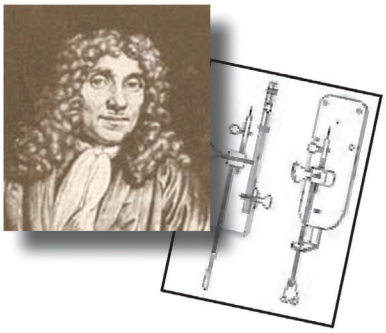
MicroscopyPioneers

Women's History Month and MSA



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It is Women's History Month, and so in this edition of Microscopy Pioneers I want to showcase the women of our society who are pioneers in the field of microscopy both in regard to technology and science, as well as the frontiers of societal change. This piece has been a process. At first it seemed ideal that we would have a March edition and could give space to the women who have left their marks on history. Then it seemed like an insurmountable task that would fail to highlight the full cohort in the manner that they truly deserve; this in part remains true. Underpinning this effort is the challenge to highlight the success of these women in breaking societal barriers, success that has truly altered our history while not allowing the inequities themselves to become the focus. The truth is that gender equality is still evolving. We have not reached an equilibrium or even agreed on what equality means. However, for this piece the inequality is the background. This background often behaves more like a shadowy character influencing our lives and evolving. The stories of the women here include that wraithlike foe, but for this piece, the women will be our feature. These women were pioneers in different ways, but their efforts have each resulted in the creation of space for women in science and within our own society.

Dr. Gertrude Rempfer (1912–2011)

Dr. Rempfer grew up outside of Seattle with the sort of childhood that brings to mind Pippi Longstocking. While there was no pirate gold, there were plenty of adventures with horses, chickens, and a dairy cow. She was raised by a single mother with the help of her grandmother. The two women instilled in the children a sense of self-reliance. In her filmed interview for the 50th (E)MSA meeting in 1992, she reflected on how this independence established a deep sense of self-confidence rooted in a tested knowledge that she could handle herself. As a child she learned to box from her brother and had a natural inclination for poetry. Decades later she could still recite by heart a poem that poured out of her one night. In her own words she had an intrinsic "creative clarity." The family house had no electricity, so her mother would diligently take down young Gert's poems by moonlight. In the interview conducted by Sterling Newberry, Rempfer is slightly bashful but mostly excited to share the poem. Watching this moment relives what so many of our more established members know: Rempfer had a bit of magic to her that is infectious.

Her mother relocated the family to Seattle for Gert to attend Queen Anne High School. Rempfer missed the rural home, but her attendance at the school expanded her experiences—experiences that opened a new vantage point. After graduating she worked for a year to save money for university. To this point she plainly addressed the benefits of having state universities with low tuition, for without them she would not have been able to continue her education. After a year of working, she enrolled in Washington State University with plans to pursue a degree in forestry, given her love of the outdoors and comfort with the natural world. These plans were interrupted in her sophomore year when all forestry majors were required to spend an extended period at a logging facility. The facility only had accommodations for the male students. So, she spent that time exploring the different sciences, but physics, to her surprise, kept drawing her back. She earned a half-time assistantship to continue at the university as a graduate student. Her doctoral work focused on thermionics and field-emission.

Without divulging details, Rempfer reflected on the other important aspect that got her through her collegiate years—helpers. She could not quite pinpoint how it happened, but there were people there along the way to guide her and advocate on her behalf. The result was the completion of her Ph.D. in 1939. She took a teaching position at Mount Holyoke before moving to Troy, NY to teach at Russell Sage. In Troy she met her husband, Robert Rempfer, who was working at Rensselaer Polytechnic Institute (RPI). When a position became available, she joined him at RPI for a short period of time before the war changed their plans. Rempfer remembered the visceral fear, watching as Hitler's army expanded, taking over country after country. Realizing the importance of physicists in the war effort, the Rempfers joined the Naval Research Laboratory to work on radar countermeasures. Then, the couple were transferred to work on the Manhattan Project at Columbia; specifically, Gert worked on mass spectrometry. However, the couple espoused liberal political views, leading to a decision that their efforts would be better matched elsewhere.

In 1945, she began working at the Farrand Optical Company, which aimed to develop an electron microscope. Gert was tasked with investigating the parameters of electron lenses. She obtained highly accurate data by using the shadowgraph technique with an electron-optical bench. The work, while lauded, was not published until 1985. However, Farrand was able to develop a high-resolution TEM. The results were shared at the 1947 EMSA meeting, and a representative micrograph was featured on the cover of the January 1949 issue of the *Journal*

Figure 1: Left: Gertrude Rempfer at the 1952 EMSA meeting in Cleveland, OH. Right: In 2011, on one of her last visits to the lab at Portland State University.

of Applied Physics. Despite early excitement, a Farrand EM was never commercially built. Her efforts were recognized through several patents for real-time stereo TEM and for spherical aberration correction using a charged gauze window. Despite these notable contributions, Farrand felt that the couple's liberal views were incompatible with the company's future. Missing the Pacific Northwest, the couple, with their four children, moved to Portland. Gert found a position at Portland State University with her very own, fully equipped lab (Figure 1). She continued her work on electrostatic TEM and partnered with Tektronix to make a simple TEM that could be used in less technologically established countries. The main aim of Gert's research at Portland State was photo-emission electron microscopy (PEEM). Specifically, she was interested in aberration correction by an electron mirror. In 1997, Rempfer published findings that demonstrated simultaneous correction of spherical and chromatic aberrations using a special electron-optical bench.

She faced her share of gender-based bias; she even received a letter from a company that boldly stated they did not hire women. Her advice for including more in women in the field was to address childcare, which is the largest hurdle for women in any workforce. To her it was deeply problematic that we as a nation had and have no policy to address this inescapable burden.

Gertrude Rempfer was named the EMSA Distinguished Scientist in the Physical Sciences in 1990 (the only female recipient of this award to date), named an Honorary Member of MSA, and became an MSA Fellow in 2009.

A summary of Dr. Rempfer's career accomplishments appears at https://www.microscopy.org/images/posters/Rempfer.pdf.

Caroline Schooley (1932–2018)

Mrs. Caroline Schooley intentionally decided she wanted a career in science. She had been exposed to science as a child through a local summer program. The experience ignited a curiosity that never faded. She also intentionally decided to pursue a master's degree and not a Ph.D. in microbiology. Schooley stated in her 1992 interview with Sterling Newberry that she does not mean for all women, but for herself and her life, she could not see balance in the full-time work as a Ph.D. scientist and motherhood. Schooley did imagine that balance could be struck with a M.S. Her passion, and perhaps where she saw the overlap between motherhood and science, was teaching. After earning her graduate degree from U.C. Berkeley in microbiology, Schooley began work as a photography technician in an electron microscopy lab where she would eventually (years later) become the director. Notably, when she was hired Caroline was the first and only biological EM technician on the campus. Her position included teaching and training students, and she felt her expertise and confidence build with each student she trained. This was simply the beginning of her impact on the development of scientists. She had the advantage of the department supporting her attendance to national meetings. In the 1970s, she began attending several meetings each year but would leave feeling like a second-class participant because of her degree and her gender. Schooley was surprised when she was recruited to the (E)MSA meeting that this was not the case; instead she found that the society welcomed her and her background. The rush of excitement from finding community who realized her value propelled her involvement in the society further. In 1979, she worked on the committee to create a certification program for EM technicians. Here she emphasized how remarkably egalitarian the society was and the power it had on so many by recognizing each segment of the community.

She then joined the Education Committee, which led way to an international outreach effort in China. Feeling a civic sense of duty as relations with the Peoples Republic of China normalized, she spearheaded efforts to provide electron microscopy training in partnership with the Chinese EM Society. The effort culminated in a 1986 trip to four Chinese cities educating 200 participants on EM techniques. Her commitment and skills were noticed, and she was later invited to be a guest of the Chinese government to help develop their own EM teaching programs at universities. She felt this was her own way to participate in personal diplomacy.

Professionally, Schooley's success was highlighted when she was granted Emeritus status by the American Association for the Advancement of Science.

In her retirement, Schooley helped form and served as chairwoman of Project MICRO, an MSA educational outreach program that works to build interest in science and microscopy among pre-college students (Figure 2). Caroline particularly hoped to inspire young girls into the sciences. Even estimating the number of individuals enriched by her passion for education is impossible. Her lasting impact was the result of a lifetime commitment to her core passion and an acute understanding of what it took to achieve it.

She concluded her interview by speaking to the unique culture of (E)MSA that supports people with creative ideas. Her candor about her professional life provides insight into the fluid definition of what it means to be a woman in science.

Caroline Schooley was awarded the Morton D. Maser Service Award in 1992 and became an MSA Fellow in 2009, cited as "an outstanding microscopist and educator who has made exceptional contributions to microscopy education from K-12 through post-graduate levels."

A special thank you to Mike Marko and the late Sterling Newberry for their efforts on capturing the history and organizing the history of EMSA and MSA. Without their efforts the stories of our pioneers would not have been captured in such detail nor from the perspective of the women themselves. Additional gratitude is

Figure 2: Caroline Schooley at the Project MICRO booth at M&M2010. Photo courtesy of Bev Maleeff.

extended to Bev Maleeff, who was not only a source of knowledge, but a supporter for the piece to come to fruition.

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