

THE AMERICAN BIOLOGY TEACHER



About Our Cover

This cover image was created as part of a student 4-H STEM-themed photography shoot aimed at combining photography skills with scientific learning about flower anatomy, plant vascular xylem, and fluorescence.

The student photographers learned that each daisy is not a single flower, but instead an inflorescence with multiple flowers. The yellow center of the daisy is made up of many small, tube-shaped flowers. This center disk is surrounded by ray flowers, which have the elongated white petals. The whole structure is supported by green bracts, found under the petals. This composite flower arrangement is common to the large Asteraceae (or Compositae) plant family.

The students also learned that xylem is a vascular tissue used by the plant to move water and nutrients from the roots up through the shoots. Xylem can also move small molecules dissolved in water, such as dyes; for this photograph, freshly cut daisies were placed in a highlighter solution for two days. The elongated cells of the xylem act like straws, directing the flow of water up the plant to the stem, leaves, fruits, and – in this case – flowers. Multiple forces may be in play to create the pressure that actually moves the water up the xylem. In this case, the most likely cause is evaporation of water from the surface of the ray petals and other surfaces, pulling the dye-water solution up the stem.

For this photo, the daisies were placed in solutions of 5% yellow or orange highlighter fluid. Exposure to a black light causes compounds in these fluids to fluoresce when they absorb energy from invisible UV light and release that energy as visible light. The orange and yellow fluoresce differently – coral and green, respectively – because they contain different fluorescent compounds. With this technique, one can distinctly see the xylem in the stems, leaves, bracts, and ray flower petals of the daisies.

This image was taken by Liberty Stone, a Sturgeon High School student and 4-H member in Missouri. The photo was taken with a 35 mm focal length at f/4.5, set as an 8.5 × 11.25 with 400 DPI.

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