

In Her Own Words: An Acoustic Story

Marcia Isakson

Address:

Applied Research Laboratories
The University of Texas at Austin
Austin, Texas 78758
USA

Email:

misakson@arlut.utexas.edu

Alex Tolstoy

Address:

1538 Hampton Hill Circle
McLean, Virginia 22101
USA

Email:

atolstoy@gmail.com

Over the last 50 years, women have gone from being tolerated in science to becoming a vital component. The stories told “in her own words” in this article are from those who lived it.

As the editor of *Acoustics Today*, Arthur Popper, was developing the topics for this issue, he realized that the first several articles he invited, by chance, had women as senior authors. At the same time, he was consulting with members of the Women in Acoustics (WIA) Committee about a set of articles on their role in the Acoustical Society of America (ASA), and it struck him that one way to “celebrate” female colleagues would be to set up the entire issue with women as senior authors. After consulting with various colleagues, he easily arrived at a diverse set of exciting articles by rather remarkable ASA members. Thus, for the first time, *Acoustics Today* has a woman as the senior author of each article. Art then gently “twisted arms” and invited the immediate past president, Marcia Isakson, and the founder of the WIA Committee, Alex Tolstoy, to author the introduction. He was also delighted to discover that Alex is a watercolorist and he invited her to do the cover for the issue.

The senior authors in this issue are a group of prominent women in acoustics. Kathleen Wage, an expert in signal processing from George Mason University, Fairfax, VA, has an article on sparse array processing. Christina Naify, from the Jet Propulsion Laboratory of NASA, gives us insight into the world of antenna arrays. Jennell Vick from Case Western Reserve University, Cleveland, OH, discusses the intricacies of speech development in children. Lily Wang, the current ASA president, writes about classroom acoustics. Lisa Zurk, the first female director of the Applied Physics Laboratory at the University of Washington, Seattle, reviews sonar and signal processing. Finally, Alexandra Loubeau of NASA talks about how humans perceive sonic booms.

This diverse and impressive list of authors shows just how much women are contributing to the field of acoustics. However, although the breadth of acoustical science is covered in these articles, the human element seemed to be missing. Therefore, we decided that an appropriate introduction would be to trace the experience of female researchers through the years. As such, we reached out to the acoustics community for help in gathering stories. While doing this, we realized that the best way to tell these stories was to let each individual tell her own story in her own words, with some light editing. So, here is a semichronological collection of individual stories in her own words. The stories are anonymous for two reasons. First, many of the women requested to remain anonymous. Second, to some extent, these stories reflect a shared experience among female researchers. In a lot of ways, they reflect the “every woman.”

We have categorized the contributions into three parts: senior researchers (covering the 1960s to 1980s), midcareer researchers (covering the 1990s to the early 2000s), and early-career researchers (covering the 2010s). These stories, both good and bad, tell the evolving story of women in science and, we believe, give hope for

the future while still highlighting some of the work that is yet to be done. Personally, I (M.I.) look forward to the day when my brilliant biochemist/biophysicist daughter who is a senior in college is just a “brilliant biochemist/biophysicist” and not a “female scientist.”

Senior Researchers (1960s-1980s)

Aspiring STEM Major

“In spring 1964, I was preparing to graduate from high school and go on to college. Thus, I was talking to a number of universities about applying and attending their campuses. One of these was Georgetown University, Washington, DC, a local school. However, I was told that although I wanted to major in mathematics, ‘girls’ were not permitted such a major there. I went elsewhere.”

Underwater Acoustician

“My first job in underwater acoustics (UA) in 1980 was very problematic and I almost left the UA field. After four years of nonrecognition (no matter how hard I worked and how much I achieved), I found that I could not advance. And not only was I the only female in science in that office (out of 30), I was the only scientist not promoted in four years. Nor could I get papers published because they had to be reviewed by my boss who would change words to contradict my findings and then, in subsequent reviews, would change things back. A nonconverging sequence.

“I went to see about moving internally to another branch. I was told by the then head of the Division that he had to ‘see’ about things. It turned out that I was actually the fourth female to report a problem with that boss. One previous woman was told (by my boss) that she would not be allowed a phone in her office because ‘women talked too much on the phone.’ Things were significantly better after the eventual transfer.”

University Professor

“As a woman scientist, I have been lucky. While at Columbia University, New York (in the late 1960s), I don’t think I had ever been treated unfairly; I always had absolute freedom to do my research without any interference. Although I am grateful that I had such a fair and nondiscriminatory working environment at Columbia, I must say that it should always be this way.”

Arctic Acoustician

“I was scheduled to make my first trip to the ice in 1982 to deploy and record an acoustic array under the ice. Unfortunately, the group managing the overall experiment

and ice camp said no women were allowed. Because I was the only one who could calibrate and repair the array, the compromise was to leave me in Thule, Greenland, and fly me up when the array needed work, a 10-hour round-trip in a DC-3. Three trips were required, but the experiment was successful. The following year, my supervisor held the line, saying that only he would determine who went to the ice. I was allowed to go, but three of us from the Naval Ocean Systems Center (NOSC; two men and myself) had to have our own tent(s) a mile from the main camp from which I was banned but the two men were welcome. Toward the end of the experiment, the chief scientist from the main camp asked for my help with the equipment, which was not operating correctly. Having proven my worth, he invited me back the following year without restriction. Things changed after I got my PhD, returned to the NOSC, and started leading my own ice camps!”

National Institutes of Health Grantee Hopeful

“I was told by someone at a 1976 study section meeting at which my NIH postdoc application was being considered that one of the men asked ‘What if she gets pregnant?’ He told me that he responded ‘She’ll have a baby!’ I guess his comment did it; I was awarded a three-year postdoc.”

Midcareer Researchers (1990s to early 2000s)

Electrical Engineer

“I was one of those girls who was discouraged from pursuing a career in the sciences. I was told multiple times that girls are not good in math and that they are better in memorizing rather than in solving problems. I was also told that if I took the entrance exam for electrical engineering at the National University in Athens, Greece, I would fail because boys trying for the same school would do better than me. That was my challenge. I decided to go for electrical engineering, although I had no knowledge of what engineers do, because that was considered to be the hardest major to get in and complete. I made it and, thankfully, I liked it. I was intrigued by signal processing and computer networking, and I decided to come to the United States for an MS. My MS advisor was the one who encouraged me to keep going and complete my PhD. And he continued to encourage me and be happy for me after my graduation until he passed away. I owe him a great deal.”

Audio Engineer

“I worked as an audio test engineer from 1996 to 2013 at a small- to middle-sized company just north of Silicon Valley

in California. I was one of two women in a group of about 10-12 audio hardware and software developers. During my earliest years at the company, one of the main software developers on my team had girly posters hung up in our conference room, and he regularly made sexual remarks during meetings and when I worked with him. Usually, the group of male engineers would laugh awkwardly at his remarks. After a few months, that engineer was made to remove the girly posters, but he still made sexual comments at every engineering meeting. He made comments about how I looked and about having sex on a daily basis. This continued despite my complaints to the head of engineering. This 40+-year-old engineer then began having a relationship with a 16-year-old girl from Canada he had met online. This man started bringing the girl into the office. My supervisor asked me to meet with the underage girl and convince her to go back to Canada. When I refused to do this, the company spoke to their lawyer who reported the abuse to the FBI. The engineer was subsequently arrested on multiple accounts of child abuse and molestation charges.

“About a year after this, in 1999, my supervisor regularly asked me out while mentioning promotion and pay raises. I reported his behavior to the president of the company. The company initially offered to pay me one-year’s salary if I left, but I refused. They switched my supervisor instead. Starting in 2000, the most outrageous incidents finally stopped. But, still from 2000 to 2013, I was always referred to as one of the girls even though I was in my 40s.”

Early-Career Researchers (2010s)

Starting a Family

“Most of my experiences have been great. The vast majority of the men I work with have been kind, respectful, and encouraging of my professional ambitions. I have had many great mentors in graduate school, at my postdoc, and in industry. I have only a handful of negative experiences, particularly with my postdoc advisor who threatened to shorten my maternity leave (which is illegal) because he wasn’t happy with my decision to work on other projects in addition to his project. I’ve also had to navigate the tightrope walk of trying to be likable AND assertive, which is often difficult for women.”

Balancing Work and Family

“I found that my experience as a woman in STEM felt very different after I had a baby. Before, because I am a woman who

gets along well with men and doesn’t mind a little off-color humor in the field (which I do realize is not OK), I felt pretty equal. However, after taking an extended maternity leave and then working part-time, I felt a bit forgotten, noticed opportunities for which I was not considered because I was not as omnipresent, and struggled to maintain the level of involvement required to excel in my field. While huge improvements have been made over the years, I think the culture of science needs to change to accommodate ‘both men and women’ with responsibilities outside work so that this time taken away from work is normal, accepted, and even celebrated.”

Working in the Minority

“I used to have more struggles with the imposter syndrome (chronic feelings of self-doubt and inadequacy) than I do now. What helped was when I came across a study in graduate school showing how the more that women are underrepresented in a particular field, the more those women outperform the men. (This was a study done on Georgia Tech students in the 1990s.) Objective data about the performance of other women, in addition to my own performance, helped me feel like I really belong in the sciences.”

Importance of Mentoring

“I am a current PhD student at the University of Nebraska-Lincoln, studying acoustics within an architectural engineering program. As an undergraduate at Brigham Young University (BYU), Provo, UT, I was studying music and never dreamed of entering a STEM-related field. After taking an introductory acoustics course, I discovered a passion for physics, research, and everything acoustics related. I was unsure if I could enter a field that at the time looked daunting and frankly out of my league. I approached my professor, daring to hope that I could join a research team of some sort. Her reaction changed the course of my life and her continued support even changed my attitude and my belief in what I can accomplish. Not only did she help me find a place in the acoustics research group at BYU, but she also mentored me throughout the process of deciding postgraduation plans and exploring career goals. I am certain that without her mentorship I would not be where I am today.”

Importance of Mentoring II

“Joining a STEM field as a female was intimidating. However, I had several professors and mentors who encouraged me and helped me succeed and thrive. Although I feel fortunate to have an incredible support system, I wonder if there are

girls who are considering a STEM career and don't get the same support as they make that decision. Sometimes we just need someone to tell us we can do it. Honestly, without some key mentors at vital points in my life, I may have dismissed my ambitions as impossible. I am confident that mentors like these exist everywhere, especially in acoustics, and I hope to be one myself."

Importance of Role Models

"During the 2017 ASA conference in Boston, MA, two of my female friends/mentors in acoustics took the train down from Boston to have dinner at my home in Rhode Island. The three of us, all scientists/engineers, returned from a day of attending and giving talks in acoustics to find my husband cooking dinner with our 3-month-old baby strapped to his chest in a baby carrier. As we sat at dinner, we were struck by the observation that this scene would probably not have occurred just a generation ago. I sat there with these amazing women and realized how fortunate I was to have female mentors and role models in acoustics. We talked about the importance of seeing women in roles that we aspire to, but whereas I had a few women I could point to, they, who are from different areas of acoustics (signal processing and animal bioacoustics), both pointed to the same inspiration or 'proof of concept' from when they were starting off in their careers: Ellen Livingston."

Conclusions

In summary, although these stories are all quite individual, together they illustrate a number of points. First, from the early stories, we can see how some discrimination is simply not allowed anymore. A distinct improvement. Second, we see that there have been significant pockets of sometimes horrible behavior. However, women as a group do not tolerate such behavior anymore, and one hopes that such situations have been wiped out. Things do seem to have improved over time. However, one needs to always watch for problems, particularly sexual harassment, which can be insidious.

Many institutions have policies to improve the female-to-male ratio in STEM areas; others are developing policies based on the growing number of women in the field. These policies typically involve keeping women in the system and getting them to return if there is a hiatus such as for family reasons.

The ASA, via the WIA Committee, is always trying to improve the number of women in the Society, such as through increased visibility, more positions of authority, mentoring, and ASA child care for attending scientists. The regular luncheons have proven to be a highly successful way to network while socializing, allowing women to cross-fertilize their scientific and Society work. It is important that women not only serve in administrative roles in the Society, which can be very time consuming, but also in scientific and honorary roles. However, as evidenced by this issue of *Acoustics Today*, women are making great strides in being leaders in the science community.

Thus, we continue to learn important lessons.

- Mentoring is extremely important. Find a mentor and be a mentor.
- Networking is invaluable.
- Talking to other women can make a colossal difference.

The day is surely coming when a scientist is recognized by her achievements and not for her gender, even if we are not quite at that day yet.

BioSketches



Marcia Isakson received her BS in engineering physics and mathematics from the United States Military Academy at West Point in 1992. On graduation, she was awarded a Hertz Foundation Fellowship and completed a master's degree in physics at The University of Texas at Austin in 1994. Captain Isakson served in the United States Army from 1994 to 1997 as a battalion operations officer. She earned a PhD in physics from The University of Texas at Austin in 2002. She has been employed at the Applied Research Laboratories at The University of Texas (ARL:UT) as a research scientist since 2001.



Alex Tolstoy was an applied mathematician specializing in the wave equation and in acoustical oceanography/underwater acoustics/signal processing for over 40 years. She retired in December 2012 and then transitioned into a professional artist (atolstoyart.com).