

PeriodicGraphics

With Compound Interest

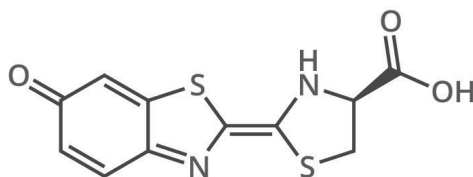
A collaboration between C&EN and Andy Brunning, chemistry educator and author of the popular graphics blog Compound Interest. To see more of Brunning's work, go to compoundchem.com.

SUMMER BUG CHEMISTRY

Summer brings with it an assortment of warm-weather-loving insects that look and smell unusual. Here, we highlight some of the chemical compounds responsible for their quirks.



FIREFLIES



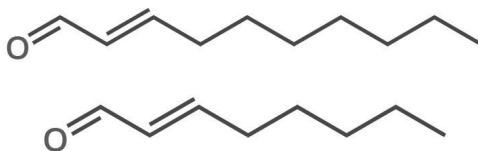
LUCIFERIN

Converted to oxyluciferin to produce glow

Fireflies glow at night because luciferin in their abdomens reacts with oxygen and adenosine 5'-triphosphate. The reaction, catalyzed by the luciferase enzyme, forms oxyluciferin. This molecule is formed in an excited state and then relaxes to its ground state, releasing energy in the form of yellow-green flickering light.



STINKBUGS



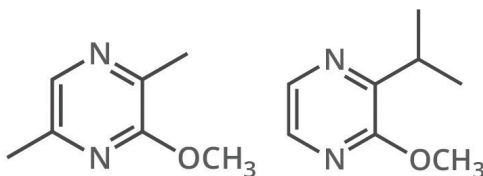
TRANS-2-DECENAL & TRANS-2-OCTENAL

Aldehydes emitted by stinkbugs

Brown marmorated stinkbugs have spread rapidly since appearing in the U.S. about 17 years ago. They release volatile chemicals when disturbed or squashed, including the two aldehydes shown. *Trans*-2-decenal is also found in cilantro, which may be why some people think the herb smells similar to stinkbugs.



LADYBUGS



METHOXYPIRAZINES

Among 38 identified ladybug scent compounds

Ladybugs emit an unpleasant odor when threatened or squashed. Methoxypyrazines play a major role in this odor, which has been described as smelling like a mixture of nuts, green peppers, potatoes, and mold. If the bugs settle into vineyards, they can taint the wine with these molecules.



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