

## Sunrise, Sunset: Quickly Pass the Hues

*By Dennis Payton Knight*

Nature cloaks herself in all the beautiful colors of the spectrum. The red of a rose, the green of a juniper, the yellow of a sunflower, the pink of a hyacinth, the blue of a cornflower. She colors her creatures much the same: the brown of a grizzly, the orange of a ladybug, the blue of a jay, the red of a cardinal.

But she saves her most profound, yet delicate, and her most overwhelming, yet fleeting hues to burst as the sun rises in the east and sets in the west. Painters, with the finest of brushes, and photographers, with the finest of lenses, oft try to capture the transitory moments but never so memorably as recorded in the instant by the human eye.

Scientifically, it is a phenomenon called scattering, caused by molecules and particles in the atmosphere changing the direction of light rays, as explained by Steven Ackerman, professor of meteorology at the University of Wisconsin in Madison. "Because the sun is low on the horizon, sunlight passes through more air at sunset and sunrise than during the day, when the sun is higher in the sky. More atmosphere means more molecules to scatter the violet and blue light away from your eyes. If the path is long enough, all of the blue and violet light scatters out of your line of sight. The other colors continue on their way to your eyes. This is why sunsets are often yellow, orange, and red."

Stephen F. Corfidi of the National Weather Service wrote in September 2014, about sunrises and sunsets. Although many people believe the colors are created and exaggerated by pollutants in the air, Corfidi insists it is not pollutants, but clean air that is the main ingredient common to brightly colored sunrises and sunsets.

At sunrise or sunset, sunlight takes a much longer path through the atmosphere than during the middle part of the day. Because of this lengthened path, the light that reaches an observer early or late in the day is noticeably reddened. Corfidi gives this example to illustrate: "A beam of sunlight that at a given moment helps produce a red sunset over the Appalachians is at the same time contributing to a deep blue, late afternoon sky over the Rockies."

Corfidi's article says, because air circulation is more sluggish in the summer, resulting in more smog and haze, the late fall and winter are the best times for viewing sunsets over most of the United States. Pollution climatology also explains why deserts and tropics are known for their hues at twilight because air pollution in these regions is, by comparison, minimal.

It is 6:07 p.m. on a pleasant October day in Denver as I gaze through the window at my desk. The setting sun has painted clouds gathering over the mountains in shades of orange and blue. It's been interesting research, but, science be damned, I'm giving credit to the Denver Broncos.