signed the letter—which will appear in an upcoming issue of *Parkinsonism & Related Disorders*—apparently agree: The letter congratulates the year 2000 award winners but states "that one prominent scientist ... should have been included in this Award."

"We want to set the record straight," says neurologist Donald Calne of the University of British Columbia in Vancouver. Calne and others emphasize that the open letter is "not intended to slight" any of this year's winners, and they acknowledge that the committee that picked the awardees could only honor three people. (A spokesperson for the foundation said that they receive complaints every few years but are barred from discussing the selection committees' deliberations until 50 years have passed.)

Hornykiewicz, a still-active professor emeritus at the Brain Research Institute of Vienna University Medical School, reported in 1960 that the neurotransmitter dopamine is depleted in the brains of people with Parkinson's disease. He analyzed postmortem brains of people with a variety of neurological disorders and discovered that only Parkinson's correlated with low dopamine levels. "More or less immediately" after that finding, Hornykiewicz says, he proposed that replenishing dopamine could benefit Parkinson's patients. He convinced a neurosurgeon colleague to administer a dopamine precursor to Parkinson's patients "and saw spectacular results," he says—results they reported in a 1961 article.

Giving Parkinson's patients dopamine precursors is "still the best medication we have," says one drafter of the open letter, neurologist Ali Rajput of the University of Saskatchewan in Saskatoon. What's more, says Hardy, Hornykiewicz's approach to Parkinson's inspired similar neurotransmitter-based therapies for depression, schizophrenia, epilepsy, and other disorders.

Many of the letter writers and signatories are concerned that the Nobel announcement seems to attribute Hornykiewicz's insights to Arvid Carlsson of Göteborg University in Sweden. Carlsson's work, starting in the late 1950s, set the stage. He discovered that dopamine is a neurotransmitter and found that animals with movement disorders improved when treated with dopamine. But in describing Carlsson's accomplishments, the Nobel Foundation also states: "His research has led to the realization that Parkinson's disease is caused by a lack of dopamine in certain parts of the brain and that an efficient remedy (L-dopa) for this disease could be developed."

While expressing the "utmost respect and admiration" for Carlsson, Calne and others contend that the statement is "not absolutely wrong, but easy to misunderstand." Although the open letter doesn't make it explicit, some signatories suggest that the 2000 Nobel Prize should have focused more narrowly on the impact of neurotransmission research on treatments for neurological disease, and Carlsson and Hornykiewicz should have shared the prize.

Hornykiewicz says he's "very grateful" for the support. "That is one of the things that really count in the life of a researcher—the recognition of colleagues," he says.

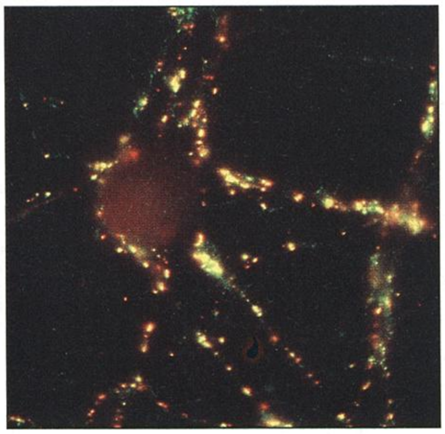
–LAURA HELMUTH

NEUROSCIENCE

Glia Tell Neurons to Build Synapses

After decades of neglect by researchers more interested in know-it-all neurons, brain cells classified as "glia" are getting some respect. Although glia account for 90% of the cells in the adult human brain, they've been written off as simple scaffolding that supports neurons, as sources of nutrition, or as a waste-disposal mechanism for sopping up extra ions and neurotransmitter molecules. But a new study on page 657 shows that glia play a more important role in neuron-to-neuron communication: They tell neurons to start talking to one another.

Before neurons can send and receive messages, they have to establish connections called synapses, points of near-contact where neurons swap chemical signals. How these synapses form is "a major question in neurobiology," says Robert Malenka, a neuroscientist at Stanford University who was not involved in the research. In the new work, Stanford's Ben Barres and his colleagues report that neurons can't build synapses very efficiently on their own. Young neurons contain all the raw materials necessary to do the job, but the neurons don't start construction until getting the go-ahead from nearby glial cells known as astrocytes.



Talk to me. Neurons grown near glia build more synapses (aglow).

The first indication that glia boost synaptic communication came in 1997, when

CREDITS: (LEFT TO RIGHT) E. ULLIAN; BIOSPHERE 2 CENTER

ScienceScope

Bioscheme The U.S. government is jumping into Biosphere 2, the giant greenhouse in the Arizona desert. On 18 January —2 days before leaving—Secretary of Energy Bill Richardson signed an agreement with Columbia University to examine the feasibility of making Biosphere 2 a Department of Energy (DOE) "national user facility." DOE will pitch in $700,000 over the next 2 years to help Columbia work up plans for a structure that failed its original test in the early 1990s as a self-sufficient home for Earth-bound econauts.

Scientists at Columbia, who took over the facility in 1996, have struggled to control gas levels and temperature in Biosphere's "biomes," including a minirainforest, ocean, and desert. The DOE agreement is evidence that Biosphere 2 "has proven itself" as a facility to study ecosystems' responses to climate change, says Columbia's Executive Vice Provost Michael Crow.

A DOE official says the department "is not prepared to start sending scientists to Biosphere 2 to do research." But the pact will allow it to explore whether the facility can complement ongoing studies of climate change, carbon sequestration, and atmospheric chemistry.

Headhunting A looming labor shortage has led some Canadian universities to spice up their hiring efforts. The province of Ontario is seeking $350 million for a recruiting drive, while Quebec is offering a 5-year income tax holiday to scholars who relocate to institutions within la belle province.

The Ontario Confederation of University Faculty Associations (OCUFA) recently estimated that 15,000 new professors—more than the number now employed—will be needed over the next decade by provincial universities to cope with retirements and a projected 40% jump in enrollment. Government budget cutbacks have already led to skyrocketing student-to-faculty ratios, says McMaster University political scientist and OCUFA president Henry Jacek. "The situation is bad and every day it gets worse."

But Jacek opposes tax holidays as a recruiting lure, saying they engender "animosity" within faculties and encourage professors to move away temporarily to be eligible for the break. He believes the long-term solution "is increased operating grants" from the government.

Barres and then-postdoc Frank Pfrieger reported in *Science* that the synapses of neurons grown with astrocytes in the cell culture were 10 times as active as those of neurons grown alone. They suspected that the glia somehow either turned up the volume on the neuron transmitting the signal or increased the sensitivity of the neuron receiving it. No one expected to find that glia controlled the number of synapses, says Barres—although, as neurobiologist Charles Stevens of the Salk Institute for Biological Studies in La Jolla, California, points out, the result makes a lot of sense. "Once you know it's true," Stevens says, "you believe it instantly."

Postdoc Erik Ullian and others in Barres's lab set out to pin down astrocytes' power over synapses by performing dozens of experiments on retinal ganglion cells. Unlike other types of neurons, these cells can be raised on a diet of growth factors and other nutrients and don't require glia for survival. In study after study, these neurons grown with glia nearby—even if the glia didn't touch the neurons—were seven times more responsive to various kinds of stimulation than were those unexposed to glia.

The reason for this improved communication became apparent when the researchers stained various proteins that neurons use to build synapses. Although both types of neurons contained plenty of these proteins, the glia-exposed neurons clustered the proteins into seven times as many synapses as did the isolated neurons. The team confirmed this count by tallying synapses under the microscope. Synapses looked just the same on both types of neurons—their sizes, shapes, and numbers of neurotransmitter-containing vacuoles didn't differ—but the synapses were seven times as numerous in the presence of glia.

"Every time we used a new technique, we saw the same sevenfold increase," says Barres. "Eventually, we had to believe it." And the glia aren't just telling neurons to build synapses, the researchers report. They're also helping neurons maintain the synapses they've established. If glia are removed, the study shows, neurons start to shed synapses within a few days.

These cell culture findings fit nicely into the picture of how neurons develop in vivo, says Ullian. Neurons send out dendrites and axons to the appropriate parts of the brain very early in development, but they don't form most of their synapses with other neurons until many days later—at the same time that astrocytes mature.

The team hasn't identified the signal astrocytes send that triggers synapse formation. Once they do, says Stevens, that signal might help decode how neurons register memory. Researchers are convinced that learning forges stronger connections between neurons. Two main theories of how this happens are now being debated, Stevens says: When neurons form a new memory, they might build more synapses with their companions, or they might strengthen existing synapses. Possibly, Stevens says, whatever glial message is at work in this study might also signal neurons to solidify memories.

–LAURA HELMUTH

GERMANY

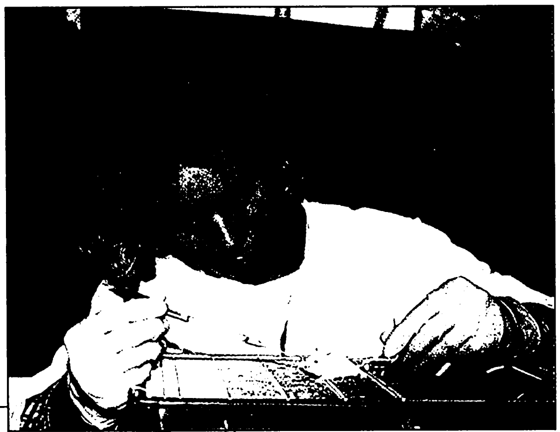
National Centers Urged To Team Up, Compete

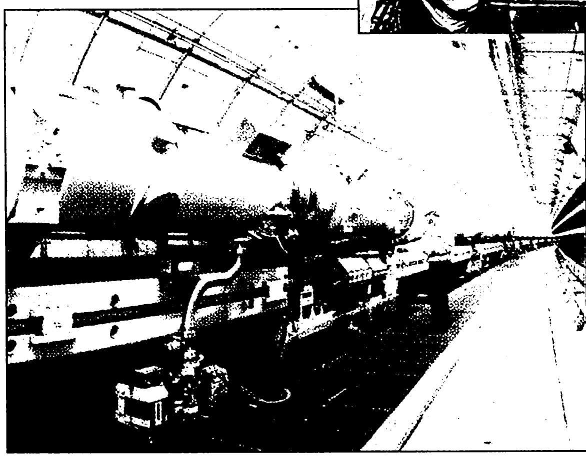
FRANKFURT—Germany's 16 national research centers—a sprawling, $2-billion-a-year array of labs ranging from the DESY synchrotron in Hamburg to the Max Delbrück Center for Molecular Medicine in Berlin—are too insular, according to a new report from the nation's top scientific evaluative body. It urges the government to foster cooperation—as well as healthy competition—among the centers and between them and outside labs by following a U.S.-style funding model that emphasizes research programs that cut across many institutions rather than block grants to individual facilities.

The latest evaluation, released Monday by the Science Council, adds the final piece of a comprehensive review of the entire German research system. Done by a 14-member panel of German and international experts, the new study finds that the research centers and their governing organization—the Helmholtz Association—suffer from inadequate networking and "too few incentives for competition." It also recommends that the centers broaden their research agendas and bolster ties with university researchers.

Helmholtz's 9300 scientists constitute Germany's biggest scientific workforce outside the university system. The nation's federal and state research ministries spend about $1.5 billion a year on the centers, with grants from other German and European research agencies and industry adding another $500 million. Helmholtz's president—Detlev Ganten, who heads the Max Delbrück Center—says the association has already been moving in the direction of more center-spanning research and is conducting "intensive negotiations" with federal and state research ministries over how to manage a revised funding system. He says that the centers already pool 5% of their budgets for competitive grants in six strategic areas.

Ganten warns that the suggested changes would require more predictable budgeting. (The centers have received relatively small increases in recent years and are still awaiting their budget for this year.) "For long-term research programs, we need longer term budgeting and more flexibility," he says. "We don't want politically 'guided' research. We want absolute academic freedom within the categories of research that are agreed upon."





Centers of attention. A new report says greater collaboration, from particle physics to biotechnology, is key to better research at Germany's 16 Helmholtz centers.

CREDITS: (TOP TO BOTTOM) GBF; DESY-HAMBURG

One significant reform already under way involves the GBF biotechnology center in Braunschweig. Its new director, mouse-mutant researcher Rudi Balling, is shifting the center's focus from 1980s-era biotech projects such as bacterial fermentation to studies on the genetic basis of infectious diseases. GBF is also planning to work more closely with other biomedical research centers, including Max Delbrück, Heidelberg's DKFZ cancer research center, and Munich's GSF environmental health research center. "National research institutes can't be islands or ivory towers," says Balling. "They have to become more competitive and more useful for other German researchers."