Peixoto studies, teaches the powerhouses of life

Dr. Aldemaro Romero Jr.
College Talk

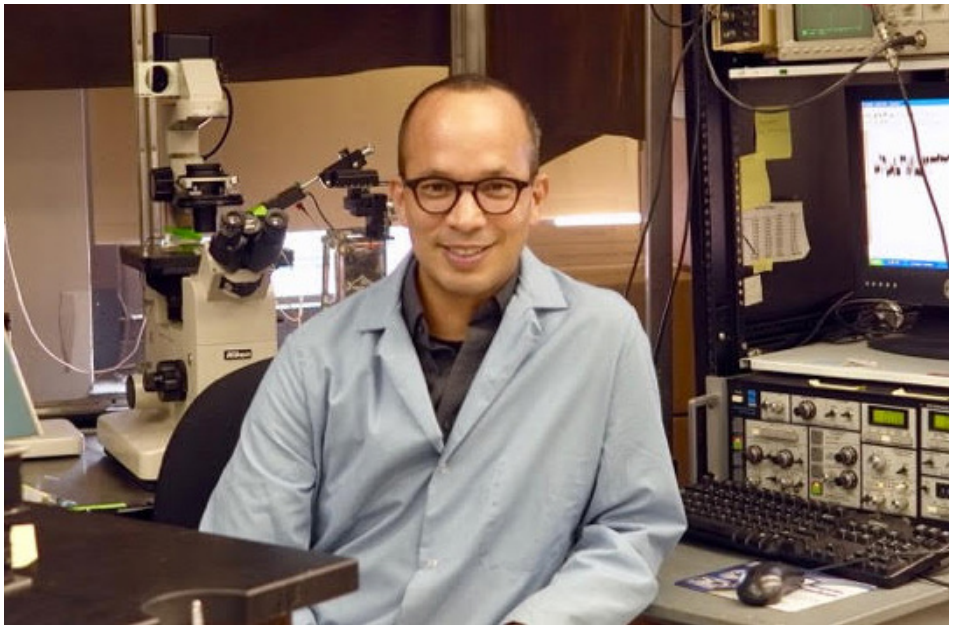

Photo by Jean Gaffney

Dr. Peixoto in his lab.

Sometimes great things come from small ones. Among the smallest structures we find in almost all cells are the mitochondria. Not only are they very small (about 0.001of an inch), but they are also very numerous (some of our cells have more than 2,000 of them each). And their role in life is enormous: they generate the energy molecules we use to make our bodies work.

Pablo Peixoto studies these microscopic structures. Born in Brasilia, the capital of Brazil, he became interested in science early in life. "I was one of those annoying kids who always wanted to know the underlying mechanisms of things. And when I spoke like that, my mom would ask, 'Who are you?' To which I would reply that I wanted to be a scientist."

After studying in Brazil, he went on to obtain his doctorate at the Universidad de Extremadura, Spain, and today he is an assistant professor in the Department of Natural Sciences in the Weissman School of Arts and Sciences at Baruch College of the City University of New York.

One of the first things that intrigued him about mitochondria is the fact that this structure used to be a bacterium, which was engulfed by another cell back at the beginnings of life on Earth. That bacterium had the particular power of generating energy in a more efficient way than the cell surrounding it.

"I have a slide I use in my lectures that shows the first step, the footprint of man on the moon, and funny enough it looks exactly like the internal structure of mitochondria when seen with an electron microscope. I like to say that the energy that mitochondria produce allows us to go to the moon," explains Peixoto. "That merger of the powerhouse with a new cell allowed for life to become multi-cellular, to become as complex as we are now."

In fact, mitochondria have a DNA in themselves that is extremely similar to the one we find in bacteria. "The DNA is the recipe for making proteins for survival and for reproduction, and a lot of those proteins became unnecessary for mitochondria once they rely on the DNA of the nucleus of the cells for those recipes."

But the importance of mitochondria goes beyond producing energy or containing DNA. "There's evidence now that mitochondria control the gender of newborns among mammals—including humans—as well as the release of chemicals that control cell death when a cell is ill and needs to be eliminated selectively. The process is called apoptosis, which is Greek for the falling of a leaf off a tree branch."

For Peixoto science is a very collaborative endeavor and his students are key. "I'm fortunate to have produced a good amount of research, most recently in collaboration with my students at Baruch College. Within six months after I started working here, I published a research article with an undergraduate student who in record time learned the lab techniques. Then I invited another three students and a graduate student at Baruch to write with me a review on the important role of mitochondria in regulating cancer."

"When a cell forgets how to die, tumors happen. Mitochondria release substances in normal cells to eliminate them if they're dysfunctional. A cancer cell is a dysfunctional cell that is insensitive to the mitochondrial programming," said Peixoto.

Peixoto is not just a researcher but also an educator, and as such he watches how participating in scientific research transforms students. "I see that impact on my students' views of biology, especially the students in the introductory courses who may be planning to major in accounting, finance, communication studies, or psychology. They come out of class, especially when I teach about cell death, and they go 'hmm.'"

And nothing is more powerful than explaining science using everyday images. "I remember this student looking at her own hands and imagining that as an embryo she had membranes in between her fingers, like a duck's feet, and those cells had to die, which allows for sculpting your body when you're being developed. Not only that, it's through apoptosis that we remove dying, aged cells from our skin, cells that were dying from contamination, or that we renew the intestinal floor, which happens about every other day. Those cells have to be replenished, which means replacing a dysfunctional cell with a functioning one."

Peixoto feels passionately not only about his own research but also about the need for society to nurture more scientists. "We are running out of scientists, and our health challenges with increasing longevity need to be confronted, but we don't have enough scientists. Government agencies such as the National Institute of Health or the National Science Foundation are waking up to the problem and they are pouring a lot of support now into scientific education, not only at the undergraduate level but also at the high school and even the elementary school levels."

Yet he knows that people have to have an inner drive for research. "I was reading one of my students' personal essays, and she mentioned that in childhood her parents gave her the opportunity to be exposed to all the different things that she wanted to be exposed to. I think it starts with that, with giving the opportunity for exposure, for allowing people to fall in love with something, and when that happens, then we have to nurture those experiences."

He backs up these beliefs with action. "Right now I have nine students in my research lab and I'm trying to juggle that high number. I try to provide an opportunity instead of trying to convince people that they need to go down a particular path."

Aldemaro Romero Jr. is the Dean of the Weissman School of Arts and Sciences at Baruch College-City University of New York. The radio show on which these articles are based can be watched at: https://vimeo.com/191643628
He can be contacted via Aldemaro.Romero@baruch.cuny.edu