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Inspired by the Land

Diana Elder Anderson

by Cassandra Brooks



North Rim of the Grand Canyon

Those who spend enough time outdoors know that the landscape tells a story. Scientists who study earth sciences learn skills on how to read this landscape. They understand the huge role that weather and climate play in shaping the landscape, as well as the dramatic effect they can have on the human occupants. Some of these events are rapid like flash floods that carve the landscape into slot canyons, such as Antelope Canyon. Other events occur gradually like the Colorado River carving the Grand Canyon over millions of years. Studying these processes is key to understanding how the climate of the past shaped our landscape, how it continues to affect it today, and what the future holds for the land and all of us who depend on it.

Diana Elder Anderson is an associate professor at the Center for Environmental Sciences and Education and the Quaternary Sciences Program at Northern Arizona University. She is a woman inspired by the beauty of the land around her, driven to find answers to her questions about the earth and hoping to help her Navajo community in a future where our climate will only continue to change. I managed to spend a few minutes with Anderson in the midst of her busy schedule in between grading finals and research trips to the Grand Canyon.



Diana Anderson

A Curious Beginning

Anderson was born in Oakland, California, to a Navajo mother and an Irish, Scottish and English father. Her father was in the Navy, so the family moved up and down the California Coast depending on where he was stationed. She and her siblings were raised Catholic, but all the while learning as much as possible about the Navajo way of life at home. Anderson says, “My mother did the best she could, but Navajo culture is by nature communal, with a strong emphasis on the extended clan network, therefore learning and living the Navajo way was almost impossible so far from Dinéah.” Dinéah refers to the traditional homeland of the Navajo in the southwestern United States and Diné is the name the Navajos call themselves. Anderson feels that the Catholic and Navajo ways of looking at the world are very different, but she believes she has found a comfortable place within both.

Like many young children, Anderson asked a lot of questions about the natural world around her. She comments, “My mom says that I was always asking questions about how thunderstorms worked, how trees grew, why the soil was different place to place. These are types of questions that children naturally ask, and I simply never grew out of it.”

Anderson was truly a research scientist at even a very young age. She would not settle for simple answers to the natural phenomena she witnessed and would instead go research the answers herself. “One pivotal moment for me was in fourth grade when I saw a lightning bolt outside the window of my San Diego elementary school,” Anderson recalls. “I asked an aide how that happened and she said that when two clouds collide it makes lightning and the collision causes thunder. I was very unsatisfied with that answer and started paying more attention to weather phenomena and trying to understand them better.” Furthermore, at home, if her mother didn’t know the answers to Anderson’s many questions, she would take her to the library and encourage her to find the answers herself. Anderson relates, “She never put me off or discouraged my incessant questioning.” In this way, her mother had an encouraging and positive influence on her. Also, whenever her father was home, he took the family camping, helping the children to learn to love and explore the outdoors.

Inspiration from the Land and People

Anderson says she had her heart set on being a meteorologist by the fourth grade. She steadfastly pursued that

path until her senior year at Northern Arizona University (NAU). But then the loss of the NAU atmospheric physics program coupled with her longing to do more fieldwork led her to consider majoring in geology. In the end, she completed a bachelor’s in geology and a bachelor’s in physical science with an atmospheric emphasis.

When I asked Anderson what the motivating factors or experiences were that steered her toward science, she recalled a time when she was engaged in helicopter-assisted fieldwork in remote slickrock canyon landscape. “I remember being so struck by the beauty of the landscape that I was speechless,” she remembers. “I felt I was so fortunate to be able to wander through this amazing landscape and have the opportunity to try and understand it better.”

She also distinctly remembers the moment she realized that she could apply her work to help the people in her community. Anderson describes visiting her grandparents who lived near Ganado, Arizona: “There was an arroyo [a dry creek bed that only seasonally fills with water] near their house that was rapidly expanding, and they and their neighbors were continually rerouting the dirt road which was being eroded, despite the brush they built up near the head of the arroyo to try and stop its headward migration. I came to the realization that one way



Antelope Canyon

Earth Science Disciplines

Geology

Geology is essentially the science of the Earth itself. It is the study of the materials of which the Earth is made, the structure of those materials and the processes acting upon them and how the Earth's materials, structures, processes and organisms have changed over time. This encompasses the composition, structure and physical properties of its substrates, including rocks, soil and gemstones.

Many geologists retrace the history of the Earth using various disciplines of geology such as paleontology, geochemistry or sedimentology. Sedimentologists analyze layers of sediments laid down over time to understand past geological, physical, chemical and biological processes. Geochemists study the chemical composition of the rocks and soils, including the cycles of matter and energy that drive their composition and their interaction with the hydrosphere and atmosphere. Paleontologists look at fossil evidence laid down in the ground. Specifically, they study how long-term physical changes of global geography and climate have affected the evolution of life, how ecosystems have responded to these changes and have adapted the planetary environment in turn, and how these mutual responses have affected today's patterns of biodiversity. By reconstructing the past, geologists can help us predict and understand what the future might hold.

Environmental Science

Environmental science is an interdisciplinary approach to understanding environmental systems and includes the interactions among physical, chemical and biological components of the environment. Environmental scientists can choose many different aspects of the field including monitoring the quality of the environment, interpreting the impact of human actions on terrestrial and aquatic ecosystems, and developing strategies for restoring ecosystems. Environmental science can encompass issues such as climate change, conservation, biodiversity, water quality, groundwater contamination, use of natural resources, waste management, sustainable development and air pollution.

Atmospheric Science

Atmospheric science is the study of the atmosphere, the layer of gases that surrounds the planet. Two common specialties are meteorology and climatology. Meteorologists study changes in temperature, air pressure, moisture and wind direction in the troposphere and often focus on weather forecasting. Whereas climatologists study the climate, including long- and short-term changes due to both natural and anthropogenic causes.

Most universities throughout the country have earth science programs, including all the possible specialties listed above.

I could help my Navajo people was to try and understand how the landscape responds to climate.”

Anderson, the avid questioner, began asking more about the land around her in the Southwest United States. “What drives landscape change in arid and semiarid regions? This is especially important now that we are undergoing climate change.” Arid and semiarid regions refer to areas with little rainfall and water, common throughout the Southwest. Anderson continues, “How will increasing high intensity rainfall, increasing evapotranspiration and other effects change the landscape that the Diné rely on for sustenance?” Evapotranspiration is an important part of the water cycle that refers to the movement of water from the land, water masses and plants to the air. These are just a few of the many questions Anderson hopes to answer.

Choosing Your Path

Anderson advises aspiring young students to “pursue the topic you are most interested in and never give up.” And furthermore, for students interested in graduate studies, “The best way to find an adviser is to decide what research topic really inspires you, find out who is doing that research and contact them.”

Anderson has spent much of her career at NAU, including obtaining her undergraduate and master's degrees. She was particularly pleased with NAU's quaternary studies program, which at the time was one of the few interdisciplinary graduate programs in the country. Quaternary science focuses on the quaternary period, which encompasses the last 2.6 million years of the geological time scale.

Anderson returned to NAU after a Ph.D. at University of California Riverside, where she worked in another beautiful area studying the processes that change the landscape in arid regions. “I applied for the position at NAU because I thought that NAU was where I could do the most for Native students, and it was my home landscape,” Anderson says. She further notes that NAU has a relatively high percentage of Native students (6% in the fall of 2007).

Anderson is currently at the Center for Environmental Sciences and Education, an interdisciplinary program that offers undergraduate degrees

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in environmental sciences and environmental studies, and master’s degrees in environmental sciences and policy and in quaternary sciences.

Anderson finds working with graduate students to be the most challenging and rewarding aspect of her career. “Every single one of them has been a joy to advise. I think it helps me stay focused on the geomorphology that I love, amidst all the other demands of my job. Advising their work has always compelled me to dig deeper (figuratively and sometimes literally) to better understand landscape processes. I value their perspectives and enjoy helping them grapple with a problem and ultimately overcome it. They motivate, inspire and challenge me!”

Long Term

Finding a career that motivates and inspires you for the long term can be daunting. But in Anderson’s case, she stays motivated because she gets to

continuously work in the field. She asserts, “I love being outdoors and am much more comfortable hiking through the forest or desert than anywhere else.” Her current studies focus on sediment movement on the landscape from processes like river or wind action. She also manages a weather station network called the Northern Arizona Mesonet (NAM) in conjunction with the National Weather Service and secondary school teachers. She uses this program to help monitor climate change in northern Arizona. In addition to being an associate professor in the Center for Environmental Sciences and Education at NAU, she is also the graduate coordinator for the Quaternary Studies Program and co-director of NAU’s Soil, Sediment, and Landform Analysis Laboratory at NAU’s Bilby Research Center.

Many people dream of a career where they can work out of doors doing what they love, inspiring others around them and giving back to their

Resources

For information on the Center for Environmental Sciences and Education, visit <http://home.nau.edu/envsci>

For information on the Quaternary Sciences Program, visit www.nau.edu/~qsp

For information on the Northern Arizona Mesonet weather station network, visit www.cens.nau.edu/~nauws/nam.html

For more information on the Bilby Research Center, visit www.bilby.nau.edu

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communities. Anderson is doing just that and for those interested in earth sciences, the opportunities are out there and waiting. ❖

Cassandra Brooks, Abenaki, is currently a graduate student at Moss Landing Marine Labs which operates through California State University. In the fall, she will be enrolling in the University of Santa Cruz’s Science Communication Program.

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