UNIT 1—INTRODUCTION TO HUMAN ORIGINS

History of Resarch into Human Origins—Part I

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Welcome to Archaeology 131: an introduction to research into the origins of us humans. We will be investigating the course of human evolution from our very early primate ancestors up until the emergence of us modern humans. It will include 14 *PowerPoint* and lecture units that can generally be divided up into 4 major topic sections:

The first major section is an introduction to the history of this area of research and an examination of the fundamentals of evolutionary theory and genetics;

The second is an introduction to primates and the basic primate condition in terms of both their evolution and primate adaptations as observed among modern, living species of monkeys and apes;

The third major topic section will be an examination of the fossil record of human evolution from pre-hominin primates through to the emergence of modern humans—you are going to be introduced to all our major fossil ancestors and will come to recognize and understand the major differences that distinguish them. This will be paralleled by an abridged survey of the development of material culture and technology;

And, the fourth major topic section will be an examination of modern human variation and adaptation.

I hope that you find this course as interesting to learn as I find it to teach. It covers some of the really big questions about what it means to be human.

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This course is essentially an introduction to the science of Physical or Biological Anthropology. These terms, Physical Anthropology and Biological Anthropology, are synonymous and using one or the other is just matter of preference.

While the nature of the research is quite specialized, Biological Anthropology and research on the origins of humans is part of the larger discipline of anthropology. In its broadest sense, anthropology is the study of people: their biological evolution and their modern and ancient cultures; including their material culture—the things they made and used, their social structure, their economic systems, and their ideology.

Anthropology is traditionally divided up into several sub-disciplines:

- CULTURAL ANTHROPOLOGY—the study of living people and their cultures
- ARCHAEOLOGY—the study of past cultures, mainly through an examination of the material culture they left behind
- PHYSICAL or BIOLOGICAL ANTHROPOLOGY—the study of human biological evolution and the study of human remains recovered from archaeological sites
- and some researchers include LINGUISTIC ANTHROPOLOGY -the study of languages—how they work, how they evolve, and the role they play in culture

The only real difference between these sub-disciplines is the type of data with which questions about human behaviour are addressed. Of course, each discipline approaches trying to understand human behaviour by asking different types of questions as well. For example, an archaeologist might want to know what the function was of the 2.5 million year old stone tools found in East Africa. A physical anthropologist might ask; “what were the differences in the morphology of the wrists and hands of the hominins who made these early stone tools compared to the hominins from 3 million years ago who apparently didn’t make stone tools?” Both scientists are trying to

better understand our early ancestors' behaviour, but are approaching this from different points of view and with different types of data.

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***Why do Biological Anthropology*?**
At its simplest, biological anthropology is reconstructing our evolutionary past—putting together some understanding of the process of human evolution and the steps that occurred along that path.

However, the evolution of our physiology is strongly tied to the development and evolution of human culture: in fact, we understand today that these cannot realistically be separated. Material culture and human social behaviour have had strong affects on the process of human biological evolution and *vice versa*.

By understanding the history and process of our biological and cultural development and our place within the biological world, we have a much broader and more accurate context within which we can try to understand the human condition in general—why we are the way we are and why we do the things we do?

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Let's begin by taking a look at where, when, and how human origins research first began. This is important for us to know because it will explain how we got to where we are now in our understanding of human evolution.

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Before we begin the story into the science of human origins, let's take a look at the context of these earliest investigations: **The earliest scientists?**

There is no doubt that human curiosity resulting in systematic investigation of the natural world: science in some form or other, were not restricted to stern, bearded, white men of 18th and 19th century Europe. We know that significant advances in history, astronomy, math, philosophy, and the natural sciences were also being developed many centuries ago by people working in East and South Asia, and in the Middle East. In fact, much of modern knowledge owes a huge debt to Arab scholars of the 7th to 12th centuries who saved many of the

writings of the important Greek philosophers and scientists (like Plato, Aristotle, and Socrates) and made huge advances in arithmetic and astronomy.

In fact the oldest continuously operating universities (if we include just those which grant degrees) are in the Arab world: *Al-Azhar University was initially founded in Cairo in the year 975 AD. *The oldest, however, is the University of Al-Karaouine in Fes, Morocco which began in the year 859 AD. If we were to include formal institutions of learning, designed to produce professional scholars, but which didn't grant actual degrees, the oldest would likely be in China.

However, it is also the case that, due to mainly random historical circumstances, the modern sciences as we know them today were generally born of systematic pursuits of knowledge carried out in Europe during the 17th through 19th centuries. Thus, discussions of the history of science tend to be strongly Eurocentric, but not without reason.

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Pre-Scientific Frameworks

Prior to the Enlightenment in the mid to late 18th century, views of the past and of human history in general, were structured and restricted by religious dogma and the biblical framework. For most people the biblical version of things was the absolute truth and could (and should) be taken literally. Interpretation was considered dangerous and when, and if, it was necessary, must be left to the 'learned' members of the clergy. Even following the Protestant Reformation in the 1500s, when for a large percentage of the population of Europe the Vatican was no longer the ultimate authority, it was still generally heretical to really question the teachings of whatever church you happened to be a member of.

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In terms of the history of mankind, the ultimate framework was provided in the 1650s by Irish Archbishop**, James Ussher**. He carefully analyzed the genealogy of the biblical patriarchs going back to Adam and Eve and calculated that the world was actually created in **4004 BC**—on Sunday, Oct. 23—at 9 a.m.! However silly this might seem to many of us today, for many years this provided the strict

parameters within which any enquiry about human history could be conducted.

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Besides putting limitations on any thoughts of a distant past for humankind, the bible also stated quite explicitly that god had created all the creatures of the earth. To the Christian church this meant that he created them **in the exact form that we see them in today**—the idea that they could change over time was, therefore, considered heretical.

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In the 18th and 19th century, geologists and paleontologists began to have a lot of trouble reconciling the biblical framework with what they were encountering in the world around them—both in terms of the limited time frame and with the idea that things couldn't have changed. Geologists could see that, in some places, numerous layers of different types of sediments that had been accumulating for so long that they were kilometers thick! and Paleontologists could see all the different species of organisms stacked in these geologic strata that strongly suggested that, in fact, in terms of the history of life on earth, *CHANGE* was the only constant.

The issue really began to come to a head in the mid to late 19th century when fossils began to turn up that looked similar to us, but were obviously different. Although several Neandertal skeletons had been found in the first half of the 19th century, these went unrecognized for several decades.

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It wasn't until 1856 that workmen quarrying Felderhofer Cave in the Neander Valley in West Germany found the remains of what have come to be seen as the "original" Neandertal. Right away this skeleton became important…

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In fact, the first person to examine the original Neandertal skeleton, a schoolteacher named **Johann Fuhlrott**, recognized that it was

something different from modern humans and an important find. *Fuhlrott brought the fossil to the attention of a German biologist, **Hermann Schaaffhausen**, who also recognized the fossil for what it was and was the one who announced the discovery to the world. Schaaffhausen had come to accept the theory of evolution and fought for its acceptance throughout his career. The discovery of an obviously very ancient human who was notably different from us modern humans seemed to be pretty definite proof of evolution. No explanation for this could be found in the bible.

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However, **Rudolf Virchow**, the founder of modern pathology and a big name in the sciences at that time, refused to entertain the idea of evolution and declared the Neandertal fossil to be that of a modern human—one with skeletal pathologies that would explain the morphological differences—ricketts or arthritis. This is ironic since he, better than anybody of the time, should have recognized this to not be the case. But he could not bring himself to think that there might have been other versions of humans in the past.

He was not alone among the important people of the day in holding this point of view and it presented a significant barrier to legitimate research into human evolution for many years.

And so, before any real investigations into the human past could begin, what was required were some changes in people's understanding of the world in general and the emergence of some radical thinkers to voice what must have become obvious issues among many 19th century scientists.

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Three major changes in thinking were required:

1. The first major change in thinking that was needed was an understanding of the ***extreme age of the earth***.

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We can watch a river depositing silt on its banks….

- wind depositing or eroding sediments….
- or waves depositing sand on a beach or eroding a coastline.

These are the same processes that have been going on for millions of years and the dominant processes that shape the geology that surrounds us—it is these processes that have resulted in geological formations that, in many places, are very, very thick.

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The Canadian Rockies, for example, are about a 12 km thick stack of layers of sediments piled up on top of each other—geologists can easily identify these as the types of rocks that form on ocean floors and, in fact, we can find the fossils of ocean creatures in these layer. It is clear that it would take many millions of years of deposition to produce such deposits.

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In 1785, ***James Hutton***, a Scottish geologist, recognized this—rather than occasional, dramatic, earth-changing events, like the biblical flood, the processes that had always been forming the earth's surface were the same ones that you could witness going on today—slow deposition and erosion by wind, water, and gravity.

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From this understanding he formulated the ***"Law of Uniformitarianism"***—that is: "*geologically ancient conditions were the same as or 'uniform to' those of today*".

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Fifty years later, in 1835, ***Charles Lyell***, a student of Hutton's, argued for an extreme antiquity for the earth based on his own observations of the earth as well as those of Hutton and other geologists and paleontologists.

While the church argued against this, the evidence was just too dramatic and compelling for it to be dismissed for very long.

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2. The second major necessary change was an understanding of the ***extreme age of human history***.

Suggestions that human history might be considerably older than the bible would maintain had cropped up from time to time going back several centuries. In 1797 an English farmer, **John Frere**, reported finding stone tools in association with the bones of extinct animal species in Hoxne, England. He even published his findings, although they went generally unnoticed at the time.

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Then, in 1841 a French customs inspector and amateur prehistorian, ***Jacques de Boucher de Perthes***, published his discoveries from St. Acheul, near the town of Abbeville in Northern France, of flint axes that inarguably predated any biblical flood because, like John Frere's, they were in close association with extinct animal species. Few people accepted Boucher de Perthes' claim at the time. The artifacts were argued to be natural.

According to different interpretations of the day, flaked stone objects, like handaxes, were either 'products of lightening strikes', or 'faerie bolts', whatever a faerie bolt is…

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or, in the learned opinion of one 17th century "expert", they were "*generated in the sky by a fulgurous exhalation conglobed in a cloud by the circumposed humour.*"

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However, in the 1850s a British scholar, ***Hugh Falconer***, curious about Boucher de Perthes' findings, visited the site at Abbeville, France himself and was convinced of the authenticity of the association

between the stone tools and the extinct animals. He then convinced other leading British scholars to visit the site as well.

In 1859 a paper was presented at the Royal Society of London supporting Boucher de Perthes' claims. While there were still many who refused to buy it because of the implications for the biblical framework, this was really a turning point in scholarly thinking.

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3. The third necessary change in thinking was about the **mutability of organic life**—'***evolution'***.

This was a necessary concept in order for people to accept the fact that the human-like fossils that were starting to be found actually represented our ancient relatives and that we, like all other organisms on earth, had gone through changes over time.
By the 1700s and early 1800s there were some scholars who had already suggested the existence of some sort of process of species change over time.

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In the early 1800s, a French naturalist, Jean-Baptiste Pierre Antoine de Monet, Chevalier de Lamarck—or just, “Lamarck” for short, championed the idea that organisms could pass on to their offspring characteristics that they had acquired over their lifetime—for example, a blacksmith’s children would inherit larger arm muscles or the children of a cowboy would inherit bowed legs.

- this theory of Inheritance of Acquired Characteristics, now defunct, came to be called “Lamarkianism”.

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The classic example is the giraffe's neck. According to Lamarckianism, as each generation of giraffe strained to reach leaves in tall trees their necks would become longer. This longer neck was then passed on to their offspring.

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Lamarck's publication of his theory sparked a bitter debate with ***George Cuvier***, a French paleontologist, who argued against the mutability of species and the existence of fossil man. He championed the traditional biblical line, the concept of ***fixity of species***. Cuvier did, however, contribute significantly to the science of paleontology and is, today, considered one of the most important natural scientists of the 19th century.

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Throughout the 1800s there were others, including Charles Darwin's grandfather, ***Erasmus Darwin***, who speculated about the idea of a process of evolution. But it wasn't until ***Charles Darwin***'s *'On the Origin of Species*' that anyone had come up with a feasible mechanism by which evolution could work….. that is, the idea that not all individual organisms can survive to have offspring and, therefore, those individuals with slight adaptive advantages will be the ones to pass on these traits on to subsequent generations.

Darwin had been working on this theory for many years, but he was quite shy and hesitant to publish it, until a contemporary of his, **Alfred Russell Wallace**, came up with a similar theory independently—this encouraged Darwin to publish his theory immediately in 1859.

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The implications of the theory of evolution were that even humans had evolved from what were seen as "less advanced" forms of life. Like Darwin, most biologists and paleontologists had long recognized that monkeys and apes likely had some close ties to us—based simply on similarities in body form. Because of our close resemblance to the great apes—gorillas and chimps—Darwin went so far as to suggest that Africa was the most likely place to find our earliest fossil ancestors—a good guess at the time.

Darwin's theory was initially met with stinging, bitter opposition from the clergy and the general public. Many people were unprepared to except the idea that we were descended from some "brutish sub-human" species, or to accept the threat to biblical teachings that this represented. Many personal attacks on Darwin were launched in the

newspapers. Of course it was not clearly understood by most people that there was no straight evolutionary line from living species of apes or monkeys to us.

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But the idea of evolution gradually became generally accepted—with the help of brilliant supporters like biologist ***Thomas Henry Huxley***, who came to be known as “Darwin’s Bulldog”, but was, in his own right, one of the most important scientists of the 19th century. When presented with Darwin’s theory, Huxley was so impressed by its simple logic that he apparently exclaimed *"How extremely stupid not to have thought of that!"*

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Finally, in 1886, two almost complete Neandertal skeletons were recovered from the site of **Spy d’Orneau** in Belgium. These fossils caused a lot of researchers who had been unconvinced to begin to doubt the naysayers like Rudolf Virchow. These new fossils were just too similar to the original Neandertal, which strongly suggested that these were all normal individuals from some ancient population of similar such individuals—rather than examples of relatively recent people with some sort of bone pathologies.

The work of an Austrian monk, **Gregor Mendel**, on the process of inheritance in organisms helped make evolutionary theory become more widely accepted. His work began in the 1850s, but it went unnoticed until 1900. Mendel will come up again in a later lecture.

Once scientists had begun to generally accept that evolution was real and that Neandertals represented a step along our evolutionary line, it was almost immediately understood that, if they were our ancestor, Neandertals must represent a relatively recent and close relative and not a major link between modern humans and apes—that link was still missing.

hominin fossils.