

Making Peace with Nature
By Dr Darren Curnoe
Department of Anatomy
University of New South Wales

International Darwin Day - 2006

Good morning, and thank you for the very kind invitation to speak today. My talk today briefly tells the story of the very close interrelationship or connectedness of our own species to the environment. I will demonstrate that in the past the environment has played a fundamental role in shaping our bodies and behaviours. I will also argue that our enormous capacity to alter, even destroy, the natural environment to suit the needs of our species can be traced back at least a couple of million years in our evolution. Indeed, it was this very capacity that allowed our ancestors to survive, but one which today has led to major destruction of the earth's environment such that our very own future as a species presently looks uncertain.

But before I get deeply into the human evolutionary story, the organisers of this event have asked me to speak about Intelligent Design, or if you prefer, Creationism, repackaged.

I will only make a few brief specific comments because, to be honest, there are much more interesting things I wish to talk about today that stem from our scientific understanding of human evolution. And, the topic of my talk will I hope convince you also that only a scientific understanding of our origins can help us to understand the challenges that we face today as a species.

Before I get to the science, I want to say that I, and many other scientists, are not anti-God, or anti-religion. It is a fact that most people in the world today believe in God, in one form or another, and many accept a version of Creationism, to account for the existence of the physical and living worlds.

I personally believe that Creationism should be taught in schools. It should be taught as part of history, or religious studies, or anthropology. Creationism in the Judaeo-Christian tradition is an important historical idea that has shaped Western culture dramatically and it needs to be taught. It needs to be said, however, in the strongest possible terms, that Creationism is completely at odds with the science I am best qualified to talk about, the science of human evolution.

Creationism is also a view of the world that has led us and every other species alive today down a very dangerous path: the path of massive and unprecedented environmental destruction. In considering humans as the pinnacle of life, forged in God's own image, and at the centre of the universe, we have developed an arrogance and a belief that to leave Nature untouched – that is unexploited for human economic needs – is a violation of God's special plan for us.

There is no mention of environmental sustainability or conservation in the creationist version of God's plan.

The events that we see in our prehistory are perfectly compatible with a Darwinian explanation for human evolution. Darwin's ideas provide a unifying thread running through modern biology and we have much to be grateful for to Darwin for his great vision and intellectual prowess. Today is the day we remember his monumental contribution, which has touched all areas of human endeavour: education, the arts and humanities, and science.

If we could invent a time machine, go back to the 19th century just before Charles Darwin's death in 1882, and bring him back to the beginning of the 21st century, I imagine he would be blown away by the incredible progress made in evolutionary biology over the last 125 years or so.

For example, science has recently sequenced the human and chimpanzee genomes. We know that almost 99% of our DNA is identical. This does not mean that we are 99% identical as species, as we are not just products of our DNA for there is a major role played by the environment in our foetal development and childhood growth and maturity. This amazing genetic similarity clearly indicates that we are both very close, in an evolutionary sense. We now know that humans and chimpanzees share an ancestor, which lived about 7 million years ago in Africa; that we humans and chimps are first cousins. Just to give this a timescale, the dinosaurs went extinct around 70 million years ago; so there were no dinosaurs around when the human-chimp ancestor was alive, contrary to the creationist portrayal of prehistory.

My two and half year old daughter insisted that I include a snippet from Madagascar in my talk. This one seemed appropriate.

The closeness of humans and chimpanzees raises some ethical questions for us; issues about the way we have and continue treat chimpanzees in the wild and in captivity. For example, do we have the right to keep chimps in zoos for their first cousin (us) to ogle and giggle at?

We now also have 1000s of pre-human and human fossils spanning most of the time back to the human-chimpanzee common ancestor. A prehistoric world in many ways very different to today.

In the past, we were not alone! There were other human-like primates with whom our ancestors shared the planet and interacted. They looked similar to us, and behaved in similar ways. Yet they were different species, and many of them left no genetic legacy for us; they went extinct without ever passing on a single gene to you and me.

Our understanding of the forces that shaped our evolution are also becoming clear now. We now know for example that climate change on a global scale played a major role in our evolution, as a driving force if you like.

Global shifts in temperature going back to more around 20 million years ago and lasting until very recently led to major changes in the distribution of tropical and subtropical forests in Africa. These maps show the difference in subtropical forest cover in Africa from 20 million years ago, the height of the ape biodiversity – there were 100s of different ape species alive back then but now only three in Africa – to around 7 million years ago when the human evolutionary line emerged.

Large areas of subtropical Africa would have gone from this...to this, in only a few 10s of thousands or 100s of thousands of years. A blink of the eye of time for evolution!

It was, as I said, during this period of profound environmental change that the human evolutionary line emerged. We know this because the first feature we see in the fossil record that is recognisably human and one that defines us relative to all other mammals is the human style of walking: our upright posture, and our walking on two feet. This is known as bipedalism. This is the style of locomotion that was present 7 million years ago in one ape that survived the contraction of subtropical forests: our earliest ancestor.

Later, we see great biodiversity in the human evolutionary tree. Pictured here a some of the wonderfully preserved skulls of some of our human ancestors from Africa spanning back over millions of years.

The bony fossil remains of our early ancestors have been found in Chad, Ethiopia, Kenya, Tanzania, Malawi and South Africa. There were large toothed forms human-like primates, which seem to have eaten tough vegetable foods, and small toothed forms that apparently ate everything. If it moved, eat it, if it didn't, have a taste anyway! It was the eat anything pre-human that was one of our early ancestors. Thus, the very broad human diet was established very early in our evolution, with perhaps one exception: our love for a big juicy steak! Our love of chocolate was something that came very much later!

About 2 and a half million years ago we see a very different form of pre-human. *Homo habilis*, or the handy man, which was the first human ancestor to make and use tools; hence its name. These tools were very sophisticated, as sharp as surgical steel, and indicate a highly intelligent mind capable of complicated tasks.

Homo habilis was probably also the first hunter as we think of human hunters. Using brain rather than brawn to track down, kill and prepare an animal for consumption.

Homo habilis also showed earliest evidence for the attribute that many people think of as being defining for humans: our big brains! *Habilis* shows evidence for brain enlargement, culture in the form of tools, and thus probably education, planning, forethought or thinking about the future, and perhaps also the rudiments of human language. Their brains were around the half the size of ours, but at least 50% larger than a chimpanzees.

The next species in our evolutionary tree from whom we inherited much – genes, body and behaviour – was *Homo erectus* or the upright man. A misnaming really as we now know that human ancestors had been upright for at least 4 million years by the time *Homo erectus* appears in the fossil record.

Homo erectus was an intrepid adventurer. It was the first pre-human to leave Africa and colonise the world. It did so during a period known as the Ice Age, which started about 2 million years ago.

This was a period of profound change: global climate cycles that fluctuated between warm and cold phases; shifting between them every 50 to 100 thousand years.

A very harsh world indeed! Not a nice place for a tropical ape to live and raise children. Here comes your woolly rhino steak!

To survive this harsh environment, *Homo erectus* used its immense brain power. It developed sophisticated behaviours that allowed it to settle successfully across Africa, in Europe and Asia, by one and a half million years ago. So, by about 2 million years ago, we have a human ancestor with a human body size, almost human brain size, culture, probably language, hunting, making of fire and clothes, and an appetite for woolly rhinoceros steak!

Finally, 200 or 300 thousand years ago, probably earlier, we see our own species, *Homo sapiens*, the wise man, appear in the fossil record.

Homo sapiens did, and does, everything *Homo erectus* did, but one better! Our species has colonised every continent and virtually every island the world has to offer and occupied every environment, no matter how luxurious or harsh, that nature has invented. Again, this would have required extraordinary innovation: adapting to harsh environments such as the north and south poles, with little food in the offing; crossing major

geographical barriers, such as deserts, mountain ranges, sea barriers, and the open ocean. It would also have required a detailed understanding of the seasons and new sorts of foods that could be eaten safely – no doubt many of kind died in this sort of experimentation, with lethal toxic plants eaten for the first time serving as a warning to other members of the group. New ways to manage the extreme cold would need to have been invented, including clothing, and probably footwear.

When the first pre-human made the first stone, or bone, or wooden tool, it marked deliberate alteration of the environment. That is, these pre-humans were changing their environment to suit their own purposes, to obtain food. This was small scale environmental change, but nonetheless significant.

But, our own species took environmental modification many steps further especially with fire, when we, began to burn the landscape on a major scale. Many pre-farming peoples, called hunter-gatherers, because they hunted and gathered their food from their surroundings rather than farmed it, regularly burned the landscape they occupied. We should remember that all humans were hunters and gatherers until about 10,000 years ago, and some are still today. This burning served to promote regrowth of plants and attracted animals that enjoyed eating the young fresh shoots. These animals were the very animals humans enjoyed eating.

So our ancestors altered their environment for at least 2 and a half million years in various ways. Sometimes burning led to long-term, sometimes destructive changes to the environment. So, our ancestors were not in harmony with the environment. Our ancestors to an extent created their own environments and this was a key to their, our, our evolutionary success!

However, large-scale changes to the environment on a scale that we are familiar with today, only really commenced during the period starting around 10,000 years ago, the so called Neolithic Revolution, when humans began farming. Farming started independently in three major centres around the world: the Middle East, China and in the Americas.

At this time, our ancestors cleared the land, turned it over to the growing of a single or a few plants for food, thus extinguishing natural biodiversity. They domesticated plants and animals, placing them within human made environments and bred them, for qualities of use to humans. Also At this time, many new infectious diseases emerged, malaria became a problem for humans, so probably did the flu and common cold, among many others.

The other major seed starting the environmental havoc we now wreak on the planet was an explosion in the human population that

accompanied farming. There were probably less than 10 million people scattered across the entire globe at around 10,000 years ago. Within about 6,000 years, this had grown to perhaps 100 million, and then with the Industrial Revolution a couple of hundred years ago, this growth became exponential and the result is the more than 6 billion humans that inhabit the Earth today.

So, tying all this together: I suggest that our destructive attitude towards the environment derives at least in part from our ancestors: they altered their environments to enhance their survival, and the survival of their descendents. It worked! The fact that we are here today is testimony to the success of their unusual ecological strategy. Their behaviours were to a large extent the result of Darwinian evolution, or evolution via natural selection.

Now, I'm not blaming our ancestors for the mess we have created, nor do I argue that it is all genetic, we could say that have we no choice, its all in our genes! On the contrary, natural selection endowed us with large brains, intelligence and language, the capacity to learn, to educate and plan ahead. It is these qualities that led us to manipulate the environment in the first place, and we must use them again now to get us and the planet out of the environmental mess we have created.

When we lived in small groups of hunter-gatherers with stone age technology our impact on the environment was low key. Today, with more than 6 billion people, engineering, industry, pollution, over crowded cities, an insatiable thirst for oil and electricity, and the nuclear bomb, we have the capacity to destroy all life on the planet.

Moreover, I would also argue that we do not have the luxury of thinking that God will rescue us and set all things right – where was God when the last dodo died, or when the hole in the ozone layer formed, and where will He be when the last wild-living chimpanzee dies sometime in the next 10-15 years?

The Creationsist belief has done little or nothing to prevent species from going extinct, or conserving living ones, or helping us to recognise, understand and alter the root cause of our present course. We have to take responsibility for the damage we have made. God will not come to the rescue!

We are the only human species of the 20 or 30 that nature experimented with, to have survived. The rest went extinct, without issue. Are we headed down the same path? How many other species will we take with us?

We now need more than ever before a story of human origins that is honest, open, and trustworthy. One that provides a genuine sense of our place in nature, our relationship to other organisms, and one that offers real understanding of our natural history, our evolution. Not one that

places humans on a pinnacle, above all other life, makes us feel special, and one that says its OK to exploit a gift given to us by a God who apparently had no sense of the consequences of His actions. We, like all species, are unique. But, the study of human evolution tells that we are not special. We have evolved through natural selection just like all other organisms alive today and in the past. Only science offers such an honest, genuine,warts and all view of our past.

We need to draw on those very capacities that our ancestors used when they first changed the environment – innovation, forethought and a deep understanding of nature – to change our behaviours, attitudes and cultures, to recognise a new way forward, a new chapter in our evolution, a new ecology, as they did, but one that takes account of our past, builds a new sustainable future for all life in taking account of our .

Only the scientific account of our past, our biology, offers the real chance to finally make peace with Nature; for our future and the future of the tiny blue planet we call home.