



## >> LEARNING

### Mom Was Right

So you goofed ...

**We learn more** from our mistakes than from our successes, the old cliché says—and now scientists know why. Researchers at the University of Exeter in England discovered a brain mechanism that alerts us to situations in which we previously went wrong.

In the study, students playing physicians had to diagnose a fictitious disease based on images from equally fictitious blood samples. When participants saw images that had

previously led them to an erroneous diagnosis, warning signals in the brain appeared only a tenth of a second later—much more quickly than did signals triggered by images that had resulted in a correct diagnosis. Earlier studies had confirmed that slipups do indeed result in better learning, but this one is the first to show the brain's specific reaction to a prior blunder.

This early-warning signal may be invaluable in situations ranging from the dangerous to the mundane. A child who touches a hot stovetop learns the hard way not to do it again—when she sees a glowing burner in the future, her brain will alert her to avoid the painful decision she made the last time. —Graciela Flores

## >> THE SENSES

### Finding the Connection

People who experience sensory cross talk shed light on brain wiring

**Many people dream in color.** Some also read and hear in color. In people with synesthesia, different senses blend in a variety of ways—one person might see the numeral four as bright yellow, and another might taste cucumbers when she hears words beginning with the letter “F.” And because synesthetes are aware of connections among parts of the brain that to most people seem distinct, they may help scientists map the mind's higher cognitive functions.

Julia Simner, a linguistic psychologist at the University of Edinburgh, is among a new crop of researchers exploring how conceptual thinking (not simply physical stimuli) may evoke colors and flavors in synesthetes. By inducing a “tip of the tongue” state—in which a known expression eludes immediate recall—in synesthetes who taste words, Simner discovered that the meanings of words can produce the same flavors as their sound or written shape. For instance, trying to remember the term “castanet” caused one woman to taste tuna, the same flavor triggered when she heard the word. Through this type of “word tasting,” Simner is exploring the potential relation between conceptual thought and perceptual experience.

People with a different type of synesthesia, who feel a sensation on their own body when they observe somebody else being touched, may provide insight into the genesis of emotions. A University College London study found that these mirror-touch synesthetes showed higher capacities for emotional empathy than others did. They may, for example, experience stronger gut reactions when they see someone in distress. When trying to rationally imagine how other people feel, however, the synesthetes scored similarly to everyone else—which suggests that more than one path through the brain ends in empathy.

Many unidentified synesthetes assume their perception of the world is ordinary. When the study about mirror-touch synesthesia made the news, many people were surprised to discover that experiencing this type of disembodied contact is considered unusual. Scientists believe that about 4 percent of the population experiences some form of synesthesia and that the phenomenon probably stems from normal

cognitive development in the womb and early childhood. As the brain grows, a large number of neural connections are formed. Many of these synapses are then pruned away as processes in the brain differentiate. Synesthesia may arise from an incomplete shedding of these connections.

Everyone may possess these same pathways in the brain to some degree, but most people do not realize it. Simner sees synesthetes as decoders because “they experience the relationship to conscious awareness.” —Melissa Mahony

