

# Starlight, Star bright

Barbara Anthony-Twarog remembers growing up in the 1950s, at a time when girls didn't have as many opportunities as they do now.



She also remembers seeing Sputnik go over. Sputnik, launched in 1957, was the world's first artificial satellite. It was an aluminum sphere 23 inches in diameter and orbited earth about every 90 minutes. It carried instruments that radioed back to earth data about the upper atmosphere. Launched by the U.S.S.R. during a time known as the Cold War era, it was the first spacecraft in a two-decade "race into space" between the United States and Russia to see who could put the first man on the moon. The U.S. won the race in 1969.

"It was a cool time," she says. "So many things were happening. I was interested in science from the time I was in high school. I took physics in college and never changed my mind." She earned a degree in physics, which is the study of motion, matter and energy and how they interact, from the University of Notre Dame. Her Ph.D. in astronomy, the study of heavenly bodies, came from Yale.

Today Anthony-Twarog is a teacher and researcher in the Department of Physics and Astronomy at the University of Kansas in Lawrence. Her interest is the stars.

Professor Anthony-Twarog analyzes light from the stars by breaking it into the spectrum. A spectrum is the rainbow pattern of colors you see when light is sent through a prism. From looking at these spread-out spectra of starlight, she can learn about the temperature, if the star is new or about ready to burn out, or even what it is made of.

Often there will be thin dark lines running through these bands of color. That is because different chemical elements leave "imprints" at certain colors in the star's spectrum. For example, hydrogen in the outer layers of a star will create a dark line in the red part of the star's spectrum. Another element, sodium, leaves dark lines in the orange portion of a star's spectrum. The sun has a lot of elements in it. If you find a picture of the sun's spectrum, you will see many, many dark lines spread across its rainbow spectrum.

Professor Anthony-Twarog's studies take her to places like the national Kitt Peak Observatory in Arizona, California's Mt. Laguna Observatory and Cerro Tololo Inter-American Observatory in Chile. One of her children was even born in Chile.

She has advice for students who would like to be a scientist in any field. "Work hard at math and writing. These are the basics of everything you need to learn."

Being curious is very important, also. "Don't be afraid to ask questions. The best scientists ask the best unanswered questions!" says Professor Anthony-Twarog.