# BIOLOGY

## Young embryos activate carcinogens

It's never too early for an embryo to suffer genetic damage. Very young embryos appear to be a target for damage by even those chemicals, drugs and environmental pollutants that require activation by metabolic enzymes. Some chemicals, such as benzo[a]pyrene, for instance, do not cause genetic changes until they are metabolized by body enzymes called p-450-mediated monooxygenases. These enzymes, which had been thought to appear in the body around the time of birth, are present much earlier, say Sheila M. Galloway, Roger A. Pedersen and colleagues of the University of California at San Francisco. They examined the effect of benzo[a]pyrene on young mouse embryos that had been removed from the womb and placed in a culture medium. In the June PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES they report that the embryos were susceptible to the chemical at 7½ days of gestation, when their organs were just beginning to form. (Total gestation period for a mouse is about 20 days.) Preliminary results indicate that benzo[a]pyrene causes genetic changes even in 3½-day-old embryos that have not yet implanted in the uterus lining.

## Second skin for commercial fruit

Fruit sealed in a polyethylene film can maintain its fresh appearance and flavor for up to a year, says Israeli scientist Ben Yehoshua. He and David Nahir have developed a high density polyethylene film that prevents moisture loss from fruit, and they also have invented a sealing machine to wrap the fruit efficiently. Yehoshua, who works at the Volcani Institute, an agricultural research center near Tel Aviv, estimates the cost of sealing fruit to be 20 cents per 100 pieces. The film not only preserves freshness but prevents rot from spreading between pieces of fruit. Finally, the film may allow handlers to inject chemicals to influence the ripening of the fruit. Injection of ethylene into the "micro-atmosphere" bounded by the film speeds up "de-greening," while injection of ethylene-absorbing chemicals delays the process. Fruit naturally has a wax coating that slows its aging, but the wax is removed when fruit is disinfected for packaging.

## Chinese hatch cloned goldfish

The first cloning of a fish has been announced by a Chinese news agency. The fish's genes came from a cell of an adult golden carp. The cells had been maintained in laboratory vessels for 385 days and transferred 59 times. The nucleus of one of those cells was implanted into a carp egg from which the nucleus had been removed. The resultant golden carp grew to be 3 inches long in 70 days. Similar asexual reproduction had been achieved previously with frogs by British scientists in the 1960s.

## Playing your mice close to the chest

A very informal courier service has delivered mouse embryos from the Jackson Laboratory in Bar Harbor, Maine, to scientists in England. Ampules containing 200 two-cell embryos were carried on a cross-Atlantic flight by Marianna Cherry. Two ampules in her purse went through the gun detectors at Logan Airport. Two others were tucked inside her blouse and thus were kept at body temperature. The ampules kept close to the heart were the most successful travelers. Thirteen mice developed from them, while only 5 grew from the purse-carried cells. Transporting tubes of embryos, rather than cages of mice, allows scientists to obtain specific strains of mice from outside their own countries without waiting for actual animals to sit out strict quarantine requirements.

# SPACE SCIENCES

## Uranus and Neptune: Magnetic fields?

Do Uranus and Neptune have magnetic fields? The only way to tell at present without sending a magnetometer out there on a spacecraft (Voyager 1 may find out late in this decade) is via the detection of radio emissions from the two planets. There is one extremely uncertain report of signals from Uranus and not a known peep from Neptune; in short, hardly a clue. But two research teams have now suggested reasons to anticipate magnetic fields at both worlds, with that of Neptune possibly generated differently from that of any other planet in the solar system.

The ideas are based on calculated "models" of Uranus and Neptune developed by William B. Hubbard and J.J. MacFarlane of the University of Arizona. Each planet, they suggested in the Jan. 10 JOURNAL OF GEOPHYSICAL RESEARCH, may have a rocky core of about 15 times earth's mass, wrapped in a thick blanket of "ices" including methane, ammonia and water. Outermost is an envelope of hydrogen and helium similar to those of Jupiter and Saturn but much smaller, since Uranus and Neptune formed farther from the sun where less of the gas was available in the early solar system.

Hubbard and MacFarlane found the likelihood of a Uranian magnetic field uncertain, since there is no good measurement of the planet's heat flow (which would bear on the chance of a field-generating dynamo). Michael Torbett and Roman Smoluchowski of the University of Texas at Austin, however, disagree. While Uranus was coalescing, they suggest in the July 17 NATURE, its gravitational and radionuclide heating kept the materials in its core liquid and, by convection, well-mixed. As the heating lessened enough for the convection to slow down, the still-liquid materials began to separate themselves by weight, a process that continues — and provides heat — to this day. The heat causes convection, and since some of the core materials (FeO and FeS) are electrically conductive, the result is a "dynamo" that creates a magnetic field.

Neptune is trickier. Though slightly smaller than Uranus, it is suggested by the model to be more dense, with about 26 percent more pressure at its core. This could solidify a greater portion of the core, say the Texas researchers, leaving less liquid in which convection can take place. Hubbard and MacFarlane, however, propose that a dynamo *could* exist in the innermost portion of the water-ice layer that *surrounds* the core. The high pressures, they suggest, could ionize the water and thus render it conductive, while the necessary convection would be provided by the planet's primordial heat.

This would mean that Neptune's magnetic field might be unique in the solar system. The rocky inner planets with fields (and possibly Uranus) produce them in their cores; Jupiter and Saturn generate fields involving their huge, compressed hydrogen-helium envelopes. Only Neptune's field, perhaps, has its source region in the icy layer *between* core and envelope.

Smoluchowski agrees with that possibility, but believes that ionization of the water by pressure is an unlikely source for the necessary conductivity. Recent experimental data, he says, show that at a pressure (about 0.3 megabars) well below that of Neptune's core-ice boundary (estimated at 7.29 megabars), the conductivity produced in water by pressure-ionization levels off at an amount too low to sustain a dynamo. Instead, he suggests, the water may become "metallic," transporting electrical charges via electrons rather than ions, like the metallic hydrogen at the depths of Jupiter and Saturn. (Such an ice-layer dynamo probably does not exist at Uranus, Smoluchowski adds, since the portion of the ice layer that is compressed enough to be conductive is probably too thin — about one-fiftieth of the planet's radius versus one-seventh in Neptune's case — to allow enough convection.)