allow cilia to propel the final rotary motions to allow cells to complete their divisions into two individual cells. It was at this time when Dr. Frankel began to theorize about how development in a unicellular organism like *Tetrahymena* could be compared to more complex multicellular organisms, especially fruit-flies (*Drosophila*) which were and still are popular in research in developmental biology.

Dr. Frankel's teaching career was decorated with several positive experiences. The course that he instructed was Principles of Biology I and he "considerably changed the way this course was taught." Dr. Frankel sought to be "fairly analytical when teaching." Understanding being distinct from rote memorization was the first of several teaching philosophies listed in his essay that accompanied the CLAS teaching award he received as a professor at the University of Iowa. The scientific method was an integral part of the teaching process and Dr. Frankel would discuss many theories and hypotheses for various topics, such as "clonal selection" in immunology. Maybe more relevant than ever was the purpose of technology as a lecturing tool. Dr. Frankel warned of abusing PowerPoint by making it your master. Rather, the lecturers

should make the PowerPoint slides their own masters and simply use them as a guide. Since much of the content in the Principles of Biology course biology was "inherently less visual and more highly verbal and conceptual," than in some other courses such as Developmental Biology, it would be wise to follow this philosophy. To spark interest in biology for people who were both biology majors and non-biology majors, Dr. Frankel would try to give prominent examples of biological phenomena, for instance using medical applications (sickle-cell anemia, thalassemia, etc.).

Nevertheless Dr. Frankel loved every bit of his astounding 50 year career at the University of Iowa. Not only did he aptly say he "really enjoyed teaching students," he also takes every opportunity he can to keep on studying those little critters called ciliates that "hold the unseen beauty of nature".