nodes for T cells. Three months after implantation, the researchers determined that the mice had relatively healthy immune systems, although they produced half as many T cells as normal mice. But when the researchers dug around the kidney to find the thymus, they saw nothing. They suggest that the cells differentiated and produced a range of T cells but then died off. Blackburn believes that 500 cells might be below the critical mass needed to sustain a thymus; the group reports finding full thymuses in mice that had received larger implants. Blackburn's work will be published in the June issue of *Immunity*; the Monash team's results appear in the 17 June online edition of *Nature Immunology*.

Still to be proven, however, is that the thymic stem cell exists. If MTS20/24 cells are largely homogeneous, that would bolster the case that the long-sought thymic stem cell exists and is among them. But the thymic cells huddled in the original implanted cluster might have been more diverse than they appeared. If so, more than a single cell type might be needed to grow a new thymus. Howard Petrie, an immunologist at Memorial Sloan-Kettering Cancer Center in New York City, also questions whether all the cells in the Monash thymus arose from the original cluster; they might have recruited others from the recipient's body. Still, Petrie and others embrace the therapeutic potential of stimulating the thymus in those with weak immune systems—an enormous population that includes the elderly, patients undergoing chemotherapy, and people with immune diseases, including AIDS.

–JENNIFER COUZIN

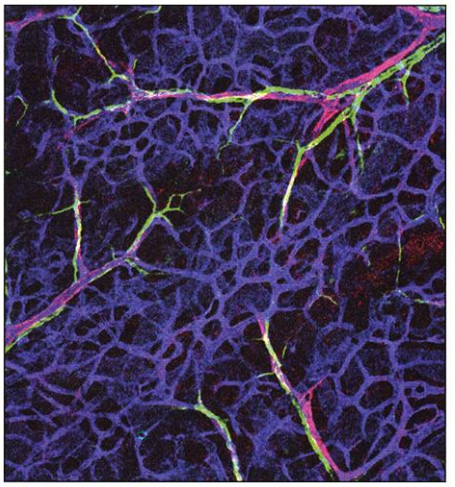
DEVELOPMENTAL BIOLOGY

Nerves Tell Arteries to Make Like a Tree

By the time an embryo's heart beats for the first time, an extensive tree of arteries is already in place. Its delicate branches—which will ultimately stretch tens of thousands of kilometers in a full-grown human—ensure that no bit of tissue goes wanting for oxygen and nutrients.

How arteries shape themselves into such fine patterns has been an open question. Now a study shows that arteries follow the lead of another of the body's branching specialists: nerves. In the 14 June issue of *Cell*, developmental neurobiologists Yoh-suke Mukouyama and David Anderson of the California Institute of Technology (Caltech) in Pasadena and colleagues report that embryonic nerves form a template that directs the growth of arteries. The team also identifies a molecule released by the nerves that apparently signals the arteries to fall in step.

"This is the most elegant paper I've read in years," says angiogenesis researcher Judah Folkman of Harvard University Medical School and Children's Hospital in Boston. "They answer one question after another."



CREDIT: Y.-S. MUKOUYAMA

Developmental tango. Branching arteries (red) follow the lead of neurons (green) in embryonic mouse skin.

Blood vessels and peripheral nerves tend to snuggle closely together. This arrangement has advantages: Arteries supply neurons with oxygenated blood; nerves tell blood vessels when to dilate or contract and help direct immune responses. However, few studies have examined how this relationship develops.

The Caltech researchers labeled nerves and blood vessels in the skin of embryonic mice. They found that arteries, but not veins, align closely with nerves. Snapshots of the skin at several time points revealed that the nerves appear first. Soon after, primitive vessels—which have yet to don the molecular trappings of arteries—align with the nerves. This hinted that the nerves might be calling the shots.

The team then turned to mutant mice lacking a gene important for guiding axons, the long tendrils extending from neuron bodies. Peripheral nerve axons in these mice tend to clump together and have fewer fine branches, and Mukouyama and Anderson's team found that the mice's arteries had the same pattern. Apparently, arteries follow axons even when the axons go astray.

It makes sense that the development of nerves and arteries is linked, says George Yancopoulos, a molecular geneticist at Regeneron Pharmaceuticals in Tarrytown, New York. "It's easy to speculate that if you're going to have two branching systems that integrate into the various tissues of the body, when one system comes up with a solution, it's very economical to have the second system just follow along."

Nerves also appear to secrete a molecule that tells embryonic blood vessels to become arteries in the first place. The team found that

ScienceScope

More for Livermore The Bush Administration this week delivered draft legislation creating the Department of Homeland Security to Congress, which is scrambling to decide how it will oversee the proposed $37 billion addition to the federal bureaucracy. But one element seems clear: The department's scientific and technological activities will be managed at Lawrence Livermore National Laboratory in California —although lab officials emphasize that the lab itself will not be swallowed up by the new department.

"There'll be a separate building on the Livermore campus, with a sign on the door designating it as an office of the new department," explains John Marburger, the president's science adviser. Asked why Livermore was chosen, Marburger says that the Department of Energy weapons lab "has a long history" of being involved in the issue, from the biological, chemical, and nuclear weapons in a potential terrorist's arsenal to the measures needed to thwart their deployment.

Although much of the department's work might be carried out by health and medical agencies, Marburger says he expects the Livermore-based office to manage their budgets. It will also represent science to the rest of the department.

U.K. Cloning Clash The on-and-off battle over the United Kingdom's stem cell and cloning research rules is on again. The country's highest court last week said it will allow an antiabortion group to appeal an earlier defeat that opened the door to human therapeutic cloning research.

Last November, the High Court ruled that the Human Fertilization and Embryology Act, passed in 1990 before human cloning seemed possible, applied only to embryos created by fusion of egg and sperm—and not those made by cloning techniques. The decision prompted one doctor to announce that he would attempt human reproductive cloning in the U.K. But after an appeals court overturned that ruling, the House of Lords empowered a government panel to issue licenses for therapeutic cloning research. Now, the Judicial Office of the House of Lords has ruled that the anti-embryo research group ProLife Alliance can challenge the current regulatory system.

A ProLife win would be a setback for researchers, says Anne McLaren, a developmental biologist at the Wellcome/CRC Institute in Cambridge. The case is expected to be heard later this year.

Contributors: Michael Balter, David Malakoff, Jeffrey Mervis, Adam Bostanci

neurons and accessory cells called Schwann cells make a molecule called vascular endothelial growth factor (VEGF), which is found in a variety of tissues and has been shown to spur blood vessels to sprout and grow. In test tube experiments, the team found that VEGF compels undifferentiated blood vessels to take on characteristics of arterial cells. Anderson hypothesizes that VEGF secreted by nerves first attracts primitive blood vessels, then tells them to become arteries.

Although people have long noted the anatomical similarities between arteries and nerves, there has been little evidence that their development is coordinated, says molecular geneticist Peter Carmeliet of the University of Leuven in Belgium: "Until now there have been no molecular clues."

The research could also help explain a number of disorders that have baffled physicians, according to Folkman. Children with Möbius syndrome, for example, fail to develop several cranial nerves and have improperly formed arteries. The link between nerve and artery development could be a step toward an explanation, Folkman says.

–GREG MILLER

CANADA

Act Seen as First Step In Protecting Species

OTTAWA, CANADA—Canada's House of Commons last week approved the country's first law to protect endangered species. But although federal officials say the legislation, which relies on incentives rather than punishments, sets a new standard for cooperation between public and private sectors, environmental groups grumble that the approach leaves much to be desired.

"We want to get ahead of the curve, with stewardship programs," says Environment Minister David Anderson. But that approach "is just a starting point," complains the International Fund for Animal Welfare's national director, Rick Smith. "It will still leave the majority of species in the country without mandatory protection."

The parliamentary vote caps a decade-long debate over how best to protect Canadian plants and animals and their habitats (*Science*, 24 August 2001, p. 1417). In addition to first-ever mandatory protection on federal lands, the Species at Risk Act will offer incentives and compensation to landowners and industry to do the right thing, says Anderson. Those inducements will amount to $29 million this year and an expected $38 million next year. The government can wield a big stick if necessary, he adds, including arrests and fines of up to $650,000.

Despite giving private landowners financial incentives to cooperate, the new bill seemed headed the way of its predecessors until Anderson struck a compromise with all sides. He appeased the rural caucus of his own Liberal party by promising that property owners will receive adequate compensation if their lands are declared protected areas because of their value to at-risk species. He mollified the environmental caucus with a pair of olive branches. The first gives slightly more power to scientists on the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). If the committee declares a species endangered, its decision will now be final unless politicians vote within 9 months to overturn it and put their reasons in writing. The second makes habitat protection mandatory on federal land (about 6% of Canada's land mass) and waters, and on all land north of the 60th parallel not governed by aboriginal land-claim agreements.

For private lands, the bill relies on a different model of governance from what he calls the "coercive command-and-control approach" of the U.S. Endangered Species Act, says Anderson. Pressure from U.S.-linked environmental groups for more stick and less carrot "have not been helpful to the debate," he adds.

Others hold a decidedly less rosy picture of the bill. "I really don't think it will do the job," says ecologist David Schindler of the University of Alberta in Edmonton, who says that the legislation defers to the provincial governments, which have a mixed record of species and habitat protection. "I would be surprised if we saw any slowdown whatsoever in the rate at which new species are added to the list."

Wise decision? A new Canadian law will try to help endangered friends of this great owl.

Environmentalists calculate that the bill leaves about two-thirds of the 402 species within various COSEWIC risk categories without any form of mandatory habitat protection. "If we're going to save species, we have to save spaces for them, and the government is only delivering on federal lands and for aquatic species," says Kate Smallwood, endangered species program director of the Sierra Legal Defense Fund. Migratory birds are at special peril, she says, "unless the nest and its habitat are in a post office, military base, an airport, a Coast Guard station, or a national park." Anderson disagrees. An existing agreement with the United States already obliges Canada to protect migratory fowl habitat, he points out.

The bill's final parliamentary hurdle—Senate approval—is a low one, because only once in the past decade has the upper chamber overturned legislation. And that's fine with an exhausted Anderson. "I'll be glad to have it over with," he says.

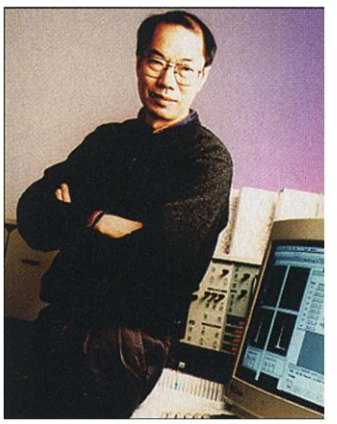
–WAYNE KONDRO

Wayne Kondro writes from Ottawa.

CANADA

Amgen Splits With Lab, But Its Money Lingers

OTTAWA, CANADA—Amgen has decided to sever its ties to the University of Toronto (UT)–based research institute it has funded for nearly a decade. But in an unusual twist, it's going to continue paying millions of dollars a year for work to which the university will hold all intellectual property rights.



New deal. Toronto's Tak Mak says "we're happy to be on our own."

The Amgen Institute was created in 1993 by the California biotechnology company, and the agreement was updated in 1999 to run through 2008. But soon thereafter the company installed a new management team, which last month decided that the institute's basic research into the functions of similar genes in mice, *Drosophila*, and *Caenorhabditis elegans* didn't fit into its new corporate strategy to focus on applied research. Earlier this month it negotiated a settlement with the university, and last week the lab set up shop under the umbrella of UT's network of teaching and research hospitals.

UT officials say that they are precluded from discussing the terms of the settlement. But both sides agree that the company negotiated an end to paying indirect research costs—administrative overhead, utilities, and the like—in exchange for renouncing any commercial claims to discoveries. "We have a contract with them to

CREDITS: (TOP TO BOTTOM) BABAK; GUY LELIÈVRE/SCF