Periodic Graphics

A collaboration between C&EN and Andy Brunning, author of the popular graphics blog *Compound Interest*

More online

To see more of Brunning's work, go to **compoundchem.com.** To see all of C&EN's Periodic Graphics, visit **cenm.ag/periodicgraphics.**

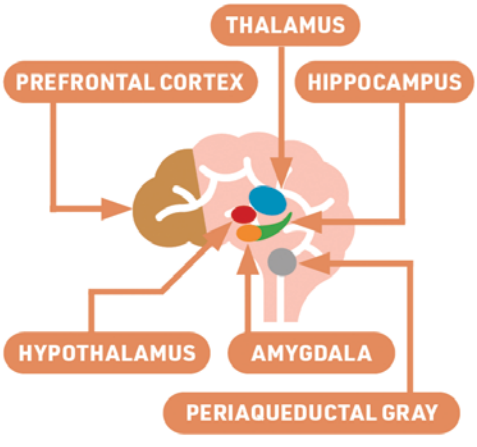
THE SCIENCE OF FEAR

It's spooky season! Here we look at why we jump when things go bump in the night and what happens in our brains and bodies when we're afraid.

WHAT CAUSES FEAR?

We feel fear when we anticipate danger or harm. The thalamus relays external stimuli to the amygdala. The hippocampus and prefrontal cortex help interpret the perceived threat, providing contextual information.

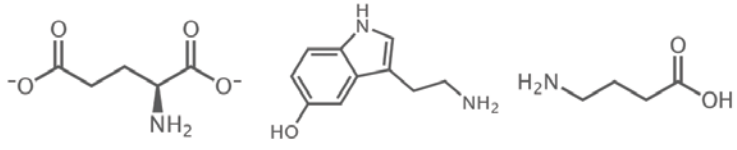
REGIONS OF THE BRAIN INVOLVED IN THE FEAR RESPONSE



The amygdala signals other regions of the brain, kicking off the responses we know as fear. The periaqueductal gray (PAG), a region in the midbrain, triggers jumping or freezing in response to fear.

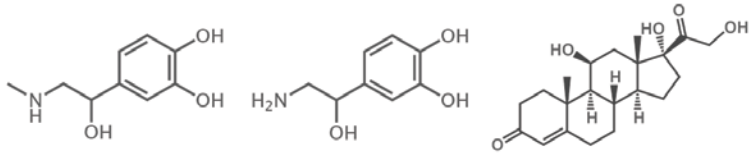
THE BIOCHEMISTRY OF FEAR

A number of neurotransmitters pass messages between brain regions during the fear response. Glutamate plays a key role in the processing of fear. Serotonin and γ-aminobutyric acid (GABA) are also involved.



GLUTAMATE | SEROTONIN | GABA

The hypothalamus triggers the fight-or-flight response by signaling the adrenal glands to release adrenaline and noradrenaline into the blood. It also triggers the production of cortisol.



ADRENALINE | NORADRENALINE | CORTISOL

These stress hormones cause increased blood pressure, heart rate, respiration, and blood sugar. The rush of adrenaline is also part of why some people enjoy being scared.

PERIODIC GRAPHICS