BIOGRAPHICAL MEMOIRS

Marye Anne Fox

December 9, 1947–May 9, 2021
Elected to the NAS, 1994

A Biographical Memoir by Jonathan L. Sessler

Marye Anne Fox, known to her students as "Ma Fox," was a towering force in science, a world-renowned organic photochemist and electrochemist, an inspiring teacher and mentor, and a skilled administrator whose service to the academic community was nearly without peer. Plus, she helped me get my job at The University of Texas at Austin.

Marye Anne Fox was born on December 9, 1947, in Canton, Ohio, to Charles and Lucille Payne. Marye Anne always had a passion for science. She was inspired by the events surrounding the Soviet launch of the Sputnik satellite in the 1950s and made science a focus as early as grade school. An excellent student, she was named "Teenager of the Year" by the local Canton newspaper in 1965. She earned a bachelor of science degree from Notre Dame College in 1969 and a master of science degree from Cleveland State University in 1970 and then completed her Ph.D. in chemistry at Dartmouth College in 1974. During this time, she married John Fox, with whom she would have three sons. After completing postdoctoral work at the University of Maryland, Marye Anne joined the Department of Chemistry at The University of Texas at Austin (UT Austin) as an assistant professor in 1976, rising to the rank of full professor in 1985 and then assuming the M. June and J. Virgil Waggoner Regents Chair in Chemistry.

Marye Anne was honored with several prestigious teaching awards while serving as a full-time faculty member active in research. Marye Anne served as director for the NIH-supported Center for Fast Kinetics Research at UT Austin before becoming the first Vice President for Research

Figure 1 UC San Diego Chancellor Marye Anne Fox. *Courtesy UC San Diego Publications. Photograph by Jim Coit.*

at UT Austin in 1994. Marye Anne was elected a member of the National Academy of Sciences in 1994 and became a Fellow of the American of the American Academy of Arts and Sciences that same year. In 1996, she was elected to the American Philosophical Society. While at UT Austin, Marye Anne married James K. Whitesell. In 1998, Marye Anne left UT Austin to become the first woman chancellor of North Carolina State University (NC State).

I overlapped with Marye Anne at UT Austin from 1984 through 1998 as a junior colleague. Most of my impressions of Marye Anne date from that period and thus necessarily color this tribute. I first met Marye Anne in the late fall of 1983

Figure 2 Undated photo from the 1980s showing Marye Anne working with then-chemistry graduate student, believed to be Gary Reitz. *Courtesy UT Austin archives.*

when I interviewed unsuccessfully for an assistant professor position at UT Austin. In those days, the organic division held receptions for the candidates, and I was lucky enough to be sitting next to Marye Anne when I picked up and identified an opera aria playing in the background. I explained to Marye Anne that I loved opera, and she replied generously, "I like you already." Unfortunately, I did not get the offer. It went to Steve Buchwald, who declined in favor of MIT. All my efforts to convince the organic division colleagues that they should hire me as their second choice failed. (I was doing this by late night pay phone calls from Strasbourg, France, where at the time I was a postdoc with Jean-Marie Lehn.) Thus, in March 1984, I started a second postdoc with the late Iwao Tabushi at Kyoto University in Japan. To my great delight and ultimately fortune, shortly after I arrived in Kyoto, Marye Anne presented a distinguished lecture to the faculty of engineering at Kyoto University. Tabushi-sensei kindly invited me to join the celebratory dinner. I was told to say little and drink nothing. Meanwhile, Marye Anne's sake cup was routinely filled to near overflowing. At the end of the dinner, Tabushi-sensei turned to Marye Anne and said, "How about Jon-san? Maybe you should hire him." Three days later, as I recall, Marye Anne, by then back in Austin, phoned me in Kyoto and offered me the UT Austin job. I never checked if these events, correlated in time, were causal in terms of fact. That is probably for the best.

As a junior colleague, I remember Marye Anne as super-organized, smart as a whip, unbelievably efficient with her time, and, to be honest, a bit scary. Tuesday nights in those days were physical organic chemistry journal club meetings. A student would pick a recent paper and present it briefly before it was opened up for discussion. Marye Anne was a key participant. She would always be busy with a sheaf of other papers, but would perk up with piercing insights and comments. She was (in)famous for shooting quickly from the hip. Almost always, her unique combination of blazing intelligence and well-honed intuition would see her hitting her target. But sometimes there would be a miss, and the collateral damage could be frightening. Tough as she was, Marye Anne's students loved her. I was close to one of her graduate students in particular, David Schultz, now on the faculty at NC State. He recalls:

> "I remember Marye Anne as a chemistry dynamo and an effective leader. For me, Marye Ann was a great mentor. She ran a scientifically diverse group that facilitated cross-disciplinary research and exchange of ideas. During my time as a graduate student in her group, there were active projects involving synthesis, electrochemistry, and photophysics, allowing me to learn a wide array of techniques. Marye Anne was insistent that her students learn a number of different techniques/areas to better prepare them for scientific life after graduate studies. Marye Anne provided just the right amount of guidance and encouragement to help me become an independent researcher."

Another student from that time, Phillip Britt, recently retired from the Oak Ridge National Laboratory, was also kind enough to share some recollections, including:

> "One of Marye Anne's prominent features was her encyclopedic memory. She could always pull a journal reference, with complete citation, off the top of her head to support a science discussion. This was highlighted in group meetings where the literature was usually discussed. After the meetings, you would routinely find the graduate students in the library frantically looking up the journal articles that were discussed so we could be better prepared for the next meeting. I remember she once forgot that she agreed to write a review article for a journal. When the journal editor called to remind her that the article was due in 2 or 3 days, she surprisingly said she would meet the deadline. She then rushed out of the office and headed to the library. After two or three hours, she came back with a large stack of index cards with two or three words written on them. I asked her what was on the cards, and she responded this was her literature search with the key points and references for her review article. The next day, a draft of the review was written, and she met the deadline. It was amazing how she remembered all the articles (with citations) and key talking points in her head and how she could assemble them into a coherent review in such a short period of time."

Figure 3 Marye Anne and her three sons in the 1980s. *Photo courtesy of Matthew Fox.*

Phillip also recalls with amusement:

> "At one point, Marye Anne did some consulting work with a company. This prompted her to go into the lab to do some quick experiments. Most of the graduate students ran and hid when they saw her come in to do an experiment (in lightning speed). One morning, I came into the lab to find a slightly deformed Erlenmeyer flask sitting on a hot plate with molecular sieves melted into the glass. This flask was secretly passed around the group to recognize similar 'experimental excellence.'"

By the time I arrived at UT Austin, Marye Anne had already made her mark as a photochemist, initially studying how light interacted with organic anions and how the course of reactions might differ under conditions of photoillumination. An early Marye Anne paper, for instance, provided both experimental and theoretical support for the notion that the ring opening of cyclopropenyl anions was disrotatory and thus controlled by orbital effects.[1] From there Marye Anne branched out into more general studies of anion photochemistry[2] and photochemical reactivity.[3-5] Her sphere of interest continued to expand and soon encompassed electrochemistry, energy and electron transfer, materials science, solar energy, and environmental chemistry. Of particular note, was her use of electropolymerization to create conducting materials,[6] as well as her pioneering demonstrations of self-assembly as a means to control organization and charge migration in stacked porphyrin arrays[7] and, separately, peptides.[8] While at UT Austin, Marye Anne also conducted a seminal study involving the effect of photo-irradiation on anthracene as a representative polycyclic aromatic hydrocarbon (PAH) present in atmospheric particulates[9] and, with the recently deceased Al Bard, was early on in creating functioning solid state photocells.[10] Marye Anne was particularly close to Al Bard, as well as the late Michael Dewar. Nate Bauld, now retired, recalls fondly Marye Anne's friendship with Michael Dewar, as well as his own interactions with Marye Anne:

> "My office in Welch Hall was adjacent to hers, and my research labs were also adjacent to hers. Some of her chemistry overlapped a bit with ours but she was more motivated in the area of interdisciplinary and applied chemistry. She used to tell the story of a colleague who had informed her that she was the 'most impure chemist that he had ever known.' I think that she was a pioneer in the movement of pure chemistry to societally useful applied chemistry. Marye Ann was easy to approach and always helpful. I remember that, in her early days, she became great friends with the renowned chemist Michael Dewar, who was at that time on our faculty. I think they collaborated on some research. Come to think if it, collaboration was one of her outstanding attributes."

Personally, as an assistant professor I was enormously inspired by Marye Anne. She was a role model of excellence and the paradigm for success in research and teaching. I also benefitted directly from her "tough love" as she worked her magic to help me bring up my game, so to speak. I recall she was deputized by the organic division to provide feedback after my formal third-year review. She noted that I was well-liked and my teaching was excellent, but that the colleagues were worried about my lack of research progress. She then added that she herself recommended that I "consider pursuing alternative career opportunities." That kick in the pants was, needless to say, highly motivational. I earned tenure a little over a year later. My promotion was made possible in part by Marye Anne. She asked her then postdoc, Steve Creager, to assist with key electrochemical measurements and flat out refused to have her name on the resulting papers. This was an act of unbelievable professional generosity for which I will always remain grateful.

Steve Creager, like so many others whose lives she touched, shares my appreciation for Marye Anne's magic ability to bring out the best in those around her. He notes:

"Marye Anne Fox was a wonderful advisor and career mentor for me in my time as a postdoc in her lab at Texas (1987–89) and beyond. While I was a postdoc, she gave me huge flexibility to pursue my interests combining physical organic chemistry/photochemistry with electrochemistry and energy conversion, and after I left her lab, she gave me much sound advice on managing the early stages of my academic career. She helped me to think like an organic chemist while not actually having been trained as one, and she give me wide latitude to spend time in multiple other laboratories to pursue a very wide range of ideas which taught me a lot and certainly impacted my formation as a scholar. Looking back, I treasure my time in her lab as one in which I had freedom to pursue almost any idea, which was very intellectually rewarding. Her lab was involved in so many different things that were an inspiration to me as I began my academic career. I also took inspiration from her enjoyment of her academic life and her passion for leadership. Marye Anne would always make time to share of her experience and provide what I now recognize as mentorship. She knew deeply that there are many ways to have impact and she found many different ways to do that in her career. I am grateful that I was able to spend some time in her light."

With my nose to the grindstone as an assistant professor and having grown up in progressive Berkeley, California, where it was completely normal for women to be highly educated and driven to succeed (to my knowledge my mother, Gladys Sessler, was the first woman to earn an advanced degree in physics from Columbia University), it took me a while to appreciate just what a pioneer Marye Anne was in terms of breaking the gender barrier in chemistry. She took on this charge with grace and dignity. She would simply do it all, including being the dedicated mother of three rambunctious boys. Apart from our annual organic division ski trips, I did not get to overlap too much with Robert, Michael, or Matthew during Marye Anne's Austin days. I later reconnected with Matthew, now a Dr. Fox in his own right, as the result of having had some minor skin cancer operations performed under his aegis. Matthew, with input from his brothers, generously shared a few memories with me:

"Mom was in many ways ahead of her time. I have clear memories of her on the top bleacher at my basketball games as a teenager with a stack of papers. I would wonder why she had to bring work with her, unlike some of the other parents. At the time, I did not understand her editorial responsibilities for JACS [*Journal of the American Chemical Society*] or the many proposals and dissertations she must have had to read through and critique. With a more mature lens, I can appreciate that she was there. That she was present. That she was doing her best to find the balance of being a mom while in the midst of a rapidly ascending career in academia.

"Mom was also generous to include us in her work travel as much as possible. Many of the great memories of my childhood, including exposure to art, culture, and historical sites around the world, were related to travelling with mom when she was invited to lecture or preside over a meeting. From the spires and gargoyles at Notre Dame in Paris to the sunflowers of the Alsatian countryside to the serene reindeer at Nara in Japan, she provided opportunities for us to expand our perspective of the world.

"Mom always had great presence and could work a room with the best of them, even in the winter of her life when the throes of Parkinsonian dementia were settling in. I fondly remember a Breakfast with Santa [event] in Austin during which she thanked Santa for coming: 'Thank you Santa, for coming to the Santa breakfast!' Even in the presence of Kris Kringle, it was clear to her grandchildren (whom she cherished more than anything) who was in charge."

What I do remember clearly from her Austin days was Marye Anne's dedication to service. Perhaps this had its origins in her being one of the top female pure chemists (as opposed to biochemist) in the country in the 1980s and early 1990s. I do not know. But she was always on the go; she seemed to be on every panel, advising every foundation, and critically involved in setting science policy. She was a natural. It thus came as no surprise to me that after moving up the administrative ladder to Vice President of Research at UT Austin she was recruited away to serve as the first woman chancellor at NC State and, subsequently, as the first women chancellor of the University of California, San Diego (UCSD).

Figure 4 Marye Anne watching her grandson play baseball. *Photo courtesy of Matthew Fox.*

I lost touch with Marye Anne when she left Austin. But by all accounts, Marye Anne did great things at both institutions. For instance, she worked to improve undergraduate education at NC State and to interface with the broader non-academic community. David Schultz commented, "My one thought of Marye Anne as our Chancellor is that she was the Chancellor who finally got our new undergraduate laboratories built!" It is also to be appreciated that during Marye Anne's term as chancellor, NC State became increasingly recognized as a leader in the fields of biotechnology, nanotechnology, genomics, bioinformatics, and nonwoven textiles. Jonathan S. Lindsey, a long-time friend and fellow porphyrin chemist on the faculty at NC State, recalls, "Marye Anne Fox visited each and every one of the 100 counties in North Carolina, went to the high schools in those counties (often with state legislators in tow)—many of which likely had never had even a faculty member visit let alone the Chancellor of NC State University—and delivered a spirited message to the students about the value of education. One of her impressive strengths was her social dynamic range, as she could talk with everyone—from plain folk to presidents—about the importance of science."

At UCSD, where she was the seventh permanent chancellor, Marye Anne oversaw major expansions and a substantial rise in the national and international standing of the institution. Under her leadership, UCSD successfully completed a billion-dollar capital campaign and celebrated the campus's fiftieth anniversary. As true at UT Austin and NC State, Marye Anne worked to raise the bar for both education and research excellence. She was chancellor when faculty member Roger Tsien won the Nobel Prize in Chemistry. Marye Anne herself was awarded the 2010 National Medal of Science by President Barack Obama during her time at UCSD. This highest of honors was afforded Marye Anne "for her research contributions in the areas of organic photochemistry and electrochemistry and for enhancing our understanding of excited state and charge-transfer processes with interdisciplinary applications in material science, solar energy conversion, and environmental chemistry." Marye Anne retired from UCSD in 2012.

Both before and after transitioning to her academic leadership positions, Marye Anne was a champion for the advancement of women in science. In addition, she worked endlessly to advance science policy for the better. She was appointed to the National Science Board by President George H. W. Bush and served on President George W. Bush's Council of Advisors on Science and Technology. She was a member of the scientific advisory board (SAB) of both the Robert A. Welch Foundation and the Dreyfus Foundation. She advised numerous other for- and non-profit organizations. For decades, Marye Anne assisted the National Science Foundation and the National Academy of Sciences in varying capacities. She truly was a role model for us all.

While I continued to draw inspiration from Marye Anne's success from afar, I only had the pleasure of reconnecting with her at a Welch Foundation banquet maybe a decade ago. It was sadly clear to me she was not in good physical shape. Indeed, shortly thereafter health issues would force Marye Anne to step down as chair of the Welch Foundation SAB. She must have seen the worry on my face when we met. But, as was her wont, Marye Anne quickly put me at ease saying something along the lines of, "Yes, I have a terminal disease. But if you breathe oxygen, you have a terminal disease." A nugget of wisdom I still cherish.

The Welch Foundation plays a central role for chemistry in Texas. It is thus appropriate to highlight Marye Anne's involvement with this particular organization. She joined the Welch SAB in 1998 and served as its chair from 2012–14, before retiring in 2017. Carla Atmar of the Welch Foundation recalls:

> "Marye Anne was always energetic, engaged, knowledgeable, and an effective leader while serving... Her experiences in research and administration gave her a unique perspective on issues discussed by the SAB and she offered expertise easily... On a personal note, I worked closely with her during her nineteen-year term on the SAB with the Welch Foundation and found her to be delightful, respectful, thoughtful, and easy to get along with. She was always encouraging in any endeavors and appreciative of hard work and effort and wasn't afraid to say so. She became a friend along with being a colleague and even with all her obligations, she always found time to ask about my family, and in some cases specifically about each of my children's pursuits. This woman was a force of nature in whatever she did, and I am grateful to have been caught up in just a small part of her storm."

Even after taking on her top administrative roles first at NC State and then UCSD, Marye Anne continued to publish cutting-edge papers, with increasing focus being devoted to aggregated systems and chemical-based devices relevant to light harvesting.[11,12] By the time of her retirement from UCSD, Marye Anne had published well over 400 peer-reviewed papers and had a CV that was more than 160 pages long. Naturally, her CV was replete with honors. It is impossible to list them all here. In addition to her election to the NAS and her Medal of Science, they include an Alfred P. Sloan Research Fellowship, a Camille and Henry Dreyfus Teacher-Scholar Award, the American Chemical Society's Garvan Medal, the Charles Lathrop Parsons Award for Public

Service, the Arthur C. Cope Scholar Award, and a Research Award from the Southwest Region of the American Chemical Society. She also received the Award for Commitment to Diversity in Higher Education from Christ United Presbyterian Church and the Climate Leadership Award from the American College and University Presidents' Climate Commitment. Marye Anne also held numerous honorary doctoral degrees, including from Dartmouth College and the University of Notre Dame.

Marye Ann passed away quietly on May 9, 2021. At the time of her passing, she was survived by her husband James K. Whitesell, sons Robert, Michael, and Matthew, stepsons Chris and Robert, thirteen grandchildren, and two great-grandchildren. Marye Anne was driven to excel and seemingly could and did do it all. I remain in her debt. Not only did she help bring me to Texas, she provided a shining light of excellence that continues to inspire me. But I am not alone. Marye Anne touched the lives of thousands of students, colleagues, friends, family, and fellow scientists. She embodied the best of humanity and made the NAS better for her membership. Marye Anne Fox was one of the greats. She will be sorely missed.

Acknowledgments

I am grateful to the individuals quoted in this memoir who so kindly provided me with their personal recollections of Marye Anne Fox. I also acknowledge with gratitude my colleague, Stephen F. Martin, who took the lead in drafting a Memorial Resolution for UT Austin honoring Marye Anne Fox; it provided a starting point for this memoir. The author (Sessler) and Eric V. Anslyn were co-contributors to this Memorial Resolution. Other factual sources of information included press releases from Dartmouth College, the University of California, San Diego, North Carolina State University, the Welch Foundation, and the Dreyfus Foundation.

References

1 Fox, M. A. 1979. Orbital topology in a photochemical carbanionic ring opening. *J. Am. Chem. Soc.* 101(14):4008–4010.

2 Fox, M. A. 1979. The photoexcited states of organic anions. *Chem. Rev.* 79(3):253–273.

3 Fox, M. A., and R. C. Owen. 1980. Mediated oxidative photochemical dimerization. *J. Am. Chem. Soc.*102(21):6559–6561.

4 Fox, M. A., and M. J. Chen. 1983. Photocatalytic formylation of primary and secondary amines on irradiated semiconductor powders. *J. Am. Chem. Soc.* 105(13):4497–4499.

5 Fox, M. A. 1983. Organic heterogeneous photocatalysis: chemical conversions sensitized by irradiated semiconductors. *Acc. Chem. Res.* 16(9):314–321.

6 Fox, M. A. 1992. Polymeric and supramolecular arrays for directional energy and electron transport over macroscopic distances. *Acc. Chem. Res.* 25(12):569–574.

7 Schouten, P. G., et al. 1991. Charge migration in columnar aggregates of peripherally substituted porphyrins. *Nature* 353:736–737.

8 Fox, M. A., and E. Galoppini. 1997. Electric field effects on electron transfer rates in dichromophoric peptides: The effect of helix unfolding. *J. Am. Chem. Soc.* 119(23):5277-5285.

9 Fox, M. A., and S. Olive. 1979. Photooxidaton of anthracene on atmospheric particulate matter. *Science* 205:582–583.

10 Liu, C.-y., et al. 1993. High density nanosecond charge trapping in thin films of the photoconductor zinc-octakis (β-decoxyethyl) porphyrin. *Science* 261:897–899.

11 Fox, M. A. 1999. Fundamentals in the design of molecular electronic devices: Long-range charge carrier transport and electronic coupling. *Acc. Chem. Res.* 32(3):201–207.

12 Fox, M. A. 2012. Photophysical Probes for multiple-redox and multiple-excited-state interactions in molecular aggregates. *Acc. Chem. Res.* 45(11):1875–1886.