sample, 68 percent reported a sample of cow's hair as human hair, and 51 percent failed to match paint chips.

To improve the use of scientific evidence in court, professional associations could help build expertise by providing continuing education and adding special programs on legal issues at their annual conventions. Saks concludes that "expert witnesses" need to learn the details of a case and their role in it. They should "learn to give accurate, two-sided presentations in court, recognizing that they are witnesses, not advocates."

Making Memories

"Learning at the Sub-Neural Level" by Robert Kanigel, in *Mosaic* (Fall 1987), National Science Foundation, Washington, D.C. 20550.

Brain biologists are vigorously investigating the workings of memory—how it is stored, preserved, transmitted. Kanigel, a free-lance science writer, shows how scientists trace the chemical and molecular events within nerve cells that stimulate—and may enhance—memory.

The key to understanding learning is in discovering how neurons, or nerve cells, communicate with each other. Brain researchers scrutinize the chemical and electrical activity in the synapses, minute gaps between neighboring neurons. An electrical charge shooting down a neuron triggers the release of chemicals called neurotransmitters; they in turn cross the synapse to receptors on the other side, charging the next nerve cell.

During the past two decades, much understanding of subneural events has come from experiments with *Aplysia californica*—a lowly snail. When it receives a blow to its head or tail, the snail tucks in its gill; soon it learns to retract at any stimuli—even light. The first stimulation releases a surge of chemicals, eventually freeing the neurotransmitters and kicking off the tucking response. Researchers wondered why the snail's ability to react—or to remember—greatly outlasts the momentarily heightened level of chemicals. After unraveling the subneural reactions, they found that certain chemical transformations (absorbing calcium, emitting potassium) allow softer stimuli to set off the same release of neurotransmitters.

This is fine for simple creatures, but do similar processes occur in more complex animals? What happens when a rat sniffs a piece of cheese that reminds him later, when he is hungry, to come back for more? Mammalian studies show that a strong stimulation of the hippocampus, a brain organ important to memory, sensitizes the synapse, strengthening its response to future, less intense stimulation.

This synaptic memory sheds light on higher forms of learning, such as the ability to associate an object with a specific event, or the triggering of one thought by another. Scientists at the City of Hope's Beckman Research Institute in Duarte, California, and the University of California, Irvine, have showed that if either of two synapses—one weak and one strong—are stimulated, the other will be strengthened, possibly increasing the brain's ability to store complex information.

Do synapses "boogie"? one scientist asks. It appears that a brief, intense shock to the synapse may actually change the shape of its neuron and cause the cell's spiny branches to grow—potentially enhancing memory.