



Left: Professor John Menninger sitting in his office at the University of Iowa. Right: DNA replication depiction in prokaryotes.

### Of Humble Beginnings

#### A Profile Story of Professor John Menninger by Tyler Jackson

There is one individual who has a phenomenal track record studying genetics with notable scientists like Francis Crick, Sydney Brenner, and Matt Meselson and has been instrumental in ensuring the success of the Biology Department at the University of Iowa. This individual is Dr. John Menninger, Emeritus Professor at the University of Iowa. He has shown this type of work mentality in the past with his work with X-Ray diffraction in Matt Meselson's lab and in the present with his extraordinary contributions to the prosperity of the biology department here at the University of Iowa. Dr. Menninger has a history of rich achievements, stories, and memorable moments for which are recounted here.

Dr. Menninger, based on his performance and interest in the sciences in high school and the occupation of his father (engineer), wanted to pursue a university subject within the realm of science. His mother's side of the family was rich with relatives who were doctors or were

training to be doctors, so with all that taken into mind Dr. Menninger believed this path would be the fit for him. The fields of concentration (majors) during his time at Harvard University, Engineering and Physics, while also taking pre-medical courses. After finishing courses required for admission to medical school, he applied and was accepted at Harvard medical school. "You must realize at the time that the minimum requirements for medical school was 1 year of biology, 1 year of organic chemistry, and a science degree." This was likely the reason why Dr. Menninger was the only or one of the only physics majors admitted class of medical students amidst the sea of chemistry and biology majors. "I don't recommend the above requirements for current medical students." Pre-med students today can attest that curriculums for pre-med courses have changed quite a lot today.

One moment changed everything he believed he would do though. Dr. Menninger took a laboratory class and he asked a question to the teaching assistant about how one piece of measuring equipment worked. This was when he was met with a rather snarky reply, "you don't have to worry about that, you're just a medical student." Dr. Menninger thought about his decision to pursue medicine from a reply that was not "encouraging" and thought maybe he was "spending [his] time ill-advised" This just about changed Dr. Menninger's mind about pursuing an MD and made him want to work in a lab where he needed to know how the equipment functioned. After reversing his course of action to becoming a doctor, Dr. Menninger decided to take on life as a graduate student, which got him to where he is today.

Thus begins the time as a graduate student in Matt Meselson's laboratory at Cal Tech after Dr. Menninger received a graduate award to study there. Meselson and Frank Stahl are celebrated as the individuals that proposed and supported the theory of semi-conservative

replication although they were skeptical at nature of the "two subunits" (that they identified in the density-labeled DNA). "Meselson put his graduate students to work trying to identify the subunits and how they were joined together." Meselson and Stahl observed the formation of hybrid DNA (heavy and light) and by studying the DNA molecules using a CsCl density gradient and found the results known today in genetics courses. Dr. Menninger used low-angle X-ray diffraction during his time at CalTech through which he would study the patterns seen by shining a tiny X-ray beam onto a sample. Meselson had to teach Dr. Menninger to measure the length per mass. Dr. Menninger was also involved in making gradients of chemical material such as carbon tetrachloride and toluene then putting in CsCl droplets to calibrate the gradient, then he would drop the gel with the DNA, which would spring up and down until he could read the density. So Dr. Menninger analyzed the data obtained from the subunits and figured out that it was two strands and this was the bread and butter of his PhD thesis.

CalTech was not just the location that Dr. Menninger worked towards his PhD. "Keep in mind as well that other very distinguished scientists were present at CalTech such as Max Delbruck (Nobel Prize winner) George Beadle, and Renato Dulbecco just to name a few." Of course, Dr. Menninger's work at CalTech wasn't all work. The X-ray diffraction experiments took 4-5 days to complete so he could also enjoy the gorgeous beaches and weather in L.A. when he wasn't in the lab. He also reminisces of a story of a luau for George Beadle after earning the Nobel Prize after receiving the Nobel Prize for his research but there was a twist to it. The people at the party thought they would give the pig roast a head start by placing it in the autoclave for a short time (large oven that his heated up by steam pressure to 120 degrees

Celsius). "One of the settings unfortunately was fast exhaust so the pig exploded in the chamber and the autoclave was retired."

After completion of his PhD at Harvard, Dr. Menninger joined Crick and Brenner as a visiting research fellow in the U.K. at MRC Laboratory of Molecular Biology to complete a Post-Doc with which his research focused on the biochemical mechanisms of protein chain termination. He worked at this lab for 3 years until applying and being accepted at the University of Oregon in 1966 as a research associate and assistant professor. A couple years passed by and Dr. Menninger soon found his way to the University of Iowa as associate professor in 1973 and eventually being promoted to full professor. His contributions to the department include teaching, research, and serving on several important committees.

Rich with experience from prior research positions, Dr. Menninger began teaching Cell Physiology for which the pre-requisites were physics and calculus. Since he believed this was the way it should be taught he took it seriously and "showed the parts of calculus, physics, and even quantum mechanics that were involved in biology." Not everyone shared this enthusiasm that biology was melded with other science courses; "everyone thought biology was separate." That and removal of the course from the "required" list are what ended his time teaching that course. Later he was assigned to lecture Principles of Biology (Foundations of Biology today). Again, Dr. Menninger was able to reintroduce his philosophy towards teaching by emphasizing topics like pH and logarithms, which are integral concepts in cell biology. "One slide used by the previous instructor was an enormous great human egg cell being approached by a very thin, glass micropipette" to show *in vitro* fertilization and then show how the structure of the membrane could heal itself from being penetrated. Dr. Menninger believed that the point of

undergraduate education is "you learn how to learn" and "you learn carefully to distinguish what you know and don't know." And as a graduate student, the logic is "you learn how to repair the deficiencies like how to learn what you don't know."

For curiosity purposes, Dr. Menninger offered me his opinion on the topic of biology that will prosper in the future. His reply, neurobiology. "We haven't been told how memory works," meaning how it is encoded. "There is huge problems and almost no general principles that have yet been discovered." I agree that the brain has some big questions still unanswered and that this will be one of the major challenges for future biologists to undertake. Aside from that fun fact, Dr. Menninger is someone who was indulged in research and teaching the next generation of biologists, which in turn has contributed to the ongoing success of the University of Iowa. Thus why he has been recognized as an Emeritus professor of biology.