A Physiological Theory of Evolution

By Courtenay Young

Courtenay Young is currently the President of the European Association for Body-Psychotherapy (EABP) and works as a counsellor & psychotherapist in the UK National Health Service in Edinburgh. This article is an expanded extract from a book entitled "Under The Skin" that he is in the process of writing about psychophysiology for body-psychotherapists and body therapists.

I would like to discuss a slightly different and somewhat controversial theory of evolution, based on a number of significant aspects of our human physiology, which also helps to explain some of them. It may also be of considerable interest to Body-Psychotherapists. It is quite an important story, as well as being quite a long one, so please persevere with me through it.

Given the essential genetic closeness (between about 4% and 1.3% DNA differences, depending on what bit of DNA you study) between us, and our nearest relatives the large primate chimpanzees, there must have been a relatively recent point in our joint evolution when we separated from them.

This, most people now theorise, occurred not later than about 4-5 million years ago, which was around the start of the Pleistocene period and possibly a lot earlier than that, maybe 6-7 million years BP[i]. However some very significant evens were happening much earlier than this, during the Pliocene era that existed for several (10-12) million years prior to this. The Pliocene was, by all accounts, a long period of very significant drought and surprisingly during this period there are very few – almost no – fossils. There is, in fact, a huge gap in the hominid fossil record, significant by its absence, from about 19 million to 4.5 million BP. The Pliocene period ended about 5-6 million years ago, and then the turbulent and more recent Pleistocene period began, and the fossil record restarted.

Before the Pliocene, the earlier Miocene rain forests had started to retreat with the on-coming periods of drought and the primates (including the proto-hominids) were faced with a number of existential dilemmas; either one stays safe in the trees but retreats with the forests, or one can change direction with the radically changing environment, but into what unknown areas?

Some anthropologists postulate that we relatively suddenly started running erect on the plains, somehow managing to chase and kill sufficient animals to survive, miraculously developing spears and tools to kill them with, and also mysteriously managing to avoid being eaten by the large number of very successful predators that were well established there on the plains already. It is a fanciful theory that neither stands up logically, nor takes into account the 'cost' of bipedalism.[ii] Neither is it one for which there is any real evidence, just a lot of theories. With the discover of "Lucy"

The process of a species being environmentally shaped is known as epigenesis and this process results in *innate* traits. What is often forgotten is that the environment changes significantly over long time periods, and thus such developed traits may become less or more advantageous. With the onset of such a long period of drought, we, as a species, were almost certainly forced, for a significant period, to become much more of a socially-grouped animal than ever before, and also forced in to the process of finding a safer environment. Being on the menu for dinner for a variety of forest-based single predators like sabre-tooth tigers, leopards and giant carnivorous bears, or being

[i] BP = Before Present.

[ii] Morgan (1994): p. 24-35: See Endnote: 11.

available as a handy snack for plains-based prides of lions, more sabre-tooth tigers, and especially dangerous packs of very large toothed, flesh-shearing hyenas has some significant evolutionary implications.

> An arms race develops between hunter and hunted which can lead to changes in the prey animal, such as increased body size, higher sprinting speeds, and improved sensory faculties. It can also produce various behavioural adaptations, including herding, heightened vigilance, and predator mobbing. So, if predation was a substantial evolutionary pressure facing early humans, how did it shape us? [1]

Richard Coss,[2] an evolutionary psychologist in the University of California, Davis, has demonstrated that there are residues of predation intelligence still existing in small urban children, who have never been faced with a predator-situation. Other traits exist as well like the 'better' ability of females to climb, one possible result of sexual dimorphism (size differences) and a possible indication of sexual dinichism (where males and females use slightly divergent evolutionary niches). Other examples of predation-avoidance are that, by foraging in groups, chimpanzees and baboons improve their chances of detecting predators and escaping in the confusion, and it is not the size of the group that is significant, but its proximity and its closeness. Behaviour inside the group is also significantly affected, and some of the inter-group alarm-signals are very semantic and may be a form of proto-language. Primates in such situations use sticks and stones as weapons in counter-attacks towards predators.

All in all, it seems certain that, at some significant point(s) in our evolution, we were hunted by predators, and that this might have definitely stimulated our evolutionary processes. In addition, as in chimpanzees, female hominids might have sought high trees in which to sleep, males might have relied more on ground safety and group skills. However, at some point, we were forced to find somewhere with a better food supply and that was possibly also safer: an environment that was different from the jungle trees that were in retreat and that were still inhabited by our cousins; and we probably needed to find it relatively fast. The Miocene forests were continuing inexorably to retreat under a massive millions-of-years long-term Pliocene climate change and so our original habitat was changing rapidly from tropical forests to savannah grasslands. We were being squeezed out environmentally and we needed to find a way out.

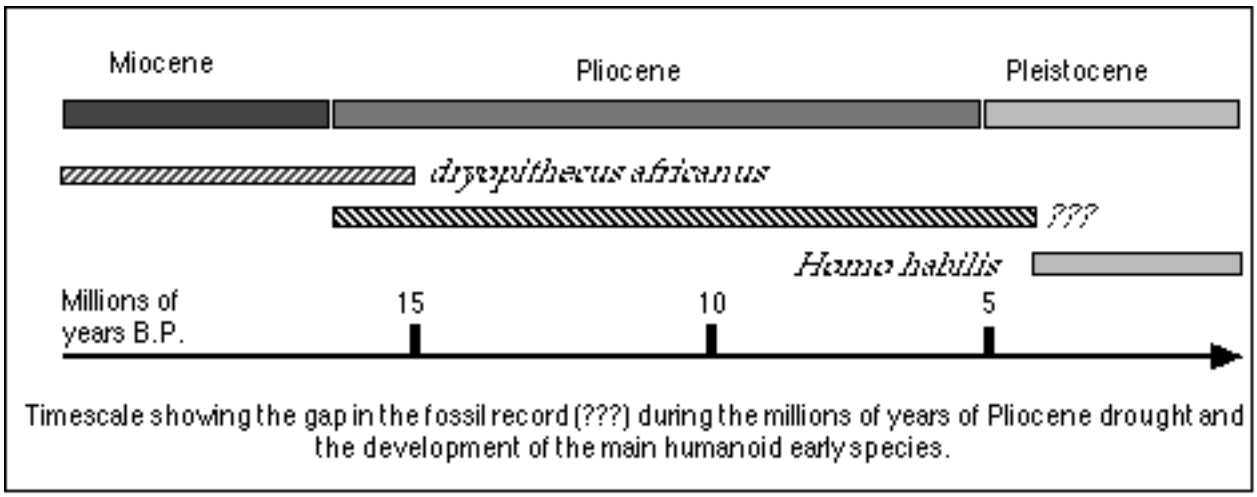

Diagram 1

Our Miocene proconsul ancestors (*dryopithecus africanus*) were small, slow-moving arboreal animals with prominent ape-like canine teeth, very slender ankles, and ape-like big toes and therefore not really bipedal walkers. They had brains, but relatively small

ones (not exceeding 180 cc). They did not have tails. Their direct descendents at the end of the Pliocene era *(palaeanthropus robustus)* had slightly larger brains (about 200 cc which is 2/3 the size of modern chimpanzees), but their most distinguishing features were that they were able to walk-about more readily and fossil remains of these apes are found from Africa through to China. They were probably fruit-gatherers and scavengers, certainly not primitive hunters and plains runners. These later apes were once thought to be our ancestors, but they are too different physiologically, as DNA studies confirm.

The next significant change in the ancestral fossil record is a fairly hefty jump of about 10 million years to various types of early Pleistocene ape-like hominids, walking upright with significant buttocks: variously named *Australopithecus aferensis, africanus, anamensis, gahri, ramidus,* and *robustus.*[3] About 3 million years ago, these new larger types of tool-using hominids began to emerge, with very few fossil records preceding them, in East Africa and South Africa. However it is significant to not that bipedalism came significantly before tool-usage

Much has been written about these hominids being the ancestors of us humans. Some populist writers, like Robert Ardrey[4] thought that we were possibly descended from *Australopithecus africanus*, whom he dubbed rather unfairly as the 'killer ape', however basic physiology (that he obviously didn't study) and modern palaeontology (with new scientific dating techniques) belie the theory that we are descended from these apes. Modern palaeontologists[5] predicate a fairly long period of evolutionary stagnation from the late Miocene through to the middle or late Pliocene during which the Micone apes gradually developed, split into various branches that eventually became orangutans (about 15 million years BP), gorillas (about 10 million years BP) and then into chimpanzees (about 7-8 million years BP) and then into "something" that later emerged as *Australopithecus* (about 3 million years BP).

Some significant climate changes had began to happen about 5-7 million years ago and there is evidence of a considerable increase in browsing and grazing species around then that might have provided an additional food source. This is also around the time when, according to DNA studies, our line separated out from the chimpanzees' descendants. But this may have been just an episode as this was still well in the Pliocene period of drought, and climate conditions did not improve significantly until the Pleistocene. An hominid evolution into that which became *Australopithecus* might have begun to fare better than the various precursors of chimps, gorillas, baboons, and other monkeys that still existed and would have competed with them for available food sources, even so it is still difficult to understand how and why these proto-hominids evolved to their greater size, brain size and with their more erect posture.

There was also a singular difference that eventually developed between the size of male and female *Australopithecii* (twice the size, compared to 10-20% in chimps and humans). Some of the explanation for this size difference is dealt with in Coss' theories of sexual dimorphism.[iii] But, as this difference was not replicated in later developments, it might have been a specialized evolution of these particular sub-species that suited its semi-arboreal, semi-plains existence. It is only significant, and also unexplainable, if one accepts a strictly linear development, or a branching development, rather than a gene-pool development, as we shall see.

There is considerable evidence that these early Pleistocene *Australopithecii* hominids had already adapted to become very primitive tool-users using 'found' tools rather than 'created' tools. Some of these 'found' tools, like an antler or a jawbone, might have been used as a weapon; these hominids might have hunted or scavenged, possibly in small groups; and there is some significant evidence they preferred living in caves. They seemed to have been relatively confined geographically to the Central and East African rift valleys, though later discoveries indicate that some of them also

[iii] See End Reference 2

migrated down to the South African coast and even up to the Ethiopian plateau. We know nothing much else about them really, except through the very meagre fossil evidence, and there seem to be no other earlier fossils to explain any of the developmental changes that preceded them.

The processes of later evolutions into *Homo habilis* and *H. erectus* etc. are also not explained satisfactorily, nor are the increased speeds in evolutionary progress explained by such developments. The theories sometimes get more and more complex, so I am postulating an Occam's Razor approach.

Certainly something very significant had happened in the several million years of the Pliocene period. During this time, orang-utans split off, gorillas split off, and our ancestors seem to have finally split from chimpanzees, and then – somehow - we profoundly changed into proto-hominids. However, even given this length of evolutionary time, there are still some serious questions as to exactly how the *Australopithecines* developed, as well as where they developed: and there are, as yet, no intervening fossils.

Then, quite quickly in evolutionary terms, other extraordinary changes started to happen, with an increasing amount of fossils remaining. After the first appearance of the various *Australipithecii* about 3 million years ago, our first real ancestor *Homo habilis* emerged 2.5 million years BP: a small upright primitive tool-using man or woman, with a significant loss of body hair and some subcutaneous fat. Within another 3/4 of a million years (1.8 Myrs BP), s/he had somehow suddenly evolved into *Homo erectus,* who was totally different with double the size and double the brainpower and walked superbly erect.

Homo erectus was definitely one of our direct pre-ancestors: but the basic questions still remain. How, where and why did something that coexisted with *Australopithecus africanus* develop into *Homo habilis*, and then how, where and why did someone or something develop into *Homo erectus*? This is still the great mystery, and is very crudely illustrated by the middle line in Diagram 1 above. Palaeontology has a number of theories, including diffuse or branching developments, but no real explanations, and very little conclusive evidence.

Homo erectus was certainly a very successful adaptation and was also almost certainly the first hominid species to move "Out Of Africa". This might have happened around 1 million years Before Present (BP). Fossil remains have been found not just in Kenya, but also in Spain, Georgia, Indonesia ('Java Man'), China ('Peking Man') and in several other places.

An illustration of hominid evolution by Victoria Edwards showing from left to right:
a. Australopithicus afarensis, b. Homo habilis, c. Homo erectus, d. Homo heidelbergensis, e. Homo neanderthalensis, f. Homo sapiens

Received paleo-anthropological wisdom now has it that *Homo erectus* then

evolved into *Homo ergaster,* then *Homo heidelbergensis*, and sometime around 750,000 years BP this adaptation split into *Homo neanderthalensis*. A later evolution of *H. heidelbergensis* seems possibly to have developed into *Homo sapiens*.[6] Little seems to be mentioned in the scientific papers as to how and why these developments might have happened; most of the debate is about when and where, for there are many more fossil records.

It is now generally accepted that *Homo erectus* was a pretty competent species. It spread out of Africa, following the coastlines where an easily found resource of protein, shellfish, was available. It extended over thousands of years around the Arabian Sea, along what are now the south coasts of Iran & Pakistan to India and South-East Asia. The recently discovered *Homo floresiensis* ('Flores Woman') who only died about 12,000 years ago is almost certainly a micro-adaptation of *Homo erectus*. This species was probably cut off by rising sea levels and isolated on this tiny Indonesian island for about 800,000 years, where the species then shrank in size (as other species do in such situations) to a 'hobbit'-size person about 1 metre high. This Darwinian process is called "endemic island dwarfism," but this is the first time that it has been observed in hominids. These 'hobbits' probably died out in a disastrous volcanic eruption about 12,000 years ago, even though there are more recent local reports of their survival to as much as 300 years ago..

What else do we know? We know that *Homo erectus,* an earlier hominoid species, but very different from us, had emerged from Africa and spread across into Asia sometime between 1.0 million years BP and existed until about 250,000 years ago.

Some people theorise that there are living human descendants of these *H. erectus* today and this all depends on which bits of DNA one studies. There are theories[iv] that there was not one, but three distinct movements Out Of Africa. Templeton theorises there was another OOA exodus between 840,000 and 420,000 years ago.

Another confusion about this time is that *H. neanderthalensis,* or Neanderthal (wo)man, another hominoid with a large brain (about 10% larger than our present brain), evolved from something, somewhere, about 500,000 years ago and then also spread in small pockets throughout Africa and also Out Of Africa, mostly into Europe, but then rather suddenly disappeared about 40,000 years ago. We are fairly certain that we have no Neanderthal genes.

We know there was an extensive period of drought about 150,000 years ago, as much of the planet's fresh water was locked up in an early Ice Age: sea levels would have fallen dramatically around then; existing populations of whoever was around would have been seriously affected.

We are also certain through studies of mitrochondrial DNA, that between l00,000 - 80,000 years ago a small group of modern human beings, one of which was definitely our common female ancestor-ess, "Mitrochondrial Eve" – now named 'Lara'[v], also moved north out of the horn of Africa. This group started to spread into Asia, and later into Europe, and we are certainly all now descended from this individual. Later there was a move back into Africa of the descendents of this group from Asia (about 50,000 years ago) that gave Africa its present human population.

We are also almost certain that about 45,000 years ago, recognisable human beings of the same species as us, *Homo sapiens,* crossed from New Guinea into Australia, and that about 14,000 - 15,000 years ago, other ancestors crossed the Bering Straights from Asia into North America, and then later down, about 13,000 years BP into South

---

[iv] Templeton examined large chunks of DNA called 'haplotypes', impervious to being broken up or split by sexual characteristics, like mitrochondrial DNA or Y-chromosomes. He used 13 haplotypes and checked hemoglobin ß, MS 205, and MC15 amongst others. Templeton, A.R.: *Out of Africa again and again:* Nature 416, 45-51, also explained in End Reference 16: p. 52-54.

[v] Skyes, Brian: The Seven Daughters of Eve (Bantam) 2001

America.

But where did these various earlier ancestors come from? Why didn't they all survive? What distinguishes them from us? Before all this expansion Out Of Africa, how did we evolve from the great apes, and it is this period evolution, from about 5 million years BP forward to about 0.2 million years BP that I want to focus on.

Lyall Watson, in an essay *The Immersion of Man*,[7] propounds a explanation that maybe there is evidence of early hominoid development in the eastern flowing African river valleys (like the lower Zambezi) where they open out on to the old Pliocene coast in the elevated terraces of southern Malawi and Mozambique: however nothing definitive seems to have been found yet. This theory might be getting closer geographically to something like the truth, but there is no explicable reason why this particular area should have been the seat of our evolution.

Another author, William Calvin[8] takes a different track and lists several behavioural abilities that distinguish us from the apes:

> ***altruism*** (beyond chimp-level reciprocal altruism); ***accurate throwing*** (not just flinging, which many chimps do, but practicing to hit smaller and smaller targets); *extensive tool making* (especially tools with which to make other tools); ***protolanguage*** (real words used in short combinations such as the language of two-year olds); ***planning*** for uncertain futures (not just the seasons) and their associated agendas; ***structured language*** (long sentences with recursive embedding of phrases and clauses, likely a different evolutionary pattern); logical trains of inference that allow us to connect remote causes with present effects …; ***ethics*** (which may require an ability to estimate the consequences of a proposed course of action); ***concealed ovulation*** (the disappearance of obvious "in heat" periods tended to force males into prolonged sharing with a female and her previous offspring, just to be around at the right time); ***games*** with made-up rules (hopscotch, not just play) and dance; our fascination with discovering hidden patterns in music (not just rhythm but four-part harmony), art and abstractions, crossword puzzles, and doing science …; our extensive offline ***creativity*** (an ability to speculate, to shape up quality by bootstrapping from rude beginnings, yet without acting in the real world)[vi]

Few of these behaviours have anything to do with physiology, nor can they explain the main physiological differences between us and these other hominid species and the apes: the only one in this list is *concealed ovulation*, which I discuss more fully later. Most of the rest of the differences can derive from, or are predicated by, an increased brain size and more elaborate neural connectivity. So this type of evolutionary thinking is not particularly helpful.

I don't happen to agree with most of the prevailing current explanations about how these significant evolutionary changes happened, or indeed what they were, because they just do not explain (or include) all of the physiological changes that also happened. As a great physicist [vii] once said: *"It doesn't matter how beautiful your guess is or how smart you are or what your name is. If [the idea] disagrees with experience, it's wrong. That's all there is to it."*

Evolutionary thinking can be categorized into explanations (post hoc derivations with few 'a priori' limits) or hypotheses (which are capable of generating predictions that can be tested empirically).

Richard Coss [viii] starts his paper with the quotation: *"Properly formed and properly used evolutionary hypotheses invalidate most common criticisms and must be judged, like other hypotheses in science, through their ability to be theoretically and empirically progressive. A complex, multi-faceted hypothesis can predict patterns of phynotypic variation that would make*

[vi] Calvin: p. 30-31 (see Endnote Ref: 8)

[vii] Richard Feynman: quoted in: Singh, Simon: *Big Bang* (Forth Estate) 2004

[viii] See End References: 2

sense if the hypothesis is true, but be unlikely if it is false."

If the perspective of the dominant icon of evolution "one species after another" (see above illustration) is taken, most of what really matters is missed: there is almost inevitably the "conceit of hindsight" whereby *H. erectus* is seen as considerably more evolved that *H. habilis,* who is seen as more evolved than the *H. Australopithecii.* Who says? They all existed perfectly adequately for considerably longer periods than we have existed. They were not in the business of evolving. They were in the business of surviving, and passing on their genes, and they did this very well, given the conditions of the time, for a very long time. They were perfectly adapted to their environment.

It is hard to deny the temptation to see these species as either on or off the main line of evolution, but try to imagine a many branching and interlaced network, with one place on it looked at from just one other place at a later point in time.

Richard Dawkins[ix] believes there are evolutionary patterns or networks that somewhere, backwards in time, eventually converge: there are confluences or 'rendevous'. He moves forward in a pilgrimage towards these convergences, but backwards in chronological time. From these points forwards in time, there are many other species, sub-species, races, types and descendants that might have evolved, but are not direct descendents, and which should not be ignored. They might have significantly impacted, cross-fertilised, or just disappeared, leaving an evolutionary niche to be filled. We will meet some of these.

So I have expanded on my one particular favourite explanation or theory that seemingly fits all the known facts and the extraordinary diverse physiological differences and I present this as a complex explanation, bordering on a hypothesis. This theory predicates that our proto-humanoid ancestors almost certainly spent an extensive number of years (several million or so) in the most sensible environment they could find then in which to last out the end of the Pliocene period of extreme and extensive drought. And that is …

… Up to their necks in water at the seaside.

Please don't laugh! It is logical; and, more importantly, there are also a significant number of physiological pointers to support this theory and even turn it into a hypothesis. Some of the pointers have been challenged and therefore this theory is somewhat controversial. It has not been proved, and some of its proponents have also used inaccurate data and illogical reasoning. But that doesn't, per se, dismiss the theory. So, let us take a step or two more in this direction and examine this theory a little closer: or … topically, *"Come on in, the water is fine!"*

One piece of supporting evidence is the point of view that this environment was possibly the best one available that keeps a more-or-less defenceless ape, now 'grounded' due to a significant lack of trees, as safe as possible from a whole lot of the very hungry four-legged predators that were roaming around the African plains at that particular time.

> "It is impossible to understand the processes of evolution of living things without reference to the geology, geography and climate of the places where they lived. Within fairly narrow limits, these factors dictate the kinds of life-forms which can exist on the world's surface, in the thin outer layer of land and water now christened the biosphere. It supplies the chemical elements of which all living things are made, and has determine the range of temperatures within which they can survive."[x]

According to one of the main proponents of this theory, the location for this safe survival environment, or subsequent 'gene pool', is near the present north-east coast of Africa, in an area where three tectonic plates meet: south of the Red Sea in what are now

[ix] See End Reference: 16

[x] Morgan, 1994: p.48-9 End Reference: 11

the plains of Ethiopia, and what was then the shallow Sea of Afar. The "Aquatic Ape Theory" (AAT) adapted by Elaine Morgan and others, predicates that:

> "What is more or less agreed upon is that by the late Miocene (seven million years ago) a marine basin had become established over northern Afar … and these conditions persisted until the isolation and desecration of the Salt Plain arm of the sea some 70,000 years ago."[xi]

> "Part of the ape population living there at the time would have found themselves living in a radically changed habitat. Some may have been marooned on off-shore islands - the present day Danakil Alps were once surrounded by water. Others may have lived in flooded forests, salt marshes, mangrove swamps, lagoons, or on the shores of the new sea, and they would all have had to adapt or die. AAT suggests that some of them survived, and began to adapt to their watery environment. Much later, when the Sea of Afar became landlocked and finally evaporated, their descendants returned to the mainland of Africa and began to migrate southwards, following the waterways of the Rift Valley upstream. There is nothing in the fossil record to invalidate this scenario, and much to sustain it. Lucy's bones were found at Afar lying among crocodile and turtle eggs and crab claws at the edge of a flood plain near what would then have been the coast of Africa."[xii] (see Diagram 2)

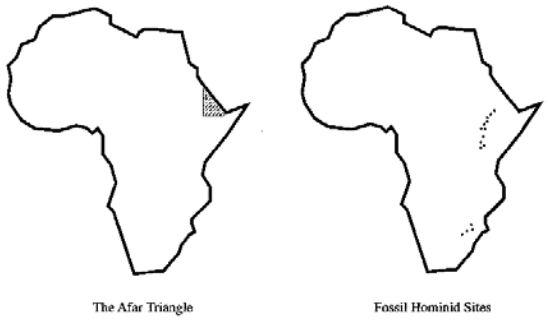

Diagram 2

These sorts of isolated environments ("geographic speciation") provide ideal conditions for rapid evolutionary change. However one of the AAT theory's main opponents has a very different view and states, despite the fact that a significant proportion of human populations still live, and exist from coastal fishing, that:

> Another immediately apparent problem with this wading, diving, etc. business is that of predators. In open forest or savannah, upright hominids would have little problem spotting predators. Predators in the shallow shoreline waters, on the other hand, are even today a big problem. The biggest culprits are sharks (mostly in salt water but also in rivers) and crocodiles (which can be found in both fresh and salt water). Rather than being the protective medium that AAT proponents imagine, shallow water is, for humans, one of the most dangerous places in the natural world.[xiii]

Crocodiles and sharks would have, and still do, exist in these areas; so do human fishermen who often wade out, carefully, into similar waters and ply their living, generation after generation. Crocodiles also dislike mineralised water, so there may have been additional factors here working for our ancestors. The author somewhat dismisses plains predators, but there is a problem there: plains predators are better adapted to the plains than humans are. We might be able to see them, but if they se us, they get to eat us for lunch. However, if this refutation (by itself) feels somewhat

[xi] CNR-CNRS tea, 1973: quoted in Morgan (1994): p. 51
[xii] Morgan: from The Aquatic Ape Theory leaflet. (see Endnote Ref: 11)
[xiii] Moore, Jim: www.aquaticape.org

insufficient, the rest of the physiological evidence that lies behind this aquatic ape theory, and indeed derives from it, builds up hopefully overwhelmingly.

The most significant and obvious main physiological differences between us and the preceding and present great apes (orang-utans, gorillas, chimpanzees, etc.) are that: **(i)** we don't have a lot of body hair, and they still do; and **(ii)** we do have a layer of subcutaneous fat, and they don't; furthermore **(iii)** we have significantly larger brains than they do, and there is no real explanation about how and why we developed these, **(iv)** we also have a number of other physiological differences (fleshy buttocks, salt tears, reactions to water on our faces, descended larynx, etc.) that were simultaneously developed for various otherwise unexplainable reasons; **(v)** we can control our breathing, which enables us to swim, dive and talk; and finally **(vi)** we walk around a lot more erectly than they do.

All these differences take up a whole raft of evolutionary choices that we must consider carefully, especially given the relatively scarce resources available. We need to hypothesise a really good set of explanations that cover all these different points, or an environment that supports these different epigenetic developments.

Modern anthropology and palaeontology is fairly certain that the division between our chimpanzee ancestors and those ancestors that developed into hominids occurred about 4-5 million years BP,[9] which puts the division into the ending stages of the Pliocene drought era. Funny things happen in periods of extreme drought: resources become increasingly scarce; populations become split up and isolated; diets are forced to change; species are forced to innovate; and some of these innovations may allow them to exploit resources not being used previously, or being used by the 'central' population.

This form of evolutionary pressure is known as "a periphery pump" as these adaptations are usually fed back into the central population by the adapting peripheral population once the arid period is over. [xiv] However, this particular period of drought did not end, nor did they feed back into the central population. The evolutionary niche they had discovered was so pleasant that they stayed there. By the time the evolved 'peripheral' population (Australopithecine hominids in the first instance) re-encountered the 'central' population (proto-chimpanzees and other apes), evolutionary pressures had taken their toll and they had become a very different species. As we shall see, competition can play funny tricks as well and can force further changes in overlapping populations. There is a suspicion of a "where" answer; we might have just begun to hypothesise an answer to the "why" question; but "how" did all these changes really happen?

Much of this theory is still open to debate [xv] as there was a relatively short time span (about 2 million years) for the change from proto-chimpanzee to *Australopithecus*, with no found fossils between, and this adaptation involved a huge amount of physiological changes (including the significant size difference [xvi]) and size of brain increase, that seems quite difficult to fit into this relatively short evolutionary time span.

The only really sensible set of environmental circumstances that could possibly

---

[xiv] Calvin: p 70-77 (see Endnote Ref: 8)

[xv] However the evolutionary time for the various points of divergence between monkeys and apes (as compared with the percentage of DNA divergence) may not be totally consistent. The New World (S. America) split from Africa about 80 million years ago in the Cambrian period, according to Plate Tectonic theory. Yet DNA has this divergence at around 30 million years BP. Diamond: p. 17 (see Endnote Ref: 9)

[xvi] There are predator-avoidance scenarios for this evolutionary difference postulating much lighter females sleeping in the higher branches to avoid leopards and such, but they don't really explain what happened when the heavier males became a midnight snack.

explain most of these physiological changes together, in one theoretical or hypothetical 'package', are that, for a significant period of time (several millions of years) our ancestors evolved on the sea-shore, or in a shallow, swampy coastal area, where we were constantly covered by, or in and out of, salt water.

Firstly, loss of a coat of fur or hair usually only occurs in mammals in two types of environment: deep underground, or in water. Constant exposure to both water and to heat makes a thick coat of fur or hair more of an evolutionary liability rather than an asset: so, animals in the desert retain their fur or hair (like the camel) as it acts as a defence against the sun and the night-time cold, and, whilst otters and seals spend very little time on the shore, they also largely inhabit temperate climates and seas, and so they need both a layer of subcutaneous fat and a thick coat of hair: in Africa, one doesn't, and the hair can go, and it did.

Loss of fur means bare skin, and the baring of the skin (to ultra-violet rays) increases the potential for melanomas (skin cancer) and the natural defence against this is for small spider-shaped skin cells called 'melanocytes' to increase the production of melanin. This chemical substance darkens the skin and absorbs the ultra-violet rays. Chimpanzees have some melanocytes; humans have a lot more. Our ancestors were almost certainly dark-skinned, and this only lightened when they 'invaded' northern climates, and there was more need for skin coverings for temperature control, lower ultra violet levels, and less available vitamin D.

Darwin believed hair loss to be a sexual characteristic, and there is some evidence that it can also be this:

> "The view which seems to me the most probable is that man, or rather primarily woman, became divested of hair for ornamental purposes, as we shall see under Sexual Selection; and, according to this belief, it is not surprising that man should differ so greatly in hairiness from all other Primates, for characters, gained through sexual selection, often differ to an extraordinary degree in closely related forms."[xvii]

But this does not negate the possibility that the cause of the hair loss might have been aquatic exposure and that the sexual characteristics were secondary. Sexual or display characteristics also tend to predominate in just one of the genders of a species, often the male, not in both.

The next major physiological differentiation is the almost unique layer of subcutaneous fat. Other mammals that have developed a layer of subcutaneous fat are those animals that spend significant periods of time in water: walrus, otters, seals, coypu, dolphins and whales. [xviii] A general conclusion from an overall survey of mammalian species is that, whilst a coat of fur provides the best insulation for land mammals, the best insulation in water is a layer of subcutaneous fat. Humans have much more fat, for their body size, than any other land mammal, and it is not seasonal, nor hibernational fat (usually stored around the kidneys and intestines). It is also the type of fat (white fat) that gives insulation and buoyancy, rather than acts as a food store.

Whilst hominid babies are certainly well insulated, Caroline Pond[xix] argues that the distribution of fat in humans is more of a sexually characteristic, especially noticeable with the increase of fat at female puberty. Again, this might be a secondary sexual characteristic and it is unlikely to have evolved just for that purpose. Jim Moore, in a

---

[xvii] Darwin, Charles: *Descent of Man, and Selection in relation to Sex:* 1871

[xviii] Bears, like other hibernating mammals, have significantly large fat stores, but these are not purely subcutaneous and are very seasonal. Incidentally, they quite like being in water as well.

[xix] Pond, Caroline: *The Fats of Life*: 1998

complex and lengthy Internet critique of the Aquatic Ape Theory,[xx] claims that Pond's work actually belies this aspect of the AAT theory and ascribes the distribution of human fat to reasons of sexual display rather than insulation. He also criticises, much more extensively, the general level of rigour and research in Morgan's work, and some of these criticisms may be justified. Again there is a controversy, but my point here is that the controversy does not actually disprove the hypothesis.

The aquatic ape theory states that human beings also shed salt through our sweat and tears, and other animals (mammals) that shed salt tears are usually those that have a high proportion of their diet coming from salt-water fish & organisms, and thus have a real physiological need to expel the excess salt from their bodies. Salt tears are found also in the seal, the sea otter and the walrus. The ability to produce salt tears, it is claimed, suggests that a significant period of evolutionary time was spent in a salt-rich environment. However, most mammals get rid of excess salt, or excess potassium, through their renal functions, not through sweat. Reptiles and birds have less efficient kidneys and so use tears, sweat, and other means to expel excess salt. Again, there is a controversy, but one that does not deny that a method is needed by humans to get rid of excess salt, which begs the question, "Why did we develop this physiological difference?"

We still have a number of relatively solid, uncontested physiological facts to support this hypothesis, but there are several more. However, the next significant pointer is not physiological but that huge gap in the fossil record, mentioned earlier. There is a surprisingly consistent set of fossils throughout all of human evolution, except for this special period of time, from the end of the Miocene, through the Pliocene era, to the mid-Pleistocene. The time scale for the existence of the Sea of Afar, is quite significant: 7 million years ago to 70,000 years ago, just about the length of the gene pool needed and predicated later.

With shrinking populations, in a period of drought, the difficulty of finding fossil evidence is definitely exacerbated. However, no fossils have yet been found and we do not also seem to have anything that gives us fossil evidence of the proto-chimpanzee/hominid split. Then the various different hominid species seem to emerge, as if out of nowhere: the *Australopithecii* and then *Homo habilis* and then *Homo erectus* and *H. heidelbergensis, H. neanderthalensis,* and then *H. sapiens* and lastly *H. sapiens sapiens.* Why? How? What about the others? And where did they all come from, in evolutionary terms? Where are these fossils?

On one hand, one can argue that the beach or shallow sea, with its constant movement of waves, tides, pebbles and sand, and also with significantly changing sea levels over long time periods due to various eras of drought, and build-ups of sediment, followed by episodes of glaciation, sea level changes, and so forth, is about as efficient a method possible of hiding or destroying any fossil remnants as anything else that could possibly be devised. The current non-existence of fossils makes the proving of our hypothesis somewhat difficult, but efforts to excavate in the Sea of Afar region, and around the Danakil region, should show good results: (it has been a significant war-zone for a while). Another perspective argues that shallow seas are ideal for the collection of fossils, as long as the seabeds are available and above present sea levels. Anyway, the jury is still out on this one.

As we continue to consider the physiological differences, I feel that some of the pieces of the jigsaw start to come together rather nicely.

Sir Alister Hardy[10], a zoologist and marine biologist, followed by Elaine Morgan[11],

[xx] www.aquaticape.org

in her somewhat feminist book, *The Descent of Woman*, and her later books, *The Aquatic Ape*, and *The Scars of Evolution*, have theorised that we evolved in the warm and fertile shallow seas of that Pliostecene time, for the above reasons. So far, so good!

Many of the physiological "costs" or disadvantages of bipedalism are removed if the more erect posture happens in water. There is no additional pressure on the discs in the spinal cord or on the lumbar vertebrae; there is no distension of the veins in the lower limbs; standing up in water does not trigger the release of certain hormones, the retention of salt, or higher blood pressure: quite the opposite, in fact.

Elaine Morgan also goes on to speculate that significant changes in the anatomy of the female sexual organs (namely a migration of the vaginal opening towards the front of the body, and a significant increase in the size and complexity of the labia, as well as a large increase in size and fleshiness of the (female) human buttocks) can be explained by the changes that were experienced in the natural environment (from trees to plains to beach).

She posits that evolution was thus led, not by man the hunter running about on the plains, but by the essential needs of the woman, the child-bearer, sitting on a sandy beach or rocky shore and needing extra protection for her most vulnerable and valuable assets. She might possibly be correct about this. Previous theorists, almost exclusively male, have not fully considered female evolution.

Unfortunately Elaine Morgan (in her first book) seemed to ignore the fact that most, if not all, aquatic mammals actually have sexual intercourse face to face, and not (like most land mammals) from behind. Some chimpanzees (especially the pygmy or *bonobos*) also happen to have sexual relations face-to-face: the *bonobos* also lived in swampy forest areas. Controversy again; but it does not discredit the essential theory.

When she postulates traumatic reactions and disturbances in our human sexuality due to this change of position, she is on somewhat less firm ground anthropologically as well as theoretically. She puts forward an elaborate theory of sudden rape due to male frustration with the enlarged female buttock-size; and this really does not convince. The female trauma of the sudden mammalian fear of evisceration by being turned onto one's back (into the 'missionary' position) is not a sufficient explanation for all the other subsequent and more modern distortions in human sexuality. There are some other sexual and physiological factors (that she ignores until her latest book) that also happen to add weight to the aquatic theory.

It is usually essential for reproductive survival that the male of the species knows when the female is in oestrus. Unlike all other apes, the female menstrual cycle and female ovulation has become hidden in humans, and the resultant period of reproductive fertility and attraction is no longer smell-based, nor is it behaviourally advertised in any obvious way. This is very strange and, in evolutionary terms, almost inexplicable. One possible reason for the ending of obvious oestrus was (perhaps) that it stopped working well, especially if we were spending significant periods of time in water, rather than on the forest floor. Loss of the pheromonal secretions and no visible markers like labial swelling meant that there was now no way of telling when the human female was in oestrus.

Sexual activity in general in humans also tends to be hidden, rather than exposed, unlike in other primates. But several of these significant physiological and behavioural changes perhaps make a little more sense if all this activity is happening with everyone immersed up to their waists (or necks) in water for several million years.

Calvin[xxi] posits, along with many traditional male anthropologists, that the result of this change to a hidden female ovulation is to keep the male in a longer and more permanent relationship with the female, so as he can be around at the right moment (of

[xxi] Calvin (see End Reference: 6)

ovulation). But this is a consequence – the conceit of hindsight again? The cause of concealed ovulation, the reason that this might have been selected for, is still not yet determined. Diamond[xxii] posits several simplistic theories, some by men, some by women; none particularly convincing.

The male goal, in every mammalian species, is nearly always towards ensuring that he sires as many offspring as possible; the female goal in every species is to ensure that her offspring come from the best available male and are given the best chances of survival. These are our basic genetic survival parameters.

The various "game plans" as to best way to ensure this vary considerably from species to species: almost certainly this issue is at the root of hidden female ovulation. It has just been distorted by recent ethical and social goals that have resulted in a multitude of distortions of male-female sexuality, sexual behaviour, and power games.

I have shown how this phenomenon might have come about, but I am much more fascinated how this is uniquely turned into an evolutionary advantage in that it also subsequently supports the need for more childcare that the increased brain capacity really demands. Which came first: the benefits or the hidden ovulation? Maybe therein lies an answer.

We also differ significantly from the other great ape species in the size of the female's breast, even before childbearing; and in the size of the male's testes and penis.[xxiii] Aspects of the female physiological differences can easily fit in with the aquatic theory, as female breasts become much more significant by being present at or above water level, and the increased fatty tissue in them also has considerable benefits for the baby as we will see shortly. Changes in male sexual characteristics are theorised as probably unrelated to the aquatic theory and are probably more determined by the frequency of hominid copulation and/or forms of competition or display between males: neither of which seems to be that attractive to females.

However interesting the various sexual behavioural aspects of this theory are, they do not go quite far enough. There are still several more outstanding and very significant physiological differences that need to be explained by this theory. Reduction in the olfactory lobe (loss of sense of smell) is also a common feature in aquatic mammals, and in seals and whales this has almost totally disappeared: the loss of smell in humans is significantly poorer to that in primates.

The next significant difference is the change in overall body size from ape to hominid and the much more erect humanoid posture. What easier explanation for extra size at little extra cost is there than being suspended for significant periods of time in a form of weightlessness, or weight-reducing salt water? This effective lack of gravity over such a long time period allows the body to grow much larger and more erect, without any of the evolutionary disadvantages of having to carry that extra weight around and needing extra supplies of food to do that. Erect on two legs gives a much greater range of movement – when in water. Bipedalism is also a relatively inefficient way of moving around on dry land: three or four limbs are much faster and easier as any film of primates moving shows. Finally the only animal that has ever evolved a pelvis anything like ours, with short iliac bone suitable for bipedalism, was the long-extinct *Oreopithecus*, known also as the "swamp ape". There are now no suggestions that *Oreopithecus* was one of our direct ancestors, but the similarities are significant, and can be accounted for by the theory of 'convergent evolution', whereby species inhabiting similar environments and with similar lifestyles often grow to resemble one another, even though they are genetically unrelated.

[xxii] Diamond, pp 66-69 (see End Reference: 9)

[xxiii] Calvin, pp 56-105

So the aquatic theory for bipedalism is a much more credible explanation than the populist Desmond Morris type of explanations, based on outdated speculations on anthropology and palaeontology, of man the hunter needing to see over the tops of tall grasses, or men cooperating together to share food, and simultaneously developing longer legs, language and larger brains. Bipedalism came first, well before the larger brain, which only makes sense if evolution occurred in a favourable environment like shallow water. We didn't have to constantly defy gravity, which would constitute a considerable energetic expense in an environment that is not at all generous; we just gracefully floated and stretched weightlessly in order to become taller.

The plains environment, in which we were supposed to have evolved otherwise, was also one in which there were a significant number of other predators, which would not only compete with us for available food resources and which were much faster, bigger, fiercer, and more effective than us, but would probably even consider us as a very tasty lunch. So the "plains" theorists predicate that we evolved and changed significantly despite and maybe even as a result of all this fierce competition: I think not! We had absolutely no competitive edge: no tools, no spears, no horns, no speed, no poison, no fangs; nothing!

We also significantly did not develop any thick horny pads on our feet. Examine a gorilla's or chimpanzee's hands and feet, even immature ones, and notice the differences to our own. Something specific happened to prevent such a development that would be logical and necessary if evolutionary success entailed running about on hard and hot plains. The early "hunter/gatherer" theory just doesn't wash; but salt water seems to.

Essentially we seem to have become "gatherers" first, rather like our ape-like ancestors, essentially vegetarian but also rooting for grubs and insects, and killing or scavenging small mammals, occasionally or opportunistically. This can help us survive, but it does not help us evolve. Hunting came much, much later and by then we had a hugely increased brain capacity that allowed us to "out-think" our prey, collaborate together, discuss strategies, and occasionally manage to drive herds over a cliff. Ardrey and Morris got it the wrong way round: we developed the brain first and only then could we out-think our prey. Modern anthropology and palaeontology seems to avoid the issue.

In advocating this extended aquatic theory, I would like to consider a few more phenomenological points that add to the weight of physiological evidence. Unlike non-aquatic mammals, human mothers can give birth in water and babies are actually able to swim from birth; they really enjoy being in water (unlike baby chimpanzees who will react with shrieks and loud cries of distress); and their high proportion of fatty tissue makes them incredibly buoyant. They even seem remarkably happy under water and this piece of evidence alone seems almost conclusive: the pictures in Freeman's book[12] (amongst others) are extremely convincing. Babies show strong reflex paddling movements if put in warm water, and they can also demonstrate an extraordinary ability to control their breathing under water and remarkably quickly become able to hold their breath for significant lengths of time.[13] No young chimpanzees can demonstrate this ability, and so logically it must have been developed after the period of separation, 7-8 million years ago, if the DNA dating is correct.

Mothers birthing babies can also do so a lot more easily and less stressfully when in a warm saline solution (and just try getting any other non-aquatic mammal to give birth in water) and the large amount of buoyant fatty tissue in the female human breast – not found in other humanoids – enables the baby to suckle as the breast nipple now floats near the surface of the water. As we will see, it can also breathe as it sucks because it's larynx does not start to detach from the soft palate until about three to six months old. Having a swimming baby alongside one might also help explain why we have

retained or developed significantly long hair on the top of our heads: what better thing for a baby to hang on to in the water, as well as to protect us from the sun.

The loss of body hair is also very significant for mothers with young babies: what do the babies cling onto if they are moving about on land? Human babies still retain something of the Moro reflex that instinctually makes them grip and grab, especially if they start to fall. But what are they gripping? There is nothing there; and yet this, and the retention of this reflex ability, becomes more understandable if their environment is essentially a salt-water bath. They won't fall, as they are swimming, and the hair on the head (retained as a protection on the only part of the body still exposed to the sun) can still be grabbed.

Allied to all this is another physiological reflex that comes into play when our human faces are immersed under water. We respond by automatically reducing our heart rate (from 70 to 30 beats per minute) and also reducing our respiration rate to conserve oxygen. This "dive reflex" is only found in other aquatic mammals.[14] That human beings can enjoy staying immersed in warm to hot water for long periods of time, and also derive general health benefits from this activity is significant in itself. That there are also significant physiological changes is highly significant. Hydrotherapy may be able to tell us more.[xxiv]

These varied physiological phenomena are almost impossible to explain unless we adopt a version of the aquatic theory. Other land mammals just cannot do these things: these behaviours are mostly physiologically impossible for them, because they did not adapt to be able to do these things over evolutionary periods of time. Dogs, large cats and many other mammals can swim if they have to, but none of them can hold their breath under water. None of this group can stay healthy in water for long periods of time. By contrast, walruses, seals, otters, water rats, coypus, hippopotami, dugongs - and humans - can.

There is another evolutionary physiological change in aquatic mammals, distinct from other land mammals and primates, and that is that the top of the windpipe, the larynx, has become detached from the soft palate. This enables them to breathe easily through the mouth. Some can also breathe as well as through the nose. However in the other land mammals the larynx has to be specifically detached by the relaxation of a sphincter in order for them to breathe through their mouth, or to vocalise sounds. In babies up to about six months old, the larynx is not fully detached. Again, this suggests a late evolutionary adaptation. It also enables the baby to suckle and to breathe.

Nose breathing is important to land mammals: it augments their sense of smell; it filters the air; air is warmed or cooled to body temperature before it gets to the lungs; and, if arid, it is moistened and slightly sterilised during its course through the nasal passages. However, if the larynx becomes separated from the soft palate, many of these advantages are lost through mouth breathing, so we need to look for some evolutionary advantages for this adaptation, or circumstances to explain this significant physiological adaptation.

Most land mammals can mouth breathe when they need to take in significantly more air, or to vocalise, but they are not habitual mouth breathers and they do not have any distinct modifications in their upper respiratory tracts. Birds and animals that are

---

[xxiv] The US astronaut-training program in the 1960's and 70's discovered that long periods of immersion in water, as part of the weightlessness training,, had the effect of leeching residues of heavy metals out of the body. The social health phenomenon of having spas and baths were significant really only at the two times in European history that lead pipes were used to supply domestic water: the period of the Roman empire and the Victorian era. Lead is a heavy metal inimical to health. That we can physiologically leech toxic metals from our bodies may be another significant pointer to the ATT.

aquatic do, primarily to stop water getting into their lungs. Their larynx has descended and they either have valvular nostrils, like seals, that close when relaxed and open to breathe; or a triangular flap of cartilage inside the windpipe that closes when diving, like the penguin. The crocodile has one as well. Sea lions and dugongs both have descended larynxes. And so do human beings, as the back of the soft palate, the velum, can be raised and lowered to isolate the nasal passage from the mouth and throat. The only evolutionary advantage of this is to be able to take in large amounts of air and to dive under water. This gives us the almost unique mammalian advantage of being able to control our breathing. It also gives us the later derived ability to speak a wide range of sounds. *"The really indispensable pre-adaptation for speech is the enhanced degree of conscious breath control which we share with all diving mammals and no purely terrestrial ones. The pattern of inhaling deeply and quickly, and exhaling slowly at a controlled rate, is characteristic of aquatic mammals when they dive – and of humans when they speak."*[xxv]

The next significant difference is slightly less physiological. Elaine Morgan deals with this phenomenon at length in her second book, *The Aquatic Ape*[xxvi] as does Diamond, though less successfully[xxvii]. At some point in this remarkable evolutionary process, we developed the facility for greatly sophisticated language abilities as well. Most animals communicate either by a complex series of subtle body movements and attitudes combined with a relatively simple set of calls or noises: alternatively (when circumstances intervene) sophisticated signals and calls evolve when visual contact is restricted. One example is bird song, where the leaves of the trees in which they live restrict visual contact: another example is dolphin calls and whale song, as the water obscures visual contact. However, when one is up to one's neck in water, the first type of communication (subtle body movements) has no significance and the second type (a simple set of calls) can get lost in the constant background of noise from the wind, waves and pebbles on the beach. Something much more sophisticated is needed – for survival – and a more sophisticated language ability depends on the development of a refined larynx, and a conscious and voluntary ability to modulate the air channels that power the voice: much better breathing control.

There are some very slight physiological differences in the position of the larynx between primates and humans, but the main difference is in the sophistication and coordination of the larynx, tongue and breathing, and the conceptual advantages of a larger brain. Whilst ververt monkeys may have evolved a wide range of simple calls for different dangers and different foods, chimps are just not able to use sophisticated words and are also restricted to relatively simple calls. Our nearest primate relatives, the chimpanzee, can only vocalise a very few words, but can learn sign language for many more. So, this constitutes essentially another physiological distinction between us and apes for, whilst they have almost the same basic structure of vocal chords, humans have evolved many more subtle controls. Furthermore primates cannot control their breathing in the same refined way that we can and they are therefore only able to make a few simple monosyllabic words. Sophisticated language is further dependent on significant developments in the increased brain department. In order to develop this last facility another hugely significant physiological change is necessary and this change is almost totally dependent on a specifically enriched food supply containing one very special ingredient.

Interestingly, when we consider cetacean species (whales, dolphins and porpoises – other mammals that have returned to the sea during an earlier epoch), we find they are also highly intelligent and can also communicate exceptionally well through a highly

[xxv] Morgan (1994): p. 140 (see End Reference: 11)
[xxvi] (see End Reference: 11)
[xxvii] Diamond: pp 125-149 (see End Reference: 9)

sophisticated acoustic system. Songs of humpbacked whales evolve over time, can circulate the earth, and can carry massive amounts of information using tonal frequency modulation.[xxviii]

So, we have left the best point to last! And this is where this aquatic theory ties in most strongly to our human physiology. The most significant differences between us, and our nearest relatives, are the relative sizes of the human brain as compared to that of the great ape, or the various earlier hominid species.

An increased brain does not come cheaply: it is a major organ, it is very heavy (and thus energetically costly) to carry around, and it carries considerable evolutionary choices, as significant resources (time and energy) that are put into the development of this organ become unavailable for any other physiological developments.

Besides the increased strength of neck muscles needed to support a larger head, the heaviest extremity of the body, is much easier to support if you are in water. There is also a significantly longer, much more evolutionarily expensive, and a horrendously risky time span needed, for the necessarily prolonged infant development, during which time it remains extremely helpless and totally dependent. The equation is that the larger the brain, the more nurturing time is needed, both inside and outside of the womb: and childcare is evolutionarily very expensive.

Much of the brain's development (neuronal linkages or plasticity) happens after birth and continues until about 18 years of age, which is how environment and experience can affect us so much: both nature and nurture are very important to brain and emotional development. This predicates an environment of almost absolutely safety and a couple, if not a socially tight-knit group, to support the infant, with an abundant food supply of all the right minerals and proteins, and a relatively easy time spent for the adults in child rearing, to make this extremely lengthy nurturing period a viable evolutionary option. Much of adult sexual behaviour and the human tendency towards relative monogamy can support this increased time span spent by the biological parents in nurturing their offspring.

However the key factor, the absolute physiological clincher, is that in order to develop a larger brain there has to be a sufficient supply of the necessary components needed to create such a specialised organ, and the very special ingredient that is needed, above all else, is a very select set of particular and irreplaceable fats: Omega-6 and Omega-3 fats.

There are a number of chemicals, essential fatty acids (EFA) and proteins: arachidonic acid (AA), eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), phosphorous (for the phosopholipid bilayers), choline, ethanolamine, serine and inositol, which are not just important in normal brain functioning, they are absolutely essential for any brain development.[15] The brain just cannot develop its present complex structure and size without a very abundant supply of these very specialised fats & proteins, and our own bodies cannot manufacture these on demand out of other fats and chemicals. So, we have to find these fats somewhere and include them in our diet, and they are not easily found in the environment in such quantities. A little of the chemical bases for these substances can be found in vegetables and nuts, insects, grubs, etc. but the biochemical pathways to make EFA from these bases are quite slow. For rapid brain development, one needs a direct supply. The only rich natural sources of supply of these EFA (especially AA, EPA and DHA) are in two main areas: animal bone marrow, or in some 'oily' fish, and most significantly in almost all shellfish. Omega-3 fats *"are relatively scares in the land food chain, but predominate in the marine food chain."*[xxix]

So, either our proto-humans ancestors (relatively small bipedal apes) suddenly

[xxviii] Williams, Heathcote: *Whale Nation* (Cape) 1988: On the nature of whales: pp. 117-120

[xxix] Morgan (1994): p. 169

and miraculously developed, at the start of the Pliocene era, the facility to kill a large supply of very large animals and were able crush their bones for the necessary supply of bone marrow (a facility that we did not seem to have developed in the preceding millions of years), or – and this is the key factor – we must have been able, quite suddenly and consistently, to explore and exploit the other main source of these specialised fats in the marine food chain.

Significantly, human breast milk, in contrast to animal breast milk, contains AA, EPA, and DHA and thus these EFA seem critical for normal human brain development. Other mammals with large brains are the marine one, dolphins and whales. There are also some theories about neoteny, the concept that we are juvenilised versions of our primate ancestors: a feature often found in marine mammals.

> "The tempo of our growth rates has in some respects slowed down; we spend longer in the various stages of development between birth and death, and that includes spending longer in the infantile stage during which the brain is expanding very rapidly. The extended period of rapid brain growth means that we end up with relatively large skulls – a head/body ration more typical of juvenile anthropoids than adult ones. (The neoteny factor and the ecological one are not, of course, mutually exclusive. Neoteny is a mechanism of evolutionary change; environmental conditions, such as changes in the food supply, could either facilitate the working of the mechanism or inhibit it.)[xxx]

So, as the expanded aquatic ape theory now goes, certain sets of circumstances forced us into a significantly different evolutionary environment, something similar to present-day mangrove swamps, salt-marsh lagoons, estuaries, archipelagos, islands, reefs or rock shores, where we were able to discover a rich and consistent source of shellfish containing these very necessary fats and minerals, ready at hand for the taking, and these new dietary sources contained the essential components that allowed our brains to grow rapidly in size, in evolutionary terms.

The Myocene *proconsul* humanoid brain peaked at about 200 cc. and the *Australopithecus* brain peaked at about 485 cc. That is a massive leap, more than a doubling in size in 12 million years. Further hominid developments into *Homo habilis* gives brain sizes varying from 500 cc to 980 cc, and then in *Homo ergaster* and *erectus* from 900 cc to 1200 cc (with the exception of the severely reduced *Homo floresiensis* who weighed in at about 300 cc). These are very significant increases, another more than doubling in size, and then an additional 50%, and so we find that massive and expansive changes occurred in a very significant organ requiring very specialist conditions (in this case dietary ones) in a relatively significant evolutionary period of drought and resultant shortages of the normal food supply.

We further find that this development continued well after the end of the Pliocene period, which only covered the initial first doubling to *Australopithecus*. These early-evolved species groups moved back into the interior at the end of the Pliocene and then stopped evolving their brain size (no shell fish): and they eventually disappeared into extinction.

But *Homo habilis* who followed *Australopithecus* by all accounts, was around from about 2.5 million years ago to about 1.5 million years ago in Africa, and was quite a small character (in height) with quite a relatively large brain capacity.

Her/his successor, *Homo erectus*, was around from between 1.75 million to 0.25 million years B.P., and was, relatively suddenly, double the physical size and also had

[xxx] Morgan (1994): p. 170-1

double the brain capacity, which is a further relative increase.[xxxi] Many more shellfish were needed – and were obviously found. According to this expanded theory, the ancestors of *Homo erectus* must have stayed by the seashore and continued their evolutionary development for another million years and more, before migrating back up the river valleys, at various times, where we are able to discover evidence of their existence (their fossils) again.

Whatever did change us so radically must have been pretty profound, and the aquatic environment provides nearly all, if not all, of the answers. Other mammals had reverted to such an environment at various periods in their evolution, as mentioned before, and with the extreme pressure of the Pliocene drought, there was probably quite simply nowhere else for our Miocene ancestors to go.

I have mentioned the significant and mysterious gaps in the fossil record. If, however, we evolved by the sea-shore, over a period of several millions of years, successive and increasingly successful humanoid adaptations could, over time and in the right circumstances, be 'fed into' the plains again, migrating gradually up the rivers and marshy valleys, and along the natural corridor of the East African Rift Valley (where some later fossils have in fact been found), searching for fresh water shrimp, fish, and marsh wild life, without any radical change of adaptive environment. These adaptations would then suddenly appear again in the fossil record, with their significant changes, and with no intervening evolutionary development: which is exactly what happens.

The millions of years of Pliocene global warming had strangely brought us a prize bonanza. We had established a safe environmental culture on the seashore, in and out of the warm shallow seas. Our brains grew with the rich supply of readily available shellfish – there for the picking; our bodies became sleek with subcutaneous fat; and also larger and taller with not having to fight gravity so much; we could get rid of excess salt through our tear ducts; we lost the hair off our bodies (retaining it on our heads only which provided a useful hand-hold for our floating babies); we developed the ability to hold our breath and to dive, so much so that the upper respiratory tract evolved and the larynx detached from the soft palate; we developed the use of simple tools to open the shell-fish; we could stay in the warm water almost indefinitely; and our sexual organs and several behavioural preferences evolved as well. These warm shallow seas, probably somewhere on the east coast of Africa, became our gene pool.

We developed an increasingly large brain capacity and started to use it to develop the ability to communicate more verbally when hand-signals and body language were obscured, above the constant sound of waves, and further developed the beginnings of a sophisticated communication system, verbal language, with our larger brain sizes and the corresponding refinements to our larynx, that our cousins, the apes, and later hominids just do not have.

When we were on the shore, we stayed in tight-knit social groups, with a reasonable degree of monogamy to facilitate the need to care for the children much longer than previously. We probably started living in some of the many caves that line such shores. These are either now all underwater due to rising sea levels with their fossil records mostly lost anyway to the ravages of the shore environment, or in an unexcavated and relatively localised area., which has not been properly excavated. As mentioned the Danakil area in what was the Sea of Afar fits the bill pretty accurately.

At various times, as and when the episode of Pliocene droughts ended, and at various other times later as well, differently evolved groups of hominids migrated inland again, probably in ever increasing numbers as the climate improved, along the rivers and lakeshores, leaving once again a visible fossil record, and thus we started the

[xxxi] A doubling of just one dimension (height) does not necessarily imply a doubling in size of the brain capacity (usually only about a 10-20% increase).

growth and spread of these new varieties of this new hominid species.

This gene pool is probably the source of the *Australopithicii*, who emerged about 3 million years ago. It was this lengthy period of evolutionary time and developmentally favourable environment that contributed to the significant differences that distinguished them from the other mammals, and from their nearest cousins the primates, and ultimately also from their more evolved successors.

Not all groups would have emigrated inland in the various phases of climatic change, and thus several groups almost certainly stayed in this rich environment, and so evolved and developed even further, and the secondary and tertiary waves of emigration inland are where *Homo habilis* and *Homo erectus* emerged from, with their even larger brains, even more erect, with better manual skills and ever-changing behaviours. Further evolution of the residual gene pool then led to later developments such as *Homo heidelbergensis* and *Homo neanderthalensis*, with their even larger brains.

It is theorised that all of these different species emerged at significantly different times from this same rich and developing gene pool (see Diagram 3). However, some of the variations might have started to arise within the gene pool itself. An evolutionary biologist called Dobzahnsky has a theory of reinforcement of reproductive isolation, whereby small differences within a particular species quickly become exaggerated into larger differences in order to discriminate between the two and these rapidly evolve into a different species with different needs on the available resources. This phenomenon grows to a point called 'character displacement' or 'reverse cline' where two species eventually differ from each other more where they overlap than when they don't: this avoids the diminishment of hybridisation. [xxxii]

Whatever happened exactly in this gene pool, an early version of *Homo sapiens* finally emerged out of the water and wandered inland and discovered an environment in which s/he could grow and flourish even further, and where these brain, stature and language developments gave 'him' a distinct advantage over all the other previously evolved hominoid species.

What is needed now, in order to develop, or even prove, this hypothesis, is to identify more precisely the East African Pliocene coastal areas and coastline and, if it is, as suspected, we evolved somewhere which is now in the Danakil Alps area (what used to be the Sea of Afar) on the Ethiopia-Somalia border to see if we can find any remnants of our ancestors' gene pool.

We could also continue searching the rift valleys and river valleys for evidence of the various evolutionary migrations out of this gene-pool, and maybe even see which way they might possibly be facing. One 70-metre line of footprints already exists: a 3.6 million year old set of footprints, from 3 hominids walking together, probably made by *A. afarensis*, have been found at Laetoli, Tanzania in what was then fresh volcanic ash.[xxxiii] Had an early Pleistocene volcanic eruption forced these 3 individuals to 'break new ground' and leave their safe aquatic home, or had they already left and an inland volcano was spewing ash over their territory and they went searching for pastures new? Where did they go?

[xxxii] (see End Reference 16: p. 262)

[xxxiii] Found by Mary Leakey in 1978.

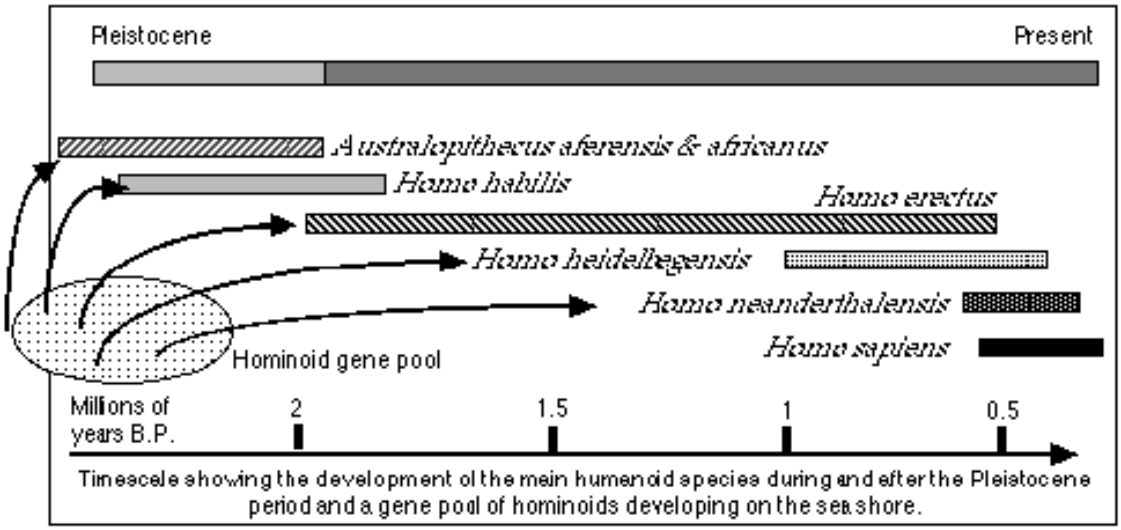

Diagram 3

Significances

What is the significance of all this to body therapists and psychotherapists and their clients? And why have I dealt with it all at such length? Well, don't you and your clients like to spend a lot of time on the beach? Don't you feel happiest there? Is this an aberration, a fantasy, or is it actually a return to our natural environment?

Joking aside: it seems that we have a fascination in trying to discover and understand our roots and origins. Evolutionary theory has always had a significant role in psychology, developing into the new study of 'evolutionary psychology'. The debates around Darwinism (which still continue today, especially in middle America), the interest in the discoveries of Raymond Dart and the Leakeys, the popularisation of Dawkin's *The Selfish Gene,* his most recent offering *The Ancestor's Tale*, the mitochondrial DNA discoveries that led to *The Seven Daughters of Eve,* the recent headlines about "*Flores Woman",* all attest to this interest, but this human interest goes further into genealogy, and into developmental psychology, and the psychodynamics of our family of origin.

Having this evolutionary information in the background of our therapeutic minds can create a new and different perception of how people move; the ease and the grace that they feel in their bodies; how they are shaped; how they affected by their environment; their natural levels of activity; how they communicate; how they make love; how they bring up babies; how they behave; what they like to eat; how they relate to tools; what they dream about; and about their basic desires, goals, interests and responsibilities.

I also think that this physiological material can be fascinating to Body-Psychotherapists due to our concerns with the body and its complex levels of functioning. Many Body-Psychotherapists study anatomy and psychiology, either as part of their training, or because of their personal interests, or as a form of professional development.

This material throws new light on Keleman's work in *Emotional Anatomy*[16]; on the four basic neuromuscular co-ordinations that Linda Hartley discusses in *Wisdom of the Body Moving*[17]; on the significance of hydrotherapy; on how and why we touch; to say nothing about the implications on social anthropology and how we exist in small groups. Our movements in relation to gravity and to the land would have changed significantly once we went back into the water. Our sense of ourselves, our ability to relax, may be intimately connected with the sound of water, the smell of the sea: as a

race, we consistently seem to want to 'holiday' at the beach, or by water.

We have quite a strange reaction to our excreta: we tend to dislike it intensely. It is also quite toxic to us. Most other mammals don't have this psychological aversion or this physiological reaction. Primates don't have such an aversion, though they will usually defecate separate from their main sleeping and living areas. They will occasionally use their excreta as ammunition in encounters with other tribes of primates: human prisoners sometimes use their excreta as a form of protest. Maybe, for us, there was a significant period of evolutionary time when we didn't have to encounter our faeces on a regular basis. This could easily be explained by the aquatic theory: our faeces were washed away almost immediately.

Other significant aspects of animal behaviour, that include the work of Lorenz & Tinbergen studied in most psychology courses, are added to by the behavioural changes of these particular animals that are supposed to relate more directly to our human evolution. However they studied birds; many laboratories study the behaviour of rats; it is only with the pioneering work of Jane Goodall and others in their studies of natural primate behaviour that we can begin to get an insight into the behaviour of our primitive ancestors. This was all before the 'Great Dive Backwards' – a pun for the revised aquatic hypothesis, or 'hydro-thesis' (another terrible pun). Maybe we need to be studying the behaviour of aquatic mammals as a way of understanding our psychology and anthropology.

Apparently some biologists also see humanoid development as an example of paedomorphosis, a form of arrested development in chimpanzees.[xxxiv] Did we not return to the oceanic womb? Later on in human development we come to the 'Great Leap Forward', the development of man-made artefacts about 40,000 years BP.

Part of the poignancy in our human struggle on this earth is the inexplicable sense of a loss of ease and pleasure: we long for something different, something that we might have lost. "Life is difficult", as Scott Peck states in opening to *The Road Less Travelled*, but somewhere we also believe fundamentally that it should be a lot easier – and just maybe, once upon a time, it really was so: maybe we still yearn for a return to the saline waters of the womb, or really to the warm marine shores and peaceful beaches abundant with a rich supply of readily available food where we spent so long evolving: our environmental womb?

There were those halcyon days (or millennia) spent as described; floating in warm water, with food to hand and in glorious abundance, with caves to shelter in, in relative safety, with a relative lack of predators, or an easy escape from them into the deeper water. There were, of course, also storms, which could be sat out in the nearby caves, or, if prolonged or violent like the recent Asian tsunami, by moving more inland, up the protected river valleys. There would be, of course, tragedies of adults and children lost through drowning, or being battered by the waves, or by an occasional shark or crocodile attack, but these were perhaps little different from losing an infant to a plains hyena, or a tribe member to a tree climbing leopard, or from an accidental fall.

The significant differences – those than didn't just divorce us from our anthropoidal cousins, but also gave us a significant evolutionary boost with just the right components to carry on to the bizarre special (or special) predominance that we now enjoy – were those enjoyed by re-entering those warm sea waters again and again, and not just benefiting from their amniotic embrace, but because they provided us with the exact conditions, food and environment that we needed to take the next evolutionary step, the Great Leap Forward, successfully. Maybe this was our Garden of Eden, but it was 'The Beach' instead.

As we work with our clients, we might notice certain phenomena that can also fit in with this aquatic theory. One common reaction to unhappiness and low self-esteem

[xxxiv] (see End Reference 16: p. 267)

in humans is to eat more. This is a strange reaction for a mammal as most other animals unhappily pine away, not stuff themselves by eating. What evolutionary and instinctual advantage could be gained by putting on weight, by growing fatter? We have answered this partially already: the right fats can make you a whole lot smarter, and 'brighter' in several ways.

Furthermore, in a weightless environment, weight is not a disadvantage, but size becomes an advantage that brings more warmth, more reserves, an increased stature, and, most importantly, extra rank: all perfect for someone depressed and with low self-esteem. Consider the social ranking of seals: the largest have the highest rank and are the more successful breeders. Perhaps, as suggested, we need to consider the behaviour of aquatic mammals, rather than birds or chimpanzees. Consider the earliest human artefacts: small statuettes of extremely fat goddess women. We used to worship fat. The modern social discrimination against size and in favour of relatively pubescent anorexia is a very recent and thoroughly questionable phenomenon that many of our clients (and ourselves) have bought into. Fat is not just a feminist issue; it is a positive evolutionary one! The aversion to fat, the labelling of 'large' as obese, is because of the health risks: many of these are brought about, not by increased size, but by lack of exercise and the consumption of poor quality food, food of the wrong sort. South Sea islanders, like those from the Fiji and Tonga, environments in many ways quite similar to the Sea of Afar, are often very big and this is seen as a good thing. They are also surprisingly healthy, when not infected by Western diseases.

If we consider the range of our human diet and the fact that we are amongst the most omnivorous of all mammals, which shows up in the development of our teeth and the diminution of our appendix, these can be considered as further physiological changes that may be, in due course, supportive to this theory. Diet can be changed relatively easily in the animal world, but these changes carry significant implications over time to subsequent evolutionary development.

I would like to mention another factor here. Our human existence on this planet is currently rapidly and increasingly under threat. If you do not believe this statement, please read Jared Diamond latest book[18] *"Collapse"* on why human societies choose to fail or survive. Body-Psychotherapists are, whether we like it or not, influential on our clients. We can encourage them towards more healthy eating habits, stress-reduction techniques, perspectives on the impact of the environment (sick-building syndrome, etc.) on them, and – if we choose to – their capacity to make an impact on the environment. What is ultimately healthier for them, sort-term policies whereby they just look after their own health or improve their own lifestyle narcissistically, or longer-term policies whereby their children retain their present health and lifestyle as well. The factors that influence these choices and that have been shown to have a significant impact in changing downward trends are those where individuals and groups collaborate, at grass-root levels, with long-term goals. The evolutionary factors that caused several of our predecessors to emerge and then not to survive may still be present. The survival period of *homo habilis, erectus,* and the other hominid species is considerably longer than the relatively few hundred thousand years that *homo sapiens* has been in existence; yet these other species disappeared and we may do very soon. However, the gene-pool no longer exists and a better, smarter hominid version is not present, indeed the opposite may be true as there is strong evidence that we are actually "dumbing-down" members of our present species through chemical toxicity[xxxv].

We find increasingly sophisticated "fads" and "diets" and obsessional traits in eating: Atkins, macrobiotic, organic, vegan, etc. Many of these are a reaction to poor eating habits, the hegemony of modern fast food chains and the abundance of unhealthy

[xxxv] See Diamond: (2005): p. 518 and also effects of lead-poisoning & vehicle fume emissions on urban children.

processed foods. And most of these commercially-oriented sources not only contain the wrong type of fats, fats which kill us rather than help us, but a rich supply of saturated fats slows down the pathways of EFA synthesis and might lead to an inadequate formation of brain phospholipids. Behind this desire, or craving perhaps for the right sorts of fats, there is an innate search to rediscover the omnivorous diversity that distinguished our species from nearly all others and led to the somewhat unfortunate predominance with which we infect the planet today. But include the modern trend of the decrease in incidence of breast-feeding, and modern humans have a very reduced source of supply of EFA: we may also literally be "dumbing-down" our race towards eventual extinction.

Most people who come to therapy nowadays are seriously over-stressed. Humans, as we have seen, did not evolve to cope with motorcars, time schedules, school runs, 16-hour days, distant bosses, airplane schedules, mobile phones and computer terminals, etc. One of the most important things that we can and often do inform (or teach) our clients is how to relax properly and regularly, the benefits of exercise, how to de-stress, and sometimes how to meditate or to prevent stress. We need to teach them this from a sound perspective and understanding of healthy physiology. Often we are doing the job of health psychologists.

I believe that our predilection for warm baths, showers, saunas, Jacuzzis, swimming pools, and beach holidays carries a particular evolutionary significance.

For those of us who are willing, and competent, to touch our clients, we nearly always follow the downward pattern of the fine body hairs that flow the same way as water flows off the body. Such touch, we have recently discovered, stimulates oxytocin, as it does in most mammals.[xxxvi] Primates spend lengthy periods of time grooming each other, and such grooming has a significant place in their social interactions: who grooms whom, and when. Humans don't groom, unnecessary when most tics and fleas have been killed off by salt-water immersion, but we still need touch, and the touch is usually either this special type of directed downwards touch, or in the form of hugs and cuddles, especially important when one has just come out of the water, or there is a cold wind blowing.

Most importantly we must remember that we are touching essentially an aquatic mammal; one that swam, floated, and fed on the abundant shellfish in warm seas for thousands upon thousands of years. It is only with reluctance, or out of a sense of adventure, that we came back on to the land, bounded again by gravity, assailed again by harshness and hardness, subjected to a wide variety of new dangers and privations, assaulted again by weather and climatic change, having now to forage and even kill for food, and all the while we were exploring the benefits of language, and finding out different ways to use our hands, our legs, and this amazing new organ that we developed as a recent gift, as a by-product of our diet, and that now dominates our life: our human brain.

But we forget our animalistic origins at our peril, for that is our source of strength, our security, our renewal, and our salvation. In times of stress, we revert to the soothing warm waters or baths or beaches; in this time of increased global warming, increasing toxicities, and the prospect of rising sea levels and climate change, we may soon have to find our way back to the beach, or the rock-pool Garden of Eden, if we want to survive.

———————

[xxxvi] Moeberg, Kirstin: *The Oxytocin Theory*:

End References:

[1] Groimes, Ken: "Hunted": *New Scientis*t, No 2338 April 2002 : p.34-37

[2] Coss Richard G. & Charles Eric P.: The role of evolutionary hypotheses in psychological research: Instincts, affordances and relic sex differences: *Ecological Psychology*:16(3) 2004

[3] Klein, Richard G. & Edgar, Blake: *The Dawn Of Human Culture*: (Wiley) 2002

[4] Ardrey, Robert: *African Genesis* (Macmillan) 1961

[5] Stern J.T. Jr. & Susman, R.L.: The locomotoranatomy of Australopithecus aferensis. *Am. H. of Physical Anthropology*, 60, 1983.

[6] Stringer, Chris: Modern human origins: prospects and progress: *Paper for Royal Society*, (London) 2002

[7] Watson, Lyall: *Dreams of Dragons* (Sceptre) 1986

[8] Calvin, William H.: *A Brain For All Seasons: Human evolution and abrupt climate change* (U. Chicago Press) 2002

[9] Diamond, Jared: *The Rise and Fall of the Third Chimpanzee*: (Radius) 1991

[10] Hardy, A.: "Was man more aquatic in the past?" *New Scientist* 7; 1960: p. 642

[11] Morgan, Elaine: *The Descent of Woman* (Souvenir) 1972: Morgan, Elaine: *The Aquatic Ape* (Souvenir) 1982: Morgan, Elaine: *The Scars of Evolution* (OUP) 1994

[12] Freedman, Francoise, Water Babies (Southwater) 2004

[13] Tjarkovsky, Igor, a Moscow gynaecologist, discovered this in the 1960's.

[14] Irving, L.: "Respiration in diving mammals." Psychological Review 19, 112, 1939.

[15] Horrobin, David: The Madness of Adam & Eve: How schizophrenia shaped humanity, (Bantam) 2001

[16] Dawkins, Richard: The Ancestor's Tale: A Pilgrimage to the Dawn of Life (Weidenfeld & Nichlson) 2004

[16] Keleman, Stanley: *Emotional Anatomy* (Center Press) 1982

[17] Hartley, Linda: Wisdom of the Body Moving: An introduction to Body-Mind Centering: (North Atlantic Books) 1995

[18] Diamond, J: *Collapse: How societies choose to fail or survive* (London: Allan Lane) 2005