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In search of our swimming ancestors

Humans are the only primates able to hold their breaths. Our skin and body fat resembles that of animals that swim. Why? A theory that humans evolved from a swimming ancestor is arousing new interest among orthodox scientists gathering at a world archaeology conference in South Africa this week.

RUBEN MOWSZOWSKI reports

IF THE proponents of a revolutionary theory of human origins are correct, our ancestors abandoned the trees not for the savannah, but for the water.

The 3.5 million year old Australopithecine fossil found recently at Sterkfontein and billed as our ancestor is to be the subject of an opening talk at the World Congress of Archaeology in Cape Town this week. Inevitably the question will be asked: in what kind of environment did this 1.2 metre tall ancestor of ours live?

A mural in the Sterkfontein tea-room makes it quite clear. A group of hominids holed up in a cave is beating off another group apparently intent on moving in, if not actually devouring them. The cave is located in the middle of savannah grassland.

But evidence which has been accumulating since the discovery of the Australopithecus fossil nicknamed Lucy in the 1970's indicates that the environment in which the Australopithecines and the earlier Ardithecus ramidus lived and died was not savannah at all . It was tropical forest. This means that the story of how our ancestors evolved the characteristics that distinguish us from the apes will have to change.

The version that most of us know is called the savannah hypothesis and it goes like this: a change in climate shrunk the forests and expanded the savannah, forcing a branch of tree-living apes into the open, so they stood up. The recently discovered 4.5 million year old, and already partly bipedal, Ardithecus ramidus lived, not in the dry savannah, but in a forest environment. This means that the human origins story - the narrative that links the fossil evidence - has to be rewritten. In other words, we are in for a new paradigm.

Paradigms are like cities within which, as long as everyone believes in the framework, social order prevails. It's when belief begins to wane that the voices of the heretics outside start to be heard. Every now and then the walls are breached and while the more determined defenders of the faith battle it out, the rest quietly change sides and the city is rebuilt.

At the recent Dual 98 Congress on Palaeontology and Human Biology one of the delegates was Elaine Morgan. Morgan, a non-scientist, is the author of *The Descent of Women*, the best-seller that put the female gender back into the evolutionary story in the 70s. For the past 27 years she has been promoting an alternative hypothesis which was put forward by scientist Alistair Hardy in 1960.

Hardy noticed that humans share certain physiological attributes, which are not present in other land mammals, with aquatic mammals. It occurred to him that bipedalism might have been an adaptation to an environment that had become not dry, but wet.

Hardy was advised by his academic mentors not to pursue the subject for fear of damaging his career. In the savannah hypothesis palaeontology already had a 'good-enough' story to explain bipedalism and it happens to be one that we are very comfortable with. The image of our ancestors coming down from trees, emerging stooped from the primeval damp forest and striding out into the open grasslands to become the erect humans that we are today is a vision of humankind triumphant. It finds biblical expression in the story of our expulsion from Eden.

Who wants ancestors who stood up just so that they could breathe?

Hardy let the theory lie for the sake of his career. Morgan took it up and it became her mission. She gave it the provocative name 'Aquatic Ape Theory' and it might have been ignored for longer if the savannah hypothesis had not begun to fail.

In 1995, the eminent South African palaeontologist Phillip Tobias delivered a lecture to the University of London. Foot bones from Sterkfontein, he said, showed that there was an "arboreal element" in the life of the hominids whose fossils were found there. His conclusion: the relatively scrubby trees one would find in savannah would not have been adequate for the size of Australopithecines. New findings of fossil animals, plants and pollen and recent evidence by way of the 4.5 million year old *Ardipithecus ramidus* fossil, he said, indicated that hominids were upright before the forest shrunk, before they got big brained. End of hypothesis.

Not entirely. There are all sorts of theories still being offered that seek to explain our physiological peculiarities as adaptations to the savannah environment. Standing on two legs, for instance, is said to reduce exposure to the sun at midday (though critics say any sensible hominid would be lying under a tree at that time) and to keep our overheated brain away from the hot ground. An older theory is that our ancestors needed to free their arms in order to reach food and carry it home, after which they progressed to throwing stones at predatory animals or, as the Sterkfontein mural shows, at each other. Another holds that we were forced into the savannah by biologically better-equipped monkeys eating the fruit off the trees before it was ripe enough for us to digest.

None of these is particularly convincing. It seems like palaeontology has

reached one of those difficult moments which science must every now and then face, when cherished beliefs that underpin established frameworks collapse and allow the heretics to pick their way across the fallen bodies of the defenders of the faith and enter the citadel.

Tobias has recognised that moment.

"All the former savannah supporters (including myself) must swallow our earlier words in the light of the new results from the early hominid deposits.....And the savannah hypothesis is washed out.... if savannah is eliminated as a primary cause or selective advantage, of bipedalism, then we are back to square one and have to try to find consensus on some other primary cause," he said in his London lecture.

Significant words that lead us to Hardy and Morgan's world of flooded forests where apes who live both on the ground and in the trees have to adapt to a wet environment or die. Which is why Morgan, who has been out in the cold for 30 years is now, at Tobias's invitation, taking her place on the rostrum in front of the brightest brains in evolutionary science.

Morgan says that the adaptations that distinguish us from the our closest primate cousins were forced on our ancestors by the presence of water. That, for a couple of million years, which is not very long as these things are measured, our ancestors lived like sea-otters in a semi-aquatic environment.

The aquatic hypotheses suggests that nakedness, bipedalism and many other distinctly human adaptations evolved long before our ancestors moved onto the savannah. It is founded on the observation that a number of the features that characterise our physiology, "though rare or unique among land mammals, are common in aquatic ones." Morgan thinks that the aquatic interlude lasted about two million years. Marc Verhaegan, a biologist who supports the theory, is more extreme. He thinks that humans may have remained semi-aquatic until as recently as 200 000 years ago.

It would be a mistake to assume that the aquatic hypothesis is not good science. In Tobias's words: "...we owe a debt of gratitude to Morgan and Verhaegan for the comprehensive and rigorous way in which they have gathered together and sifted an enormous body of evidence based not only on Marc Verhaegan's own researches, but on those of a number of human biologists....." The suggestion that between 2.5 and 4.4 million years ago a small-brained, biped Australopithecine lived in a woodland or forest niche and not a savannah terrain he said, fitted in with the physiological and biochemical evidence, gathered by the two of them. He pointed out however that his rejection of the savannah hypothesis did not mean that he was "automatically " espousing the Aquatic Ape hypothesis.

A feature of the aquatic ape hypothesis is that it deals with a large number of physiological and structural features, the best-known of which is bipedalism.

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Morgan says perpendicular gait has many disadvantages. It is slower, unstable, needs to be learned and exposes vulnerable organs to attack. "Only some powerful pressure could have induced our ancestors to adopt a way of walking for which they were initially so ill suited " she says. We are still suffering the consequences of this adaptation in the form of backaches, varicose veins, haemorrhoids, hernias and difficult childbirths.

Morgan points out that all the other primates that stand up on occasion have a habitat that is wet rather than dry. The proboscis monkey, which stands very readily, lives in mangrove swamps. The habitat of the bonobo, which, like dolphins, beavers, sea otters and humans, mates face to face, includes a seasonally flooded forest. She says that "the only animal that ever evolved a pelvis like ours, suitable for bipedalism, was the long-extinct *Oreopithecus* - known as the swamp ape."

Then there is our nakedness. The only other mammals which are naked are swimmers like the whale and dolphin, wallowers like the hippopotamus and pig, and animals like the elephant and rhinoceros, which, she says, "bear traces of a watery past". Human hair direction (we are naked by virtue of thinner hair, rather than fewer, hair follicles) occurs in whorls corresponding to the movement of water against a swimming body. In all the other apes it points downward.

Humans are the fattest primate. We have 10 times as many fat cells in our body as any other animal of similar size. Unlike other primates, our children are born fat with a large proportion of white fat which is good for insulation and buoyancy but not for energy. Morgan thinks it is an adaptation that protected babies that had fallen out of trees. As with most aquatic animals, but unlike other primates, our fat is present all year and is stored, not deep within the body, but under the skin where it serves as an insulative layer. The only other mammals that store fat in this way are aquatic, like dolphins, seals and hippos.

Humans are the only primates which have the ability to hold their breath voluntarily. The only other mammals that are able to do this are aquatic diving animals like seals and dolphins. The descent of the larynx that occurs in the human infant at about three months is an adaptation that allows air to be gulped in large quantities through the mouth. The only other mammals that have a descended larynx are the sealion and the dugong. "Without voluntary breath control, it is very unlikely that we could have learned to speak," says Morgan.

We have larger brains than any other ape. The building of brain tissue is dependent on availability of Omega-3 fatty acids which are abundant both in the marine food chain and in fresh-water fish. The mammal with the largest proportionate brain size after humans is, of course, the dolphin - a terrestrial animal that returned to the sea.

Morgan's scenario for these evolutionary adaptations is based on known geological events. About six million years the low-lying section of land near the Red Sea known as the Afar triangle (where Lucy was found) was flooded and became the Sea of Afar. Some hominids, she says, would have been isolated in islands, others would have found themselves having to survive in flooded forests, among marshes and swamps..

Rapid speciation, such as occurred in the change from ape into homid, Morgan says, "is almost invariably a sign that one population from a species has become isolated by a geographical barrier such as a stretch of water. Survivors

of such massive flooding would have been forced into adapting."

When the sea became landlocked and evaporated their descendants would have followed the waterways of the Great Rift Valley upstream, towards the south, and emerged, as at Sterkfontein, erect, with no body hair, the ability to hold their breath and with a descended larynx, ready to speak. They were tied by their modified physiology to remain in places where water was plentiful; and, she imagines, they got a good proportion of their food from it for quite a long time. When did they snap the umbilical cord keeping them near the water? "Presumably when they got good at making containers."

Tobias's invitation to Morgan to speak at a congress of professionals has brought her inside the walls of the citadel and scientific evolutionary theory, in so far as human origins are concerned, might never be the same. -- *The Mail & Guardian, January 14, 1999.*

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