In The Spotlight: Developmental Biologist, Melinda Duncan, Ph.D.

December 2001 -- Not many people know that Dr. Melinda Duncan was born and raised in Cecil County, Maryland, which is literally just a few miles down the road from the University of Delaware. She even went to elementary school with the daughter of Dr. Robert Boord, now Professor Emeritus with the Department of Biological Sciences. Dr. Boord once brought one of his daughter's yearbooks into work not long after Dr. Duncan was hired - it contained a poem she had written back in sixth grade. "It's not often your sixth grade poetry comes back to haunt you," she says laughing.

Writing poetry would not become the focus of Dr. Duncan's collegiate career; the two subjects she enjoyed most were Biology and Chemistry, and she had a difficult time deciding between the two as an undergraduate. She earned a degree in Chemistry with Honors at Lafayette College, and went on to complete her Ph.D. in Biochemistry at age 26 from a joint program between Rutgers and the University of Medicine and Dentistry of New Jersey. Her husband Andrew, who is also a scientist, received a National Research Council Fellowship, so they moved to Washington D.C. It was during her post-doctoral work at the National Institutes of Health and the National Eye Institute in Washington that she developed an interest in the eye, and the switch to Biology was made.

Dr. Duncan's research covers two areas of eye development; the first is trying to understand what a cell decides to be during the developmental process. "In the early stages of development, cells are identical, but they become different later on due to decision-making pathways," she explains. "We're studying these pathways by studying the lens of the eye." Dr. Duncan is quick to point out a couple of images she recently captured using a confocal microscope: in Figure 1, you can see the outline of what is the very early stages on an eye. The dark area labeled 'A' will become the lens, and the grouping of cells labeled 'B' will eventually be the retina. Figure 2 is a small area in Figure 1 that has been magnified further, here 'A' points to the lens and the thin layer marked as 'B' is the cornea.

The second area of Dr. Duncan's research has to do with extracellular matrix (ECM), which is a material produced by cells and secreted into their surrounding region. "The matrix consists of a mixture of many different proteins," she explains. "It binds to the cell and tells the cell what it should become." The molecular composition of the lens matrix and what components of it are sending signals to the lens is currently unknown - this is what her research is trying to sort out. Having this knowledge could lead to cure a side effect of cataract surgery known as After-cataract. In cataract surgery, a layer of ECM, the lens, and the cataracts are removed, and then an artificial lens is put in place of the original lens. However, this procedure does not always work as desired. "Some of the cells around the incision aren't happy without the neighboring cells there anymore," she says. "They start dividing rapidly, lose their transparency, and migrate right into the optical path." While After-cataract can be treated by laser surgery, it is not recommended for everyone.
because it can aggravate problems with the retina.

Dr. Duncan is also very proud of her Vertebrate Developmental Biology course, which she developed from scratch and teaches every spring semester. The course is offered through both the Department of Biological Sciences and the Department of Animal and Food Sciences to undergraduate and graduate students. She advertises the course as "what's known about going from an egg to a college student," and covers other related topics like how twins are made and what goes wrong during development to make birth defects. Dr. Duncan comments that the course seems to be very popular with the students, and that she "shows a lot of yucky pictures." Smiling after making that remark, she says, "students look a little green sometimes, but they're awake!"

Recently, Dr. Duncan was recognized for her work at UD as the recipient of the Francis Alison Society’s Young Scholars Award. The award is given annually to a tenure-track assistant professor that "has shown distinction on combining research and publication with teaching and curriculum." Dr. Gerard Mangone, University Research Professor of International Maritime Law and Secretary of the Francis Alison Society, commented to the UD newspaper UpDate that the award is "the recognition of scholarship in our young faculty and their promise of great academic achievement. It is the University acknowledging that we have a remarkable harvest of young scholars ahead of us." Senior faculty members who have received the prestigious Alison Award, the highest academic honor the University of Delaware can confer on its faculty, vote to determine the recipient of Young Scholars Award.

Looking towards the future, Dr. Duncan hopes to continue strengthening the Molecular Biology and Genetics graduate program track that she coordinates for the Department of Biological Sciences. She believes the current strategy of hiring more faculty and continuing their successful efforts in recruiting highly qualified graduate students are the best ways to accomplish this. She is also looking forward to the completion of the current renovations to Wolf Hall so that she can take advantage of what will be state-of-the-art teaching and research facilities.