to turn a quick profit by selling or licensing commercial rights to new technologies as soon as possible, even if the highest bidder is a foreign firm. That approach conflicts with a "Canada first" clause that obligates networks to focus on creating new Canadian companies and new export lines that will sustain a more knowledge-based economy.

University officials say they try to encourage homegrown companies when it is feasible. "But sometimes, it's just not very sensible to go with something on a start-up basis," says University of Calgary Vice President (research) Cooper Langford. It's unreasonable to constrain a university's ability to generate revenue through intellectual-property sales, he says, given that they must often absorb all research overhead costs associated with the NCEs.

The network managers are hoping that the consultant's report will serve as a wake-up call to university administrators. "Big, old, entrenched, immovable universities are going to have to start taking this seriously," says Ellie Prepas, program leader for the Sustainable Forest Management network. What's needed, adds Health Evidence Application and Linkage Network manager Corey Wentzell, is consensus on a "national" intellectual-property strategy. But Dalhousie University Associate Vice President (research) Robert Fournier believes negotiations will do the trick: "I don't see [intellectual property] as an immovable object that will sink the ship of the NCEs."

–Wayne Kondro

Wayne Kondro is a writer in Ottawa.

DEVELOPMENTAL BIOLOGY

A Zebrafish Genome Project?

BOSTON—The National Institutes of Health (NIH) calls its massive genome-mapping and sequencing effort the Human Genome Project, but *Homo sapiens* isn't the only species whose genetic blueprint the program aims to decipher. From the outset, researchers have sought clues to human genetics by mapping more tractable genomes, probing such organisms as the bacterium *Escherichia coli* and baker's yeast (*Saccharomyces cerevisiae*)—whose genomes are already completely sequenced—as well as the roundworm *Caenorhabditis elegans*, the fruit fly *Drosophila melanogaster*, and the laboratory mouse. Now, if a small but intrepid band of biologists has its way, the zebrafish *Danio rerio*—a sleek, diminutive breed once known only to embryologists and aquarium hobbyists—will be the next species to hitch a ride on the mammoth project. Some 60 leading zebrafish geneticists and others gathered at Boston's Children's Hospital last week to lay plans for charting the zebrafish's estimated 2400 key developmental genes—and for persuading NIH to fund the effort.

Like humans and mice, zebrafish are vertebrates. But unlike our whiskered cousins, zebrafish produce thousands of transparent embryos, so researchers can watch the brain, heart, and other organs develop. And geneticists in the United States and Germany have already created hundreds of mutant strains with developmental flaws that could eventually shed light on related abnormalities in humans—once the affected genes are located and their functions known.

But isolating and cloning those genes will be a long, slow task, because the zebrafish genome is largely uncharted territory: Fewer than a dozen genes have been sequenced, and only rough maps are available. To make the most of their mutants, conferees agreed, they need a high-resolution map of genetic landmarks in zebrafish DNA, like those already completed for the human and mouse genomes. Such a project, they say, could be done cheaply, perhaps for as little as $350,000—a drop in the bucket compared to the genome project's 1996 budget of $170 million. "This could be of enormous value to the Human Genome Project," argues conference participant Christiane Nüsslein-Volhard, a Nobel laureate at the Max Planck Institute for Developmental Biology in Tübingen, Germany.

Research overseers at NIH—where the group plans to submit a detailed proposal this spring—will be asking hard questions about why the zebrafish should be one of the handful of organisms mapped, acknowledges Leonard Zon, a hematologist and geneticist at Children's Hospital, who co-organized the conference. "Their bias is going to be that they don't want just another model organism, so we're also going to have to justify the advantages of the zebrafish."

PHOTOS BY SAM OGDEN

Fishing for dollars. Zon and Postlethwait, and Nüsslein-Volhard, plotted strategy.

That's something at which Nüsslein-Volhard, a former fly geneticist, has had plenty of practice. In a field dominated by studies of *Drosophila*, zebrafish were small fry until 1987, when Nüsslein-Volhard set up her first fish tank. Under her leadership and that of her former student, Wolfgang Driever, now at Massachusetts General Hospital, researchers have created thousands of mutant zebrafish strains, with body and behavioral flaws traceable to disruptions in 600 previously unknown genes (*Science*, 6 December 1996, p. 1608).

Locating these genes without a detailed map, however, is like looking for a specific straw in a haystack, which explains why so few zebrafish genes have been cloned so far. But many of the abnormalities found in the new zebrafish mutants resemble—and could help researchers disentangle—specific disorders in humans. Fish carrying a mutation in the gene *gridlock*, for example, have a blood-vessel defect similar to a deadly human condition called coarctation of the aorta. And the developmental functions of many human genes could one day be explored by manipulating the corresponding genes in zebrafish.

At the conference, researchers discussed several likely methods for zeroing in on zebrafish genes. Most techniques locate genes by starting with landmarks in the genome, so combining the rough maps already compiled by University of Oregon biologist John Postlethwait and others, and peppering them with many more chromosomal landmarks, will allow researchers to find and clone genes much faster. Such a high-resolution map could be created for only $350,000, estimates geneticist Marco Marro of Washington University in St. Louis. "Even if it were twice that, it would still be a bargain," says Postlethwait, who co-organized the meeting with Zon and biologist Nancy Hopkins of the Massachusetts Institute of Technology.

NIH officials, six of whom sat in on the conference, said they were impressed. "A lot of model organisms are already being used for specific research purposes, but this one seems to have the potential to bring in something different," says David Badman, a hematology program officer at the National Institute of Diabetes and Digestive and Kidney Diseases. "Being able to look at gene function in developing organisms is really critical, and that hasn't been possible in other vertebrates. And it seems that a large number of organ-specific and disease-specific genes have already been found." And that, say conference organizers, is no fish story.

–Wade Roush