# *Human evolution and migrations*

**Young age for "Mungo Man" (*February 2003*)**

In the February 2001 issue of *Earth Pages news*, I commented on the extraordinary feat of Australian geneticists' having extracted mitochondrial DNA from fossil Australians that date back perhaps 60 thousand years (*Out of Africa hypothesis confounded?* January 2001). The oldest not only represents the earliest Australian yet found, but turned out to be very different from that of later inhabitants (Adcock, G.L. *et al*. 2001. Mitochondrial DNA sequences in ancient Australians: Implications for modern human origins. *Proceedings of the National Academy of Sciences*, v. **98,** p. 537-542**)**. That was "Mungo Man", named after an archaeological site near Lake Mungo in western New South Wales. At the time of publication, the date associated with the level in which the skeleton had been found was about 60 ka). This was so early relative to the evidence for a 70 ka estimated age for the last common male ancestor of DNA in modern humans' Y chromosomes (one pin in the Out of Africa Hypothesis), that multi-regionalists reckoned that it supported their ideas. Oddly, the dating, based on thermoluminiscence of quartz, which records the time since grains were last exposed to daylight, used material from 400 metres away from the burial.

Cranium of Mungo Man (Credit: Bradshaw Foundation)

In the last few years, thermoluminescence dating has improved. Using an optically stimulated variant to date sand grains from Mungo Man's burial, James Bowler and associates from Australia have resolved the problem (Bowler, J.M. and 6 others 2003. New ages for human occupation and climatic change at Lake Mungo, Australia. *Nature*, v. **421**, p. 837-840; DOI: 10.1038/nature01383). The burial was 40 ka ago, late enough for migrations spreading from Africa around 70 ka to have reached Australia. Bowler and colleagues suggest that first colonisation of Australia was perhaps around 50 ka. The date also support two other much debated ideas, that humans' arrival resulted in their eating to extinction most of the large animal species in Australia, and by using scrub burning on a large scale to drive game in the "red centre", changed the climate to its present arid state. Mind you, climate change may have been coincidental and arose from global cooling and low-latitude drying as northern ice sheets began to spread in earnest. Possibly climatic stress drove the first Australians to adopt fire as a hunting tool. What the new work does not do is set to rest the suspicions for even earlier occupation recorded by artefacts and even stone

markings that may be art. Some workers have suggested that these may date to more than 100 ka, although without a clue as to the creators.

**See also:** Young, E. 2003. Mungo Man has his say on Australia's first humans. *New Scientist*, 22 February 2003, p. 15.

**Darwinian evolution of humans challenged by Y-chromosome data? (*February 2003*)**

This section is usually reserved for items that predate historic times. However, new work on genetic markers in the Y-chromosomes of Central Asian (from the Pacific to the Caspian Sea) men has revealed an astonishing feature. Of the 2123 individuals who donated swabbed tissue for Y-chromosome DNA sequencing 8% have almost identical patterns of markers. Scaled up to the regional population, the data suggest that about 16 million men in the area show this peculiar similarity – about 0.5 % of all living males. The authors of the study (based in Mongolia, Uzbekistan, China, the UK and Italy) make a strong case for the direct male lineage of this living population having started in Mongolia 1000 years ago, and really getting underway with Genghis Khan's imperial exploits in the 13th century (Zerjal, T and 22 Others 2003. The genetic legacy of the Mongols. *American Journal of Human Genetics*, v. **72**, p. 717-722; doi: 10.1086/367774). For the line to have remained so dominant requires "social engineering" on an almost superhuman scale. Not only must Genghis himself have been the "stud" he is reputed to have been, together with his contemporary, close male relatives and their direct male descendants, but unrelated men of the time in that region must somehow have been excluded from access to local women. History suggests that was ensured by massacre and bondage on a vast scale throughout the history of the Mongol Empire.

Genghis Khan – Mongol Emperor (1206 to 1227)

Markers in Y-chromosome DNA arise through mutation, and are highly unlikely to carry any kind of genetically determined trait, least of all a predilection for pillage, murder and rape! Complex analysis of the distribution of genetic markers in populations leads to ideas about

how they arose, their relatedness to other markers, and an estimate of their age relative to one another. Study of Y-chromosome markers helps understand when a male lineage began. One such marker is estimated to have first appeared about 70 thousand years ago (see *Eve never met Adam* November 2000) and occurs in all analysed modern men, giving rise to the notion of a last common male ancestor living around that time. That all modern males are descended from him suggested some kind of evolutionary "bottleneck" at that time, through which only a very small, related group's were fit, in the Darwinian sense, to pass. Maybe some other mutations conferred that fitness. Perhaps some universal calamity reduced human population to only one or two small bands; chance rather than genetic determinism.. The third suggestion was that a small group's development of a new technology conferred the potential for them to have progeny that survived to breed successfully for generation after generation, thereby coming to dominate the small populations of the pre-agricultural period. The last would have had little to do with Darwinism, arising from a cultural change that had a dramatic effect. The Genghis-related Y-chromosome discovery raises another possibility, that of social and sexual dominance of some "Big Man" through political achievement and ruthlessness; aspects of conscious social being and culture, and indeed economics and technology. Tool makers and users who passed their skills down the generations are quintessentially human, and have increasingly developed with a cultural "cushion" from purely unconscious, natural processes for 2.5 million years. Surely, some kind of "Big Man" (and possibly "Big Woman") hypothesis has a place in thinking about human evolution as a whole.

**Gut bacteria and human migration (*March 2003*)**

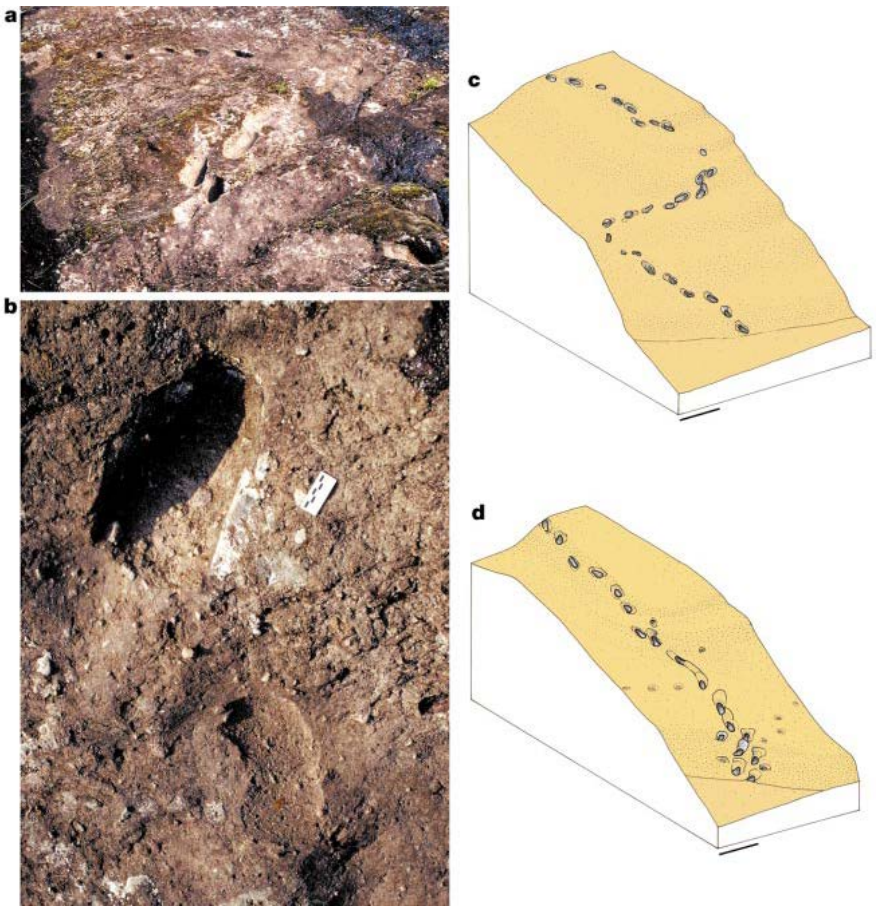
Our churning bowels and stomach mimic a variety of inorganic environments in which a large range of bacteria have thrived for hundreds, if not thousands of million years. The stomach has low pH thanks to hydrochloric acid, sufficiently strong to make limestone fizz should you be unfortunate enough to throw up while collecting fossils. Parts of the gut are highly reducing, so that humans contribute their bit to global warming through the action of our symbiotic methanogen bacteria, although much less so than ruminant mammals which are major methane producers. We also host sulphate-sulphide reducing bacteria, with sometime spectacular effects in enclosed spaces. The animal gut has been around for quite long enough for internal bacteria to evolve and adapt to the dietary habits of their hosts, mostly as symbionts. However, some are pathogenic and infective. One pathogen in particular is not infective, so its effects have remained undetected until recently. It is now known that a major cause of gastric and duodenal ulcers, and digestive-tract cancers is the Gram-negative bacterium *Helicobacter pylori.* Massive doses of acid suppressants and bactericides effect miraculous cures on individuals who have had decades of misery from stomach pain. Now that the culprit has been fingered, you will not be surprised to learn that its DNA has been studied in some detail. The results are surprising (Falush, D. and 17 others 2003. Traces of human migrations in *Helicobacter pylori* populations. *Science*, v. **299**, p. 1582-1585). *Helicobacter* is extraordinarily diverse, and regionally distinctive. Because it is pervasive, but not infective, the bacterium travels along with populations of its hosts, and is therefore a potential tool in tracking migrations. There are 7 geographically distinct *H. pylori* groups today, and their genetic structure can be traced to ancestors in Africa, Central and East Asia. Their geographic distribution matches those of human genetic and linguistic patterns, which have been attributed to the colonization of Polynesia and the

Americas, to Neolithic migrations of agricultural peoples into Europe from the near-East, the expansion of Bantu-speaking people in Africa and to the slave trade.

**Neanderthal review (*March 2003*)**

The last ten years has seen enormous developments in understanding the first Europeans. So, a review of how they lived, how they differed from us, how they might have thought and how they came to an end shortly after our immediate ancestors turned up is very welcome (Klein, R.C. 2003. Whither the Neanderthals? *Science*, v. **299**, p. 1525-1527; DOI: 10.1126/science.1082025)

**The first volcanologists? (*March 2003*)**




350.000 years old footprints at Tora e Piccilli on the Roccamonfina volcano Italy (Credit: Mietto *et al*. 2003; Fig. 1)

If there is ever a chance, the site that I would most like to visit is that discovered by Mary Leakey near Olduvai Gorge in Tanzania. A bedding surface in volcanic ash records footprints of two adult australopithecines and a juvenile who trudged together through fresh debris from a nearby volcanic eruption. The earliest and irrefutable confirmation of bipedalism, the tracks are also among the most poignant in the fossil record of humanity. Did this family survive the tragedy? The trackway is now covered to guard against erosion and theft. Altogether less heart-rending are younger footprints in an ash layer from the Roccamonfina volcano in Italy (Mietto, P. *et al*. 2003. Human footprints in Pleistocene volcanic ash.

*Nature*, v. **422**, p. 133; DOI: 10.1038/422133a), long known to locals as “devils’ trails”. The ash formed on the slopes of the volcano, as a pyroclastic flow, and the fossilised trail slopes at up to 80º. Because the ash is about 350 thousand years old, whoever made the prints were not fully modern humans, but probably ancestors of Neanderthals (*H. heidelbergensis*). The individuals had quite small feet, and may well have been children. The tracks come down the slope, both zig-zagging and showing occasional hand prints to steady the descent. They give the impression that whoever made them was not escaping an eruption, but having fun, much as kids today cannot resist hurling themselves down sand dunes and snow slopes. There is another possibility: curiosity drove them up the volcano after products of an eruption had cooled. Volcanologists cannot resist doing that either, and, as today, maybe they went up a little too early for comfort and had to leap for their lives.

**See also:** Muir, H. 2003. Earliest human footprints preserve prehistoric trek. *New Scientist*, 15 March 2003, p. 15.

**Ancestral lines squashed? (*April 2003*)**

Highly distorted skull of *Kenyanthropus platyops* (Credit: Wikipedia)

Many of the famous finds of hominid crania, on which ideas of human descent hang, consist of small fragments that have to be glued together to reconstruct their form. The basic work of palaeoanthropology is very like doing a 1000-piece jigsaw puzzle, but in three dimensions. Tim White, one of the pioneers of modern studies of hominin fossils, is now worried that the fragmentation of bone is connected with distortion during burial (White, T. 2003. Early hominids - diversity or distortion. *Science*, v. **299**, p. 1994-1997; DOI: 10.1126/science.1078294 ·). His own studies of fossil pigs present a disturbing pattern of post-mortem distortion that spurred earlier workers to subdivide them “exuberantly”. There are even “flat-headed flat pigs” and “narrow pigs” (literally, from their given Linnean names), but they are now known to be mechanically distorted remains of a single early pig.

Hominid crania viewed in this light, and there are nowhere near as many as those of pigs, are a mess. White gives one example, *Kenyanthropus platyops* ("flat face"), which may well be a distorted and quite ordinary *Australopithecus afarensis*. Combined with the shape variation within living species, notably humans but also among bonobo chimpanzees, distortion throws the bushy tree of human descent into considerable doubt, just as Jonathon Kingdon predicted 10 years ago in his book *Self-Made Man and His Undoing*. There are so few hominid remains, and most are a mess, that it seems impossible to decide whether many hominin species existed together at any one time in the Late Miocene to Early Pleistocene, or that just a few (even one?) spread to many different habitats across the face of Africa; something of a bombshell for those who make a tidy living from skull-hunting and hominin cladistics.

**Walking with Slade (*April 2003*)**

Imagine, if you will, the Pliocene savannah of East Africa and a band of upright apes (*Australopithecus afarensis*), each (even the females) with the trademark sideburns of Noddy Holder of the 1960's rock band Slade. Imagine too that peeping from the bush is a voyeuristic obstetrician who resembles Groucho Marx, drinking a hot beverage (Cuppasoup?) from a flask, and trying ever so hard to get one over on Whispering David (Attenborough). There is a story here, because one of the apes is Lucy, who gets clobbered in Pliocene Slade's fracas with a rival band (Status Quo?), her infant falling into the long grass. Her sister rescues the child, and all is well on the long road to humanity. That was the first episode of the BBC's *Walking With Cavemen*, the third series aimed at popularizing palaeontology, which began with *Walking with Dinosaurs*. All three owe as much to *Bambi* and *Dumbo* as they do to CGI and modern research, despite the best efforts of the numerous scientific advisors. I saw the trailer for the next episode, concerning *Homo ergaster* – quite apt, because that was "Action Man", that was. Not only were they white with tangled grey locks, but despite the brow ridges it was hard to conceal the fact that they were Pan's People and the Chippendales striding purposefully across a salt pan. Did even female *H. ergasters* have 6-packs? Physically arousing it may have been, again leaving out the brow ridges, the bad barnets and table manners, but I thought, "Tripe", and watched the footy the following week. (Note: "barnet" – rhyming slang for hair, from Barnet Fair).

**A genetic key to human evolution? (*April 2003*)**

It will not be too long before the publication of the chimpanzee genome. Because chimps are our closest relatives, and we shared an ape ancestor about 5 to 7 Ma ago, there is bound to be a media hullabaloo (and agitation among creationists) on the day of the release. At first sight, a comparison of human and chimpanzee genomes might seem to offer plain clues about the genetic side of our co-evolution, but evolutionary biologists are not so optimistic about an imminent breakthrough (Carroll, S.B. 2003. Genetics and the making of *Homo sapiens*. *Nature*, v. **422**, p. 849-857; DOI: 10.1038/nature01495). Their hesitancy stems from a matter of arithmetic and the sheer volume of work that needs to be done, as well as because of gross uncertainties about how genes relate to the important traits of humans and their differences from closely related apes. The human genome consists of about 3 billion base pairs and the gross difference from that of chimpanzees is about 1.2% (incidentally, it is likely that all mammals, from mice to men, share around 80%

of their genes). Assuming that this difference is split 50:50 between the results of evolution towards us and towards chimps over the last 5 to 7 Ma, the divergence from the genotype of our shared ancestor in the human genome should amount to about 16 million new base pairs. Some of them may be "chaff", but the genetic side of human evolution is buried in this massive area of potential work. Maybe around 200 000 are tied to evolved changes in protein production, that could be the key candidates for research. Although there have been claims for genes that control this or that side of humanness, properly tying down traits to genes will be an awesome task.

The differences between chimpanzees and humans manifest themselves in anatomy and behaviour, and a huge body of knowledge on both has grown in the last two centuries. So biologists know pretty well what they are looking for in terms of interesting genotype-phenotype links. However, a chart of those parts of the genome that account for the differences, whenever that becomes a believable reality, really does not help with the hows and whens of the course taken by evolution over several million years. They rely on the fossil record. Astonishingly, chimpanzee fossils are almost totally unknown, especially in the early part of their phylogeny. Even by the most optimistic account, the record of our predecessors is patchy and only a handful of near-complete skeletons are known from before about 500 ka. Carroll uses the most "bushy" version of hominin cladistics claimed by palaeoanthropologists, with 19 species, to illustrate the current status of hominin descent. White's view of the uncertainties (*Ancestral lines squashed?*, above) makes the crucial connections before about half a million years ago extremely flimsy. But, there will undoubtedly be a huge growth in human evolutionary studies, once the key chimpanzee data become available. Of course there will be a massive media hype as well, and all manner of outlandish claims. But maybe also more funds for palaeontology will stem from the potential to link the evidence from today's graspable realities with the exciting though puzzling anatomical record since the late Miocene.

**Elderly South African Australopithecines (*May 2003*)**

The Sterkfontein Caves near Johannesburg in South Africa have provided some of the best preserved hominid remains, because they are enveloped in chemically precipitated cement. Fossils are also much more plentiful than at other sites, and the caves have yielded about 500 specimens. However, unlike sites in bedded sediments interleaved with volcanic horizons, cave deposits are difficult to date accurately. Up to now, correlation of other fossil animals in the breccias that encase Sterkfontein hominids with those at more amenable sites, together with dating based on palaeomagnetic reversals, have been hotly disputed. A new technique based on the radioactive decay of isotopes that cosmic-ray bombardment induces in quartz grains promises to resolve the paradox of wonderful fossils that cannot be dated. While quartz grains are at the surface, in alluvium or the debris on slopes, cosmic rays produce radioactive aluminium and beryllium isotopes in a fixed proportion. The longer the exposure time, the more radioactive isotopes are produced. But if such irradiated grains are buried, the isotopes decay away, because they are protected by overlying material. Detrital sediments enter cave systems very quickly, so they are near-ideal for the use of cosmogenic dating. Of the two most-used isotopes, $^{26}$Al decays quicker than $^{10}$Be. So, the $^{26}$Al/$^{10}$Be ratio decreases with time and gives a measure of how long the sediment has been buried. Results from Sterkfontein (Partridge, T.C. *et al*. 2003. Lower Pliocene hominid remains from Sterkfontein. *Science*, v. **300**, p. 607-612; DOI:

10.1126/science.1081651) show that the stratigraphically lowest fossils are much older than previously thought; around 4 Ma. Previous age estimates suggested that the oldest Sterkfontein hominids lived around the same time as *Australopithecus afarensis,* of which the famous "Lucy" skeleton was an Ethiopian member. Four million years ago *A. anamensis* would have been a contemporary, yet the hominids at Sterkfontein seem quite different anatomically. Maybe there were two species in Pliocene Africa, one East African and the other a southern one. In fact, there are hints that perhaps two species of australopithecines, along with a more robust paranthropoid may have been washed into the caves. There are two problems though: cosmogenic dating is notoriously imprecise (the age reported is 4.2±0.3 Ma), and Sterkfontein has such excellent preservation that the number of specimens outweighs those from elsewhere – comparisons are not easy!

**Tracking migrations with language (*May 2003*)**

One of the first surprises that arose when genetic relatedness among living people and the estimated time of their separation began to encompass global populations was how well the genetic patterns matched with the distribution of the world's languages. When populations move they not only carry their genetic heritage but their languages. Probably the greatest migrations in human evolution took place at the end of the last Ice Age, and so it might seem that plotting language distribution ought to chart the paths these wandering people took. Jared Diamond and Peter Bellwood (Diamond, J. & Bellwood, P. 2003. Farmers and their languages: the first expansions. *Science*, v. **300**, p. 597-603; DOI: 10.1126/science.1078208 ) have reviewed just how complex such a task will be. Genes and language can tell only part of the story, because people carry skills and culture too. The two dominant cultures around 11 000 years ago were the age-old ways of the hunter-gatherer and the new agriculture and animal husbandry. There are at least five possibilities involved. Genes, language and lifestyle could mix between both groups when they came into contact. Hunters might take up farming but keep their identity. Hunters were as likely to shift as farmers when climate belts changed. Powerful incomers might impose their language but not their genes. When one group moved, another might take its place. Bearing in mind these caveats, Diamond and Bellwood review the main patterns of linguistic groups, using excellent graphics.

**Rasta man (*June 2003*)**

The late Ras Tefari Makkonnen (Haile Selassie) claimed direct descent from the liaison between Solomon and the Queen of Sheba, several millennia before his reign over Ethiopia. Now, "everyone knows" that we are all descended from a single African woman who lived about 120 to 150 thousand years ago – only the line of descent from her proved continually fertile and survived until now. So, it is perhaps fitting that the earliest known remains of properly modern human beings have emerged from the soil of Ethiopia, in the highly fossiliferous sediments associated with the Awash river that drains into the Afar Depression. The cover of *Nature* (12 June 2003) shows a forensic reconstruction from a male skull found at Herto Bouri, and it bears an uncanny resemblance to the handsome fellows who roam with their herds in modern Afar. There the resemblance stops, for the Afar are not truly African but hale from Arabia, as do many other Ethiopians. These human fossils are 160 thousand years old, and may be contemporary with "African Eve", or even earlier. The issue

of “modernity”, as with others based on anatomical features in incomplete fossil remains, is a bone destined to be gnawed at continually. The discovering team was led by Tim White of the University of California, who you will recall came up with the shocking suggestion that deformation of hominid remains could underlie a profligate splitting of human evolution since 4 Ma into many species, some of which might be spurious, even capricious (*Ancestral lines squashed?* above). The central feature of the well-preserved and undeformed Herto fossils is that they look modern, yet pre-date the classic Neanderthals of Europe (White, T.D. and 6 others 2003. Pleistocene *Homo sapiens* from Middle Awash, Ethiopia. *Nature*, v. **423**, p. 742-747; DOI: 10.1038/nature01669). The paper shows nicely, by photographic comparison, how the 160 ka humans lie between the more heavily browed archaic *H. sapiens* from Ethiopia and Zimbabwe (ca 500 ka) and 100 ka humans from Israel. However, statistical plots show graphically the limited number of specimens that palaeoanthropologists have to grapple with, even for relatively recent hominids. Modern as they appear, the Herto fossils lie outside the spread of morphologies gleaned from anatomical studies of Holocene humans. But they do have an astonishingly human characteristic.

All three crania, two adult males and an infant, show clear signs of cut marks (Clark, J.D. and 12 others 2003. Stratigraphic, chronological and behavioural contexts of Pleistocene *Homo sapiens* from Middle Awash, Ethiopia. *Nature*, v. **423**, p. 747-752; doi: 10.1038/nature01670). It appears as if the heads of the individuals were cleaned of any skin and flesh, probably by scraping with extremely sharp obsidian blades. The infant cranium is also polished, as if it had been carried around for a long period. Since the markings are very different from those produced by preparing carcasses for eating, and in any case only the brain is a substantial object for cannibalism of a human head, these marks must signify some kind of post-mortem ritual.

**The “Big Daddy” theory of human evolution! (*September 2003*)**

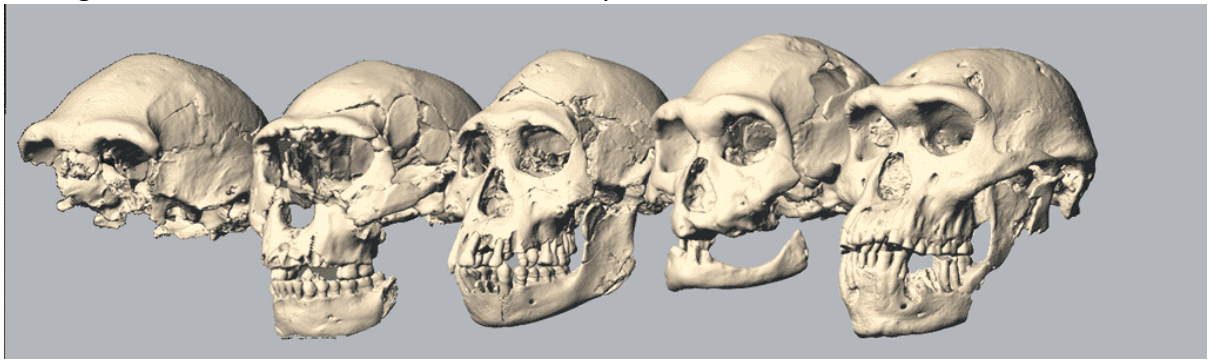
One of the anthropological shocks of the 21st century was the discovery that the gene pool of central Asian men is dominated by such a limited range of Y-chromosome characteristics that the only conclusion is that one small group of closely related men dominated impregnation across the region about 800 years ago. They were probably all Mongols closely related to Genghis Khan (see, *Darwinian evolution of humans challenged by Y-chromosome data?* above). Studies by geneticists from Italy, Portugal and Spain recently suggested that sexual dominance by very few men may have been widespread before about 18 to 12 thousand years ago, around the beginning of the warming that closed the last glacial epoch (Dupanloup, I. *et al*. 2003. A recent shift from polygyny to monogamy in humans is suggested by the analysis of worldwide Y-chromosome diversity. *Journal of Molecular Evolution*, v. **57**, p. 85-97; DOI: 10.1007/s00239-003-2458-x). Mitochondrial (passed maternally) and Y-chromosome (paternal) DNA studies have been key tools in explaining the timing of migrations of humans over the last 100 thousand years, since their genetic patterns seem to cluster regionally. Molecular clock estimates that use the appearance of new genetic mutations indicate the timing of population separations. The study by Doupanloup and colleagues examined data from individuals who live on all continents. There is an odd and generally distributed difference in genetic diversity between mitochondrial and Y-chromosome DNA, which superficially suggests far more women than men during the last glacial epoch. In terms of births, that is clearly impossible.

One explanation, favoured by Doupanloup *et al*., is widespread polygamy that dwarfs that which notoriously occurs within some religious sects today. Moreover, the "privilege" would have had to be passed on to successive generations of men directly related to the original "Big Daddies". Rapid shifts in power would not have left such a clear imprint on global Y-chromosomes. How that was achieved without repression or slaughter of potentially competing men, is impossible to judge. However, probable changes in EuropeanY-chromosome patterns around 70, 40 and 20 thousand years ago, that have been ascribed to either evolutionary "bottlenecks" during periods of rapidly dwindling numbers or sudden migrations, might equally have been due to the rise of new patterns of a few males' dominance over others. Dupanloup *et al*. show that the rise of agriculture around 10 thousand years ago seems to coincide with a breakdown of massive polygamy and more common monogamy. There are other possible interpretations of the data. In a largely monogamous society, if males stayed where they were born while women moved to live in their mates' home area, men would be closely related to others in their area, eventually resulting in very similar Y-chromosomes being shared by many. Different migration patterns or early deaths for most men while hunting may also have led to the genetic bias that is causing great discussion among evolutionary geneticists.

**Source:** Bhattacharya, S. & Le Page, M. 2003. A few prehistoric men had all the children. *New Scientist*, 6 September 2003, p. 18.

**First out of Africa? (*November 2003*)**

In 1991 archaeologists working at the Georgian site of Dmanisi, which had been an important town on the Silk Road, found human remains, but they lay beneath the level at which several extinct mammals had been found. As work progressed in the deeper levels, head bones emerged. They were exceedingly primitive, and associated with equally archaic tools; not the elegant biface stone tools of *Homo erectus* and later, truly human people, but similar to the Oldowan culture found with the earliest *Homo habilis* in Tanzania. The first estimate of their age, based on the mammal remains, was 1.6 Ma. Apart from disputed finds in Indonesia and China, the Dmanisi hominids were the oldest found outside of Africa. Yet at that time, the larger, more brainy *H. erectus* was thriving in Africa, using the Acheulean biface axes. For the Georgian archaeologists, and the growing number of international collaborators, 9 years of painstaking work lay ahead before enough data had been gathered to draw conclusions confidently.



Five skulls excavated at Dmanisi in Georgia. (Credit: M.S. Ponce de Leon & C.P.E. Zollikofer, University of Zurich, Switzerland)

A well illustrated summary of what Dmanisi has revealed appeared in the November issue of *Scientific American* (Wong, K. 2003. Stranger in a new land. *Scientific American*, v. **289**(5), p. 54-63). Lots fell into place, when eventually the stratigraphic position of the hominid remains was convincingly established using radiometric dating of basalts below and above it – 1.85 and 1.76 Ma respectively. With more cranial fossils, the Georgian team led by David Lordkipanidze and the late Leo Gabunia were able to show just how primitive the Dmanisi hominids were. Their brain capacity was half that of modern humans, and detailed skull features resembled the earliest known member of the human genus, *H. habilis*. They were small people too, and palaeoanthropologists really cannot decide whether they were australopithecines or part of our genus. Lordkipanidze believes that they are transitional between habilines and erects. What is most surprising is that they migrated as far as Georgia. That would have involved either crossing the mountains of Turkey and Iran, or, had they taken the possible route out of Africa across the Straits of Bab el Mandab (possibly dry land at the time), an even more circuitous route following the coast of Arabia and perhaps up the Tigris-Euphrates rivers. Their journey began before *H. erectus* invented the biface axe, which up to now has been regarded as the first sign of both a leap in intellect and the beginning of some command over the rest of nature. The Dmanisi hominids made it and survived, despite their apparently puny frames, if the abundance of animal bones at the site marks long occupation.