

## Rita Varagona

### How did your career get started?

I loved being outside. I really wanted to become a park ranger, but I've never been all that strong physically. I can walk for miles, but I'm just not athletic. I had a long fascination with plants, probably from elementary school days when a woman scientist from Oak Ridge National Lab came and told us about photosynthesis. For me, plants were always out there to see, not like animals that might show up or not. And, in the mid '70s when I was trying to figure out what to do with my life, there was this environmental movement going. Keeping the earth beautifully covered with forests and a creating a healthy environment for all was important to me, plus I was fascinated by all the different forms and shapes of the plants around me. I knew I would be going to University of Tennessee, since I came from a large family where a college education was expected, but there wasn't a ton of money to pay for it. I opened the UT catalog and saw there was a Masters in Ecology, but not a bachelors, so maybe a BA in Botany would be a good place to start.

I loved all my botany classes, from taxonomy to ecology. But in the summer of '79, I took plant physiology from Dr. Otto Schwarz. It had a lab component where we got to work with plant hormones and do classical plant physiology experiments. I knew I had found my place. Reductionist plant biology was for me, with its cool research to understand how plants grow and develop. I found UT had a course for undergraduate research, and so I



asked about a lab where I might try out doing research. I was fortunate to land in Dr. Beth Mullin's lab, working on nitrogen fixing bacteria isolated from black locust trees growing at strip mine sites. Her hypothesis was that maybe these bacteria could survive in soils with the acidic pH that resulted from mining activities and acid rain. Good that she had a lot of patience! It took me most of one quarter just to make a complex series of agar media at different pH's to start the experiment. But I got the experiment done in the next quarters, and she was able to present the results later at a conference. I also did another undergraduate research project in plant genetics with Dr. Les Hickock, and I was sold that this was what I wanted to do with my life.

I applied to graduate schools, but I got an offer to work as a technician at the UT-Department of Energy (DOE) Comparative Animal Research Lab. (CARL) in my hometown, Oak Ridge, TN. There were a few plant scientists there wrapping up their work before all plant research was to be terminated or transferred elsewhere. My job in Dr. Randy Henke's group was screening mutagenized barley for the ability to germinate without gibberellin (GA) or with GA plus various inhibitors. What

an experience it was to do research in plant science. I had so much to learn from everyone there. And I remember how, in the wintertime, I would go to work before sunrise and drive home after sunset. Maybe, I should go back and get that MS in Botany.

I got to use a piece of the work at CARL for my MS thesis; I was trying to understand what happens when seeds are treated with the lysine analog, S-2aminoethylcystine. Specifically, did it affect the ability of lysine tRNAs to be charged with the lysine? This work was a collaboration between Randy's and Beth Mullin's lab, and was funded by an emerging plant biotech company, Agrigenetics. I learned a lot about germination physiology and plant biochemistry, including the importance of recording everything in a green notebook with carbon copies of each page. I loved the lab atmosphere and the hunt to understand plant growth and development. I ended up not only doing tRNA profiles from various tissues in the seed during germination, but I also did some crude inhibitor enzymology. I learned I loved being in the lab but writing the thesis, while necessary, was not as much fun.

From UT, I went to University of Georgia (UGA) to work as a technician for Dr. Susan Wessler, who was just opening her lab. I got to learn all those new techniques in the rapidly evolving area of plant molecular biology. I was so excited each day to come into the lab and do Southern blots, DNA cloning and sequencing, and other new techniques. The lab was where I wanted to be.

Sue offered to take me on as a PhD



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student, and I jumped at the chance to further develop as a plant scientist in this rapidly growing area. It was an adventure to work with people from all over the country who had come to pursue similar goals as mine. I got to unlock an understanding of many of the maize waxy mutants, and in the process learn some of the many ways transposons can affect gene expression. I also got to experience corn pollinations in the hot Georgia summers, as well as other types of hard work to get the answers we were looking for. How cool to understand the molecular basis of mutants discovered by some of the pivotal corn geneticists. It was also during this time that I met and married my first husband.

From Georgia, husband and I moved to East Lansing, Michigan (in December!) for a postdoctoral job at the Michigan State University (MSU)-DOE Plant Research Lab working with Dr. Natasha Raikhel on protein import into the nucleus. We had a small group working to increase our understanding of this area, while others in the lab were working on protein trafficking through the endomembrane system, using plant lectins as a model. While identifying one of the first plant nuclear targeting signals, I created my first transgenic plants, gave my first graduate student lectures (on plant transposons), and trained undergraduates in the lab. I appreciated how Natasha worked with us on many aspects of becoming a plant biologist, like building your professional network and reviewing papers.

From Michigan, we moved to New Mexico State University (NMSU), where I was hired in a tenure track

position in the Biology Department. It was a journey into the desert in many ways. I learned so much about myself and plants (not so cushy for plants in the desert). My small lab continued work on nuclear targeting and I taught a lot. I had a great crew of undergrad students, grad students, and summer students from Native American colleges, and I received a few research grants. We built a great lab culture and had some wins: several undergraduate theses, a few Masters theses, but really only enough data for one paper...which I still haven't submitted for publication. During my fifth year I was up for tenure and my marriage was at a bad place; it ended in a bad way. The promotion and tenure committee graciously gave me an additional year to get a paper published (and teach two new courses), but with the advice of my former advisors, I took a look at career options in industry. I wasn't sure I wanted to leave academia, but I was looking to see what else was possible. Maybe a fresh start would be the best option.

What I found was amazing. Genomics was revolutionizing what we could do with plants and the first transgenic plant products were beginning to enter the market. What a cool place to be and take the science I loved to do and apply it to help farmers. If I got an offer, I had to make the jump. After three interviews at different biotech companies, Dr. Tim Conner, who I knew from my time at UGA, offered me a job in genomics at Monsanto.

I found I loved doing cutting edge research with career scientists. And working in teams was the best! I could be the expert in my area and work with others who were also

experts and design and carry out experiments quickly. I couldn't believe the productivity. Even with all the turmoil in a business that went through mergers and spin-offs, we stayed focused on our goals and moved both our science and our products forward. We took the time to learn how to work together effectively, how to best communicate with each other, and how to effectively lead people and teams. We mentored and coached each other to grow in scientific knowledge and our knowledge of the company. And we supported each other as humans with families and outside interests. I had found the culture that worked best for me, and I had also found my love, Guy, and we built our family with son Michael (who attended the day care at Monsanto), and a bonus daughter, Sarah. Life wasn't always easy, but it was complete.

Today, I'm in the fourth iteration of my "career" at Bayer (which bought Monsanto in 2018), having worked in genomics and then quality traits for the animal feed industry. After a company reorganization, I did a second stint in genomics, this time leading our vector strategy. During that time, I got to lead/support various teams that discovered genetic elements needed for building new traits, work with folks who were leading the way toward vectors to make plant transformation and plant evaluation more efficient, and then I worked with the folks that sourced antibodies and did protein analysis on transgenic plants. I got to know many wonderful people who worked in the company. I returned to building novel traits in 2011, when I took on the weed control/herbicide traits team. I love bringing the science I know to foundational work for our farmer customers, and I love learning about





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how farmers use our tools. I got to work closely with more scientists who are great project leaders.

I became a Science Fellow at Monsanto in 2011, and today I'm a Bayer Distinguished Science Fellow. Along with my day job, I serve on the Fellows Advisory Board, as we Fellows work to develop, support, and inspire our science community. I continue to do outreach and push our scientists to do their best work to support our products. We have published peer-reviewed papers supporting these products.

I was honored to serve on the Executive Committee for ASPB as Elected Member, and I continue to engage in plant biology societies, especially ASPB, where I was elected as a Fellow in 2017. I have totally enjoyed helping my colleagues stay connected with these Societies, and to help both the external science community and my company colleagues grow and share our science and what we've learned about working together. I've had enjoyed getting to know many new colleagues and a few university students through various mentoring programs.

Personally, I enjoy working in my vegetable garden and playing music, which these days is mainly at church. Guy and I love to hear from the kids, both now grown and on their own. My company is currently going through another major change, and I'm here to help the younger members ride the wave. Why wouldn't you want to work with a great internal and international science community? Believe it or not, we are truly serious about helping farmers produce their crops in a way that is healthy for both people and

the planet. I plan to keep this up for a few more years...and then retire to my garden.

### What do you consider your most impactful contribution to plant sciences?

If I had been asked this question back in the late '90s, I'd say my biggest contribution was the rapid assay for protein targeting that I developed as a post-doc at Michigan State. There was a time when you couldn't open a plant science journal without seeing a paper that used my onion epidermal cell assay to prove where the authors' protein of interest had localized in onion cells. It was really a nice assay and was fairly easy to teach undergraduates in my lab at NMSU. They got to learn gene cloning and use the gene gun. What's more fun than hurling DNA into onion leather and then doing GUS assays the next day to see where your protein went.

But today, I think it's more about the people. We do really challenging applied science at Monsanto and now Bayer. It takes a bunch of us to figure out where to start and how best to test our plants, and then there's the army of folks and plant breeders who do all the safety studies to deregulate our products and get them into farmer's hands. I love the work and the people I work with. I love working in teams and doing my best to bring out the best in each of us so we are successful. And I really love getting to know people through the various mentoring programs that I've been a part of. Hopefully, something in our interactions helps someone get where they want to be, while having the life they wish to live. The bonus comes when our collective science is

chosen by farmers because they find value in what we have created and may be appreciated by the downstream folks who get value out of it as well. I think that's what all of us want: to use our science for the good of the world...and to be good stewards of the world. For me, it's our 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, and now 6<sup>th</sup> generation herbicide traits.

### What advice would you offer to a person considering a career in plant biology?

Plants are amazing creatures. They do many of the things we do, while being held in one place. They have to put up with whatever environment comes their way. We are just beginning to understand what it means to be a plant. We have an amazing partnership with plants called agriculture. To be part of that partnership, whether as a farmer, gardener, researcher (basic or applied), can lead to a really fulfilling life. It takes patience because plant growth is slow relative to some model organisms, but it's worth it.

The plant biology community, by and large, is a very welcoming one. Get to know others. Partnerships in research can really help lead to new levels of understanding. Use your time in school to try all sorts of different techniques and see what you do well and what you enjoy doing. Not only will you learn more about yourself, but you'll also cultivate relationships and learn concepts and perspectives that can help you work with others later. Stay curious and collaborative, because learning is a constant. Don't be afraid to speak up, share yourself, share your ideas. You might have an idea that will spark a conversation that will help you and/or your colleagues figure out the next big

thing. You might instill a love for science and/or plants that some other person will follow on for their career.

The drive to know is fun and it can consume you but doesn't have to. The work is important, but you also need time to rejuvenate and balance your life with home and community. That balance can be different for everyone. Seek out those people who ground you and be there for others. It's a great adventure to understand these creatures that we share the planet with. Take time to pause and appreciate what life has brought your way.