From Lucy to Language:
The Archaeology of the Social Brain

In 2003 the British Academy selected 'Lucy to Language' as its Centenary Research Project. **Professor Robin Dunbar FBA**, *Co-Director of the Project, reports on the first phase of the research programme to unpack what it means to be human.*

FEW would disagree that humans are a remarkable species. Though we share a long history with our great ape cousins, and much of our biology and psychology is all but indistinguishable from theirs, nonetheless those handful of features whereby we do differ are little short of spectacular. Only humans have created the computer, put anyone on the moon, written the works of Shakespeare and Molière, built the Great Wall of China, conceived the philosophies of Emmanuel Kant and Lao Zi, or invented religions as diverse as shamanism and Christianity. The list could go on. But while our technical skill is impressive, it is really our capacity to live 'in the imagination' that really differentiates us from all other animals. We seem to have uniquely advanced cognitive capacities that allow us to create virtual realities in the mind in a way that no other species can even come close to. It is human culture that sets humans apart.

So if we accept that it is here, in the world of the imagination, that the uniqueness of human nature lies, we are left with an obvious question: why should it have come to be this way? And why should it be only us?

Professor Robin Dunbar contemplates the skull of a European Neanderthal. Neanderthals very successfully occupied Europe and western Asia from around 200,000 years ago until they were displaced by the arrival of modern humans. The last Neanderthals died out around 28,000 years ago in Spain.

Ever since the discovery in 1856 of the first human fossil in the Neander valley near Düsseldorf in western Germany, archaeologists have puzzled about the course of human evolution. As the antiquity of our lineage has gradually been pushed back to its current origins at around 6 million years ago, several startling discoveries have emerged. The real shocker for our Victorian forebears would have been the fact that we are more closely related to the chimpanzees than either of us is to the gorilla, or any of the other monkeys and apes. But surprising as that bald fact may be, our subsequent history after our lineage parted company from that of the other apes some 6 million years ago contains even more surprises. One is the fact that the road from these earliest ape-like creatures to us has been far from linear. It has been more like a bushy tree, with a multitude of species of our family around at any one time. Indeed, the situation in which we currently find ourselves is almost unique: for the last 30,000 years, we have been the only member of our family alive. Yet, in the six million years prior to this there had been anything between two and half a dozen species around at any given time. Another surprise – offered us by developments in modern genetics barely a decade ago – is that modern humans had a rather traumatic birth: all currently living humans descend from just a handful of individuals who lived about 200,000 years ago. All the other lineages then alive went extinct over the ensuing 150 millennia, while ours underwent very rapid evolution – particularly in terms of brain size and geographic dispersion. It was more by luck than judgement that our lineage made it at all.

While the archaeologists have told us a great deal about the bare bones and stones of this story, two of the most important questions we could ever ask remain tantalisingly unanswered: What is it that makes us human? And how and why did we come to be that way? The Lucy to Language Project – the Lucy Project, for short – has the ambitious aim of trying to answer these two great conundra by filling in the social and cognitive

Handaxes at the 1.5 million year old hominid site at Chesowanja in the Kenya Rift Valley, east of Lake Baringo.

Right: Remains of houses at the Neolithic village site of Beidha in Jordan. When agriculture forced humans to settle in villages, it dramatically affected the patterns of our social relationships and changed the nature of social life for ever.

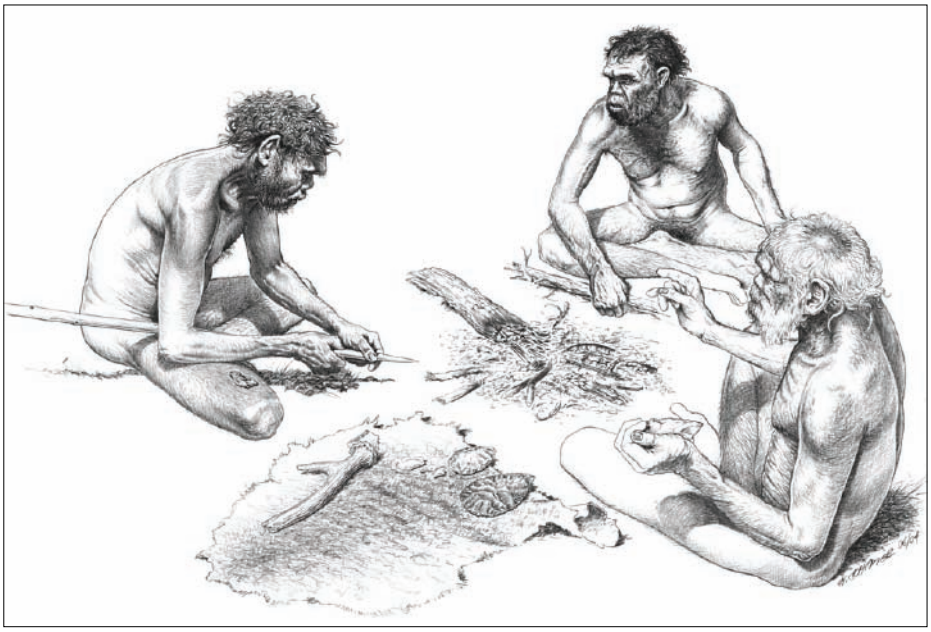
interstices between the bones and stones of the human story. The core to this endeavour lies with the Social Brain Hypothesis, the brain child of evolutionary psychologist Robin Dunbar FBA, one of the co-Directors of the Lucy Project. The Social Brain Hypothesis was originally developed as an explanation for the fact that monkeys and apes (and, of course, humans) have unusually large brains for their body size. The ex-planation for this lies in primates' intensely complex social lives, which are more cognitively demanding than the simpler social lives of other species. Within the primates, there is a simple relationship between brain size, on the one hand, and both social group size and social complexity, on the other hand. By applying some of the ideas of the Social Brain Hypothesis to the human fossil record, we hope to be able to illuminate the story of human social evolution.

So grand a project would inevitably be beyond the scope of a single discipline, so the Lucy Project has always been conceived as being a multi-disciplinary venture. Palaeolithic archaeology and evolutionary psychology constitute its essential core as the parent disciplines of the Project's three Directors. Professor Clive Gamble FBA (School of Geography, Royal Holloway University of London) is a specialist in the late Palaeolithic, with a particular interest in Upper Palaeolithic societies. Professor John Gowlett (School of Archaeology, Classics and Egyptology at the University of Liverpool) is a specialist in the first two million years of the long stone age record. And Professor Robin Dunbar FBA (School of Biological Sciences, University of Liverpool) is an evolutionary psychologist with particular interests in the evolution of sociality. In addition to these core disciplines, a number of other disciplines will be providing essential input into the grand story by helping to unpack what it means to be human. So far, these have included social and cognitive psychology, social anthropology, history, linguistics and sociology, but we expect the political sciences, economics, philosophy and religious studies, among others, to play a part as the Project develops.

The early phases of the Project have focused on understanding the broad ecological and cognitive background among monkeys and apes and what this has to tell us about the social life of our earliest ancestors, the australopithecines – one of whom was the famous Lucy, the 3.2-million-year-old fossil skeleton discovered in the Ethiopian desert in 1974 (said to have been named after the Beatles' song *Lucy in the Sky with Diamonds*). One of the aims of this phase of the project has been to identify some of the key crisis points in early human evolution that triggered major developments on the track leading to modern humans. At what point did meat-eating, for example, become critical? What constraints might there have been on the evolution of social groups? Modern humans are characterised by what is termed a 'fission-fusion' social system – we belong to dispersed social networks whose members do not necessarily meet all that often, even though they continue to share a sense of community, a characteristic we share with chimpanzees and some of the other apes. Understanding the ecological and cognitive forces that give rise to, and limit, these kinds of social systems provides an important starting point for exploring the broader scale of later human evolution.

The nature of social networks in modern humans is itself an important part of the Lucy Project, since this is the end-point up to which the long story of human evolution leads. As part of this, the size and structure of personal social networks is being explored among contemporary humans in modern post-industrial societies. In collaboration with Professor Bob Layton, a social anthropologist at the University of Durham, the lessons to be learned from contemporary hunter-gatherer societies are being explored, and then projected backwards into human evolutionary history to see how earlier societies might have worked and when their key elements might have emerged. In addition, these ideas are being applied to a number of historical case studies to give us insight into particular circumstances. In collaboration with medieval historians, for example, we are exploring the social world of the early Viking colonists of Iceland in order to discover how communities organise themselves in the absence of the constraints of formal political control. At slightly greater remove, we are exploring the social implications of the Neolithic transition at the dawn of agriculture, when the first settlements appeared. What impacts did the transition from hunter-gatherer to settled agriculturalist have on the way social life was organised? Finally, at even greater remove, we are exploring the context of hearths as foci of social life in the middle and late Palaeolithic of Europe and Africa: how did the growing control of fire influence our social world?

One of the surprising discoveries to emerge from this work has been that contemporary



The Three Wise Men? Stone tool knapping around the hearth as it might have been in the late Palaeolithic. (copyright: Karol Schauer)

Professor John Gowlett examines a hearth at the 400,000 year old occupation East Anglian occupation site at Beeches Pit.

Hearths became a focal centre for social life. Lightning strikes were presumably the source when our ancestors first learned to control fire.

Japanese macaques enjoy the relaxing experience of being groomed. Social grooming provides the glue that binds monkey and ape societies.

human social networks have a distinct structure. We are embedded in a series of concentric rings – the circles of acquaintanceship – whose sizes have a very consistent ratio to each other: each circle is almost exactly three times the size of the circle immediately inside it. The innermost circle consists of about five people with whom we have very intense relationships; the circle outside this includes an additional 10 people with whom we have a less intense but still strong relationship, making a total of 15 people in all; beyond this lie successive layers that enclose 50, 150, 500 and 1500 individuals. Both the frequency of contact and the intimacy of our relationships seem to drop off precipitously at each of these boundaries. Indeed, the circle that includes 150 individuals seems to be especially significant, because it marks out all those people whom we know as *persons*, as individuals with

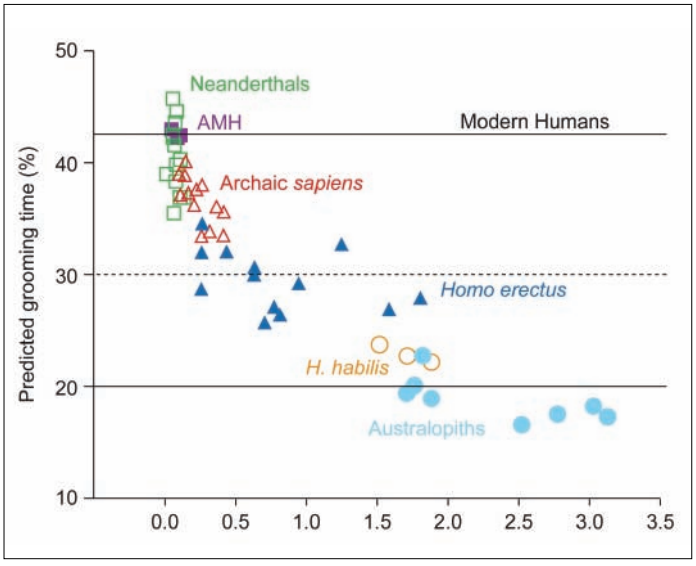
whom we have an individually definable relationship. They are the people whom we trust, whom we can count on for favours because we are linked to them through a series of personal relationships and social obligations. Individuals differ somewhat, of course, in the exact sizes of their circles of acquaintanceship – some people are just more social than others – but it seems that the pattern holds good across a wide range of individuals, societies and cultures.

Trying to understand why this pattern should be so remains a major challenge for the Lucy Project, not least because it seems to have important implications both for the way societies as a whole are organised and the way that businesses and other organisations are structured. Are the circles caused by psychological constraints on how many individuals we can hold at a particular level of emotional intensity? And if the limit is a psychological one, how does it relate to the size and structure of our brains? Or are these circles of acquaintanceship created by the fact that time is limited: if we have to invest a certain amount of time to make a relationship work at a given level, is the number of friends we can have at a given intensity limited by how much free time we have for socialising with them? Everyday experience would tell us that friendships fade gradually if they are not constantly reinforced by personal contact, especially those that are not in the most intense innermost circle.

Human societies are, in many respects, social contracts. We create social groupings of the kind defined by our networks to allow us to solve the problems of survival and successful reproduction more effectively. But social contracts of this kind are fragile arrangements. They are always susceptible to freeriders – those who take the benefits of the social contract, but don't pay all the costs. If the temptation to freeride becomes too strong, and too many people cheat on the social system, the contract very quickly falls apart. Those who are exploited too often become reluctant to trust their neighbours, and there is a rapid spiral into selfishness. Societies based on social contracts like this need mechanisms that enforce commitment to the communal ideal and police freeriders (or at least, ensure that they do not become too common).

Caught as a 3D jigsaw: the world's earliest evidence for work by the fireside, from Beeches Pit in Suffolk. One flake (bright red) rolled forward into the fire as an early human was making a hand-axe.

This important issue about the 'glue' that holds society together is being explored in a series of studies on the behaviour of small groups. Do individuals who laugh and play together trust each other more, and behave more altruistically towards each other? How important are charismatic leaders in bonding small social groups? Some of these topics are being explored in the Lucy Project by Professor Mark van Vugt, a social psychologist at the University of Kent. Other aspects of human culture like music and dance, story-telling and religion seem to play important roles in the bonding of small-scale communities. They will be explored in contemporary society in collaboration with specialists in these areas. And, of course, around the hearths, whose origins are being



Social grooming provides the 'glue' that binds primate societies. Using equations derived from the behaviour and brain sizes of living primates, it has been possible to predict both how large the social groups of fossil hominids might have been, and how much of the day they would have needed to devote to grooming to ensure that they remained cohesive.

A dancing therianthrope (half human, half animal figure) painted on the wall of Volpe cave in southern France about 12,000 years ago. Both dance/music and the world of the imagination played a crucial role in the later stages of the evolution of modern humans. (copyright: Arran Dunbar)

explored in the Palaeolithic record, what does one do but tell stories and sing songs, both of which serve important functions in bonding social groups? So the work on the early control of fire indirectly opens up a theme in the role of story-telling and music in creating a sense of community. And this raises further questions about the cognitive demands that story-telling, for example, makes on both story-tellers and their audiences. Many of these are issues of the moment, topics to which we would like answers in the here and now. Is a dysfunctional society the inevitable consequence of the fragmentation of our social networks as people move in search of career opportunities? Are there lessons to be learned about the contemporary situation from the apparent power of religion to move people, for example?

But whatever emerges from these studies of contemporary humans, we are always brought back to the archaeological record. What can we learn about the origins of these phenomena from the signatures they have left us in the stones and the bones? What can the archaeological record tell us about the evolution of the anatomical structures that make language possible, or the cognitive demands of tool-making? Can we say anything about when they first appeared, and the circumstances under which they did so? And do these, in turn, tell us anything about the reasons why these capacities evolved? Some of these questions are already being explored by members of the Lucy Project, but as our understanding of these core social and cognitive features of what it is to be human emerge from our research, so it will cue us in to the key traits to search for, as well as help us identify the likely time frames within which we should look.

Visit the Lucy Project website at
www.liv.ac.uk/lucy2003/index.html