'Missing link' to cancer is found

A scientist described last week what he calls the first product of a cancer gene known to bind with human DNA and directly control the activity of other cellular genes. Researchers found the gene product, a protein, by focusing on one of its many targets, a gene involved in regulating zinc metabolism. But its real significance, says Michael Karin, who led the team discovering it, is that it "was the missing link in the whole concept of how cancer occurs."

For years, scientists have believed cancer occurs when the normal processes regulating cell growth somehow get out of control. And there has been evidence for aberrant regulation in every step of the cellular growth-control process except the last one, Karin says. Researchers have seen aberrations in the production of hormonal growth factors that bind to cells, in the activity of the cell-surface receptors for those growth factors and in the enzymes that translate the receptors' activity into chemical messages that control cell growth. Missing was evidence that proteins carrying these chemical messages not only would bind to the cell's DNA but also would trigger the expression of genes in the cell nucleus. And that's what the University of California at San Diego team has found. Says Karin, "It's like finding the Rosetta stone" for cancer.

The newly identified cancer-gene-derived protein, triggered by an animal virus, resembles "activator protein 1," or AP-1, present in all normal cells. As a "transcription factor," AP-1 is able to switch on the transcription machinery — which copies DNA into RNA — of genes in the cell nucleus, Karin says. And at least by function, he says, "we cannot distinguish between AP-1 and its [cancer-gene-derived] homolog."

The cancer gene's protein appears to cause cancer by turning on a process that ultimately leads to cell division. But because the virus carrying the cancer gene overproduces this protein, the cellular proliferation process never shuts off — and a cancer is born. Ordinarily, regulation of AP-1 in normal cells is tightly controlled. When triggered into action it does its job and then stops. But certain cancers — most notably lung cancer — contain an excess of AP-1. Karin says it appears the AP-1 excess operates in precisely the same way as the massively produced cancer-gene homolog — triggering runaway cell proliferation and the cancer. Karin hopes that by studying the genes targeted by AP-1 — whether it's produced at normal levels or at high levels — he can gain a better understanding of the mechanisms of cancer and clues to its undoing. *— J. Raloff*

Evidence of an atmosphere on Pluto

Not much is known about tiny, distant Pluto beyond the existence of its single known moon, Charon, and the fact that methane in some form has been detected there. On June 9, however, at least eight separate groups of astronomers aiming their telescopes at the planet detected clear signs that it has an atmosphere. In fact, says James L. Elliot of the Massachusetts Institute of Technology, who co-led a team flying over the South Pacific aboard NASA's Kuiper Airborne Observatory, "Pluto has an atmosphere — no question."

The occasion was Pluto's passing between the earth and a star, an event called an occultation, in which astronomers can learn a great deal from the way the star's light is shut off by the object getting in the way. The rings of Uranus, for example, were discovered that way in 1977, when the starlight blinked out not only behind the planet but also several times on either side of it.

Pluto's motion is imperfectly known, however, and until last week there had been no confirmed stellar occultations by Pluto on record, so astronomers gathered to take a look not only from the NASA aircraft but also from observatories in New Zealand, Australia and Tasmania. The starlight, they found, did not simply blink off and on as Pluto moved in front of it but got gradually fainter and brighter. The light, it seemed, had not merely been chopped off by the sharp edge of the planet's disk but was weakened and strengthened as it passed through a medium that looked increasingly dense with proximity to the disk — like an atmosphere.

This week, the astronomers and their colleagues were analyzing their data, with answers in the offing to several fundamental questions. What is the atmosphere made of? Most gases would simply freeze onto the surface at Pluto's temperature, estimated to be within as little as 40°C of absolute zero. Even if past methane detections could not distinguish ice from gas, says Alan Stern of the University of Colorado in Boulder, there must be some gas above it. Other candidates include carbon monoxide and molecular nitrogen, and Stern notes that the "long shots" could include argon, resulting from the decay of radioactive potassium. The atmosphere, Elliot suspects, may turn out to be as much as a few hundred kilometers deep above a planet less than 2,400 km in diameter. *— J. Eberhart*

Warm Cretaceous earth: Don't hold the ice

The long-held assumption that the earth has been ice-free for significant stretches of geologic time may be on the rocks. Large, out-of-place boulders in Australia have led scientists to suggest that ice existed there even during the warmest known section of earth history, the Cretaceous period — a time so temperate that forests thrived in Antarctica.

During this period, which spanned from 144 million to 66 million years ago, ocean levels peaked and large seas filled the interior of Australia as well as other continents. Sediments that settled to the floor of the ancient Australian sea formed layers of small-grained rocks such as sandstone. But geologists there also have found many boulders of exotic rock that sit in the middle of these sedimentary layers. These rocks, measuring up to 3 meters in diameter, are sometimes located more than 100 kilometers from what was then the coastline.

The only viable explanation for the presence of these boulders is that small rafts of ice carried the rocks out to sea and then dropped them as the ice melted, say L.A. Frakes and J.E. Francis of the University of Adelaide in Australia, who report their analysis of the rocks in the June 9 NATURE. The scientists say they ruled out the possibility of other modes of transportation such as mudflows, strong water currents or volcanoes.

It is not possible to tell whether the ice on Australia could have lasted throughout the year or only during the winter. "Either one is a big change from how people viewed the Cretaceous climate," says Eric J. Barron from Pennsylvania State University in University Park.

Using computer models, Barron has estimated that the mean global temperatures during the Cretaceous averaged some 6°C to 12°C warmer than today — a whopping figure by climate standards. But he and other researchers now believe that in spite of the average global warmth, the interior of certain continents may have been cool.

Scientists have found similar dropstones in Cretaceous deposits from the Northern Hemisphere, and the rocks also are found in sediments from other warm periods. According to Frakes and Francis, these finds suggest that "the possibility of an ice-free earth having ever existed appears small."

Alfred M. Zeigler at the University of Chicago, a supporter of the ice-free-earth theory, says "people are kind of skeptical" about the report by Frakes and Francis. "On the other hand," he adds, "the claim they make [about ice-rafting] seems to be the most likely explanation." *— R. Monastersky*