

Impressions of a Brilliant Star

In the mid-1990s, I was working for the Rocketdyne Division of Rockwell International. My colleague and mentor, Les Fritzeimer gave me very good advice. Find a technical area that needs more research and development and become an expert at it to carve out your niche within the company. He explained to me that the Americans were starting to look at rocket engines cycles that were new to them but had been used by the Russians for many years. These cycles required that certain components operate in hot gaseous oxygen at very high pressures. I started doing research on materials that would not burn in these environments. This was challenging because almost every metal that had traditionally been used to construct rocket engines had a very high propensity for burning in the hot oxygen.

A short time into this endeavor, Les came to my desk and said, "Our sister division, the Rockwell Science Center, hired two, highly regarded, metallurgists named Dallis Hardwick and Patrick Martin. Patrick is mostly working on titanium alloys which will burn in the hot oxygen so let's talk to Dallis, who may have some background with nickel based alloys, which will be better suited to our environments." Shortly thereafter, Les and I took the half hour drive and I met **Dallis Hardwick** for the first time. They say first impressions really stick with a person and my first impression of Dallis was one of awe. Dallis was this beautiful, vivacious, brilliant, humorous and petite ball of energy. She was captivating. I was still in my twenties and relatively inexperienced and now I stood in front of one of our nation's top metallurgists. She was completely unassuming, kind and gentle. She made me feel comfortable immediately and put me at ease. I did not know then that this would be the start of a long, rewarding and very fruitful relationship and technical collaboration.

We shared our work and ideas with Dallis and she was interested in the research and certainly had some ideas of her own. This was it - our collaboration commenced. We worked on developing a new alloy that, not only could survive in the hot gaseous oxygen environment, but that was also strong, so we could keep the overall weight of the engine at a minimum. We did experiments on new alloy formulations and it was Dallis who devised new ways to study them. These innovative studies were grounded in metallurgy and were instrumental in gaining insight into the alloy behavior. These studies ultimately led to some very promising compositions for our rocket engine applications.

While I did not work at the same location as Dallis, I paid her frequent visits. It was always a welcome excursion to go to her facility which we fondly called the "country club" because the grounds were beautiful, the cafeteria food was superb and Dallis always lifted my spirits. We would share our latest work and she would take me to the lab to show me what she had been cooking up (literally, except the constituents of the recipes were metals). While Dallis and I never formally entered into a mentor/protégé relationship, I knew this was a great opportunity to learn and absorb the knowledge and wisdom she was full of.

We would sometimes travel together to such places as NASA's White Sands Test Facility in Las Cruces, New Mexico, where they would perform burn resistance tests on our experimental alloys. It was nice to have another "gal" to travel with. I remember the first time we went out to dinner together. We went to old town Las Cruces/Mesilla and dined at Peppers Cafe. We each ordered a margarita to go with our New Mexico cuisine and had a lovely conversation. We talked a little about work but then moved on to share more personal stories about relationships,

food, travel and our hobbies. This is when I learned about what a special relationship she had with her husband, Patrick Martin. It was obvious that she simply adored him.

Through these conversations, I was still learning from Dallis. She was a wonderful role model of a female who was highly successful in her career but not at the sacrifice of her personal relationships and of having a very enriching life outside of work. It was always so enjoyable conversing with Dallis. I felt like we had much in common and later learned that included that we both attended single sex (all girls) high schools. I attended a small Catholic school (Mayfield Senior School) in Pasadena, California with a graduating class of 48 (close knit) girls.

It was also a special treat to see Dallis in a technical meeting or review. She could command a room of experts in the field, typically male, without raising her voice or sometimes without speaking at all. She was so well-respected that the other attendees wanted to hear her perspective, which was typically delivered in a very logical and frank manner.

We continued working together over the years in various capacities. After our initial work of developing strong, burn-resistant alloys and inventing several viable compositions that were attractive for our rocket engines, Dallis applied for a patent and included me as co-inventor. She then decided to leave Rockwell and she and Patrick got jobs up at Boeing Commercial Airplane Group in Seattle. She asked me to follow through with the patent, which I did. Meanwhile, the United States Air Force was interested in further development of the alloy and Rocketdyne was awarded a substantial program to mature the alloy and develop processing methods. By this time, Dallis and Patrick made another move in employment and ended up at the Materials and Manufacturing Directorate of the Air Force Research Laboratory at Wright Patterson Air Force Base, Ohio. As luck would have it, Dallis was assigned to be the program monitor for the program we were awarded. So now she would be my customer, continuing to impart her expertise and knowledge to this area of study. I was under pressure to name the top 2 alloy compositions of interest to the Air Force. I consulted the Director of my department regarding the common naming practice for new alloys. I was told the company did not have one as it happened so rarely. He gave me a few ideas and left the rest up to me. I decided to take a poll among my project team members and a few others within the company who had a vested interest. The overwhelming response was for the alloy name to be a combination of the names Dallis and Monica. I suggested to Dallis it should be Dalmony and she responded, "That does not sound as good as Mondaloy - let's name it that". It stuck and the two variants became Mondaloy 100 and Mondaloy 200. I think this was just Dallis being humble. I suspect she was as uncomfortable as I was to have an alloy named after oneself.

Dallis continued to be a mentor and role model that helped foster my career. When she was at Boeing, my division was also bought by Boeing and we were working for the same company again. She contacted me on several occasions to ask me such questions as, "Are you familiar with Boeing's Technical Fellows program?" "You would be a good candidate for the Fellows program. Have you given any thought to applying to become a Technical Fellow?" It was never a hard suggestion but rather the planting of a seed. Each time, I was inclined to give it more consideration. I eventually applied and became a Boeing Associate Technical Fellow then when my company got bought again, I became a Pratt & Whitney Technical Fellow and later became the lead of our division's Fellowship program.

Later in my career, I would learn that Dallis would call the head of my department to put in a good word or make suggestions regarding my career path and growth. I understand she did the same for others, as well. She never sought praise or credit - always just wanting to foster others in their careers.

As I look back to successes and growth within my career, I am fortunate to say that I had a guiding light throughout. I have always considered Dallis to be a trail-blazer who came to the US from Australia, was one of a select few females at that time who received a PhD in a technical field and who went on to be one of the top metallurgists in the US. Dallis' technical and career accomplishments were many and she had a great impact on the metallurgical community, but I believe the impact was much greater than that of a single individual. She helped grow another generation of leaders who, hopefully, will turn around and do the same so that her contributions will continue to multiply in enormous numbers. I hope she understood that my accomplishments and successes are, in large part, due to her. Thank you, Dallis, for always being a bright and shining light along my journey.

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