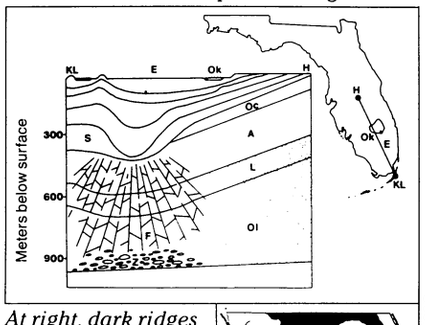
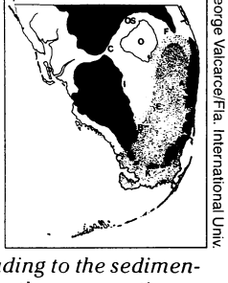
rocks. Petuch argues that had an asteroid bombarded the carbonate rocks under Florida, carbon dioxide and calcium oxide would have been produced. And since calcium oxide grains are water soluble, any trace of them at the Eocene-Oligocene layer would have long ago dissolved, leaving only the iridium dust.

While Shoemaker has no quarrel with Petuch's scenario from the growth of the coral reefs onward, he doesn't think there is evidence for an impact. He argues that the proposed asteroid would have deposited material outside the crater and would not have wiped away the Eocene layers. He also contends that chunks of asteroids are never found buried beneath craters and that the magnetic anomaly in Florida is not consistent with the way impacts are known to alter the magnetic fields of rocks.





George Valcarce/Fla. International Univ.

At right, dark ridges surround the oval-shaped Everglades. The stippled area represents the missing Eocene layer. Petuch thinks an asteroid hit near the Everglades' southern tip, creating the fracture zone and leading to the sedimentary patterns shown in the cross section above. (Letters refer to geologic formations and geographic locations.)

Petuch says he welcomes other theories explaining the Florida magnetic anomaly, but he thinks the impact idea is the only plausible one now in the running. "This is the last place in the world you'd expect to see such an anomaly, because the nearest igneous rock [that would have a magnetic signal] is over 5 miles straight down through solid limestone," he observes. Moreover, he argues that the bulk of impact research to date has focused on craters in continental crust and that the record of an impact may look considerably different in carbonate rocks. The Florida impact could represent "a whole class of craters to itself, completely different from any other one known," he says.

If Petuch is proved wrong, he has, at the very least, raised some tantalizing questions about the geology of Florida—questions that he hopes will inspire more field work. And if he is right, he should expect standing-room-only crowds for some time to come. —*S. Weisburd*

Switching-on genes in development

Studies of the simplest gene system in plants and animals are drastically changing scientists' ideas of how genes work in complex organisms, Donald D. Brown of the Carnegie Institution in Baltimore reported last week at the National Institutes of Health in Bethesda, Md. Whether these genes are active or silent, he has found, depends both on the folding of DNA with proteins into its characteristic "chromatin" structure and on the stable binding of particular proteins to a site in the center of the gene. This mechanism of gene control is quite different from that of bacteria, which previously was the only such mechanism described at this level of detail. Gene regulation is a basic puzzle of modern biology, with implications for all aspects of how organisms function.

Brown and his colleagues studied two families of genes found in the African clawed toad, *Xenopus laevis*. Each gene encodes a small RNA molecule, called 5S ribosomal RNA, which is part of the cellular organelle that makes protein. The two families of genes are called the oocyte (egg cell) genes and the somatic (body) genes. The families differ in about six positions among the 120 nucleotides that make up each gene.

In the toad egg cell, or oocyte, all of the 5S ribosomal RNA genes are active. But because there are 20,000 oocyte genes and only 400 somatic genes, the oocyte form of 5S ribosomal RNA predominates. In contrast, in somatic cells of the toad, the somatic genes are 1,000 times as active as the oocyte genes.

A two-tiered system governs the activity of the oocyte gene, Brown reports. The top tier involves chromatin, the natural chromosomal structure in which the DNA is condensed with proteins called histones. Brown's team has developed a new test that measures the activity of chromatin, rather than just naked DNA. When the chromatin from somatic cells is dipped into a solution containing all the required components, the somatic genes are expressed and the oocyte genes remain repressed, as in the intact cell.

The scientists next disrupted the chromatin structure, dissociating the DNA from the histone H1. The result was a massive synthesis of the oocyte form of 5S ribosomal RNA. Brown concludes that the repressed state of this gene and others is maintained by the interaction between DNA and histone H1.

The second tier of gene control relies on three proteins that Brown calls transcription factors A, B and C. These proteins must bind to the center of the gene, forming a "transcription complex," before the enzyme called polymerase III begins making new RNA.

The surprising finding about this transcription complex is its stability. It remains in place for many rounds of RNA synthesis. Somehow the complex avoids being knocked off the DNA as the polymerase works its way along the gene. "The polymerase goes through the transcription complex as if it were butter," Brown says.

In recent experiments, Brown and his colleagues demonstrated that the presence of a transcription complex underlies the specific activity of the oocyte gene. In the region where the factors bind, the oocyte and somatic genes differ by three nucleotides out of 50. The A factor, they find, binds more strongly to the somatic than to the oocyte gene. This discrimination is most evident in situations where there is limited factor. In the oocyte there are 10,000,000 factor A molecules per 5S ribosomal RNA gene, but in the somatic cell there is only one factor A molecule for every five of these genes.

The intriguing question now is whether the transcription complex is the "memory" that maintains the activity state of the gene from one cell generation to the next. If so, it might be the basis by which—as an organism differentiates — various cell lines become committed to expressing different patterns of gene activity.

—*J.A. Miller*

Paying attention at many levels

An animal is continuously bombarded with sensory input — all the sights, sounds, smells and skin sensations delivered by the environment. Somehow the brain selects from this barrage the relatively few stimuli important for the animal's immediate behavior. This essential screening occurs at many levels within the brain. But surprisingly, scientists now report, the screening process begins before the signals reach the brain's complex processing centers, perhaps even before they reach the brain.

"The screening occurs right when information comes into the central nervous system, not as some higher function of the cortex," Mary C. Bushnell of the University of Montreal reported last week in Dallas at the meeting of the Society for Neuroscience. The new data stem from scientists' increased ability to study awake animals trained in particular tasks.

In their recent experiments, Bushnell and Ronald Dubner of the National Institute of Dental Research in Bethesda, Md., trained monkeys to press a button to begin a trial, to wait for a cue and then to release the button to get a juice reward. Each monkey learned to recognize two cues—a light signal and small increase in heat from a heating element on its face.

The scientists recorded the electrical activity of nerve cells that receive input from the face's pain receptors. These cells