Ripped from the Headlines! Creating Case Studies from Primary Literature.

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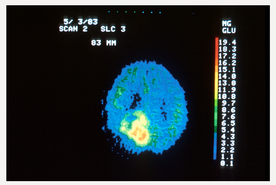
Aedes aegypti

Case Studies are a great way to engage students in real-world problems, to introduce students to primary research literature and to help build science identity.

In this example, two case studies were developed from a 2014 *Nature* paper (McBride, CS, Baier, F, Omondi, AB, Spitzer, SA, Lutomiah, J, Sang, R, Ignell, R and Vosshall, LB. Evolution of mosquito preference for humans linked to an odorant receptor. *Nature*, 515: 222-227, 2014



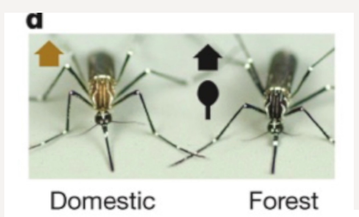
Interesting Headlines make great potential case studies.

Study On Toxin That Tainted Spinach, Shiga Toxin, Reveals Treatment Possibility.—Science Daily, December 11, 2007.

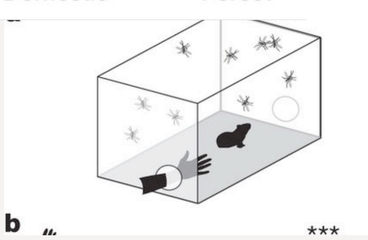
This Burrowing Clam Is Not Boring. It Uses Acid to Make Its Home.

Researchers have solved the mystery of how this small species of giant clam forms its own cave inside the rock of a coral reef.—NY Times, June 14, 2018

The first case study (published in the National Center for Case Study Teaching in Science) starts with a fictional lab meeting in which James, a new undergraduate research student, meets for the first time with the Vosshall research group at Rockefeller University. Later, James reads some of the papers he was given and tries to write a hypothesis to explain the research. This case focuses on hypothesis writing, experimental design and evolution (speciation).

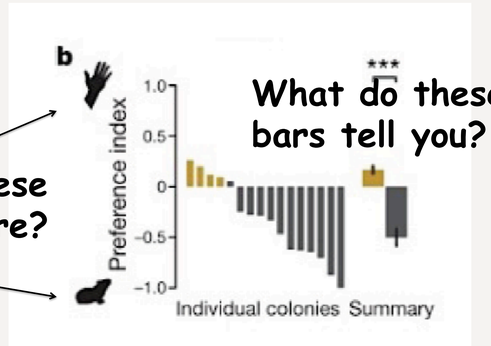


Domestic and forest forms *of Aedes aegypti* found at the study site in Kenya.
One species or two?



Apparatus for quantifying biting preference (human vs. anesthetized guinea pig. **Are there flaws in the experimental design?**

Why are these drawings here?

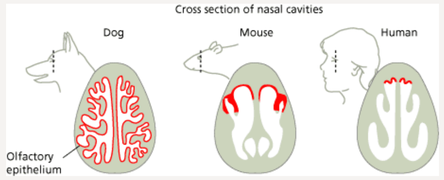


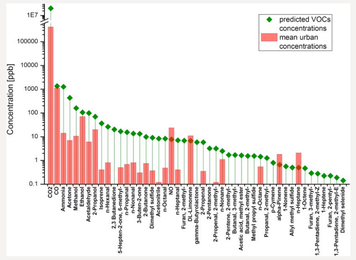
What do these bars tell you?

Results from the first experiment. **What do the bars tell us? What is the "preference index?"**

A few weeks later in the semester, we revisit the *Nature* paper with the second (unpublished) case. This time we look at how the authors designed experiments to determine the **specific compound and its mutant receptor** that gives the domestic subspecies a human preference. Both cases are presented in the second semester of a year-long Introductory Biology course

How do we smell? How do odorant receptors communicate information? Why are some animals better "smellers?"





Volatile compounds emitted from human breath and skin. Research is looking into potential detectors for finding earthquake victims.

Record action potentials to see which compounds activate the OR4 receptor

Aedes Or4 gene expressed in a mutant fruit fly with no odorant receptors!

Gas chromatography to separate volatile compounds from human skin.