Ancient ape suggests human, chimp lineage

Hungarian fossils of an ancient ape provide comparative data supporting the view that chimpanzees and humans are more closely related to each other than either one is to gorillas or any other living primate, contends a report in the Sept. 25 SCIENCE.

A majority of studies examining DNA and its molecular products in living primates conclude that humans and chimps form a distinct evolutionary lineage with a common ancestor that lived between 6 and 8 million years ago, although a substantial minority of molecular studies dispute that conclusion. Moreover, studies of modern and fossil primate skeletons suggest that the African apes lie within an evolutionary group separate from hominids, the evolutionary family that includes humans.

The Hungarian fossils provide an unusually good opportunity to gauge whether different groups of hominids and living apes share anatomical features of ancient or more recent origin, asserts anthropologist David R. Begun of the University of Toronto.

Begun and Lazlo Kordos of the Hungarian Geological Institute in Budapest reconstructed fossils uncovered about 20 years ago at a site known as Rudabanya. The specimens include large portions of two skulls, two pieces of upper jaw, four partial lower jaws, isolated teeth, and several fragments of bone from the lower body.

Begun assigns these specimens to the genus *Dryopithecus,* a fossil ape that lived in western and southern Europe between 9 million and 11 million years ago.

Dryopithecus and modern gorillas — but not chimps or fossils belonging to the first hominid genus, *Australopithecus* — share a number of features that apparently arose early in their evolutionary history, Begun says. These traits congregate in the lower part of the face and the teeth, especially the teeth at the front of the mouth, he asserts. *Australopithecus* and chimps share different facial and dental features that evolved from the *Dryopithecus*-gorilla pattern, Begun says.

Most attributes shared by gorillas and *Dryopithecus* also show up on specimens of *Ouranopithecus,* another ancient ape (SN: 6/23/90, p.390), he adds.

The evolutionary separation of *Australopithecus* and chimps from gorillas implies that anatomical traits occurring exclusively in chimps and gorillas, such as knuckle-walking, evolved independently, Begun says. Or, knuckle-walking may be the evolutionary endowment of an ancestor of apes and hominids, which disappeared in the latter group, he theorizes.

"Begun's conclusion doesn't surprise me," remarks anthropologist Steve Ward of Northeastern Ohio University College of Medicine in Rootstown. But the results remain tentative, he adds. "The jury is still out" regarding much of the facial anatomy of *Dryopithecus,* Ward cautions.

Fossil evidence currently cannot pin down the proper anatomical traits for comparison in a study such as Begun's, contends anthropologist Lawrence Martin of the State University of New York at Stony Brook.

Begun disagrees. *Dryopithecus* specimens from Rudabanya, which continue to emerge in ongoing excavations, offer insight into key areas of anatomical variation among apes and hominids, he says.

— B. Bower

First clear images of solar flux tubes

Using a new technique to examine the sun, a Swiss astronomer has obtained high-resolution images that reveal a solar surface covered with small-scale, magnetically active regions related to the more extensive sunspots.

Researchers have long theorized about the form and evolution of these features, called magnetic flux tubes, but have been unable to directly observe them in detail until now, says Christopher U. Keller of the Institute for Astronomy in Zurich. In the Sept. 24 NATURE, Keller announces the first simultaneous observations of the visible-light and magnetic-field signatures of flux tubes.

He obtained the images using a modification of an observing method known as speckle interferometry. The new technique should reveal details of the energy dynamics of the sun, which affect such things as radio communications and electrical power transmission on Earth, explains Carol Jo Crannell, a solar physicist at NASA's Goddard Space Flight Center in Greenbelt, Md.

Flux tubes represent concentrated regions of intense magnetic activity similar to that observed in sunspots (SN: 6/20/92, p.404). However, unlike the massive sunspots, whose diameters often span several thousands of kilometers, flux tubes reach less than a few hundred kilometers across. While these areas may account for more than 90 percent of the magnetic flux outside of sunspots, their small size has prevented researchers from directly observing them in detail, Keller says.

Turbulence in Earth's atmosphere blurs images of the sun, limiting the resolution of observations from ground-based telescopes. Traditionally, astronomers have eliminated some of this blurring in visible-light images by using speckle interferometry, which creates an image composed of many short exposures. By modifying this technique to include magnetic flux data, Keller observed individual flux tubes with diameters as small as 200 kilometers. He found that such small tubes correspond to previously observed bright spots on the solar surface, whereas many tubes larger than 300 kilometers in diameter appear darker than their surroundings. Keller notes that flux tubes seem to evolve rapidly, changing noticeably within 15 minutes.

He made his observations using the 50-centimeter Swedish Vacuum Solar Telescope at La Palma, in the Canary Islands.

Such findings may help astronomers determine the exact relationship between flux tubes and sunspots, says Douglas M. Rabin, an astronomer with the National Solar Observatory in Tucson, Ariz. Rabin says the new study represents "a promising line of investigation," which may finally verify theories that have been debated for decades.

— K. Hoppe

Fingering the right genes in development

Proteins called transcription factors serve as the sergeants of the genetic army. They tell genes when to turn on, when to turn off, and when to stand silently at attention.

Since the early days of molecular genetics, researchers have predicted that each transcription factor controls a separate platoon of related genes. If not, the scientists reasoned, the resulting army would have as many sergeants as soldiers — making for a very unwieldy state of affairs. However, no one could explain how transcription factors — which must match up to chemical similarities in their subordinate genes in order to function — could recognize and direct the activities of more than one gene.

Several recent studies now suggest that at least some types of transcription factors come in a variety of slightly different forms, with affinities for different genes. The newest report, in the Sept. 25 SCIENCE, indicates that a given type of transcription factor can vary during the development of an organism, turning some genes on and others off in successive stages of the organism's life.

A group of researchers led by Fotis C. Kafatos of Harvard University studied the gene that carries the blueprint for making the outermost layer, or shell, of a fruit fly egg. Kafatos — who also holds a position at the University of Crete in Greece — and his colleagues found that female embryos, pupae, and adult flies each possess