Profiles in Leadership #3

Bonnie J. Dunbar: Inspiring Youth to Reach High

Retired astronaut and now a university professor, Bonnie J. Dunbar, Ph.D., NAE, Texas Epsilon ’83, let nothing obstruct her childhood dream of flying in space—demonstrating that, with hard work, no goal is too high.

by Trudy E. Bell  © 2013 Trudy E. Bell


“My parents also rented about a thousand acres of federal sagebrush land in the summers for summer feeding of the herd of Hereford cattle. There was no room for traditional gender role-playing in the family business. As the eldest of four kids, my parents expected me to work.” Duties included rounding up cattle, checking fence lines, picking rocks from arable fields, and weeding cash crops like sugar beets. “It was very egalitarian: if one of us kids had an idea for a better way to do something, our parents listened.”

Moreover, “when you grow up farming and ranching, you are doing science and engineering,” Dunbar continued.

“You learn to understand and respect the weather, understand soil chemistry and geology in order to grow the best crops and gardens, learn biology from assisting animals give birth, and botany from farming. You learn the properties of materials, such as the difference between conductors and insulators: we had electric fences, and if you didn’t want to get shocked, you learned to hold down the fence with a wooden stick and not a metal bar when you walked over it.”

On the irrigated ranch, she also learned first-hand about risk and risk-taking. “The biggest gamblers in the world are farmers because they depend on the weather,” she explained. “There was no monthly paycheck—just an end-of-the-year check for crops and cattle—and no allowances for us kids. You learned survival skills.” Not only was it necessary to kill an occasional rattlesnake when alone on the range, but “we had to learn to make everything.”

Her father repaired his own equipment, welding with an acetylene torch. As Dunbar and her two brothers and sister had few store-bought toys, “we made our own teeter-totter and learned ourselves about where to put the fulcrum because we were different weights.”

The lack of amenities generally found in urban areas did not deter the family from sharing a strong culture of education. “My grandfather, who had emigrated from Scotland to homestead in Oregon early in the 20th Century, Dunbar with Joseph F. Sutzer, Washington Alpha ’43, Boeing design team manager for the 747 project, during her 2005-10 tenure as president and CEO of The Museum of Flight.
once said to me, ‘Your greatest possession is knowledge, for no one can take it from you.’” Dunbar recalled.

As a result, she loved learning at the rural K-8 school in the nearby town of Outlook. She spent all her free time reading; H.G. Wells and Jules Verne were her favorite authors. In the summer, when the school library was closed and she rarely traveled to the nearest larger town (Sunnyside), Dunbar looked forward to each week’s visit of the bookmobile. On black-and-white TV, she was captivated by Watch Mr. Wizard (1951–1965), in which Don Herbert demonstrated the science behind everyday things to a young boy and girl, and Flash Gordon, who explored the universe before the days of computer special effects.

In October 1957, the Soviet Union shocked the world with its launch of Sputnik I into Earth’s orbit. A year later, the U.S. founded the National Aeronautics and Space Administration (NASA). “It was an exciting time for Americans,” Dunbar recalled. And at age nine in 1958, she determined she “wanted to design spaceships and ride in them.”

“Oh, sure, there were dinosaurs around who thought girls shouldn’t think about science or engineering,” Dunbar tossed off, “but all my friends, teachers, and parents were very supportive. If there was negativity, I just ignored it.” She was very athletic—“you have to be to work a ranch”—and played team sports. The Outlook school was so small there were not enough boys to make a baseball team, so girls had to play some of the positions. In the farming community, she played touch football often as quarterback.

Education program
When she graduated from eighth grade, her teacher Mr. Miller asked her what she wanted to do with her life. “When I told him, he encouraged me to take algebra in ninth grade at Sunnyside High School.” She did, followed by geometry, trigonometry, and math analyses. She also took biology, chemistry, physics, and two years of Latin, and was active in cheerleading, math club, and debate. Dunbar excelled in high school. “My high school physics teacher, Mr. Anderson, recommended that I consider a career in engineering.”

Although before the dawn of the Space Age, college would have been beyond her family’s means (“for much of my childhood, I grew up in a house without an indoor toilet”), the 1958 National Defense Education Act (NDEA) with its program of low-interest loans and grants for academically qualified students studying science and engineering changed everything. “I entered the University of Washington in 1967 on the NDEA,” Dunbar declared, majoring in ceramic engineering because the department chair, James I. (Doc) Mueller, Ph.D., Washington Alpha ’39, explained that they had NASA grants to help design parts of the new Space Shuttle.

Upon graduation in 1971, she worked two years for Boeing Computer Services as a systems analyst followed by two more back at the University of Washington to earn her M.S. in ceramic engineering. After a summer at Harwell Laboratories (Atomic Energy Research Establishment) in England, Dunbar was hired as a senior research engineer at Rockwell International Space Division in Downey, Califor-
nia. There she found herself in the center of manufacturing for the Space Shuttle, developing equipment and processes for its ceramic tiles, and spending much of her time working on the Space Shuttle in Palmdale, CA.

In 1978, Dunbar joined NASA Johnson Space Center (JSC) in Houston, Texas, as a Payload Officer and flight controller, integrating items in the Shuttle’s payload bay, and then operating them during the mission. A year later, she was the guidance and navigation officer when the first U.S. space station, Skylab, then at the end of its life, was guided to reenter Earth’s atmosphere safely away from populated areas. In 1980, she finally achieved her dream: she was selected to begin training as a NASA astronaut.

Between 1985 and 1998, she flew five Space Shuttle missions [see sidebar for list] on four of the five craft in the fleet (all but Discovery), logging over 50 days (1,208 hours) in space. Before her fourth flight, she was tapped to qualify as a back-up crew member for a three-month flight on the Russian space station Mir, and sent to Star City, Russia, for 13 months of training. Although she never flew a long-duration mission on Mir, she qualified for both Soyuz and Mir flight, became fluent in Russian, and was on the first Space Shuttle to dock with Mir in 1995.

Dunbar’s knowledge of both space programs lined her up for her next assignment: from October 1995 to November 1996, NASA detailed her to the JSC Mission Operations Directorate as assistant director, where she chaired the International Space Station (ISS) Training Readiness Reviews and helped to train astronauts and cosmonauts for joint Russian-American operations aboard the ISS.

Final Mission
After her final mission (the eighth docking mission to Mir) in 1998, she served in several assistant and associate director positions at JSC. In 2002, she was elected into the National Academy of Engineering, which she called “one of my proudest professional moments.” She retired from NASA in September 2005 for the next phase of her career: dedication to science education of today’s youth as president and CEO of the Museum of Flight in Seattle, WA.

As JSC assistant director in the late 1990s, Dunbar and NASA’s senior staff observed it was much more difficult to find qualified U.S. citizen engineers to hire. Today she, like many engineering colleagues, is concerned that fewer than 5 percent of U.S. undergraduates today are enrolled in engineering. “More college students are majoring in hospitality and leisure industries than in science and engineering,” she declared. “Yet in Asian countries, 40 to 45 percent of undergraduate students are enrolled in engineering because they know it will transform their world and society.”

In addition to insufficient math and science preparation in K-12 education and declining public literacy in science and engineering, Dunbar points to a third culprit: popular media. “Negative stereotypes about scientists and engineers permeate popular culture,” she explained. “For example, girls who are good in math are often portrayed as being socially inept. One school guidance counselor said to me ‘I discourage students from considering careers in engineering because my students like to work with people’. A director of
an art gallery asked ‘Don’t engineers just make bombs?’ A Congressman stated during a budget hearing with NASA ‘Why do we need to fund more weather satellites when I can go onto the internet to see the weather every day?’

“How do we ‘change the conversation’?” she asked, quoting the title of a 2008 report by the National Academy of Engineering that became a NAE initiative. “Much of the responsibility can be laid at the feet of the popular public media, including Hollywood. Unfortunately, Hollywood is probably not aware how much of their own technology and business case is generated and created by engineers. How do we reach them? How do we turn around such appalling misunderstandings?”

‘Another Sputnik moment’

Dunbar is working tirelessly to raise awareness. Through the Museum of Flight in Seattle, which serves more than 140,000 students every year in STEM (science, technology, engineering, and mathematics) programs, she found that working directly with the public through informal science education was very effective. In 2010, she joined the faculty of the Cullen School of Engineering at the University of Houston, where she is both the director of the University STEM Center as well as director of the graduate program in aerospace engineering. The University STEM center coordinates approximately 34 university programs serving K-16+ students. As a professor of mechanical engineering, she intends to ensure a continued pipeline of talent that will take the nation back to the Moon and on to Mars.

“I am concerned about the future of our nation,” Dunbar states. “We stand at a crossroads in terms of educating the scientists and engineers we need to prosper and lead. We need to remain a great nation that explores and innovates. In some respects, we are still living off the nation’s investment in the Apollo program to land a man on the Moon. That program alone gave us unparalleled investments in education, research and development, innovation, and new industries.

“However, where once we strove to be number one in technical indicators such as patents granted, percentages of graduating engineering and scientists, and academic math scores for high school students, often now we are not even in the top ten. And we seem to be satisfied by being just above average when compared to the rest of the world. I am not satisfied with that ranking. I remain an optimist about what this nation can do when motivated and mobilized forward—and we are at another Sputnik moment.”

Trudy E. Bell, M.A., (t.e.bell@ieee.org, www.trudyebell.com, and @trudyebell), is senior writer for the University of California High-Performance AstroComputing Center (http://hipacc.ucsc.edu) and a contributing editor for Sky & Telescope magazine. A former editor for Scientific American and IEEE Spectrum magazines, she has written a dozen books and nearly 500 articles, 19 of which have won top journalism awards. Bell shares two unusual commonalities with Dunbar: both were born not 50 miles apart in rural southeast Washington, and as a college senior Bell was a mission controller for sun-orbiting spacecraft Pioneers 6, 7, 8, and 9 at NASA Ames Research Center. This profile is her 20th feature for The Bent.