Relative anthropology:

Dr. Morris Goodman puts humans in their place – beside the chimpanzees

By Leslie Mertz

Morris Goodman has a smile that is both charming and a bit mischievous, a light shower of wispy, white hair that flutters with every move of his head, and the kind of bright, tinkling laugh that makes people grin even when they don't know what the joke is. He is also an internationally known and respected scientist who has drawn worldwide attention for putting humans in their place on the tree of life: grouped so near the chimpanzees that the two species are more closely related to each other than to any other animals.

Goodman, a distinguished professor in the School of Medicine's Department of Anatomy and Cell Biology and the Center for Molecular Medicine and Genetics, received a pair of important awards for his work last year. On April 12, the American Association of Physical Anthropologists presented Goodman the 2002 Charles R. Darwin Award for Lifetime Achievement. This annual award recognizes one senior scientist who has made "unique and outstanding contributions to the science and profession of physical anthropology over a lifetime of distinguished achievement."

Then, in late April, Goodman was elected to the National Academy of Sciences, one of the highest honors that can be accorded to an American scientist or engineer. He is the first person from Wayne State University ever elected to this prestigious organization.

Goodman also is a member of the American Academy of Arts and Sciences, and has come to be known internationally as a pioneer in the field of molecular phylogenetics.

"It appears that about 6 million years ago, human and chimp last shared a common ancestor, where it would be in the range of 7 to 7 1/2 million years ago that chimp and human shared their common ancestor with the gorilla," Goodman says, noting that those figures come from a combination of evidence, including comparisons of DNA for each species and an examination of the fossil record.

"After that, you have a jump to about 14 million years ago before we shared the last common ancestor with the orangutan, about 18 million years before we shared it with the gibbon and about 25 million years ago when we had the last common ancestor with the Old World monkeys."

In other words, this primate limb of the evolutionary tree of life shows Old World monkeys, such as baboons, mandrills and rhesus monkeys, branching off earliest, and humans and chimps branching off last.

Goodman's curiosity about the evolutionary history of humans began in 1958, just before he joined the WSU medical school as a research associate professor. He struck up a friendship with fellow immunologist Morris Wilson, who was chief pathologist at Veterans Hospital. They started sharing their thoughts on evolution and began a small research project to see if certain human proteins evolved more rapidly than others. Soon, Goodman's interest centered on primate taxonomy, or their classification among living things. "As I read the literature and learned more about the state of primate taxonomy and our knowledge of the evolutionary history of primates, I could see there were many uncertainties as to who was

related to whom, as well as where the human species belonged."

At first, his background as an immunologist was well-suited to the techniques for working out the evolutionary, or phylogenetic, relationships of organisms. As science advanced and techniques changed, Goodman quickly adapted, making the most-telling discoveries using DNA sequence data. For this work, he and his research team determined the DNA sequences — the details of the genetic blueprint — for different primates.

The team's comparisons revealed that chimps and humans were 99.5 percent identical among the "coding" DNA, which is the DNA that has a function and carries instructions for making proteins. Among non-coding DNA, the correspondence was about 98.4 percent.

"It was not entirely unexpected — to me, anyway — to find that chimp and human are most closely related, rather than chimp and gorilla," Goodman says.

A handful of earlier research papers hinted at the relationship, but it wasn't clear cut until Goodman's research group obtained extensive DNA sequence data and announced their findings in a highly publicized 1987 paper in the journal *Science*.

The evidence has continued to mount. Most recently, a Japanese group refined the correspondence between human and chimp DNA to be about 98.8 percent. If the comparison is limited to only the "coding" DNA, the correspondence jumps to 99.3 percent.

Using the data he and others have collected, Goodman again stepped into the limelight in 1998 as a member of a large scientific group suggesting that humans and chimps should be combined under the same genus — the most intimate taxonomic classification species can share.

He is now focusing his efforts on investigating the convoluted evolutionary history of the DNA that uniquely shapes humans, as well as other big-brained primates.

"Ultimately, we hope to get a correspondence between the genetic changes that natural selection favored in our ancestry and the phenotypic (observable) features that these changes helped mold," he says. "We think that getting this evolutionary perspective is highly important in assessing what's of functional significance in the DNA molecules and what is not, and, therefore, it can help put your finger on where you can expect a mutation to be harmful."

He is collaborating on this study with Lawrence Grossman of WSU's Center for Molecular Medicine and Genetics; Gregory Kapatos, WSU professor of psychiatry; Robert Johnson, WSU professor of biochemistry; and Mark Weiss, program director of physical anthropology at the National Science Foundation and an adjunct WSU anthropology professor.

The research group is also questioning how genetic changes affect the brain's cognitive capacities in big-brained primates. Goodman has become a proponent of the increasingly popular idea that the DNA in humans and other long-lived, big-brained primates is evolving much slower than it has in the past.

"I believe that the nature of our genetic evolution has brought about the situation where it's our culture, and therefore environmental influences, that are really much more important in shaping our behavior now, rather than biological evolution," he said.

Outside of science, Goodman enjoys simple pleasures: taking walks or seeing an occasional film with his wife, visiting his two daughters and grandson on the West Coast and reading novels. He had a heart operation in July, but his only lingering complaint is that his cardiac rehabilitation classes are eating up time he would rather spend pondering life's mysteries.

"I find it satisfying to collaborate with scientists who are younger and more active than I am," he says, "and I guess they find my participation useful. Myself, I like to think about the results of different experiments and see connections and suggest ideas."

It's precisely what he has been doing since the beginning. "I see connections and I just follow up on them."

This article first appeared in the Spring 2002 Wayne State Magazine, a publication for members of the Wayne State University Alumni Association.

Biography

Dr. Morris Goodman earned his bachelor's, master's and doctoral degrees in zoology from the University of Wisconsin. He joined Wayne State in 1958, and is a distinguished professor in the School of Medicine's Department of Anatomy and Cell Biology and the Center for Molecular Medicine and Genetics.