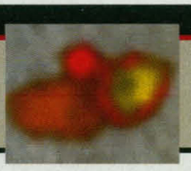
PAGE 507
Korean science reform draws protests



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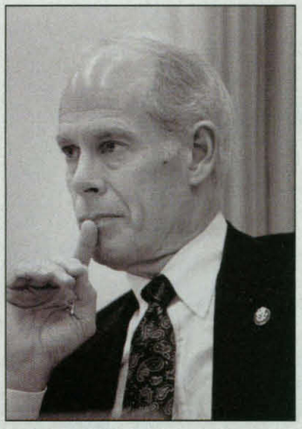
Watching the brain decipher smells

BIOMEDICINE

Ethicists Back Stem Cell Research, White House Treads Cautiously

Research on a scientifically promising type of human cell received a vote of confidence last week. In a decision that Stanford University biologist Paul Berg calls "gutsy," the National Bioethics Advisory Commission (NBAC) recommended on 14 July that the federal government fund not only research on human embryonic stem cells but also the production of cell cultures—even if it means sacrificing embryos. In an official notice, NBAC, a presidential panel of 17 scholars and ethicists, says it will deliver its final report (not yet finished) to the president "very soon."



"I don't want to see NIH's funding wrapped up in an argument that to me is tangential."

—John Porter

The president's staff, however, didn't wait long to distance itself. On the same day that NBAC reached its decision, the White House released a note saying that the Administration's policy will be spelled out in guidelines being drawn up by the National Institutes of Health (NIH). It noted that the president has ruled out funding the creation of human embryos for research. Congress has gone further, for several years adding a general ban on funding embryo research to the NIH appropriation; the current law runs through 30 September. The White House concluded: "No other legal actions are necessary at this time because it appears that human embryonic stem cells will be available from the private sector," and research on these cells "is permissible under the current congressional ban."

With this, the Administration formally backed a policy adopted by NIH and the Department of Health and Human Services (HHS) in January. Their legal experts ruled that government funds may be spent to study, but not to derive stem cells from, embryos (*Science*, 22 January, p. 465). Under this policy, only private labs may develop human stem cells from embryos, but NIH-funded and other U.S.-backed researchers may use them. (The restriction on development doesn't apply to fetal tissue.) Even this plan is controversial, however, because some right-to-life activists have declared that *any* destructive use of an embryo is immoral.

Despite the legal clouds, many biomedical researchers think this field has a bright future. They say that stem cells derived from human embryos and fetal gonadal cells, which are capable of developing into a wide variety of specialized cells, may be a valuable source of transplant tissue. For the past 9 months, NBAC has been deliberating over ethical guidelines that might enable more rapid development of this biomedical technology by opening it to public funding. NBAC concluded that the potential benefits of stem cell research outweigh the disadvantages—provided the cells are drawn from embryos that would otherwise be discarded. NBAC recommended that only "spare" embryos from fertility clinics be used, and only when both donors give full consent. NBAC also said that the government should establish a watchdog committee to set ethical rules and enforce them.

NBAC's position could have an impact on debates on biomedical funding in Congress this summer and fall if right-to-life advocates seek to extend the congressional ban on embryo research and apply it explicitly to the derivation or use of embryonic stem cells. Representative John Porter, chair of the House appropriations subcommittee for Labor and HHS, which drafts the NIH budget, has tentatively set a meeting on 21 July to begin work on next year's appropriation. Although Porter told *Science* that he personally supports NIH's perspective, he said he didn't want this discussion to "overwhelm the funding process." Porter said: "I told [NIH director Harold] Varmus that we should fight the issue on the intellectual basis of what will happen with or without this kind of research. … But I don't want to see NIH's funding wrapped up in an argument that to me is tangential."

Other members of Porter's subcommittee —including Representative Jay Dickey (R–AR), a sponsor of the embryo research ban—reject both NBAC's view and the Administration's compromise position. "We believe that science should serve humans, not that humans should serve science," says Dickey. He does not think the current law permits federal research on embryonic stem cells, and says he will help take the fight to court, if necessary. He hasn't proposed any change in the embryo research ban.

But Berg, a spokesperson for the American Society for Cell Biology, says NBAC has developed a position that he hopes will make sense to scientists and the public. He calls NBAC's recommendations for monitoring the field "bureaucratic," but reasonable if they reassure the public that this research will be guided by ethical principles.

–ELIOT MARSHALL

RESEARCH FUNDING

Michigan Plans Massive Investment in Biotech

In what may be the largest windfall for research from a state tobacco settlement so far, Michigan Governor John Engler this week signed a bill allocating a stunning $1 billion over the next 20 years for a competitive biotechnology research fund for his state's scientists. The fund, to focus on aging and health, may be spent on a range of programs, from research grants for diabetes to building new bioinformatics databases.

PHOTO: SAM KITTNER; ILLUSTRATION: C. FABER SMITH

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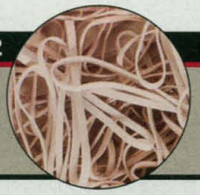
Move to sequence malaria mosquito

LEAD STORY 512
Stringing the universe along



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Why mammals have seven neck vertebrae

Michigan leaders hope their plan for a "life sciences corridor" centered around the state's research universities will put the area on the map as a powerhouse comparable to, say, Research Triangle Park in North Carolina. The plan makes use of $8.5 billion Michigan will receive from the settlement last November with tobacco companies, under which 46 states will recover the costs of treating tobacco-related illnesses. The only comparable program is a 10-year-old research fund in California financed by cigarette taxes that allocates about $20 million a year to state scientists. Some other states have modest research programs on the drawing board.

The Michigan Health and Aging Research and Development Initiative—its official name—was proposed by the presidents of Michigan State University, the University of Michigan, and Wayne State University, as well as the Van Andel Institute for Medical Research and Education in Grand Rapids, founded by the family that owns the Amway company. The governor will appoint members of those institutions to serve on the steering committee, and awards will be made on a competitive basis to scientists in Michigan. Although the budget for 2000 has already been set at $50 million, subsequent budgets will be approved by the legislature.

The specific agenda has not yet been decided but is governed by legislation that calls for spending 40% on basic research, 50% on applied collaborative projects, and up to 10% on commercial development. Robert Huggett, research vice president at Michigan State, says "we want to focus at the molecular genetic level" on topics that might range from neuroscience to diabetes. The initiative's planners have talked about using some money "to bring in world-class scientists in a few critical areas" and build infrastructure such as nuclear magnetic resonance facilities shared among universities, says James B. Wyngaarden, former director of the National Institutes of Health and a member of the Washington Advisory Group, a consulting group in Washington, D.C., that helped design the initiative. But "there's an awful lot of planning to be done," he adds.

Not everyone is happy with Michigan's plan, which would spend most of the rest of its settlement on college scholarships. Antitobacco advocates are disappointed that none of the money will go for smoking prevention programs. Michigan "doesn't have anything approaching a comprehensive tobacco prevention program," asserts Joel Spivak of the Campaign for Tobacco-Free Kids.

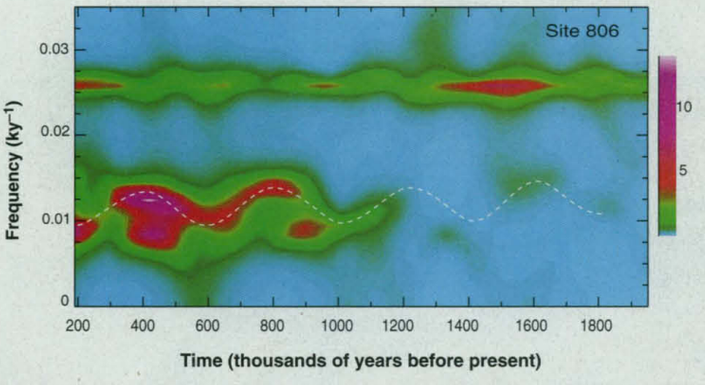
But scientists in Michigan are giddy with anticipation. "This is a great story and an exciting day for Michigan," says George Van de Woude of the National Cancer Institute, who as of October will be the new research director of the Van Andel Institute.

–JOCELYN KAISER

PALEOCLIMATE

Why the Ice Ages Don't Keep Time

According to the textbook theory, the ice ages and much other climate change should unfold with clocklike precision. In this astronomical or Milankovitch theory, the pacemaker for climate cycles over tens to hundreds of thousands of years is the rhythmic nodding and gyroscope-like wobbling of Earth's spin axis and the periodic stretching of its orbit, all of which change climate by redistributing sunlight across the planet. These cycles can be calculated millions of years into the past, and ice cores and other climate records do reveal climate swinging from one extreme to another with pendulum-like precision in time with some orbital forcings. But other climate changes, including the ice ages themselves, don't quite keep time, raising doubts about how much the astronomical theory can explain (*Science*, 8 May 1998, pp. 828 and 874). In this issue of *Science*, two studies attempt to tidy up some of these loose ends and reassert the power of the astronomical climate clock.



Climatic pitch. The frequency of the ice ages varies in time with a 413,000-year orbital cycle (dotted line), while a shorter cycle (top) goes unmodulated.

On page 564, geophysicist José Rial of the University of North Carolina, Chapel Hill, explains why the timing of the ice ages seems to be off by invoking an interaction between orbital forcings that resembles the way FM radio signals are generated. The work "show[s] that the Milankovitch frequencies really are deep in the [climate] data set," says geophysicist Jeffrey Park of Yale University. And on page 568, geographer–plant ecologist Katherine Willis of Oxford University and her University of Cambridge colleagues present a new record of the start of the ice ages 2.75 million years ago suggesting that an intensification of one orbital cycle may have triggered a surprisingly abrupt drop into northern glaciation.

Although cycles of 23,000 and 41,000 years in the climate record do match up precisely with Earth's wobbling and nodding, the ice ages don't keep to the 100,000-year schedule that should be set by the periodic elongation of Earth's orbit. Some ice ages have come as much as 120,000 years apart; other cycles have been as short as 80,000 years, Rial says. But he noticed an underlying regularity: A complete cycle from quicker, higher frequency cycles to slower, lower frequency cycles took about 400,000 years, suggesting that yet another astronomical cycle—a second, 413,000-year cycle in orbital elongation superimposed on the shorter cycle—might be modulating the frequency of the 100,000-year cycle the way broadcasters "frequency modulate" a carrier signal to produce FM radio broadcasts.

To test his idea, Rial calculated how a 413,000-year signal should modulate a 100,000-year one and checked the climate record to see how it matched the simulation. He found that the frequency of the 100,000-year cycle has risen and fallen in time with the longer modulating cycle, matching the calculation. As in an FM broadcast, the modulating signal itself failed to show up in the climate record but left its fingerprints in pairs of "sideband" signals that have frequencies just above and below the carrier frequency. Rial found exactly the predicted

SOURCE: J. RIAL/UNC CHAPEL HILL