working on strategies to prompt stem cells to become specific cell types—neurons, muscle, or pancreatic cells—that could treat diseases such as Parkinson's or diabetes. The most controversial research has been conducted on cells derived from aborted fetuses or days-old human embryos; in other cases, stem cells from adults have been used. Opponents of embryonic or fetal tissue research argue that adult stem cells could offer the same benefits without the ethical problems, but the Nobel laureates' letter calls this assertion "premature." Stem cells from adults may prove very useful, says signatory Paul Berg, a biochemist at Stanford University, but "we can't ignore the potential of embryonic stem cells. ... We should be proceeding full-speed along both tracks."

Bush has ordered the U.S. Department of Health and Human Services to review existing National Institutes of Health (NIH) policy. Under this policy, which was developed last year, government-funded researchers may not derive human embryonic stem cells but can use them if they are obtained from privately funded scientists who prepared the cells in accordance with a set of ethical guidelines (*Science*, 1 September 2000, p. 1442). (For example, applicants must certify that the cells were derived from embryos that were created for fertility treatments but were slated to be discarded.) The next deadline for submitting applications for embryonic stem cell research is 15 March, and, barring a change in policy, applications will be reviewed by an ethics board in April.

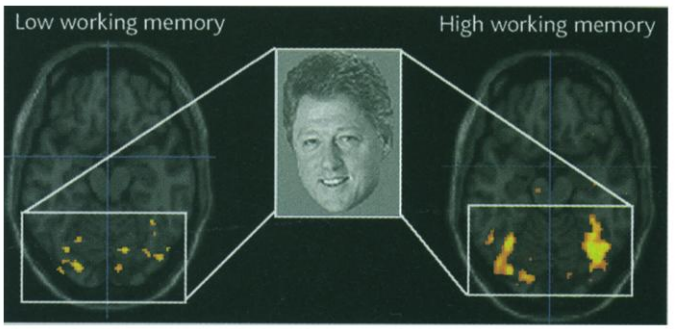
The letter was written and circulated by researchers Robert Lanza and Michael West of Advanced Cell Technology, a biotech company in Worcester, Massachusetts, that works on cloning and stem cell research. The duo, with many of the same laureates, signed a similar letter in 1999 urging the U.S. Congress and the Clinton Administration to support plans at NIH to fund work on stem cells (*Science*, 19 March 1999, p. 1849). That letter was "successful," says Lanza, who hopes the current one will show the president that "the scientific community is unified in support of this research." –GRETCHEN VOGEL

NEUROBIOLOGY

Working Memory Helps the Mind Focus

When traversing city streets, a driver needs to focus on important information—say, a red light or a car veering into the lane—rather than irrelevant images such as the type of tree lining the road. New work now provides a better understanding of just how the brain achieves such feats of selective attention—information that may have both public health and medical implications.

In experiments described on page 1803, cognitive psychologist Nilli Lavie of University College London and her colleagues have pinpointed a surprising new influence on a person's ability to focus: working memory, which is where the brain temporarily stores information used in reasoning and planning. In both behavioral and brain-imaging studies, the researchers have demonstrated that when a person's working memory is occupied, his or her brain cannot filter out distracting sights in a separate attention task.



Distracted. The greater stimulation of the visual areas at the back of the brain shows that the brain is more distracted by an image, such as that of former U.S. President William Clinton, when working memory is full (right image) than when it is less occupied.

Researchers had suspected that parts of the brain involved in conscious planning, such as working memory, might play a role in selective attention, but they did not know how. For the first time, Lavie's work provides "direct evidence that the working memory system is modulating attention and affecting processing within the brain's object recognition system," says neuroscientist Robert Desimone of the U.S. National Institute of Mental Health in Bethesda, Maryland.

The new findings could also have implications for the debate over cellular telephone use in cars. So far, safety measures have largely centered on getting drivers to use telephone headsets or speakerphones. But the new study suggests that the availability of one's hands may be only a small part of the solution. If a phone conversation requires any thought, it will tax working memory and may therefore cause a driver to be more distracted by irrelevant sights on the road.

When Lavie began this research in the late 1990s, she was trying to identify the environmental factors that might influence a person's ability to screen out visual distractions. She had discovered, for instance, that this was easier when the scene was busy than when a person had to focus on fewer objects; this is because people become more focused when the task is harder. But because a person's ability to concentrate seems to vary even when the scene stays constant, Lavie knew that the scene's complexity couldn't be the whole story.

Indirect evidence suggested that working memory might also play a role. In monkeys, for example, neurons in the prefrontal cortex, where working memory resides, seem to fire only in response to visual stimuli relevant to a given task. In addition, anatomical links between the prefrontal cortex and visual regions at the rear of the brain could mediate the hypothesized interaction between working memory and brain areas known to be involved in detecting objects.

To test the idea more directly, Lavie and postdoc Jan de Fockert first devised a task that required selective attention. They flashed the names of pop stars and politicians in front of 10 volunteers, asking them to choose the profession of each person named. As each name was flashed on the screen, the researchers also showed the volunteers a picture of a face that might or might not match the name. This forced them to try to ignore the face and focus on the text. As expected from previous work, the volunteers took significantly longer to answer when the face didn't match the name than when it did, a measure of the influence of the distracting face.

To investigate working memory's involvement, the volunteers also had to memorize a string of five digits, which they were asked to recall right after the attention task. When the number string was easy, such as 0 1 2 3 4, volunteers could remember it without taxing their working memories; as a result, they could classify the pop stars and politicians as quickly as they could in the absence of the memory task. However, when the digits were more random—say, 0 3 4 2 1—the volunteers had to continually rehearse them in their minds, putting a heavy load on their working memories. In this situation, they took much longer to determine whether a name belonged to a pop star or a politician in the presence of a nonmatching face.

To see how this played out in the brain, Lavie and de Fockert teamed up with brain imaging experts Christopher Frith at the nearby Institute of Neurology and Geraint Rees, now at the California Institute of Technology in Pasadena. The researchers used functional magnetic resonance imaging to measure brain activity while six new volunteers performed the tasks.

As expected, the researchers detected more activity in the prefrontal cortex when working memory was heavily taxed than when it was not. They also found that the dis-

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tracting faces caused greater activation in a posterior brain area devoted to processing faces when working memory was full than when it was not. That is, when the brain was thinking hard, it spent more effort processing irrelevant visual information. "The ability to act upon relevant information and ignore irrelevant distractors depends on the availability of working memory," Lavie concludes.

The work not only adds a new slant to attention research but also could suggest new avenues for treating certain brain disorders. Schizophrenia and Parkinson's disease, as well as normal aging, are generally accompanied by both a loss of working memory capacity and a diminished ability to screen out distractions. If working memory exerts some control over visual attention, these symptoms might be due to impaired neural connections between the prefrontal cortex and visual brain regions or perhaps to damage solely within the prefrontal cortex itself. Indeed, Lavie and her colleagues may soon explore the implications of their findings for schizophrenia patients. **–INGRID WICKELGREN**

BRAZIL

New Industry Taxes Boost Science Budget

RIO DE JANEIRO—Science funding in Brazil, long hobbled by fluctuating federal support, now has a new and involuntary champion—industry. A new tax covering eight industrial sectors is expected to generate many times the current level of spending for research aimed at strengthening the economy. Although most scientists applaud the additional resources and look forward to closer ties with industry, some are worried that the money may not be well spent, that basic academic research may suffer, and that the mechanism gives the government an excuse to reduce its own contribution to research.

Legislation passed in the last year or so by the Brazilian parliament imposes taxes on companies that will be channeled into three types of funds for the support of science and technology. This month, Brazilian officials will draw up ground rules for how to manage the revenues and then form committees that will oversee the process. Each panel will have representatives from the government, industry, universities, and other experts in the field, and the money will be spent within each of the designated sectors (see table). The process has been shepherded by Carlos Américo Pacheco, executive secretary of the Brazilian science ministry (MCT), who hopes to create additional funds in health care, biotechnology, agribusiness, and aeronautics.

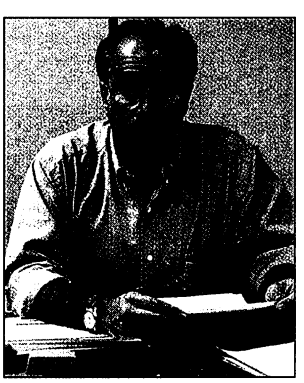
The sums already are significant. The petroleum industry, whose CTPetro fund was the first to be created in 1999, last year generated $75 million of the government's overall science budget of $500 million. This year, the telecommunications fund is expected to be an even bigger contributor, as more than half of the projected $850 million federal science budget will come from the industrial sector. A second type of fund, called Green-Yellow in honor of Brazil's national colors, aims to stimulate business-university collaborations and increase local capacity by taxing companies that send money abroad to pay for royalties and technical assistance. A third fund will skim off 20% of the money collected by the sector funds and invest it in research infrastructure.

"This is an exceptionally positive move," says Carlos Henrique de Brito Cruz, a physicist at the State University of Campinas and president of the Foundation for the Support of Research for São Paulo, the richest science state. "The sector funds are especially important as a new and stable source of funding." Adds Reinaldo Guimarães, a professor of social medicine at the State University of Rio de Janeiro, "This is the first time that the [current] government has adopted a scientific measure that is both original and important."

Government research funds are currently disbursed by the National Research Council (CNPq)—now called the National Council for Scientific and Technological Development—which will have a seat on the sector fund committees. Pacheco says that the council's 50-year history gives the country plenty of expertise in managing research monies. "There is no doubt that we are on a learning curve," he says, "but I don't believe that there will be waste nor risks to the system." But others are less sanguine. "There has been no planning, and management of the program is complex and confusing," says Guimarães, a consultant to the CNPq. "Planning is necessary if we want to prevent waste."

Scientific societies are also troubled by a provision that reserves about 60% of the money for applied research. "There is no money specifically earmarked for basic research," notes Dora Fix Ventura, a psychology professor at the University of São Paulo and president of the Federation of Associations of Experimental Biology. The Brazilian Society for the Advancement of Science voices a similar sentiment. "At all costs, we must preserve the capacity for research at public universities, which are the backbone of science in Brazil," says Glaci Zancan, the society's president.

Pacheco says that won't be a problem. "We must support the entire network of scientific knowledge, whether at universities or companies, whether basic or applied research," he says. The sector committees have also fostered greater interaction between university and industry scientists, something that scientists say has been sorely lacking. "This has been a process of mutual education," says Luiz Bevilacqua, a mechanical engineer at the National Laboratory for Scientific Computation and a member of the committee that governs CTPetro.



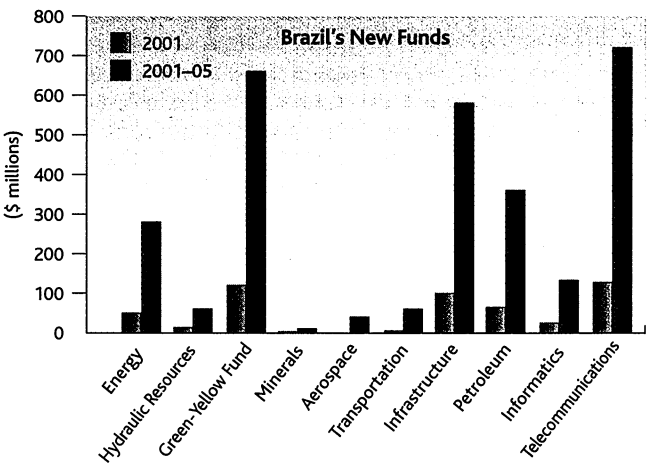
Watchful. Brazilian medical professor Reinaldo Guimarães urges "constant vigilance" to make sure the new tax monies go to science.

Despite the increased flow of money, scientists remain cautious about the long-term impact of the new arrangement. The government's decision to withhold $70 million from this year's science budget as a contingency against an economic downturn raises questions about the ultimate fate of the sector funds. In addition, some scientists fear that the government may at some point trim its contribution to research because of the growing share coming from industry taxes.

Pacheco insists that the government wouldn't do such a thing. "In fact, the opposite is happening," Pacheco says, citing a $75 million hike in this year's science budget "above and beyond the money received from the sector funds." But Guimarães remains wary. "Constant vigilance is needed," he says.

–CASSIO LEITE VIEIRA

Cassio Leite Vieira is a science writer in Rio de Janeiro.



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