

Commenting on the Need for Rock Solid Pre-Historical Models: Exposing the Inadequacies of the Out of Africa Theory

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Abstract: The objective of this paper is to revisit the ongoing debates and controversies regarding the origin and evolution of humans, and also to evaluate the various pros and cons associated with various versions of the Out of Africa model, and the multiregional hypothesis, given that these are the two major classes of models in common intellectual discourse and debate. We would also like to state and declare emphatically at this juncture that there is inadequate or insufficient evidence to jump to grand conclusions. Instead, the only viable path forward would be to synthesize data from across a wide variety of fields, and develop rock solid and robust interdisciplinary models that can be further refined as more and more data emerges. This approach would serve the best interests of science and scientific progress. We also propose the wholly independent multiregional model, with evolutionary paths taking place across Africa, Europe and Asia, and complex, multiple and divergent ways, with oversimplification posing a major obstacle to scientific progress. We also show that many species from the dawn of life have been universal or near universal, but this may be because different species around the world may be subject to similar evolutionary pressures, and may therefore have pursued similar evolutionary paths. Of course, migrations would always be possible given the scarce fossil records of early humans in Australia, and in North and in South America, but these must be justified on a case to case basis, and must not be beyond the realm of possibility taking into account geographical barriers and technological constraints.

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I. INTRODUCTION

About thirty years ago there was much talk that geologists ought only to observe and not theorise; at this rate a man might as well go into a gravel-pit and count the pebbles and describe the colours. How odd it is that anyone should not see that all observation must be for or against some view if it is to be of any service. (Charles Darwin on Sept. 18, 1861, in a letter to Henry Fawcett, quoted e.g. in Gould 1992 and in Shermer 2001)

Science must begin with myths, and the criticism of myths – Karl Popper

‘It is better to debate a question without settling it than to settle a question without debating it’ - Joseph Joubert

The objective of this paper is to revisit the ongoing debates and controversies regarding the origin and evolution of humans, and also to evaluate the various pros and cons associated with various versions of the Out of Africa model, and the multiregional hypothesis, given that these are the two major classes of models in common intellectual discourse and debate. We would also like to state and declare emphatically at this juncture that there is inadequate

or insufficient evidence to jump to grand conclusions. Instead, the only viable path forward would be to synthesize data from across a wide variety of fields, and develop rock solid and robust interdisciplinary models that can be further refined as more and more data emerges. This approach would serve the best interests of science and scientific progress. We also propose the wholly independent multiregional model, with evolutionary paths taking place across Africa, Europe and Asia, and complex, multiple and divergent ways, with oversimplification posing a major obstacle to scientific progress. We also show that many species from the dawn of life have been universal or near universal, but this may be because different species around the world may be subject to similar evolutionary pressures, and may therefore have pursued similar evolutionary paths. Of course, migrations would always be possible, given the scarce fossil records of early humans in Australia, and in North and in South America but these must be justified on a case to case basis, and must not be beyond the realm of possibility taking into account geographical barriers and technological constraints. This paper also presents some additional points of argument to show why the traditional out of Africa model may be somewhat outdated at the present time, and must be jettisoned in favour of more complex evolutionary models.

This paper is to be construed as a social and cultural Anthropologist's honest criticism of the long-standing Out-of-Africa theory explaining the origin and spread of humans across the globe, a theory which has come under severe criticism over the past one decade. This paper must also be viewed as a criticism from the point of view of scientific and research methodology, and from a multidisciplinary standpoint. This we believe, would set it somewhat apart from other common and growing criticism of the aforementioned theory. This paper stems from the Author's interest in this field as he has been publishing research papers on Human Migrations for well over two decades. We evaluate another contender, the Multi-regional hypothesis, and evaluate the evidence in support of this hypothesis and examine its drawbacks as well. In this paper, we propose a variant of the Multi-regional hypothesis, the 'Wholly independent Multi-regional hypothesis' explaining the origin of the Human species. This hypothesis is formulated taking into consideration aspects of natural history current theories cannot adequately and satisfactorily explain. Wherever required, the author has aggressively sought and hunted down data from various other related fields as well. In this hypothesis, we state that it is reasonable to assume that humans evolved independently in more than location around the globe, unless it can be proven convincingly in specific geographical contexts that migrations, assimilations or population replacements took place and autochthonous origins are unlikely. Such proof may come from either genetic data, or from tools and other cultural artifacts. In sum, postulated migration paths must not be based on hunches alone. Evidence may be either strong or weak, and we had discussed the concept of strong and weak evidence on multiple occasions previously. The author is aware of the tentative nature of this hypothesis, given the paucity and the incompleteness of the fossilized record demonstrating the transition of early primates to Homo Sapiens, but will argue that approaches such as these alone can provide a satisfactory receptacle that can fit in all prospective future data. It is therefore imperative to create a phalanx to challenge and replace other constructs.

Factors that may work against the early wholesale adoption of this theory are also listed here in the true spirit of dialectical approaches. While answers to questions people ask cannot be found immediately, or gaping holes in hypotheses closed immediately, such models deserve to be evaluated as they have the potential to trigger the search for precise and fine-tuned explanations and hypotheses including wide-ranging alternative scenarios, and eventually, the search for further data. The truth is however, far from certain at this juncture, and needless to say, there can be a range of solutions between the recent OAT and the Wholly-independent Origins, and these include models proposing migrations to specific regions only. We propose the term 'Wholly independent multi-regional hypothesis' because, we believe that this should constitute the base assumption, and exceptions proven on a case to case basis in order to avoid gross over-simplifications. This approach will also account for the genetic diversity among human populations around the globe, (including genetic diversity within Africa too) our pithy moniker here being 'Similar but

distinct'. The major advantage of various versions of the multiregional hypotheses – including this variant – is that they are much more multilayered, complex and intricate – they can also be easily adjusted and modified as more and more data emerges in comparison to the highly simplistic out of Africa model which begets confirmation biases and over-simplification driven errors of judgment and commission.

Of course, migrations are always possible, and indeed entirely reasonable, (except some highly unrealistic ones) but we believe that the strength of the possibility of migrations must be argued on a case to case basis. Recent out of Africa models also give very little time for the forces of evolution such as genetic mutations (including speciation, macro mutations, and adaptive radiation) and genetic drift to occur, and in some cases, population bottlenecks and the founder effect too. We must also note at this juncture that the interrelationship between fossils is various parts of Africa is notoriously unclear and uncertain. We have an absolute dearth and paucity of data at the moment. We cannot and must not change theories "one fossil find at a time"; comprehensive and interdisciplinary model building is the only viable path forward.

We will argue over the next couple of pages that gross over-simplifications such as the old Out of Africa theory should not persist in the broader and larger interests of science. Real world problems are complex, and can seldom be so simple and straightforward, especially given that long time frames and large swathes of geographical territory are involved. There is a lot of persistent criticism against the old Out of Africa model, and indeed criticism has been escalating over the past couple of years. Why would tens of thousands of people (if not many, many more) migrate from Africa to the whole world? What motive triggered this? Some postulated migration paths may also not be tenable, such as those to Japan or remote Polynesian Islands. An alternative hypothesis is the multiregional hypothesis. But perhaps the truth lies somewhere in-between, and some migrations did indeed take place. Also, Out of Africa proponents also accept the fact that other hominins pre-existed elsewhere in the world. Also, the classification of early humans into hominin groups is not cast or set in stone. A reclassification of hominin fossils has already happened on a couple of occasions. There is too little data, and some rethinking may be required, at least in some cases, and subject to more data being uncovered. Some miscegenation may also have taken place across ethnic groups in ancient times. Researchers and scholars tend to engage in ding dong battles and settle into well-trenched intellectual camps and cul-de-sacs. This may be in part due to rampant careerism. Perhaps that is not the right way forward in the best interests of science.

The emphasis should be on building rock solid and foundational pre-historical models and then tweaking or modifying them as new data emerges. Paleontological data alone should not and cannot be the basis, as we have relatively very little of it at present. Some careerism is tolerable, but it should be subservient to scientific and

scholarly interests. As such, believe that scientific method and the philosophy of science need a foundational overhaul. Gross over-simplifications damage science. We must desist from the tendency to target popular audiences in lieu of targeting erudite, scholarly audiences. Theories must be constantly revised as and when more and more data becomes available. Also, the amount of human genetic diversity on the planet points to the fact that more complex models are required. Also, classifications, between early hominins are subject to revision as more data emerges, at least in some cases. They are not always necessarily set in stone. Does the out of Africa model satisfactorily account for the sheer breadth of human genetic diversity? We don't think so. The human genetic diversity within Africa itself is mind-blowing- both in early, prehistoric times, and modern, contemporary times.

Of course, there are several other distinct possibilities- for example, population densities could have varied from region to region, and these could have been at variance with modern population distributions. Secondly, evolution timeframes may have varied from region to region, and may have begun in some parts of the world earlier. Thirdly, fossils may have been better preserved in some parts of the world than others, and may have been more widely excavated in certain regions too. Moreover, Africa is just a large continent with enormous human genetic diversity, and Out of Africa models do not generally postulate which part of Africa migrations emanated from. All these factors and aspects must be borne in mind too. Time alone will provide us a complete picture. It is too premature to jump to conclusions, as there is presently relatively very less data available. Hasty generalization can be dangerous, and is such is widely recognized as a scientific fallacy. We must guard and stand vigil against premature declarations of “fait accompli” the latter would only be making a mockery of the truth. The paths of evolution from primates to early hominins and then to anatomically modern humans have yet to be clearly mapped out, and we are still a long way from getting to the truth. A candid admission of this fact is vital to all future progress in the field.

➤ *What is a Research Model?*

A research model may be defined as a simplified, (though elaborate enough and not oversimplified) structured representation—that may be either visual, diagrammatic, mathematical, or statistical, —that clearly depicts the most important variables involved in a research study and how they may be relatable to one another in different ways. In some, a research design may be thought of as a blueprint or a roadmap that guides and steers researchers throughout the process of data collection, hypotheses formulation, testing and refinement, and the interpretation of results derived from a study. There are several core aims and objectives of a research model, and these include the simplification of data by weeding out needless and superfluous complexity, by cutting through the maze and chaos of a real-world problem to focus primarily on pertinent and relevant factors. It also guides researchers throughout the process of analysis and the definition and measurement of complex sets of variables and their patterns of correlation. It is also used to test

theories by translating broad and high-level concepts into testable, and measurable statements. The more common and widely used research models include descriptive models that summarize and organize data in a simplified yet interrelated way, predictive models that are used to extrapolate past patterns and data to forecast and predict future trends and possible outcomes. Explanatory models, on the other hand, are primarily used to uncover the cause-and-effect relationships between independent and dependent variables, including intervening variables in some cases.

Research models are also related to conceptual frameworks which are generally broader and more structural. It outlines the overall context, background, and general direction of the entire research project. Good research models most often also make use of data drawn from diverse fields of study – this is known as interdisciplinary research or multi disciplinary research. Transdisciplinary research on the other hand used data from a much more diverse set of fields of inquiry, and is only being common of late. We had discussed all these three concepts multiple times in the past, and readers are as such request to read these papers as necessary. Interdisciplinary models may however be somewhat difficult to build because researchers may not be trained in multiple specializations or fields of study, and there may be differences in methodology, approaches, jargon, and terminology used. There is a general tendency of researchers to operate and function in silos, and this continues to remain a highly unfortunate and deeply disturbing trend. According to research methodology standards, a highly effective research model possesses several defining characteristics such as comprehensiveness, accuracy, reliability, and simplicity. In other words, good research models are clear, lucid, unambiguous and parsimonious. They are also strongly theoretically grounded – with reference to clear and undiluted findings and proven findings, testable, measurable, and logically structured. They are also generalizable, falsifiable, and possess explanatory depth and breadth.

The key and most important advantages of a research mode are that they drive focus and research productivity and efficiency, improve accuracy, precision, and replicability, besides channelizing communication efficiently. We have also written extensively on research methodology and the philosophy of science in the past, and readers are requested to read our previously published papers such as “Envisaging a New Era in Interdisciplinary and Transdisciplinary Research: Presenting the COMPASS Model for Interdisciplinary and Transdisciplinary Research”, which was published by us a couple of years ago. Research models also commonly include historical models, and common examples of these include models to construct patterns of dispersal of Indo-European speakers from a postulated urheimat or an Indo-European homeland. Historical models can also be used to depict the relationship of the Indus valley civilization to the cultures of the Gangetic plains , or the transformation of Harappan India to Post-Harappan India. Models can be used to map pre-historical data too, and this is what we mean in this context. Of course, data

must be tied from both ends, and emic and etic views obtained. This is what we had emphasized previously. Otherwise, researchers run the risk of thinking in bits and pieces, and getting it all wrong in the process.^{1 2 3 4 5}

➤ *A Brief Introduction to the Mystery of Life*

The origins of life are complex indeed, and available evidence suggests that different forms of life most often did not originate in a single location and spread to other places—as a matter of fact, the overwhelming quantum of evidence suggests otherwise. This is of course not to say that we support teleology, determinism, the strong anthropic principle, or the weak anthropic principle blindly, implicitly, or unreasonably; far from it. We have no connections whatsoever, to any religious ideology, and have even written against religious dogma extensively. We would only like to state that it is quite reasonable to expect that similar life forms existing in different parts of the world were subject to similar evolutionary pressures due to climactic conditions, and other known or unknown and under investigated factors and forces. The origins of life have bewildered thinkers right from the times of Anaximander (610 BC-540 BC) and Empedocles (495 BC – 435 BC). Aristotle (384 BC – 322 BC) introduced the concept of vitalism, and believed that life was propelled by a mysterious, non-material force. One of the earliest modern theories of evolution was given by Jean Baptiste Lamarck (1744-1829), and this is known as Lamarck's theory of evolution. Some ideas on evolution were also provided by Erasmus Darwin (1731-1802), who was the grandfather of Charles Darwin. However, present theories on evolution were provided by Charles Darwin (1809-1882) who was a gifted naturalist. His famous voyage aboard *The Beagle* between 1831 and 1836 provided the basis for his famous and greatly acclaimed work 'The Origin of Species' which introduced the concepts of 'Natural Selection' and 'Descent with Modification'. Subsequent theories also saw the emergence of further schools of thought such as Neo-Lamarckism and Neo-Darwinism.

Subsequent decades also saw breakthroughs in the field of Genetics whose founding father was Gregor Mendel (1822-1884). Although his work was not recognized during

his lifetime, it was rediscovered by Hugo de Vries, Carl Erich Correns and Tschermak in 1900, and further work was done by JBS Haldane and AR Fisher. Oswald Avery (1877-1955) discovered in 1944 the DNA formed the basis for transmission of Genetic material. Even though some inquiries into the structure of DNA were made by pioneers such as Erwin Chargaff, the most important contribution was by James Watson and Crick who discovered the Double Helix structure of DNA. Major work on Mitochondrial DNA was done by RL Cann, M Stoneking and A C Wilson in 1987. Even though major breakthroughs have occurred in vital fields, the origin and dispersal of *Homo sapiens* around the world, and their interrelationships, if any, with other species of hominins have eluded consensus as of the early twenty-first century, and as such, it still remains a major scientific puzzle. The Out of Africa theory or the complete replacement theory, was proposed by Chris Stringer and Peter Andrews in 1988, to accommodate the large number of hominin fossils found in different parts of Africa. However, the earliest similar proposal was made by Charles Darwin in his seminal and epoch making work "the descent of man" based on a preponderance of ape fossils in Africa. Other supporters of the Out of Africa model in some form have included the likes of Savante Paabo, Allan Wilson, Rebecca Cann, Mark Stoneking, Michael Petraglia, and Nicole Boivin. However, even the Out of Africa theory acknowledges the fact that Neanderthals were present in Western Europe at an early date, but recommends interbreeding and partial replacement. Modern and contemporary Out of Africa proponents are also at a complete and total loss to explain how the transition from primates to Neanderthal man occurred; the same is the case with *Homo Erectus* and *Homo Pekinensis*. They are also at a complete and total loss to explain the cause for extinction of such species. There are clearly a lot of bewildering and baffling mysteries and unresolved issues here, in spite of the fact that Chimpanzees and Gorillas are found only in Africa—however, other known apes exist elsewhere such as the orang-utan of Borneo and Sumatra—these regions have yielded rich hominin fossils as well. After all, several extinct apes lived in Europe, examples being *Rudapithecus*, *Ouranopithecus*, *Graecopithecus*, *Hispanopithecus*, *Pierolapithecus* and *Anoiapithecus*.

The key premise of this paper is what we call the "Wholly independent multi-regional hypothesis of the origin of *Homo Sapiens*". This approach which is a variation of the Multi-regional hypothesis questions the recent Out-of-Africa origins of *Homo Sapiens* and suggests that humans, like other universal, semi-universal or pervasive species such as canines, felines, bovines, equines and pachyderms, appeared independently around the world having followed similar but distinct evolutionary paths, and without in any way undermining Charles Darwin's principles of Natural Selection or necessitating ideas such as teleology or pre-determinism given that fact that evolution as it is known today does not plan for the future, have any long-term goals and is primarily driven by local considerations. This is the core tenet of this approach, and one which will impact any analysis of the origin of languages considerably. Our approach would constitute a form of polygenism. This idea

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² Kara, Helen (2012). *Research and Evaluation for Busy Practitioners: A Time-Saving Guide*. Bristol: The Policy Press

³ McRaney, David (2022). *How Minds Change: The Surprising Science of Belief, Opinion, and Persuasion*. New York: Portfolio/Penguin

⁴ Gauchat, Gordon William (2008). "A Test of Three Theories of Anti-Science Attitudes". *Sociological Focus*. 41 (4): 337–357

^{5 5} Marburger, John Harmen III (10 February 2015). *Science policy up close*. Crease, Robert P. Cambridge, MA: Harvard University Press

was first proposed by Franz Weidenreich and Carleton Coon in 1984, and then refined by Milford H. Wolpoff. Researchers Alan Thorne, Erik Trinkhaus, Franz Weidenreich, and Xinzhi Wu also support the multiregional hypothesis. This model which is known as the Multiregional Continuity Model, proposes that *Homo Sapiens* independently originated in different parts of the world from *Homo Erectus* at roughly the same time. However, Multiregionalists also admit to some gene flow among humans. (Smith et al, 1989) One example multiregionalists talk about is the similarity between humans in Indonesia and aborigines in Africa in the form of massive cheek bones, projecting face etc. There are also other via media models such as the leaky replacement model, and the braided stream assimilation model. All these may be partially true, but we require not jumps of logic and untenable logical non-sequiturs, but cogent and coherent (systemic) evidence.

We reach similar conclusions in this paper, but follow a wholly different approach. We admit that while there would undoubtedly exceptions to this model in the form of human migrations, these will need to be attested or inferred either directly or indirectly using some form of reliable evidence. This approach automatically induces complexity into the research process. An example for this would be the somewhat scanty evidence for early human fossils and the absence of apes in North America which appears to be the biggest trump card for recent Out of Africa proponents. Instead of basing hypotheses purely on existing or available evidence, it would be a better idea to adopt more comprehensive and multi-disciplinary approaches, and look for alternative and via media explanations wherever possible: examples of these could be possible low populations of primates and early humans in the region, loss of fossil records etc. Another possibility is that migrations may have happened much earlier and in smaller numbers. However, notions of primates floating on rafts to reach the Americas from Africa appear to be too fantastic to believe. Region-specific approaches and proposals and a combination of both approaches may also bring us closer to the truth, but autochthonous origins would probably be a much safer bet for most regions than miscegenation. Again, it would be too early to place a bet on anything, but it would be safe to say that dialectical approaches would be our perennial magic wand and would stand us in extremely good stead. Wherever other explanations fail, migrations may naturally be the only plausible explanation. Another model is the Candelabra model which postulates that *Homo Erectus* left Africa and colonized the rest of the world. This model which was proposed by Carleton Coon in 1962, is now considered to be outdated. Our approach differs significantly from the Candelabra model, and the two must not be confused.

The idea of plurogenesis (or the ‘Wholly Independent Multi-regional Hypothesis’) does not imply that humans emerged independently in every part of the world. Also, it may not be a good idea to propose over-simplifications targeted at a popular audience: solutions to real-world problems would naturally be seldom simple, straightforward, sensational or based on politically-correct premises

and strategies. All newer approaches are expected to remain controversial for some time in the absence of reliable or concrete evidence, but time alone will bear testimony to the eventual outcome of complex debates such as these. On the other hand, if more unsophisticated solutions such as the canonical Out of Africa theory are opted for, and willy-nilly become the gospel truth, all further progress is eventually thrown out of the door. We need to be prepared for a wide variety of outcomes, and we also anticipate substantive progress in the decades to come and hope that the issue will be studied with the microscopic precision it undoubtedly deserves.

➤ *A Brief History of the Earth*

According to standard theories taught to us today, the Milky Way Galaxy began to form some 13.6 billion years ago, and the leading theory proposes a Big Bang or a Cosmic Explosion. The earth, on the other hand, evolved some 4.6 billion years ago from interstellar dust that comprised mostly hydrogen and helium and smaller planetesimals. Around this time, or sometime later, a Mars-sized body appears to have collided with this young and newly-formed earth, and this also appears to have played a role in the formation of the moon. This, combined with the high temperatures on the young earth, would have made Earth inhospitable for at least the first one billion years of its existence, and much of the Hadean and Archean periods. Around 4 billion years ago, the earth was still being bombarded by meteorites, and the Sun was much dimmer than it is today. The Earth also span much more rapidly than it does today, and the day barely lasted five hours. Oxygen was non-existent in the atmosphere, and the percentage of carbon-dioxide in the atmosphere was much higher. The Earth was fully molten. It is believed that the oceans first formed some three and a half to four billion years ago as clouds that poured enormous amounts of rain began to form. Oxygen gradually began to build up starting some two million years ago.

➤ *A Brief History of Life on Earth: Bacteria*

It is believed that the Earth's first life forms began to form during the Archean period some three billion years ago. The earliest life forms are believed to be primitive bacteria Archeobacteria or prokaryotic bacteria which may have been well over three and a half billion years old, as attested to by evidence from Australia, Canada, Greenland, and other places. These eventually evolved into well over 4000 forms of Bacteria. It is as yet unclear whether they originated on land or in the oceans, but they are today ubiquitous and pervasive. Algae, which had the ability to photosynthesize, first appeared during the Paleoproterozoic period some 3 to 2.5 billion years ago. These were all unicellular forms, and many contained RNA rather than DNA. The causes of the origin of life are extremely unclear. However, most modern researchers such as Al Oparin, JBS Haldane, and Sydney F Fox believe in Abiotic or physiochemical evolution, and that life was created in deep-sea hydrothermal vents. There were believed to have been several steps in the process, including free atoms during the Hadean period, the birth of inorganic molecules, simple organic molecules, complex organic molecules, colloids,

coacervates or microspheres, protobionts, progenotes, and then simple life forms with PNA or Peptic Nucleic acid turning into RNA again turning into DNA for Genetic material. There have been no successful attempts to create life out of nothing using artificial methods despite some experiments by Stanley Miller and Harold Urey. However, the theory of evolution as first proposed by Lamarck, and then hugely reformatted by Charles Darwin in subsequent years to include 'descent with modification' and 'natural selection', is an undisputable fact, and has withstood the test of time. However, modifications are suggested from time to

time, examples being Stephen Jay Gould's Punctuated Equilibrium model as opposed to the earlier uniform gradualism.

Multi-cellular, and then relatively more complex life forms with eukaryotic cells are believed to have originated in the Neoproterozoic period some 800 million years ago including eukaryotic bacteria which are similar to the Bacteria present today. The birth of multi-cellular life forms was followed by an explosion of life forms during the Cambrian period, some 500 million years ago.

Table 1 Periods in Earth's History as Per Scientific Convention

Geological era	Geological period	MYA
Cenozoic	Neogene	0-23
	Paleogene	23-65
	Cretaceous	65-145
Mesozoic	Jurassic	145-200
	Triassic	200-250
	Permian	250-300
Paleozoic	Carboniferous	300-360
	Devonian	360-415
	Silurian	415-445
	Ordovician	445-488
	Cambrian	488-540
	Neoproterozoic	540-1000
Protozoic	Mesoproterozoic	1000-1600
	Paleoproterozoic	1600-2500
Archean		2500-4000
Hadean		4000-4500

Some researchers also believe in the Atmospheric transport of such life forms to the farthest reaches of the world. This accounts for the prevalence of such forms at high altitudes and accounts for the role of dust storms in their world-wide dissemination. However, this does not convincingly show why life should have originated only in one place as the same factors were present everywhere. This does not however, explain the spread of all forms of life and does not propose mechanisms for the spread of other forms of life.

➤ *Viruses: The Boundary Between the Living and the Non-Living*

Viruses are extremely small; viruses range only from 50 nanometres to 200 nanometres in diameter, and are deemed parasites typically reproducing with a host cell. There are a wide variety of viruses, some enclosed only by a shell of protein, and some containing and some others containing a membrane-like envelope as well. The genome is ensconced within this covering, containing DNA, or in some cases, only RNA. Viruses lack the components of a typical cell such as nucleus, plasma membrane and cytoplasm. They cannot generate energy or synthesize proteins on their own. Theories on the origins of viruses are highly uncertain, but some scientists believe they were the first forms of life on earth. Others however, think Bacteria evolved earlier as viruses are parasites, but the debate rages and attempts to identify the Last Universal Common ancestor (LUCA) have proven elusive. Viruses are the

boundary between living and non-living, but exhibit some properties of life such as the presence of Nucleic Acids and the ability to make copies of themselves. Needless to say, Viruses are known throughout the world.

➤ *Early life: Algae and Photosynthesizing Life Forms*

It is now known that blue green algae or cyanobacteria, which evolved towards the end of the Archean era or the early Proterozoic era, first used the process of photosynthesis to generate Oxygen. This is sometimes referred to as oxygenic photosynthesis. This greatly helped release oxygen into the earth's atmosphere at a time when there was very little Oxygen in the earth's atmosphere, even liberating oxygen from water, thus radically changing the composition of the earth's atmosphere, and paving the way for other life forms. Free oxygen, it is believed began to build up some 1.8 billion years ago, during the early Protozoic period, and this process accelerated due to the multiplication of Oxygen-producing algae. Simultaneously, the percentage of carbon dioxide in the Earth's atmosphere began to decrease rapidly. Algae also contain Chlorophyll, and are Eukaryotic. Algae can be either unicellular or multi-cellular. They are a universal species and are found throughout the world.

➤ *Early Life: Fungi*

Fungi are a group of eukaryotic organisms which evolved between 1.4 billion years ago, and 900 million years ago. They do not contain chlorophyll and do not photo-

synthesize. They are classified into several different types such as Phycomycetes and Ascomycetes. Fungi are also a universal species.

➤ *Early life: Multicellular life forms and the Cambrian Explosion*

It is believed that the diversity and complexity of multi-cellular forms greatly increased in the paleoproterozoic and the mesoproterozoic periods, and well before the Cambrian explosion of life forms. Multi-cellular organisms also began to develop spines during this era, but the earliest examples of fully-formed spines date to around 500 million years ago during the start of the Cambrian explosion. Examples of organisms that lived in this era were Acrithids. Such organisms gradually evolved into more complex forms such as the Ediacarans. The Cambrian explosion, or the emergence of many new types of animal life during the Cambrian era some 500 million years ago, is one of the most baffling puzzles in science and is poorly understood. The first large trees came into being 500 million years ago, and the Earth was covered with forests some 400 million years ago. The end of the Paleozoic era was marked by the Permian-Triassic Extinction event which occurred some 250 million years ago.

II. THE PANGAEA

The Pangaea which was a giant super-continent located in the Southern Hemisphere during the Palaeozoic period and surrounded by a giant ocean known as the Panthalassa, began to break up in stages starting from the Triassic Period some 250 million years ago, or perhaps sometime later than this, and the process of break up appears to have continued till the Cretaceous period. This supercontinent itself was formed around 335 million years ago, and all our data must be validated against this model. This was a complex and long-drawn process, producing several intermediary continents such as Laurasia and Gondwana, and continents did not reach their present form until much later. In pre-Pangaea times, Vaalbara, Kenorland, Nuna, and Rodinia also were postulated to have existed.

➤ *The Dinosaurs and their Extinction*

Dinosaurs were the dominant vertebrate animals which lived from about 230 to about 65 million years ago. The earliest Dinosaurs appeared at the start of the Triassic period or earlier. They increased in size, complexity, diversity in numbers throughout the Triassic, Jurassic and Cretaceous periods, but the Cretaceous period appears to have marked their zenith. After this, there was a mass extinction of dinosaurs probably due to the collision of a major asteroid nearly fifteen kilometers in diameter with Earth which threw up large quantities of dust and destroyed other plants and animals as well. This extinction event took place around sixty-five million years ago. However, some mammal and birds appear to have survived this extinction, and evolved into mammals. In the early Triassic Age, all continents we joined together, but subsequently, they broke up. Mammals evolved from Synodonts or mammal-like dinosaurs which lived about 220 million years ago. This completes the entire cycle of evolution: fish to amphibians, amphibians to

reptiles, and then reptiles to mammals. The extinction of Dinosaurs heralded the Cenozoic era and more particularly the Paleogene period, or the age of the mammals.

Many Dinosaurs likewise were cosmopolitan, and their fossils have been found throughout the globe. For example, fossils of Stegosaurus have been found in North America, East Asia and South Asia. Similarly, fossils of Pachycephalosauria have been found in North America and East Asia. These are from the Late Cretaceous period i.e. less than 100 million years ago. Fossils of the type Ceratopsia are similarly found in North America and Asia while Iguanodontia have been found all over the world. Fossils of Sauropodomorpha, another group of Dinosaurs have been found in North America, South America, Europe, Asia and Africa. Similar observations can be made for Theropoda (which are again of many different sub-types and sizes) and other Dinosaur types, and it would be far-fetched to attribute this to migrations. These observations would serve to reinforce the 'Similar but distinct' hypothesis. Opponents would again need to explain why evolution happened in more than one location concurrently and why different species appear to have been subject to the same evolutionary pressures. Reversely, if we assume that each species evolved only from one predecessor species and only in one location, we would need to produce viable hypotheses for the migration of every cosmopolitan or universal species that ever lived to different parts of the world. This is a tall order, a gargantuan task, and at best an unviable option.

➤ *Birds and their History*

The earliest primitive bird Archaeopteryx first appeared some 150 million years ago in the late Jurassic age, and fossils of this type have been preserved in Solnhofen in Germany. They may have represented a transition between Dinosaurs and modern birds, and their flying capabilities may have been limited. According to one theory, the ancestors of birds were small arboreal Dinosaurs. This would also seem to suggest that Birds appeared simultaneously around the globe. However, the spread of some kinds of birds around the world can be attributed to their ability to fly long distances. This explanation does not hold water for some kinds of birds and most other species. For example, hens and the common crow are found in many parts of the world, and so are the pigeon and the sparrow.

➤ *Mammals: Identifying Universal and Cosmopolitan Mammals*

Mammals, or animals belonging to the class Mammalia comprise some 4600 species of animals. The earliest ancestors of mammals date from the carboniferous period around 300 million years ago, but the first true mammal appeared in the Triassic period some 200 million years ago. Early contenders for this title include Morganucodon, Brasilodon quadrangualis and some others. Many palaeontologists think Mesozoic mammals evolved from the therapsids of the Palaeozoic period. Mammals diversified and increased in complexity during the Jurassic and Cretaceous periods and some small mammals lived alongside Dinosaurs. Mammals appeared to have survived

the mass extinction 65 million years ago and evolved into larger and more complex mammals. Many mammals such as dogs (canines), cows (bovines) and cats (felines) are near-universal, and are found in many locations around the world with some genetic differences. Others such as Elephants or pachyderms (Africa and India) and Tigers (Siberia, Caspian region, India, Indonesia: some extinct) are found in more than one region, and across ecological niches, and it would be somewhat difficult to attribute this to migrations, even though peripatric speciation and parapatric speciation may sometimes have been involved. For example, even though sand cats evolved in a particular region of the world, they can be easily interbred with almost any other species of cat. Likewise, Siberian dogs can be mated with Indian street dogs, (or with Pomeranians to produce Pomsies) but nobody says dogs emigrated from Siberia to India or vice versa. Again, several large wild, cats are native to the Americas, including the extinct American lion, panther atrox, which humans could not have taken with them. There are native American horses too- Two main extinct species of the genus *Equus* lived in the Indian subcontinent, long before historical times namely *Equus sivalensis* (Sivalik horse) and *Equus namadicus*. It is highly unlikely that they migrated in land bridges, but instead evolved independently in different parts of the world.

➤ *The Paleocene Epoch and Possible Early Primates*

Primates are an order of evolved placental mammals comprising some 300-350 species and include all monkeys, prosimians, apes such as chimpanzees, gorillas and orangutans as well as modern humans. Primates are first attested in the fossil record some fifty five million years ago at the start of the Eocene epoch, and evolved right through the Miocene epoch, which was their golden age. This term originated from the Latin word *primus* which means 'first'. We have two primary types of primates, and these are old world primates and new world primates. Old World monkeys belong to the scientific family *Cercopithecidae*, and are often called cercopithecids as a part of the group catarrhines. New World monkeys are also often called *Platyrrhini*, which means "flat-nosed". Humans are descended from early primates, and the earliest one of the earliest observations and models showing this descent was proposed by Carl Linnaeus. Interestingly humans are genetically the most closely related to Chimpanzees which are believed to share around ninety-six percent of their DNA with humans. There are many features that characterize Primates. They have an erect or a semi-erect posture, an opposable thumb, possess the ability to grasp things with their hands, move their limbs freely, and make use of tools to varying degrees. They also possess binocular vision or stereoscopic ability. Primates have body hair, are characterized by live birth, and have an innate ability to learn as a result of increased brain complexity. All Primates have two sets of teeth, namely, infant teeth and adult teeth. They also have different kinds of teeth (Heterodonty).

Palaeontologists have discovered fossils of different types of primates in North America, Europe and Asia dating to the Paleocene epoch. The fossils of the earliest primates or ancestors of may be as old as 65 million years old.

Palaeontologists have discovered Primate-like Taxa or Euprimates in places such as North America, Europe and Asia. These are sometimes referred to as Plesiadapiformes. This would indicate that primates evolved simultaneously around the globe, including places such as North America. Interestingly, one of the earliest primate fossils *Purgatorius* (65 MYA) comes from North America (Purgatory hill, Montana). Primates continued to evolve into the Eocene and Oligocene epochs. Given the dearth of fossils of early primates, new discoveries may change the landscape completely. According to some researchers, primates may have originated as early as 85 million years ago, during the Cretaceous Period, and such estimates are generally made on the basis of molecular studies. (Springer et al, 2003). An early mammal that may have been the missing link between other Mammals and Primates is believed to have been from the Archonta group, though this classification may be obsolete. Later Primates include *Adapoids* and *Omomyoids* and both species have been found in North America, Europe and Asia. Other early Primates include those from the *Eosimidae* and the *Oligopithecidae* families, and examples have been found in Egypt, south Asia, south east Asia, and China. As such, it would appear that primates were widespread in North America, Europe, Asia and Africa during the Eocene epoch. A mass extinction however appears to have occurred at the end of the Eocene epoch due to rapid cooling. Oligocene primates are divided into the following three groups, viz. *Parapithecidae*, *Propliopithecidae*, and *Platyrrhini*. Examples have been found in places as far apart as Egypt, China and South America, again implying that most Primates species were cosmopolitan. New world Monkeys are also sometimes referred to as *Platyrrhine* monkeys. On the other hand, Old world monkeys are referred to as *Catarrhine*. There are some fundamental differences between the two groups. Interestingly, many of the earliest fossils of Primates have been found in Europe and North America. *Branisella* and *Szalavatus* are other primates, but the fossil record is sparse. In the Miocene period, most early fossils are found in Africa, but later fossils including both apes and monkeys appear elsewhere. Much more interestingly, the oldest fossil of a primate namely *Purgatorius*, was found in the western part of North America, and this fossil is dated to around sixty-six million years ago. So much for simplicity.

Examples of primates that are found in the Americas include Howler species (Central and South America), Spider monkeys and muriquis (Central and South America), *Atelids* (Argentina), *Cebids*, *Prince Bernhard's titi* (Brazil), *Uakari* (Brazil), *Saki* (Brazil), *Squirrel Monkeys* (South America), *White-faced Capuchins* (South America), *Marmosets* and *Tamarins* (South America). Some extinct New World monkeys were *Caipora* and *Protopithecus*. The first apes evolved during the Miocene Epoch which lasted from 23 Million years ago to around 5 million years ago. The first ape was the *kamayopithecus* which lived in Africa. There are only some 20-25 species of apes surviving today, but the figure may have been once much higher. The earliest apes are believed to have evolved in Eastern Africa. Examples of such apes were *Afropithecus* and *Kenyopithecus* and specimens belonging to the family *Proconsulidae*. However,

many Miocene apes were found in Eastern Europe and Asia as well. Dryopithecus is a European ape (with fossils also found in Africa) from this epoch while Sivapithecus Indicus is from India. There are considerable differences between the fossils found in different regions, putting to rest the theory of migrations. Oreopithecus, Ouranopithecus, Lufengpithecus, and Ankarapithecus are apes from the later Miocene epoch. Oreopithecus was found in Italy, and it is far-fetched to postulate migrations from Africa to this part of Europe. The other three specimens were found in Greece, China and Turkey respectively. Gigantopithecus blacki and Gigantopithecus bilaspurensis were huge apes that stood nearly feet or three metres tall and could weigh upto 500 kg. Gigantopithecus lived from 2 MYA to about 200,000 years ago. Fossils have been found in China, Vietnam and India. Fossils of this kind of ape were found in Siwalik hills in India, and in Pakistan but some palaeontologists think these did not evolve into humans; this is still tricky and complex as a non-human like jaw still does not exclude indirect descent. Examples were also found in China, Kenya and Turkey.

Some primates such as Lemurs (these are Prosimians) are found exclusively in Madagascar and Comoro islands. Lorises, which are quite similar, are found in South Asia and Africa. Tarsiers, on the other hand, are restricted to South East Asia. Gibbons are also known as lesser apes and possess very large arms. They are found in North Eastern India and South Eastern Asia. Remains of an early gibbon known as Limnopithecus have also been found in East Africa. Orangutans possess long arms and a bulky body. They are found in East Asia. The percentage difference in non-coding genetic DNA between Orangutans and humans is 3.1%. Chimpanzees are apes which spend most of their time on the ground. Chimpanzees are found in Equatorial Africa. Humans are closest to Chimpanzees, genetically. The difference of genetic DNA between Chimpanzees and Humans expressed in percentages is 1.2%. Gorillas are the largest apes and are found in Equatorial Africa. There are two types of gorillas, forest gorillas and mountain gorillas. Forest gorillas are found in West Africa while Mountain gorillas are found in forests in Zaire, Rwanda and Uganda. The percentage difference of Non-coding genetic DNA between Gorillas and humans is 1.6%. We also then have siamangs which are endangered arboreal, bonobos or pygmy chimpanzees, macaques, mandrills, mangabeys, and guenons.

While there were no native apes in North and South America, earlier primates such as the omomyiforms did indeed exist in the region along with the later howler monkeys and spider monkeys. The age of the apes came to an end 10 MYA to 5 MYA in the Late Miocene epoch, and apes began to be confined to rainforest areas in Africa and South East Asia. This data clearly shows that patterns of evolution were quite similar in many different parts of the world, even though they may not have been exactly the same. There are some missing pieces and unresolved issues undeniably, though time alone will bear testimony to the nature of new discoveries and the direction of future research. We must brace for complexity at all times. As

Franz Brentano once said, "Whoever deviates only a little from the truth in the beginning is led further and further afield in the sequel, and to errors which are thousand times as large. Even minor errors in conceptualization can cause ripple effects, and wreak havoc in science. Likewise, an error does not become a mistake until we all agree to correct it, and course-corrections must therefore become an integral part of research." It is only good science that will restore public trust and public confidence in science in different parts of the world, and this alone will keep wayward forces at bay. This is what we have, as a matter of fact, saying all along. The human scientific mind must also be taught to embrace complexity; as a matter of fact, this would be essential for scientific progress, and to build a strong foundation for science.^{6 7 8 9 10 11 12 13 14 15 16}

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➤ What is the Out of Africa Theory?

There are many versions of the Out of Africa theory, all of which make similar but distinct, and non- overlapping claims. This theory is also sometimes referred to as the recent out of Africa expansion model. It must be emphasized at this juncture that the most common version of the Out of Africa theory states that anatomically modern humans (which in scientific parlance are called *Homo sapiens*) evolved in Africa between 300,000 to 200,000 years ago (the date range appears to be highly fluid for the most part, and many out of Africa proponents also postulate that a major wave of early hominins left Africa some 70,000 to 50,000 years ago) and later migrated across different parts of the planet, thereby replacing other archaic human species in the process. The latter included Neanderthals and Denisovans, among several others. Such theories however fail to explain how and why early hominins possessed such an incredible wanderlust, (moving from resource rich regions with salubrious climate to places with less bountiful resources and with hostile and inclement weather) and how other non-African archaic hominins evolved. Such theories also fail to explain how archaic hominins in different parts of Africa interbred with each other – they also do not explain which part of Africa is the postulated cradle for humanity; however, the north eastern part of Africa is most often the top contender.

Large scale miscengenation with non-African species also seems hard to believe (as many out of Africa proponents postulate a near total or total replacement of Neanderthals, Denisovans and others), given that groups generally tend to interbreed. We may also remind readers at this juncture that the world human population around 100,000 years ago would have been far less than one million souls. The population of hominins on Africa at that time may have been upto 50,000 souls, and the population of Neanderthals even lower. The population of hominins in Asia may have been equal to that of Africa by an approximate estimate. Therefore, a basic reconciliation of populations is necessary, as better estimation models become available. By a conservative estimate, some 30,000 people should have left Africa 70,000 years ago, and this is a tall order by modern standards given that it is the approximate population of a medium size town. Migrations of this size and nature may have required several thousands of boats besides land based journeys, and ocean based journeys may have lasted a year or more, if at all they had happened. How did early humans survive such long journeys? Social and cultural anthropologists must contest the claim of rampant miscegenation with sound and logical reasoning, and non-African groups would not have bred themselves out of existence. Why would they do this? Other out of Africa proponents claim that only a small group of early humans left Africa, but this claim leaves open gaping holes as it does not convincingly or satisfactorily account for how interbreeding and replacement occurred. The claim that as Africa possessed a great deal of diversity in early hominin finds, it must be the cradle of mankind, must also be contested on grounds of plain common sense. We will argue that this itself does not form or constitute any definitive proof. Out of Africa proponents also claim that

non-African populations are typically more uniform because they stem from that single, small founding group which left Africa. This claim itself appears to be totally false, and further more fails to take into account possible interbreeding with different groups. Likewise, the claim that as “African populations had the highest genetic diversity, this automatically proves that humans had lived there the longest“, appears to be highly tentative, probabilistic, and non-conclusive. The anatomical differences between *Homo Sapiens* and Neanderthals do not appear to be very major. The primary differences appear to be that of body proportions, skull and facial proportions, cranial size, etc. Also, African populations would have had a hard time surviving in harsh and inclement European weather for which they were ill-suited and adapted. The same holds good for East central China where many *Homo erectus* fossils were found. Winter temperatures in this region can fall to subzero Celsius levels, vastly different from Africa. Some studies have even suggested that East Asians carried more Neanderthal DNA than Europeans, and therefore, most present studies do not appear to be reliable or convincing. Likewise, *Homo erectus* had slightly different features and smaller cranial size which grew with the passage of time. Furthermore, even Out of Africa proponents accept the fact that all three were capable of interbreeding. All studies and their primary assumptions need to be revisited from scratch, and practical and realistic viewpoints adopted. Modern humans are indeed polytypic, and anatomical variations are just as high among modern humans as well.

However, there are many distinct variants of the Out of Africa theory, and the original version has spawned many downstream variants. It has also evolved from a more canonical and doctrinaire form to form more hybridized and complex variants. In the process, anthropologists have moved away from a rigid, single-event model toward much more nuanced, complex, and intricate variants – these may also be seen as via media approaches. Therefore, the lines of distinction between out of Africa proponents and multiregional proponents appears to have blurred somewhat, even though proponents of these rival theories themselves may not be forthcoming to accept it. There are also two principal variants of the out of Africa models, namely out of Africa I, and out of Africa II. Out of Africa I proponents claim that archaic human species, primarily *Homo erectus* and other early hominins emigrated from Africa between 1.8 million and 500,000 years ago (during the Early Stone Age), evolving to Neanderthals and other hominins in the process, and then to anatomically modern humans. The out of Africa model II is known as the recent African origin model, which states that early humans left Africa between 200,000 and 60,000 years ago. Both variants may encompass either single wave models or multi wave models. We also then have genetic interaction models such as the strict replacement model, and the leaky replacement model. According to the strict replacement model which is largely considered to be outdated, modern *Homo sapiens* completely wiped out or outcompeted older hominins without any interbreeding. According to the leaky replacement model, *Homo sapiens* originated in Africa and represents most of modern human ancestry, but absorbed

small percentages of archaic DNA due to limited interbreeding in Europe and Asia. The assimilation model on the other hand, sits at the border between the out of Africa model and the multiregional model. While this model accepts a African origin model for modern homo sapiens, it accounts for extensive gene flow and interbreeding with other archaic hominins. In addition to single wave migrations and multiple wave migrations, we also have models to explain the origin of humans in Africa itself. According to the classic single origin model, modern humans evolved in east Africa or North East Africa, while according to the pan-African model, humans emerged from highly interconnected groups of diverse early hominin populations spread across the entire African continent, exchanging genes over tens of thousands of years, if not more.

Again, we must bear in mind the fact many early hominins lived over large regions. For example homo erectus fossils were claimed to have been found in Drimolen in South Africa some two million years, and in Trinil, Java, Indonesia as well, by Eugene Dubois. In the 1950s, biologist Ernst Mayr reclassified the fossils as Homo erectus, making Java Man among the oldest discoveries of this early human species. At least two more discoveries of Homo Erectus have been found in different parts of Africa. One was found in Koobi Fora in Kenya, and is around 1.73 million years ago, and another early 1.2 million year old homo erectus fossil was found in Olduvai in Tanzania by Louis Leaky in 1960. Therefore, we believe we must revisit the classification systems of early hominins from scratch; a truly ground up approach would be required here. This is in spite of the fact that there are differences between homo sapiens and homo erectus with respect to features such as cranial size and body size. Again, the oldest known homo sapiens fossils were found in Jebel Irhoud in Morocco in North Africa, and not in north east Africa. Other homo sapiens fossils were found in Omo Kibish and Herto in Ethiopia, and therefore anatomically similar hominins may have sprung up in different parts of Africa too. The earliest homo sapiens fossils are dated to between 310,000 years ago to around 233,000 years ago.

There is also of course a great deal of diversity among early hominin fossils found in different parts of Africa, and there are wide interregional variations too. As a matter of fact, the sheer diversity of the early hominin fossils found in the continent overshadows the diversity of finds found in most other parts of the world, a fact readily acknowledged by many paleontologists. Among the early fossil finds in the continent, Sahelanthropus tchadensis is arguably one of the most important. This fossil find dates to between six and seven million years ago, and sits at the dawn of the early hominin era. The above fossils were discovered in the Totso Menalia region of Chad's Djurab desert. Orrorin tugenensis fossils were among the earliest to demonstrate bipedalism, their fossils were found preserved in the Cheboul region of Tugen hills, Kenya. Ardipithecus kadabba fossils which were known for large projecting canine teeth were found in the middle Awash region of Ethiopia, and are dated to around six million years ago. On the other hand,

Ardipithecus ramidus fossils were found in the Aramis region of Ethiopia, and are dated to between 4.5 and 4.3 million years ago. Another important early hominin type is that of Australopithecus anamensis, and fossils representing this type were found in lake Turkana and Kanapoi, and are dated to around four million years ago.

Similarly, Australopithecus bahrelghazali and Kenyanthropus platyops fossils were found in Chad and Kenya respectively, and are dated to between 3.6 and 3.3 million years ago. Many researchers think Australopithecus afarensis was the ancestor of the genus homo, to which modern homo sapiens also belong. Fossils of this type of hominin were found in Tanzania, Kenya, and Ethiopia, and are dated to between 3.7 and three million years ago. Australopithecus africanus is yet another important type of hominin, and fossils representing this type were found in different parts of South Africa, and are dated to between 3.3 to 2.1 million years ago. We also have other hominin fossil finds in Africa such as Australopithecus garhi, Paranthropus aethiopicus, Paranthropus robustus, Australopithecus sediba, and Paranthropus boisei, and the sheer diversity of human fossils in the region – i.e., across the length and breadth of Africa is truly mind-boggling. Later species such as Homo habilis and Homo ergaster were found in Africa too. We have several interesting finds from Africa. For example, Lucy, the early Hominid from Awash valley in Ethiopia was discovered in 1974 by Donald Johanson.

There is also an incredible amount of human genetic diversity in modern Africa. Africa is home to over two thousand distinct ethnic and ethnolinguistic groups, ranging from extremely short African pygmies to extremely tall Nilotic groups as well, and variation has been observed between groups too. Major ethnic groups in East Africa include the Oromo, Amhara, Maasai, while major ethnic groups in west Africa include the Hausa, Yoruba, Igbo, and Mendinka. In southern Africa, we have the Zulu, Xhosa, and the Shona, while in central Africa, we have the Kongo and the Luba. In North Africa, we have the Berbers, and other groups. Therefore, the genetic origin of all these ethnic groups is far from certain, and the idea that Africa is the cradle of mankind only because it has the highest genetic diversity must be shattered. Both Nilotic peoples and African pygmies are also additionally classified as homo sapiens, and why did two such widely disparate peoples interbreed? How did the two distinct groups emerge in the first place? How did they still manage to retain their individual identities? In sum, the sheer diversity of early hominin populations in Africa does not by itself prove anything. The transition from pre-hominins to early hominins and then to homo sapiens is far from certain. We must always stand and guard vigil against assertion of fait accompli. Again, the observation that there are very few populations of non-African ancestry in Africa does not automatically vindicate the out of Africa model. Such observations may be attributed to historical factors, and not genetic and evolutionary ones. Likewise, the origin of complex tool technology and Paleolithic art was a complex process. While the Lomekwian and Olduvai tool technologies emerged in Africa, tools have also been found in places in Europe such as Kolobava and Kozarnika.

Different tool technologies also appear to have evolved independently, and there was generally no superimposition of one tool technology over the other. Timelines can also easily change with the emergence of new finds. The paths of evolution from primates to modern humans via hominins are far from clear, and an honest admission of ignorance is vital to progress, rather than misplaced hubris. As a matter of fact, we will argue that this must be a necessary adjunct and concomitant to scientific progress.^{17 18 19}

Therefore, the "Out of Africa" theory and the "Multiregional" hypothesis also known as the regional continuity model represent the two most influential, competing frameworks in paleoanthropology that seek to explain how anatomically modern humans also known as *Homo sapiens* populated different parts of the planet, and how human traits emerged and spread. According to the multiregional hypothesis, humans emerged in multiple regions of the world simultaneously such as Africa, Europe and Asia. However, such theories do hold that some interbreeding occurred, and this helped humans emerge as a distinct species. According to the multiregional hypothesis which was first proposed by anthropologist Milford Wolpoff in 1984, *Homo sapiens* did not appear in just one place. Instead, the species emerged from a slow, evolutionary process spread across multiple regions and continents, with more complex evolutionary paths. Of late, more via media solutions are gaining traction in lieu of the old out of Africa model or pure multiregionalism. While many archaic fossil finds are indeed found in Africa, the applecart can easily be upset with new and serendipitous finds.

Out of Africa proponents also use Mitochondrial DNA evidence to trace all human populations back to a single mother in Africa. The Y-Chromosomal Adam has also been sometimes been traced back to Africa. Such sensational claims must be taken with a generous pinch of salt, and must be corroborated with as much additional evidence as possible drawn from diverse and multidisciplinary fields. But what exactly is mitochondrial DNA, we may ask. Mitochondrial DNA refers to the small, circular genetic material found inside mitochondria, which are the energy-producing structures or powerhouses located in the cytoplasm of eukaryotic cells, and not its nucleus. Mitochondrial DNA passes down the matrilineal line, and changes extremely slowly through infrequent mutations. It is used often by researchers to trace deep ancestral lineages to tens of thousands of years ago, if not more through the use of molecular clocks. It has also been proposed that as

African populations possess the greatest amount of diversity in mitochondrial DNA, they must have been the original ancestor of all human populations. We would like to invite as much criticism to refute this assertion, as it appears to contradict claims that mitochondrial DNA evidence could be traced back to a single mother in Africa. The primary criticisms of using mitochondrial DNA as being definitive proof fall into several different categories. The original "Mitochondrial Eve" study was published in 1987 by Cann, Stoneking, and Wilson, and it relied heavily on very early computer algorithms to generate the human evolutionary tree. On the other hand, Geneticist Alan Templeton and other researchers quickly pointed out that the original computer program was fed data in a way that made it support the out of Africa theory in a biased kind of way. Templeton and others have argued that without such induced biases, the software could be made to generate a large number of equally plausible other evolutionary trees without African origins or roots. Furthermore, human populations are complex, and as many out of Africa proponents themselves admit, a great deal of genetic admixing must have occurred. Therefore, human ancestries cannot be traced to a single source, and out of Africa claims are somewhat suspicious. Braided stream models and multi-origin models remain a strong possibility.

Other criticisms have centered around sample size, sample diversity, and the confirmation bias associated with such studies. Also, such studies can fail if mothers produced only sons and no daughters, and as such sufficiently large samples are required from different parts of the world. Mitochondrial DNA accounts for less than 0.001% of a human's total genetic blueprint. When the remaining 99.99% of the human genome (nuclear DNA) are mapped, the picture can become far more complex with total replacement of non-African populations becoming implausible. Critics also claim that nuclear DNA decoding has soundly disproved total replacement by showing that all living non-African humans carry 1% to 2% Neanderthal DNA, and some indigenous groups carry up to 4% to 6% Denisovan DNA. Therefore, the picture is far more complex and multilayered than previously imagined. Most certainly, many other groups would have played a major part in the evolutionary process. It has also been pointed out that the timeline proposed by early mitochondrial DNA studies does not always match the physical evidence found in the ground, given that modern human fossils and in some cases advanced tools have been discovered in places such as China, (Fuyan cave 100,000 years ago) South East Asia, Greece, (homo sapiens fossil found in Apidima cave, and dated to 210,000 years ago) Israel, (Misliya cave 185,000 years ago) Siberia, and South Asia (Hathnora man or Narmada man discovered by Arun Sonakia which may or may not be an anatomically modern human, and is dated to upto 600,000 years ago) that date back significantly further than the traditional 50,000 to 60,000 year migration timeline. Balagonda man appears to have lived in Sri Lanka some 40,000 years ago, and this appears to be an early example of a homo sapiens fossil in the region.

¹⁷ East Asians 2.3–2.6%, Western Eurasians 1.8–2.4% (Prüfer K, de Filippo C, Grote S, Mafessoni F, Korlević P, Hajdinjak M, et al. (November 2017)

¹⁸ Shea, John J. (2003). "Neandertals, competition, and the origin of modern human behavior in the Levant". *Evolutionary Anthropology: Issues, News, and Reviews*. 12 (4): 173–187

¹⁹ Walter RC, Boffler RT, Bruggemann JH, Guillaume MM, Berhe SM, Negassi B, et al. (May 2000). "Early human occupation of the Red Sea coast of Eritrea during the last interglacial". *Nature*. 405 (6782): 65–69

Out of Africa proponents assume interbreeding too, so how did other hominins such as Neanderthal man, Denisovan man, Homo Georgicus which is sometimes called Homo Erectus Georgicus, (fossils found in Dmanisi, Georgia dated to around 1.8 million years ago, and are among the earliest well-dated human fossils outside Africa) and the Peking man originate? Therefore, while there are many supporters of the Out of Africa theory, it is no longer seen as the simple, linear "replacement" event once proposed or imagined. More and more critics are now acknowledging the fact that human evolutionary paths could have been far more complex. Discoveries have also been made of the dragon man or Homo Longi in 2021, and this archaic species of humans lived in East Asia. Some trace it to almost one million years ago, (Yunxian2 skull) though other estimates are more modest and conservative. Again, homo erectus fossils have been claimed in Europe, in Sima del Elefante in Northern Spain 1.4 million years ago, and homo antecessor fossils have been found too, in Gran Dolina cave, and in Sierra de Atapuerca in Spain. These pioneer man fossils preserve many hybridized traits, of both modern humans and Neanderthal man. Interestingly, Homo heidelbergensis appears to have lived over a wide area, in places as far apart as east, north and south Africa, and excavations have also been carried out since 1964 in Arago in France.

Populations can also evolve for protracted periods in time in complete isolation, and studies have been carried out among Koisan populations to prove this. All these findings and points of view challenge the traditional out of Africa narrative, and point towards a deeply interconnected global genetic web. Multiregional hypothesis proponents therefore support multiple areas of evolution such as Africa, Europe (where Neanderthal man fossils have been found), East Asia (where Peking man or homo erectus fossils have been found, and south east Asia where discoveries of Java man have been made in Trinil and Sangiran in Indonesia between 1.3 and 1.5 million years ago, and other homo erectus fossils traced to a later date (Ngandong and Madura sites). In addition specimens of Homo Luzonensis a small homonin, have been found in the Phillipines, and a more diminutive species called the homo floresiensis in Indonesia. The strongest evidence in support of the Multiregional hypothesis comes from the sheer diversity of human populations worldwide, and the persistence of traits such as flat noses and broad cheekbones which were found for example among early east Asian fossils, and carried forward to modern populations in the region. Homo longi and other groups have demonstrated large cranial capacities too, similar to anatomically modern humans. Also, there are strong "racial" or ethnic boundaries between Africa and Europe, between North Africa and the rest of the African continent, between peninsular India and north East India, and between India and China. Of course there are many, many more such as those found between Russia and China. How can the out of Africa theory satisfactorily account for all this? It is also obvious that many archaic humans from different parts of the world interbred with each other, and must have shared genetic similarities with each other. This points out to evolutionary similarities of species in different

parts of the world. After all, cats cannot mate with dogs, though cats and dogs from different parts of the world obviously can.

Evidence to support blending and complex process of miscegenation have also emerged in different parts of the world in addition to newer genetic data and evidence, and these suggest a much more complex process of evolution – examples to attest this are the Dali skulls of China, and the Lagar Velho child of Portugal. Other early hominin fossils have also been found in the Middle East such as the Skhul and Qafzeh caves in Israel (120,000 to 90,000 years ago) and at Al Wusta in Saudi Arabia between 95,000 and 85,000 years ago. Some examples of Neanderthal fossils have also been found in the Middle east, examples being at Shanidar and at Amud cave. In addition to more traditional sites in Europe in locations in Belgium, Italy and Gibraltar. In Italy, Neanderthal fossils are represented by means of the Saccopastore skulls, which are around 130,000 years old. Again, Denisovan man fossils have been found in the Altai mountains, and a hybrid child belonging to a Denisovan father and a Neanderthal mother has also been claimed. Other Denisovan discoveries have been made in Bianfeng cave in southwest China, and at Harbin in North East China. Discoveries have also been claimed in Tam Ngu Hao in Laos, and in Penghu channel in Taiwan. On the other hand, another extinct species of humans, names homo Naledi lived in South Africa (where they were discovered in the rising star cave system) around 250,000, when homo sapiens were already emerging elsewhere.

All this suggests that interbreeding between different types of humans took place in parallel in different parts of the world, and we must therefore, never over-simplify. While some multiregional hypothesis supporters claim that homo erectus populations left Africa some two million years ago, the evidence to support this may be rather flimsy, given the very tentative nature of classification of early hominin fossil finds. Opponents of the multiregional model also argue that genetic diversity is often higher in some parts of the world than the others- this does not necessarily however, automatically falsify this model; genetic diversity among early hominins has been found in south east Asia too. Another concept called the serial migration effect has been proposed, but this by itself may not prove anything. The evolution of humans by itself is likely to have been a complex, messy and chaotic process which serial founder effect proponents appear to grossly oversimplify. Instead, serial founder effect proponents assume a one-way linear march and ignore the effect of interbreeding. Some others, claim the human DNA is too similar across the globe to allow for the multiregional models, but as we have shown previously, many species and life forms around the world have demonstrated incredible genetic similarity. Some others claim that African languages are incredibly diverse, but this by itself does not appear to prove anything. Cranial capacity for languages may at best be a little over 100,000 years old based on a study of FOXP2 genes, Broca's area, and Wernicke's areas, and social and communal languages may be somewhat younger than that. Moreover, the sheer diversity of human languages on earth is truly mind

boggling. What is most likely is that human spoken languages evolved independently in different parts of the world. This is the model that we had presented in our epochal polygenesis approach. This model essentially supports polygenesis (not monogenesis) and suggest that historical factors, cultural factors and political factors must be taken into account and consideration while evaluating the origin of languages. We may also note that there are many types of language families such as SVO languages, SOV languages, and VSO languages. Current models are at a loss to satisfactorily explain how one type of language morphed into another in the practical real world. Also, since most out of Africa models now accept a great deal of interbreeding and gene flow (various early hominin species were apparently perfectly capable of interbreeding with each other), this automatically makes a mockery of claimed or postulated mitochondrial DNA results. We are also not racists. We have written extensively against racism in the past. However, research driven purely by anti-racist propaganda without regard to scientific considerations is not a good idea either.^{20 21}

Again, China is home to one of the densest and most revolutionary records of early hominin fossils in the world. Discoveries across East Asia range from nearly 1.8 million years ago up to the arrival of modern humans, constantly reshaping our understanding of *Homo erectus* migrations and the origin of the Denisovans. We also have besides traditional Denisovan strongholds, Peking man (Zhoukoudian fossils found near Beijing and dated to between 800,000 and 400,000 years ago by Davidson Black. Transitional finds and other new species have also been found in China, and examples include *Homo juluensis* found in the Hualongdong site in the Anhui province with complex and hybridized traits. Other discoveries made in China include the Yunxian skulls (1.77 million years ago), Yuanmou teeth (1.7 million years ago), and a couple of more. We also have the Maba man (maba cranium) find in China which may be an intermediary between *Homo erectus* and *Homo sapiens*. This fossil was found in 1958, and is dated to around 200,000 years ago. Another interesting find comes from South East Asia, and is represented by Solo Man which is a subspecies of *Homo erectus* that lived along the Solo River in Java, Indonesia, between 117,000 to 108,000 years ago. In other parts of the world, hominin fossils are relatively much more recent.

For example, in Australia, we have Mungo man and Mungo lady fossils dated to around 42,000 years ago, and later ice age footprints at Willandra lake. Kow swamp skeletons in Victoria appear some ten thousand years ago, and apparently demonstrate diversity among *Homo sapiens*

populations. Aborigines may have however lived in Australia since some 50,000 years ago, though this is disputed. The earliest hominin fossils in North America are typically dated to around 23,000 years ago, with footprints having been found in the White Sands national park in New Mexico. Earliest skeletal remains in North America are dated to around 13,000 years ago, and examples have been found in Arlington springs. Again, early human colonization of South America is attributed to the Santa Elina rock shelter of around 20,000 years ago. In Monte Verde in Chile, human occupation is claimed at 15,000 years ago, though this is disputed. The near total absence of early hominin fossils from Australia and the Americas are indeed strange and baffling, and it is indeed possible that some early migrations took place. However it is interesting to note that the Americas and Australia were not discovered until recently. The first documented European to reach Australia was William Janszoon, and he arrived in the continent in 1606. Of course, migrations are indeed possible, but we must also bear in mind the fact that absence of evidence is not evidence of absence. Time alone will reveal the complete picture.^{22 23}

We have argued over the past couple of pages that gross over-simplifications such as the old Out of Africa theory should not persist, and a comprehensive grounds up assessment of all factors is required. Real world problems are complex, and can seldom be so simple and straightforward. Hasty generalization is dangerous. There is a lot of persistent criticism against the old Out of Africa model. Why would tens of thousands of people (if not much, much more) migrate from Africa to the whole world? What motive triggered this? Some postulated migration paths are also not tenable. An alternative hypothesis is the multiregional hypothesis. But perhaps the truth lies somewhere in-between. Also, Out of Africa proponents also accept the fact that other hominins pre-existed elsewhere in the world. Also, the classification of early humans into hominin groups is not set in stone. Researchers and scholars tend to engage in ding dong battles and settle into well-trenched intellectual camps and cul-de-sacs. This may be in part due to rampant careerism. Perhaps that is not the way. The emphasis should be on building rock solid pre-historical models and then tweaking or modifying them as new data emerges. Paleontological data alone should not be the basis, as we have relatively very little of it at present. Some careerism is tolerable, but it should be subservient to scientific and scholarly interests. As such scientific method and the philosophy of science need a foundational overhaul. Gross over-simplifications damage science. Theories must be constantly revised as and when more and more data becomes available. Also, the amount of human genetic diversity on the planet points to the fact that more complex models are required. Also, classifications, between early

²⁰ James HVA, Petraglia M. Modern human origins and the evolution of behavior in the later Pleistocene record of South Asia. *Curr Anthropol*. 2005; 46(Supplement):S4–S27.

²¹ Petraglia M, Clarkson C, Boivin N, et al. Population increase and environmental deterioration correspond with microlithic innovations in South Asia ca. 35,000 years ago. *Proc Natl Acad Sci USA*. 2009; 106(30):12261–12266. [PubMed: 19620737]

²² Abi-Rached, L., Jobin, M.J., Kulkarni, S. 2011. The Shaping of Modern Human Immune Systems by Multiregional Admixture with Archaic Humans. *Science* 334: 89-94.

²³ Agoni, L., Golden, A., Guha, C. 2012. Neandertal and Denisovan retroviruses. *Current Biology* 22: R437-438

hominins are subject to revision as more data emerges, at least in some cases. They are not always necessarily set in stone. Does the out of Africa model satisfactorily account for the sheer breadth of human genetic diversity? We don't think so. There are several other distinct possibilities- for example, population densities could have varied from region to region, and these could have been at variance with modern population distributions. Secondly, evolution timeframes may have varied from region to region, and may have begun in some parts of the world earlier. Thirdly, fossils may have been better preserved in some parts of the world than others, and may have been more widely excavated in certain regions too.²⁴

III. RECOMMENDATIONS

- The process of emergence of early hominins took place in parallel in many different parts of the world.
- The process of emergence of early hominins took place in parallel in many different parts of the world, but at different points in time. This must at least be admitted as a theoretical possibility.
- Population densities of hominins may have varied from region to region, and may have been at variance from modern population densities.
- The first hominins quite possibly emerged in Africa - as evolution possibly took place there earlier based on current – but we must admit to several other possibilities as new data emerges.
- Modern humans would have emerged in parallel in different parts of the world but perhaps in different periods. It is also likely than humans first evolved in Africa and the process was delayed in other regions.
- Migrations would need to be evaluated on a case to case basis to different parts of the world either from Africa, or from other regions, and at different periods in time. Some linguistic, technological or cultural evidence can help. We would also beseech and implore researchers to analyze all such evidence from both or multiple ends of the geographical spectrum, and see what sense it makes when approached from different perspectives.
- Migrations would have increased over time from and to different parts of the world due to improving technology, and such migrations would have led to acculturation in specific parts of the world e.g. India. This again needs to be studied on a case to case basis, and makes a stronger case for migrations over the past ten thousand years or so as compared to postulated migrations over one hundred thousand years ago. Again small genetic inputs may have also led to major cultural change, as was discussed in our previous papers. The latter has been proven time and again in different parts of the world.
- Miscegenation and interbreeding could have quite possibly taken place on a limited scale. Other cultural anthropologists may like to give their inputs, but again, there can be no blanket generalization. Complete

replacement of archaic populations appears to be an unviable path in most scenarios.

- Hybridization would also have resulted from gradual assimilation among neighbouring peoples over a period in time.
- This would imply that fossils of hominins and primates are likely to emerge in other parts of the world: however, population densities, and preservation levels would have varied widely from region to region, and hence the number of fossils found, discovered, or expected would vary from one another in different parts of the world.
- The absence of evidence is not the evidence of absence; if fossils are not found in a reasonable span of time, it does not vindicate the Out of Africa hypothesis. The focus should then automatically shift to discussions based on other indirect evidence.
- It is possible to speculate what undiscovered fossils in a given region and pertaining to a specific period may look like, and this may enable models to be created. These types of models can be further refined upon actual discovery of new fossils.
- It would also be recommended to speculate on the reasons for the absence of fossils in specific regions in lieu of hasty conclusions.
- Early hominins would have interbred in a plethora of different ways in specific situations at different points of time to give rise to modern humans.
- This approach would account for the diversity of humans around the globe satisfactorily and adequately.
- Some hominins such as *Homo floresiensis* may have gone extinct, but many others would not. Wherever possible, it would be necessary to formulate theories for their extinction. A more common and plausible explanation would be their inability to adapt to changing environments, though other explanations too are indeed possible.

We can also make the following general observations, though there could also be some genuine and bona fide exceptions to these observations:

- Migrations are usually driven by a compelling need.
- Accidental migrations seldom happen over long distances.
- Migrations driven by a sense of adventure are relatively rare in occurrence, and would have been extremely rare in the pre-historical past. Exceptions can however be made on a case to case basis.
- Migrations happen from less salubrious to more salubrious regions, and from less fertile or more arid regions to more fertile regions.
- Migrations happen from more isolated to less isolated regions.
- Migrations could happen from more densely populated regions to less densely populated regions in a specific set of circumstances, though the reverse is also likely in some cases.

²⁴ Wolpoff, M. H., & Caspari, R. (1997). *Race and Human Evolution*. Simon & Schuster

- Migrations could happen from less developed regions to more developed regions in a specific set of circumstances. This observation may not have always held good for pre-historical times.
- Migrants often look for conditions similar to their homeland, though there could indeed bonafide exceptions to this observation.
- Technology does play a role in shaping migrations, and migrations become more viable with better technology.
- Migrants may maintain contacts with their original homeland, or retain contacts with it; this would however, vary on a case to case basis, and would be highly unlikely in case of prehistoric migrations. Memories of older homelands may dissipate with time, especially where written records are not available.

We may also note at this juncture that postulated migration paths involve routes such as Siberia to Alaska which are highly suspect (However, we may refer to the concept of Beringia): in a period of sparse populations and non-existent technological skills, no humans would have felt the need to cross the harsh climates of Siberia and Alaska to reach North America or would have felt the need to land on Australian shores. These would be feats even for modern humans. Therefore, each postulated migration path must be evaluated on a case to case basis, and the proce and cons of such paths listed out. The general reasons for human migrations out of Africa that are given, are overpopulation, overexploitation of natural resources, and the hunt for greener pastures, but from our perspective, these reasons do not appear to be highly convincing.

• *Via Media Solutions:*

- ✓ Migrations have happened to select regions only
- ✓ Migrations in small numbers have indeed happened from Africa, but these may have either happened much earlier or may have left only a minor impact on the skeletal record.
- ✓ Migrations may have happened at different points in time to different parts of the world.
- ✓ Migrations must be justified on a case to case basic, with clear underlying logic and reasoning provided. For example, migrations in small numbers to North America, South America and Australia are likely when all other possibilities are ruled out. We may also note at this juncture that the aborigines of North America, South America and Australia are anatomically different from peoples of the rest of the world, and it is also likely that some older hominin fossils will be possible in this region.

We therefore believe that the right way forward would be to list out and evaluate as many different scenarios as possible from time to time. And not jump hastily to conclusions. The classifications of hominins into subspecies must also be carried out from time to time, and complex and multi-parameter anatomical classifications preferred. We In sum, we must resist the temptation of succumbing to hasty generalization fallacies, and suspend and reserve judgment for the time being rather than proclaiming statements of fait

accompli. Many different kinds of solutions, including various via media ones, are indeed possible. We also look forward to more and more paradigms and frameworks emerging in due course; more complex and meaningful ones. As of today, however, a preponderance of evidence appears to suggest that humans evolved concurrently in Africa, Europe and Asia.

IV. CONCLUSION

The entire objective of this paper was to revisit the ongoing debates and controversies regarding the origin and evolution of humans, and also to evaluate the various pros and cons associated with various versions of the Out of Africa model, and the multiregional hypothesis, given that these are the two major classes of models in common intellectual discourse and debate. We also stated and declared emphatically that there is inadequate or insufficient evidence to jump to grand conclusions. Instead, the only viable path forward would be to synthesize data from across a wide variety of fields, and develop rock solid and robust interdisciplinary models that can be further refined as more and more data emerges. This approach would serve the best interests of science and scientific progress. We also proposed the wholly independent multiregional model, with evolutionary paths taking place across Africa, Europe and Asia, and complex, multiple and divergent ways, with oversimplification posing a major obstacle to scientific progress. We also show that many species from the dawn of life have been universal or near universal, but this may be because different species around the world may be subject to similar evolutionary pressures, and may therefore have pursued similar evolutionary paths. Of course, migrations would always be possible given the scarce fossil records of early humans in Australia, and in North and in South America, but these must be justified on a case to case basis, and must not be beyond the realm of possibility taking into account geographical barriers and technological constraints. This paper also presents some additional points of argument to show why the traditional out of Africa model may be somewhat outdated at the present time, and must be jettisoned in favour of more complex evolutionary models.