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.

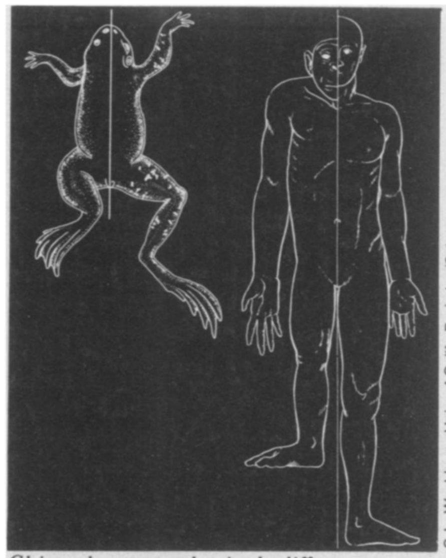
But before that stage is reached, Kasamatsu told Science News, "we have to do more basic science in animals." Direct needle injection into the human brain, for instance, is not feasible. However, scientists conceivably could orally administer L-dopa, a percursor of norepinephrine that is capable — in 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.



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