



meet a member

Dan Sanders and a Hobby to Treasure

Lynne Robinson

On any given weekend in the Washington state wilderness, you'll find Dan Sanders, Senior Technical Fellow with Boeing Research and Technology, digging deep into his hobby—quite literally.

Sanders works his family's gold mine for fun and adventure, (half)-joking, "I tell my friends and colleagues that I plan

to buy them all Cadillacs when I hit the mother lode."

The mine has been in his family for five generations, first prospected by his grandfather, Les, and now co-owned by Sanders, his father, Douglas, his mother, Marcia, and his brother, Warren. The claim dates back to the Gold Rush, and its early history is a tapestry of colorful characters and tales from those days.

"Les once told me that the original owner had used the mine as collateral when playing poker games in town and that, on occasion, he had to buy it back when it was lost," said Sanders. Another clue to the hardscrabble life of the old-time miners, observed Sanders, could be found in the garbage pit behind the cabin that had been built on the site in 1889. "I harvested a very large collection of old whiskey jugs from there when I was a little kid," he said. "I remember thinking that they must have drunk more whiskey than water, because there were hundreds of mostly broken whiskey bottles in that hole."

The real riches yielded from Sander's gold mining experiences, however, are the secrets that he has chipped away from the dark tunnels over the years—insights that have helped define and direct him to a profession that he loves.

Sanders is considered a leading expert in fabrication technologies using titanium alloys, with an impressive listing of patents, papers, and presentations to his name. His earliest classroom in materials science and metallurgy was his family's gold claim, starting when he was around eight years old. "I had panned down a sample from one of the surface locations and discovered a significant amount of 'color' at the tip of the black sand," he recalled. "It was gold—the real thing—and I had dug it out of the Earth all by myself. I knew that I needed to



Dan Sanders pauses in the meandering tunnel of the gold mine that he prospects for a hobby. The mine has been in his family for five generations and is located outside the tiny town of Liberty, Washington, where Sanders is also a volunteer firefighter. (Photo: Robert Ferguson, Boeing)

understand how the metal formed so I could find more.”

By the time Sanders was a teenager, he was adept at looking for clues to potential sources of gold in the geology around him. He developed some of these skills working in the summers as a mountain climbing guide and with the Washington State Department of Natural Resources to build hiking trails. “I spent a fair amount of time at the Shriners Peak fire lookout tower, which doubled as a radio relay station to communicate with our climbing teams on the face of Mt. Rainier,” he said. “Staring out from the lookout for so long got me interested in studying volcanoes and how the Cascade Mountains were formed. This early knowledge in geology has helped me in terms of being able to determine where to find gold at the mine.”

In the meantime, Sanders became well acquainted with the “nuts and bolts” of running the mine. “I worked with my family to repair equipment, which was generally old, broken gear that we picked up cheap at auction,” he said. His experience eventually landed him a job at Boeing at the age of 19 as a tool and die maker. “That’s when my work with metals really took on a life of its own,” he said. “Now I was making aerospace tooling and assembling airplanes, so I had to broaden my understanding into aluminum, steels, and processes.”

Between his self-taught knowledge of metals and natural engineering abilities, Sanders quickly made a name for himself and often ended up working with the tool engineers to solve problems. “I remember being in a safety meeting and the tooling superintendent singled me out and asked why I wasn’t going to college,” he said. “My tooling shop lead was in that same discussion and he dared me to take a class. So, I signed up the next quarter.”

A college education, up until that point, had seemed out of financial reach for Sanders. The pursuit of an engineering degree, however, made him eligible for Boeing’s Learning Together Program, which paid the tuition for his bachelor’s and master’s degrees, as well as his Ph.D. Sander’s academic journey stretched over nearly three decades, as he worked full time at Boeing’s final assembly plant

on second and third shifts while taking classes during the day.

Sanders joined this classroom learning with the hands-on insights that he had gained on the shop floor and in the family gold mine to become a formidable innovator and problem-solver. One of his proudest achievements, he notes, is building Boeing’s first superplastic forming (SPF) press out of an old four-post hydraulic press that had originally been used for vacuum forming plastic cockpit windows. He was motivated



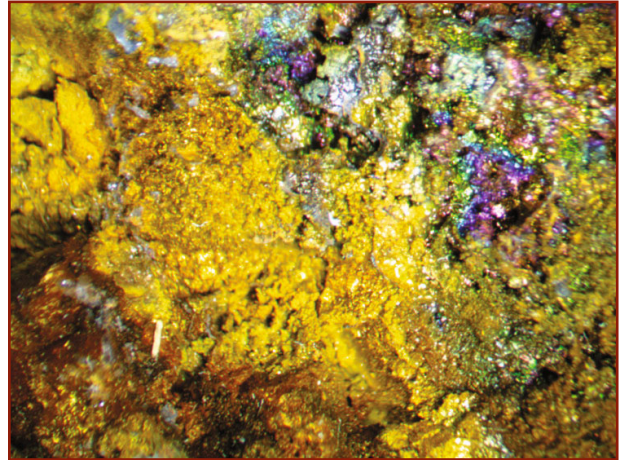
Dan Sanders at work at Boeing, examining a titanium tail cone assembly for the 787 Dreamliner. (Photo: Robert Ferguson, Boeing)



On his own time, Sanders works the family gold claim, generally using a pneumatic air drill and hammer. He is also licensed by the state of Washington and the federal Bureau of Alcohol, Tobacco, and Firearms as a blaster and surface/underground explosives engineer. (Photo: Robert Ferguson, Boeing)



Sanders (left) examines ore samples at his home near the mine with his father, Douglas. (Photo: Warren Sanders)



A volcanic vent on Sander's mine property led to a gold formation millions of years ago. The vein from which the above image was taken (magnified 50 times) yields metal that is 64% gold and 31% silver, with traces of copper, iron, lead, zinc, tungsten, tantalum, and uranium. The multicolored material was called "peacock copper" by early prospectors, but technically is a mix of bornite and chalcopyrite. The rock surrounding the deposit is volcanic baked mud from the bottom of an ancient sea, presumably located in the Pacific Ocean. Plant fossils on the surface indicate that the region was once a tropical jungle. (Photo: Daniel G. Sanders)



Sanders with his Siberian Husky, Ally, at the entrance of the mine. Sanders said that Ally became his companion because she was too small to be part of her original owner's dog sled team. He noted that her stature belies her courage—She successfully fought off a wolf more than twice her size that was threatening him at the mine site last spring. (Photo: Robert Ferguson, Boeing)

to pursue the project after he saw photographs of some sheet metal parts that had been made with the then-new SPF process. "I was absolutely amazed by what I saw," he recalled. "Titanium 6Al-4V had been formed into incredibly complex shapes that I would never have thought possible. I knew I had to find a way to get Boeing into it."

The SPF press that Sanders and his team originally constructed had been intended for research, but was soon transitioned to production. "We found that tooling for the SPF process could be relatively inexpensive by using ceramic dies," Sanders explained, "so some of the first production parts that we made were for 'airplane on the ground' spares in which the original tooling had long since been scrapped." Sanders notes

that his enthusiasm for SPF has spread significantly over the years, with his initial project growing into an operation that now employs or is supported by roughly 400 people.

Beyond his engineering talents, Sanders has been diligent in "paying back" his own opportunities by mentoring the next generation of aerospace machinists and engineers. "There are around 175 people that I consider to be partnered with as mentees," he said. "Many of them have already turned into exceptional engineers, managers, and materials scientists at Boeing or elsewhere."

While Sanders works on solutions to populate the skies with safer, more fuel-efficient aircraft during the week, he continues to be inspired by the riddles presented underground on his weekend excursions to the gold mine. Recently, he was excited to find traces of tantalum in the tunnels, although the quest for his shiny metal of choice is far from over. "When I hold a chunk of gold in my hand, it becomes a magical moment," he said. "And, I want more."