with binocular vision in certain brain areas.

In other experiments, Caltech's John D. Pettigrew and Takuji Kasamatsu demonstrated further that brain catecholamines (which include norepinephrine and other chemicals) are crucial to the learning stage of vision. The researchers depleted kittens' brains of catecholamines while blocking one eye of the test animals during a portion of the visual learning period, which ranges from 4 to 13 weeks after birth for cats. They found that when sight was restored to both eyes, the kittens responded normally to visual stimuli and were not imprinted. "The catecholamine depletion had rendered them incapable of learning from visual stimuli," the researchers concluded.

In their latest work, Pettigrew and Kasamatsu used two groups of cats that should have been incapable of visual learning: kittens with drug-induced catecholamine depletion, and adult cats that had already passed the critical period of visual learning. After covering one eye in each of the 10 cats, the scientists then *injected* norepinephrine continuously for one week into the visual cortex of the animals' brains.

They found that both groups of cats imprinted the abnormal visual learning experience and became stereoblind. The norepinephrine had, in effect, made their brains more "plastic" and caused the animals to lose their normal binocular nerve cells. "This experiment demonstrated conclusively that brain catecholamines are involved in the normal maturation of visual functioning," Kasamatsu says.

The "increased plasticity" apparently triggered by norepinephrine "long after their [adults] brains were supposed to have ceased this type of learning ... raises the intriguing possibility of using these chemicals to treat adult humans who are stereoblind," he suggests. "We may be able to cause their brains to revert to the period when they were capable of developing visually, and thus correct their sight deficiency." Humans are believed to undergo critical visual learning from birth to about three years of age.

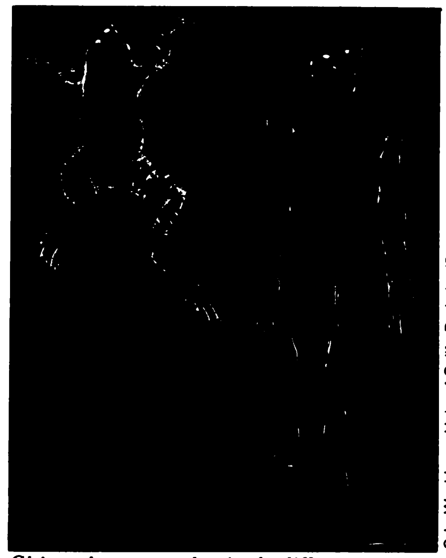
But before that stage is reached, Kasamatsu told SCIENCE NEWS, "we have to do more basic science in animals." Direct needle injection into the human brain, for instance, is not feasible. However, scientists conceivably could orally administer L-dopa, a percursor of norepinephrine that is capable — in combination with a metabolization inhibitor—of crossing the blood-brain barrier, Kasamatsu said.

Before that is tried, even in cats, the two researchers will pursue "more basic information." They have yet to determine if any other agents such as dopamine or serotonin might bring results similar to those produced by norepinephrine. In addition, "we do not yet know what kind of [brain] receptors are involved," Kasamatsu says. "That is the next step." □

The genes fit but the bodies don't

Scientists generally recognize the evolutionary link between chimpanzee and human largely on the basis of the pair's remarkably similar genetic structure. Biochemically, chimp and human appear more similar than most pairs of species within a genus.

A debate has been simmering for years, however, over the apparent, paradoxical *dissimilarity* of the physical structure of human and ape. Some morphologists have even assigned humans and chimps not just to seperate species but also to separate taxonomic families. Other biologists, however, have been reluctant to accept this theory that biochemical evolution and morphological evolution can and have proceeded at independent rates. They note that chimpanzee-human morphological differences have never been compared quantitatively to existing differences among other species.



S.L. Washburn, Univ. of Calif., Berkeley/Science

Chimp-human physical differences are greater than those between two suborders of frogs. Biochemically, however, man and ape are 30 times closer than the frogs.

Now, such a comparative morphological study has been reported in the April 14 SCIENCE by biochemists Lorraine M. Cherry and Allan C. Wilson of the University of California at Berkeley and Susan M. Case of the American Museum of Natural History in New York and now at Harvard University's Museum of Comparative Zoology.

University of Minnesota zoologist David J. Merrell suggested three years ago that the human-chimp physical difference might be no larger than that between two sibling species of frog. So, in their newly reported study, Cherry, Wilson and Case undertook that comparison. Their guide was a set of nine morphological traits — assessing the shapes of all major body parts — that have been used to assess shape changes in frogs.

The researchers compared the skeletons of 16 adult humans and 12 chimpanzees, and then compared various pairs of frog species. The measurements included relative comparisons of shank, head, forearm, toe and vertebral length; nostril-lip and eye-nostril distances; head width; and eye-tympanum distance.

They found that chimps and humans "differ significantly ... in the relative length of every trait." More significantly, they report that human and chimpanzee are more dissimilar, morphologically, than even the *most* dissimilar pairs of frogs that were compared.

"The results," they conclude, "are consistent with the proposal that the morphological difference between chimpanzees and humans is large in relation to the structural gene differences between the two species." This confirms, they add, "that morphological evolution and structural gene evolution can proceed at independent rates." □

Buried forest tells glacial tale

A forest of hundreds of erect spruce trees, some of them up to two feet in diameter, has been accidentally unearthed from more than 25 feet below the surface of a Michigan bog, where it had been buried for 10,000 years. Unearthed during a mining company's excavations about 15 miles from Marquette, the forest may lead to rewriting the history of the great glaciers that alternately advanced and retreated across what is now Lake Superior.

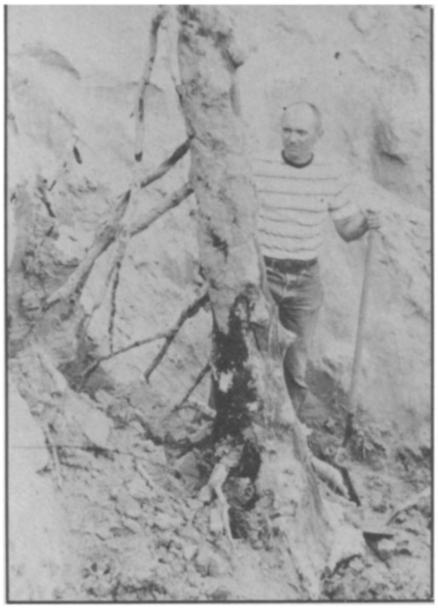
The trees were discovered by heavy-equipment operators of the Cleveland-Cliffs Iron Co., who were digging in an area now called the Gribben Basin to make a pit in which to deposit mine tailings. At depths of 25 to 30 feet they encountered a layer of "gravel," in which were the tops of the trees. Further excavation revealed the surviving portions of the trunks to be from 12 to 15 feet high, with growth rings indicating that they had lived as long as 150 years. The 800-foot-wide pit ended up being about 2,000 feet long, with trees over all but about the last 300 feet of length.

Soil and rock deposits in the pit suggest that the forest was drowned by the meltwater preceding a glacier that advanced upslope toward the trees and cut off their natural drainage. The "gravel," carried along with the water, apparently ground off the trees' upper portions.

The new find may require "substantial revision" of theories about glaciation in the upper Great Lakes region, says geologist John D. Hughes of Northern Michigan

University, who has been studying the site with NMU botanist W. James Merry. It has been thought that the last glacial advance in the region occurred some 11,850 years ago, an episode called the Valders stadial. Now, says Hughes, it appears that "as recently as 10,000 years ago, glacial ice filled almost all if not the entire Superior basin." The Valders stadial could have lasted longer than previously believed, but there may have been a whole additional retreat-advance episode. Growth-ring studies of one 130-year-old tree suggest that the climate was slowly cooling for the first hundred years, followed by more rapid cooling over the last 30, Hughes says. A possible inference is the onset of a new glacial stage.

The forest was actually discovered more than a year ago and kept secret while the NMU scientists studied it with the aid of a $16,000 grant from the mining company, whose cooperation throughout the project is highly praised by both researchers. The secrecy, says Hughes, served both the company, by preventing what could have been long-lasting protectionist delays, and the scientists, by preserving the site. As soon as the age of the forest was made public, in fact, says Hughes, "one of the stumps disappeared overnight."



Hughes/NMU

Ancient spruce: Drowned by a glacier?

The wood in the Gribben Basin trees was "remarkably well preserved," says Merry, with only the bark and a fraction of an inch of the outer layer showing carbonization. The only comparable finds, according to Hughes, have been a glacial forest unearthed about 50 years ago at Two Creeks, Wis., showing the 11,850-year age, and a 6,000-year-old one discovered in Cochrane, Ontario, about 300 miles northeast of the Gribben site. □

An attractive way to deliver drugs

Often drugs kill or injure healthy, innocent cells in addition to their diseased targets and this limits their use. In the past, efforts have been directed at devising drugs tailor-made for the diseased cells, but this is not always possible and is usually expensive and time consuming. Two medical school students had a different idea. Why not guide the drug to what it is to destroy instead of giving it free reign in the body where it can play havoc? Why not manufacture minuscule, magnetic drug packets so that a magnet outside the body could direct the drug to its desired destination? That way the dose and subsequent unwanted toxicity of the drug could be reduced.

Andrew E. Senyei and Kenneth J. Widder took a year off from medical school and, working with Steven D. Reich, David F. Ranney and Dante G. Scarpelli of Northwestern University Medical School, did just that.

Senyei, presenting the group's findings at the annual meeting of the Federation of American Societies for Experimental Biology in Atlantic City this week, reported that by using magnetic microspheres, they have been able to concentrate in sections of rats' tails toxic amounts of adriamycin —a potent anti-cancer drug—using levels of the drug 100 times lower than those required when the drug is administered by conventional means. The packaged drug was able to exert its toxic effects on the skin of rats' tails, while drug concentrations in other major organs of the body were 20 to 60 times lower than when the drug was given in free form, Senyei said.

The technique is potentially useful for a variety of localized diseases, such as surgically inaccessible cancers or bacterial abscesses and for a variety of water-soluble drugs.

The microspheres that have been used in medicine for the last five or six years were too big for what the researchers wanted. They needed tiny microspheres that could travel through the capillaries without blocking them. A drug has its best shot at the deranged cell when it is in a capillary. The microspheres they fashioned using ultrasonic techniques are one micron in diameter, or about one-fifth the size of a red blood cell. Small amounts of the drug and magnetite, a nonirritating particle capable of responding to a magnet, are embedded in a matrix of albumin —a protein normally found in the body— that composes the bulk of the microsphere. The spheres can be engineered so that they contain as much drug as desired.

A magnet is held over the diseased site and the medicine-laden microspheres are injected into an artery upstream. (Microspheres are injected at a site close to the target so that they won't pass by the spleen or liver, which gobbles up and destroys foreign particles.) The circulating microspheres are attracted to the magnet and stop at the target site. Once there, the spheres adhere to the sides of the capillaries or migrate into the spaces between cells of the capillary walls, break down and release the drug locally, Widder said at a press conference.

Once the microspheres are localized, the magnet is no longer needed, Senyei told SCIENCE NEWS. In the rat tail experiments, the magnetic field required was very low and could be removed after 30 minutes. Twenty-four hours later, the microspheres were still in the same place releasing the drug. The amount of iron in the microspheres is lower than the levels normally ingested each day.

Senyei and Widder began their work with a very unsophisticated "dime-store" magnet. They said with more sophisticated magnets currently available drugs could be localized with this method quite specifically at less superficial sites in the body. □

Habits, fluoride aid heart?

Death rate in the United States has declined dramatically in the last five years. The drop is due almost entirely to a reduction in heart disease, says Peter Bourne, a special assistant to President Carter. Bourne credits focus on diet, exercise and early detection of hypertension.

Fluoridation of water supplies may be another factor, Donald R. Taves suggests in the March 23 NATURE. Taves, of the University of Rochester, compares heart disease rates between 1950 and 1970 in 20 fluoridated and 15 nonfluoridated cities. He finds a 2.5 percent greater decrease in all heart disease in fluoridated cities. Fluoride might inhibit calcification within blood vessels, and thus reduce heart disease caused by artery blockage. Taves says the fluoride-heart disease link is at this point only an intriguing possibility, but he proposes that it would be worthwhile to obtain additional epidemiological and laboratory data. □

Chinese accelerator physics

Particle physics has mostly been done in Western countries. East of Russia, Japan is the only country that has gone in for the building of accelerators in a significant way. Now the world's most populous nation has decided to join the group. The People's Republic of China has announced plans to build a proton accelerator with an energy between 30 billion and 50 billion electron-volts. China has established a cooperative relation with the West European laboratory, CERN, at Geneva. Last week a delegation from the Academia Sinica's Institute of High Energy Physics, including Ho Lung, Fang Shou-Hsien, Tsao Tsan and Han Tsien arrived at CERN to study problems of large accelerator construction. □