Biology

Julie Ann Miller reports from Dallas at the meeting of the Society for Neuroscience

Brain selects among sights and sounds

The gleaning of useful information from the jumble of sensory input the environment provides is a major task of animals' nervous systems. This focusing of attention seems to begin as information first enters the nervous system (SN: 11/9/85, p. 295) and continue at various levels in the brain. Scientists are analyzing the information-screening process for auditory and visual input, as well as for pain.

The screening of auditory information is called the "cocktail party effect"—in a noisy room you can screen out all conversations except the one in which you are participating. Josef M. Miller of the University of Michigan in Ann Arbor reports that experiments on trained monkeys demonstrate that cells in the lower brain stem influence whether the animal pays attention to a specific stimulus. This influence is not at the first nerve cell connection, or synapse, as in the pain experiments. But it is considered to occur early in processing—the third synapse in a path of six or seven synapses.

Researchers examining vision also find brain centers that control what they call "the flashlight of attention." David Lee Robinson of the National Eye Institute in Bethesda, Md., reports that cells in the brain area called the pulvinar thalamic nucleus respond more strongly when an animal has been trained to pay attention to the visual stimulus than when it is not paying attention. "Previously, we had no idea what this part of the thalamus did with vision," Robinson says.

In the cortex, generally considered the highest processing area of the brain, specific regions recently have been implicated in information screening. For example, Joaquin M. Fuster of the University of California at Los Angeles has identified cells in the monkey prefrontal cortex that respond to color, but only when the color is relevant to the task the monkey is performing. When there is a delay between the viewing of the color and the opportunity to choose a similarly colored disk to earn a reward, some of the cells continue responding until the choice has been made. These cells in effect retain information for a short time to allow the animal to perform a desired behavior.

Direct view: Dynamics of development

For scientists intrigued by how nerve cells establish their highly regular pattern of connections, what could be better than just watching the cells project and perhaps rearrange their contacts? Now scientists report they can do just that. Using a new long-lived fluorescent dye, they can directly observe the development of connections between the eye and the brain in toad *(Xenopus laevis)* embryos. Their results indicate that at least some nerve fibers do not grow directly to their appropriate targets but, according to a "dynamic" mechanism, they establish a roughly ordered projection that is refined over time.

To view nerve cell projections in a live embryo, Nancy A. O'Rourke and Scott E. Fraser of the University of California at Irvine inject a fluorescent dextran dye into a single-celled embryo. As the embryo develops, the dye becomes distributed to all the cells. The scientists then take fluorescently labeled tissue destined to become an eye (or half of an eye) and graft it into the appropriate location on an embryo that was not injected with dye. Because the head of the developing larva becomes transparent, the scientists are able to follow for several weeks the growth of the labeled neurons.

Two phases of pattern development were revealed by this technique. On one axis across the retina, the dorsal-ventral nerve fibers form an ordered projection early in development, O'Rourke and Fraser report. In contrast, fibers from cells along the other axis, the nasal-temporal axis, initially overlap on the tectum, then sort out into the adult pattern over a period of days. This provides strong evidence for "dynamic behavior" of at least some nerve cell fibers in the patterning process.

Earth Sciences

Stefi Weisburd reports from Orlando, Fla., at the meeting of the Geological Society of America

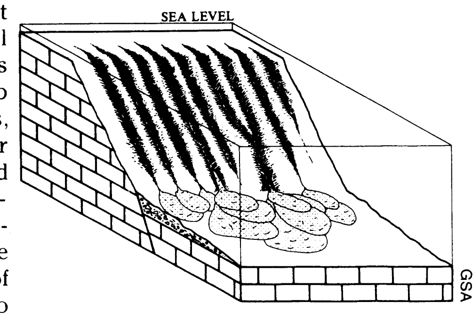
Modern antibodies date ancient shells

What happens when you inject a rabbit with amino acids extracted from the shell of a modern *Mercenaria* mollusk? No, it's not a way to find out if the mollusk is pregnant; rather, it's the first step in a new technique for dating the fossils of mollusks that lived during the last million years or so.

In the second step, the researchers isolate the antibodies produced by the rabbit's immune system in response to the injected molecules. They then observe the antibodies' reactions with the amino acids of fossil *Mercenaria*. Since amino acid molecules degrade with time and heat, the extent of the antibody-amino acid reactions enables the researchers to gauge the number of intact amino acids and the age of the shell.

Gerard Muyzer and Peter Westbroek of the University of Leiden in The Netherlands and John F. Wehmiller at the University of Delaware in Newark have recently demonstrated the viability of this technique with samples from five East Coast sites whose age and temperature history are well known. According to Wehmiller, however, the researchers are most interested in this immunological method to ensure that another biochemical dating technique — based on measuring the number of left-handed forms of amino acids that have racemized or changed to the right-hand structure over time — is providing consistent results. While the immunological approach does have its drawbacks, the researchers in The Netherlands are so intrigued by it that they are setting up a center entirely devoted to the new field of geoimmunology.

Grooving on exhumed carbonate margins



Some of the largest accumulations of oil are found in the kinds of rocks that make up carbonate platforms, which are underwater shelves composed primarily of sea-animal shells. Scientists like to study the sides, or margins, of such platforms to better understand how the platforms, and potential oil reserves, develop. Unfortunately, the margins of most modern platforms lie in deep, dark waters and can only be studied bit by bit in the light beam of a submersible.

Now, a discovery by two graduate students at the University of California at Berkeley will expedite the study of one kind of margin, in which sediments "bypass" or completely flow down the margin slope. David Bice and Kevin Stewart recently found, in Italy's Sibillini Mountains, the first two examples of ancient bypass margins that are now elevated well above sea level.

The researchers believe the margins originally formed about 180 million years ago in the Jurassic period, when faults sliced through a carbonate platform as the crust near what is now Italy stretched out and thinned during the opening of an ocean basin. Heavy sediments from the top of the platform blocks then flowed down the sides, eroding the underwater carbonates and etching deep channels into the margin. Eventually, however, sediments filled in the grooves, obscuring this bypass channel pattern and contributing to the drowning of the platform blocks.

"Just by fortune this [bypass] surface has been perfectly exhumed," says Bice. When the Sibillini Mountains formed, the crust was compressed and the carbonate blocks were uplifted. Over time, the sediments filling in the grooves were eroded to expose the bypass pattern. "Since it's so nicely exposed, it gives us a good chance to see what kind of processes shape these margins," adds Bice.