THE ANATOMY OF ANXIETY

TIME Diagram by Joe Lertola.
Text by Alice Park

WHAT TRIGGERS IT . . .

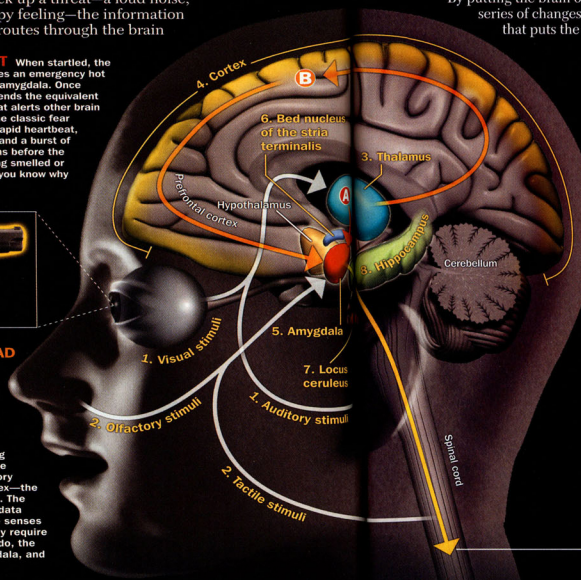
When the senses pick up a threat—a loud noise, a scary sight, a creepy feeling—the information takes two different routes through the brain

A THE SHORTCUT When startled, the brain automatically engages an emergency hot line to its fear center, the amygdala. Once activated, the amygdala sends the equivalent of an all-points bulletin that alerts other brain structures. The result is the classic fear response: sweaty palms, rapid heartbeat, increased blood pressure and a burst of adrenaline. All this happens before the mind is conscious of having smelled or touched anything. Before you know why you're afraid, you are

B THE HIGH ROAD Only after the fear response is activated does the conscious mind kick into gear. Some sensory information, rather than traveling directly to the amygdala, takes a more circuitous route, stopping first at the thalamus—the processing hub for sensory cues—and then the cortex—the outer layer of brain cells. The cortex analyzes the raw data streaming in through the senses and decides whether they require a fear response. If they do, the cortex signals the amygdala, and the body stays on alert

. . . AND HOW THE BODY RESPONDS

By putting the brain on alert, the amygdala triggers a series of changes in brain chemicals and hormones that puts the entire body in anxiety mode



STRESS-HORMONE BOOST Responding to signals from the hypothalamus and pituitary gland, the adrenal glands pump out high levels of the stress hormone cortisol. Too much cortisol short-circuits the cells in the hippocampus, making it difficult to organize the memory of a trauma or stressful experience. Memories lose their context and become fragmented

RACING HEARTBEAT The body's sympathetic nervous system, responsible for heart rate and breathing, shifts into overdrive. The heart beats faster, blood pressure rises and the lungs hyperventilate. Sweat increases, and even the nerve endings on the skin tingle into action, creating goose bumps

FIGHT, FLIGHT OR FRIGHT The senses become hyperalert, drinking in every detail of the surroundings and looking for potential new threats. Adrenaline shoots to the muscles, preparing the body to fight or flee

DIGESTION SHUTDOWN The brain stops thinking about things that bring pleasure, shifting its focus instead to identifying potential dangers. To ensure that no energy is wasted on digestion, the body will sometimes respond by emptying the digestive tract through involuntary vomiting, urination or defecation

1. Auditory and visual stimuli Sights and sounds are processed first by the thalamus, which filters the incoming cues and shunts them either directly to the amygdala or to the appropriate parts of the cortex

2. Olfactory and tactile stimuli Smells and touch sensations bypass the thalamus altogether, taking a shortcut directly to the amygdala. Smells, therefore, often evoke stronger memories or feelings than do sights or sounds

3. Thalamus The hub for sights and sounds, the thalamus breaks down incoming visual cues by size, shape and color, and auditory cues by volume and dissonance, and then signals the appropriate parts of the cortex

4. Cortex It gives raw sights and sounds meaning, enabling the brain to become conscious of what it is seeing or hearing. One region, the prefrontal cortex, may be vital to turning off the anxiety response once a threat has passed

5. Amygdala The emotional core of the brain, the amygdala has the primary role of triggering the fear response. Information that passes through the amygdala is tagged with emotional significance

6. Bed nucleus of the stria terminalis Unlike the amygdala, which sets off an immediate burst of fear, the BNST perpetuates the fear response, causing the longer-term unease typical of anxiety

7. Locus ceruleus It receives signals from the amygdala and is responsible for initiating many of the classic anxiety responses: rapid heartbeat, increased blood pressure, sweating and pupil dilation

8. Hippocampus This is the memory center, vital to storing the raw information coming in from the senses, along with the emotional baggage attached to the data during their trip through the amygdala

Source: Dennis S. Charney, M.D., National Institute of Mental Health