The BIG News

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BUSINESS, INDUSTRY, AND GOVERNMENT SPECIAL INTEREST GROUP OF THE MATHEMATICAL ASSOCIATION OF AMERICA

Who was Sallie P. Mead?

By Greg Coxson, US Naval Academy

I was developing my slides for a Radar History talk at the 2022 IEEE Radar conference. Part of that story is the development of waveguides, used for channeling microwave signals. In the years leading up to World War II, engineers were realizing that microwaves would be important for seeing smaller targets such as the periscopes on German submarines. I wanted to mention Sallie Mead in my history talk. Although she is an important figure in the 1930s work on waveguides, I was having trouble even finding reliable birth and death dates to post with her photograph. I contacted my longtime friend Bill Haloupek, who is both a skilled applied mathematician and a skilled family historian. The search for those dates became a collaborative project to understand her life and career.

Who was Sallie P. Mead, and why should you care?

Mead was the first woman to publish in AT&T's technical publication, the Bell System Technical Journal (BSTJ), in 1925. She was the first woman at AT&T to be granted a patent, in 1929. (Ultimately, she would be granted a total of six patents.) Mead is credited (e.g. by Sidney Darlington, one of AT&T's most famous engineers) with inventing the first equalizer. She is also on a short list of engineers who developed the specifications for electronic attenuators.

In 1924, there were only four female industrial mathematicians on the membership list of the American Mathematical Society. One was Sallie E. Pero, later to become Sallie P. Mead. Another was Edith Clarke, who is better known (for example, for being the first woman to earn a PhD from MIT). Clarke and Sallie P. Mead had been computers together at AT&T in the mid-1910s.

Her most important legacy, however, is undoubtedly in the field of waveguides. Waveguides were needed as radio enthusiasts pushed to higher and higher frequencies in the 1930s. Cables and wires were not practical at these higher frequencies, where they experience high losses. The 1920s had been a time of hiatus for waveguide development. However, George Southworth, one of Mead's colleagues at AT&T Development and Research, picked the ball up again in 1931. He did the practical

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MAA MathFest

- Aug. 3 – 6, 2022
- Registration open now!

BIG SIGMAA Activities at MathFest

Business Meeting and Guest Lecture
Thursday, August 4, 5:00 p.m. - 6:50 p.m., Salon E

Bats, Random Time Series, Nonlinear Transforms, and Moving Autonomy into the Great Outdoors

Autonomous systems have made remarkable progress, but continue to struggle in uncontrollable environments. Bats can serve as models for solving this problem, because these animals have achieved dexterous mobility in structure-rich natural environments based on short ultrasonic echoes that are superpositions of contributions from many scatterers and have to be considered random time series due to lack of knowledge. Soft-robotic reproduction integrated with deep learning can shed light on sensory information encoding and extraction from such "clutter" signals.
Speaker: Rolf Muelle, Virginia Tech

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Sallie P. Mead (cont. from p. 1)

work, but without mathematicians to develop the theory, he was, in a sense, "flying blind". That theoretic work fell to Mead and a Russian emigre at Bell Labs named Sergei Schelkunoff. In the summer of 1933, they independently discovered a mode in circular waveguides for which attenuation decreases with frequency. This helped spur development of waveguides at AT&T.

Radar saw rapid development in the late 1930s, pushed by the German threat. Radar uses microwaves. Microwaves need waveguides. When the war started, it was radar that gave the British a force multiplier in air battles with the Germans. Without radar, the British Isles were sitting ducks. Without Britain, the Germans and Italians were on their way to victory in Europe.

Sallie Eugena Pero was born on the Upper West Side of Manhattan on October 1, 1893, the third child and first daughter of Robert Robinson Pero (1864-1931) and Lillian M. Foggin Pero (1862-1956). Sallie earned a Bachelor's degree in Mathematics from Barnard College in 1913, and a Master's degree in Mathematics from Columbia the following year. Her first job was as a substitute math teacher at Evander Childs High School in the Bronx. But in 1915 she was hired by AT&T, for her mathematics training. Think about that – a woman, hired in the mid-1910s, for her mathematics training! Her initial title was "Computer", with the duty to assist engineers with computations. The computers at AT&T were mostly young women from elite colleges. The thinking was, back then, that these computers would not last more than a couple of years in the job; they would marry and leave to focus on their families. Sallie Pero and others bucked the trend. Her career lasted 43 years, ended by retirement at age 65. By 1919, when AT&T reorganized after WWI, Salle Pero had the title of engineer, a job title normally reserved for men. In September 1924, she married engineer Charles Edwin Mead, after which her professional name was Sallie P. Mead.

Sallie Mead's story is interesting not just for her accomplishments, but also because it sheds light on industrial mathematics in the early 20th century. Among the close associates of Mead during her career were three powerful advocates for Applied and Industrial Mathematics: George Ashley Campbell, John Renshaw Carson and Thornton Fry. Campbell hired her, and assigned her to telephone traffic studies. Renshaw was her supervisor in AT&T's Transmission Engineering department for over 20 years; it was a tiny unit, at times only comprised of Carson and Mead. Fry was the founder and director of AT&T's unique Mathematics Research Department, to which Mead belonged by the mid -1930s. Some sources credit Fry with being the spark for the creation of the Society for Industrial and Applied Mathematics, or SIAM.

Sallie Pero Mead should be better known in the Mathematics, and especially Applied Mathematics, community. Furthermore, there are several good, related stories waiting to be investigated.

BIG SIGMAA at MathFest (cont. from p. 1)

Contributed Paper Session

Thursday, August 4, 1:00 p.m. - 4:20 p.m., Salon E

MAA Session on Mathematical Experiences and Projects in Business, Industry, and Government (BIG)

The extraordinary growth of complex open-ended problems facing business, industry, and government, along with the flood of available information and data to address these challenges, may seem overwhelming. It should not! As mathematicians, operations research analysts, and engineers, including those within academia who have addressed these issues, we experience and tackle these problems with experience, knowledge, and technological tools. We solve applied mathematics problems in business, industry, and government, including military applications, almost daily. We seek presenters to share their real world applied examples of this type of problem-solving. These talks may include successful mathematical applications or problems where you have no clue how to proceed and are seeking ideas from our audience. Your talks will serve as inspiration to solve and tackle the real challenges that we may face in the future. You do not have to be a BIG SIGMAA member to attend or present.

Although not sponsored by the BIG SIGMAA, the AWM-MAA Etta Zuber Falconer Lecture will certainly be of interest to BIG SIGMAA members:

Suzanne Weekes, Executive Director of the Society for Industrial and Applied Mathematics (SIAM)

Thursday, August 4, 2:00 p.m. - 2:50 p.m., Salon GH

Continuity of Surfaces

Rather than thinking of interfaces as barriers that must never be crossed, we look at the wonderful opportunities and outcomes that come about when we bridge two states and embrace a harmonious coupling.

With this mindset of seeking continuity at interfaces, I consider **[Material 1 | Material 2]** wave propagation through materials that vary in space and time, **[Academia | Industry]** successful programs between universities and industry, and **[Intellectual Merit | Broadening Participation]** ensuring the progress of mathematics and its applications.

Officer Positions

The BIG SIGMAA invites nominations for the positions of Vice Chair for Services and Vice Chair for Membership.

The Vice Chair for Services is responsible for:

- Dissemination of information to the SIGMAA membership, primarily through electronic media.
- Designing and preparing a minimum of two newsletters: one in the fall and another in the spring.
- Keeping the SIGMAA's website up to date with events, resources, officers' list…etc.
- Assisting the Nominating Committee in their task of soliciting suggestions and volunteers for the officers' position, and for submitting the nominations to the MAA.
- The vice chair for services will assist the secretary-treasurer, as needed, with correspondence, and recording and disseminating the activities of the SIGMAA.

The Vice Chair for Membership will:

- Maintain the membership roll.
- Correspond with the members.
- Have primary responsibility for membership development and retention.
- Assist the secretary-treasurer, as needed, with correspondence and finances.
- In the event that the chair is temporarily absent or unable to act, the vice chair for membership will perform the duties of chair, including presiding at meetings.

The vice chairs will also perform other duties as may be prescribed from time to time by the Executive Committee.

The election for these positions will take place in fall of 2022, with the new officers to assume their duties in January 2023.