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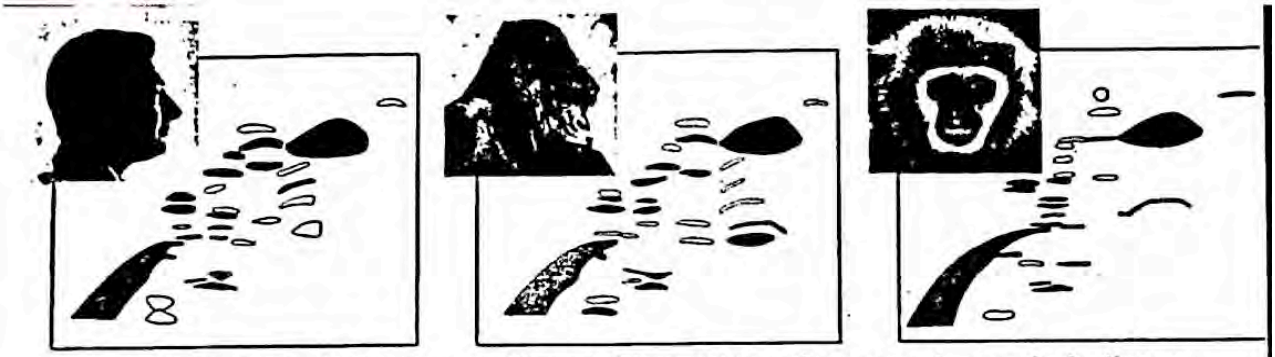

Blood protein samples from man, gorilla, and gibbon: Evidence that two are closer on the family tree

Blood Brothers

Ten minutes' thoughtful observation of the primates on both sides of the cages at the zoo will reveal the essential similarities among man, chimpanzees, and gorillas. But the closeness of this relationship, which was always subject to some debate, is now being dramatically demonstrated by new and precise methods of inquiry that go beyond visual and fossil evidence. The new evidence not only cements the kinship beyond all doubt but also suggests that man and ape are much closer together on the family tree than originally believed. As chemist Emile Zuckerkandl of Caltech says somewhat wryly, in certain respects "it appears that the gorilla is just an abnormal human, or man an abnormal gorilla."

The new discipline that is producing this evidence is called molecular anthropology—the investigation of man's evolutionary relationships through analysis of the proteins that all animals manufacture within their cells. Because of the intricate composition and distinctive pattern of protein molecules (for example, each albumin molecule contains more than 20,000 atoms) there is no possibility that two completely unrelated animals could possess similar proteins solely by chance. The supposition is, therefore, that similarities in living creatures indicate kinship; the greater the similarity, the closer the kinship.

Techniques: One prime example of the work being done on proteins is contained in a volume just published, entitled "Classification and Human Evolution" *(371 pages. Aldine Publishing Co. $7.50).* Among its contributors is Dr. Morris Goodman, an immunologist at Wayne State University Medical School in Detroit. Goodman began by obtaining blood samples from chimps, gorillas, orangutans, gibbons, man, and other members of the superfamily Hominoidea. These samples were found to contain such proteins as albumin, gamma globulin, and hemoglobin.

To test them, Goodman used a technique called two-dimensional starch-gel electrophoresis, which makes use of the fact that different proteins have different sizes and varying electrical charges. First, a small bit of a protein-bearing plasma is dropped on an ordinary piece of filter paper, which is then stretched between electrodes. After sixteen hours, the different proteins will have migrated toward one or the other pole, depending on their charges. Then the filter paper is placed at one edge of a dish of jellied starch. This time, the proteins migrate not only according to their charge, but also their size: the smaller ones are able to move through the jelly faster than the larger ones (migrating from bottom to top in the diagrams above). The result is a distinct pattern of blood proteins nicely spaced and easily compared among species.

Goodman and other researchers have done countless numbers of these tests, and the results show that so far as the blood proteins go, the apes that evolved in Africa—chimp and gorilla—are much more closely related to man than are the Asian apes—orang and gibbon.

Identical Twins: Caltech's Zuckerkandl notes in the same volume that the amino acids in gorilla and human hemoglobin have now been charted; both contain 146 building blocks, and there is only one point of difference in the two sequences. Throughout all these tests, the African apes and man appear so similar that they could virtually be called blood brothers.

No anthropologist, of course, is ready to classify chimp, gorilla, and man on equal levels in the scheme of nature. Man seems to be unique. But physical anthropologists are uniformly impressed with the molecular studies, and happy because it reinforces their own conclusions reached through imaginative deductions from woefully inadequate fossil evidence. As Sherwood Washburn, University of California anthropologist and editor of the volume, said simply last week: "That settles that. The evidence is overwhelming."

The striking closeness between the African apes and man has also raised another question. Just how long ago did the two species branch off from a common ancestor and go their separate ways? The traditional view has been that the divergence took place in Africa not long after the first apes evolved some 30 million years ago.

The new insight based on the closeness of blood lines suggests that man and chimpanzee took different paths much more recently. Some estimates now put the time of divergence only 5 million years ago, with one branch of the family tree developing slowly along toward chimp, and the other evolving rapidly into Homo sapiens.

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