

Archeologists Join Geologists In The Quest To Define The Age Of Humans



Deborah Barsky

05-09-2025 ~ *A new archeology is being developed based on evidence of human activity in the Earth's sedimentary record, and archeologists are helping to define the Anthropocene as a new stage in the geological record.*

The evolution of the human mind has allowed us to transcend our modern [understandings of time](#) and expand into the realm of "[deep time thinking](#)." One example of this is the [Geologic Time Scale](#) (GTS), a human construct that traces the astrophysical events that have affected the composition and structure of the Earth since it was formed some 4.6 billion years ago.

Scientists have assembled bits and pieces of this huge temporal scale into periods of relative climatic and biotic stability based on geological and fossil data. By ordering these events sequentially in time, they have been able to reconstruct when, how, and under what conditions life emerged on the planet. Under the aegis of the [International Union of Geological Sciences](#) (IUGS), the [International Commission on Stratigraphy](#) (ICS) is charged with defining geological epochs based on fundamental changes registered in the Earth's geological formations. The GTS is often [depicted with spiraling concentric branches](#) divided into segments representing distinct geological epochs defined by periods of relative geobiological stability.

These epochs are named, dated, and ordered, and the length of each segment is proportional to its duration relative to the other phases. As we progress toward

the outer rings of the spiral, we notice that the time segments gradually become smaller, especially around 500 million years ago after the unprecedented proliferation of complex life forms that appeared during the [Cambrian explosion](#), which accelerated the pace of global ecological changes registered in the Earth's layers.

The emergence of the first humanoid species has been traced back to only around [7 million years ago](#) and is placed at the extreme tip of the last branch of the spiral, underscoring how little time has passed, relatively, since our ancestors appeared on the planet. Based on global climatic data, the evolutionary story of the genus *Homo* has taken place throughout the [Quaternary Period](#) that began around 2.58 million years ago during the Pleistocene Epoch. This period roughly overlaps with the invention of the [first breakthrough human technologies made from stone](#). A global warming event that began 11,650 years ago around the same time as the emergence of early sedentary civilizations in the Fertile Crescent signals the start of the Holocene Epoch, in which we currently live.

[The Anthropocene \(The Age of Humans\)](#) has been proposed as a new geological epoch after or within the Holocene, and, if formalized, would be the first to be introduced based on geologically observable effects of human activity on the planet. This compelling proposal spurred the establishment of the [Anthropocene Working Group](#) (AWG), which is tasked to evaluate whether the geophysical signature of human behavior is sufficient to justify placing this new epoch at the apex of the spiraling branches of the GTS. While many scientists agree on the idea in principle, a major point of contention is [when exactly the Anthropocene began](#).

Not surprisingly, pinpointing a precise threshold when human activity caused recognizable global geological alteration has proven to be a very difficult task that geologists and archeologists are working together to resolve. Some archeologists consider the Anthropocene as an incremental process, whose genesis can be identified diachronically in the Earth's strata as early as tens of thousands of years ago, when [modern humans consolidated planetary dominance](#), appropriating and transforming landscapes and biotic resources in archeologically detectable ways.

Anthropogenic signals, such as changes in ecosystems brought on by [human overhunting of ice age megafauna](#), can be traced back to this period. By 10,000

years ago, plant and animal domestication boosted human [ecosystem engineering](#) as populations grew steadily through time. By around 5,000 years ago, the first urban dwellings drew swelling numbers of individuals into restricted areas, and technological innovation surged after the invention of metallurgy. Growing populations and intensified farming consumed and modified land, and animal husbandry led to increases in methane emissions traceable in the Earth's sedimentary record.

The human imprint on the planet becomes significantly more conspicuous after the industrial age was launched in the Western world around 200 years ago, with an upsurge in carbon emissions from burning coal to feed technological development and increasing concentration of greenhouse gases driving global warming.

While viable arguments support each of these signposts along our evolutionary highway, the AWG concluded that the most suitable time to begin the Anthropocene would be in the 1950s, when [the Great Acceleration](#) sharply augmented the signs of human activity in the global geological record. This made the signs even more clearly distinguishable thanks to [a wide range of indicators](#) synchronously chronicling their symptoms, like climate deregulation, atmospheric, terrestrial, and water pollution, loss of biodiversity, excessive resource consumption, and massive land transformations.

[In March 2024](#), the IUGS decided not to formally integrate the Anthropocene into the GTS; a verdict that has hardly quelled disagreements surrounding this matter. And there are other problems related to this issue. For example, while the existing chronostratigraphic divisions of the GTS register periods of stability lasting millions of years, the Anthropocene would be the first geological epoch to occur within only a human lifetime.

Even if we situate its beginning thousands of years before the industrial revolution, the Anthropocene sedimentary archive is currently still under formation. No matter the outcome of this fascinating planet-wide debate, the [Anthropocene has indelibly entered into scientific and social discourse](#) as the world faces many challenges posed by the unprecedented expansion of advanced human populations with unique techno-social behaviors that are now clearly linked to cataclysmic climatic events and biological genocide. It has become evident that the implications of the Anthropocene now exceed the question of its

validity as a geochronological division in the Earth's evolutionary history.

While geologists examine the end results of long-term paleoecological scenarios, archeologists center on more recent layers that record the origins and evolution of human life ([the archeosphere](#)). Fascinating interpretations are coming out of the collaboration between geologists and archeologists on the issue of the Anthropocene. Among these, the concept of the physical [technosphere](#) is particularly interesting since it addresses questions about how the entire mass of materials manufactured and modified by humans is becoming assimilated into the Earth system. [In 2016](#), Jan Zalasiewicz and colleagues estimated the total mass of the physical technosphere to be a staggering 30 trillion tons, and it continues to grow, far [surpassing](#) both the volume and the diversity of the domesticated biosphere (plants and animals).

“We define the physical technosphere as consisting of technological materials within which a human component can be distinguished, with part in active use and part being a material residue. The human signature may be recognized by characteristics including form, function and composition that result from deliberate design, manufacture and processing. This includes extraction, processing and refining raw geological materials into novel forms and combinations of elements, compounds and products,” [stated](#) the article by Zalasiewicz and colleagues published in the Anthropocene Review, United Kingdom.

The study further added, “The active technosphere is made up of buildings, roads, energy supply structures, all tools, machines, and consumer goods that are currently in use or usable, together with farmlands and managed forests on land, the trawler scours and other excavations of the seafloor in the oceans, and so on. It is highly diverse in structure, with novel inanimate components including new minerals and materials... and a living part that includes crop plants and domesticated animals. Humans both produce and are sustained by (and now are dependent on) the rest of the physical technosphere.”

Although it was formed culturally because of anthropogenic agency, the technosphere combined with natural forces, has become an integral part of the functioning Earth system. It operates above and below the ground, in the seas, and even in outer space, with components interacting constantly and dynamically with the lithosphere, the biosphere, the hydrosphere, and the atmosphere.

While these other spheres have evolved over millions, or even billions of years, the technosphere—like the Anthropocene—has existed for a comparatively minute period of time. Continuously growing in pace with human demography and technological advances, the technosphere now generates so much excess waste that it cannot all be recycled back into the system, creating an imbalance in the structural relationships guiding the planet's equilibrium and generating traceable Anthropocene deposits.

Beyond its physical aspects, the technosphere also encompasses the human social structures that enable it to function and in which all individuals play a part. Much like the synapses within the human brain or molecular systems forming the parts of a larger whole, humans constitute the individual components of the technosphere, cooperating to enable it to function while also creating the need for its existence.

“The technosphere is also manifest in the wide distribution of myriad artefacts such as needles, motors, and medicines, and by technological or technologically assisted processes like pumping and harvesting, as well as by nominally human activities that are closely tied to technological processes, such as watching television or filling out tax forms. Most such localized systems, processes and artefacts derive from, or are connected either directly or indirectly to, the globe-spanning networks of the technosphere,” [stated](#) the 2014 article by P. K. Haff, published in the Geological Society, London.

Following geological precepts and using [methodologies classically applied in archeological sciences](#), the imprint of human activity on the planet is gradually being defined, quantified, mapped, and categorized, while novel subjects like [technospheric taxonomy](#) are being developed to complement traditional geological and stratigraphic practices. Just like the remnants of prehistoric material culture—like stone tools or pottery sherds—the objects we produce, use, and throw away in our daily lives are transforming into [technofossils](#) that will become markers in the chronocultural framework of human evolution, providing fodder for future archeologists.

At the generational scale, residues from polluting gases, sewage, toxic chemicals, and microplastics are melding into sedimentary layers, and [artificial ground](#) transformed by landfills, war rubble, mining, and urban settings is converted into novel anthropic geological settings with the passage of time.

There is no doubt that scarring and modification of land and sea resulting from wars, agriculture, urbanization, mining, and other human activities are being incorporated into the Earth's geological layers. The evolution of human technologies has led our species to embark on an ongoing process that began incrementally and snowballed exponentially over the millennia, converting into the [emblem of modern human heritage](#).

The global distribution of all human waste will be chronicled in relation to its position in sub-actual sedimentary formations that—in the not so distant future—will serve to define and classify the sequential cultural contexts of the Anthropocene.

By Deborah Barsky

Author Bio: Deborah Barsky is a writing fellow for the [Human Bridges](#), a researcher at the [Catalan Institute of Human Paleoecology and Social Evolution](#), and an associate professor at the Rovira i Virgili University in Tarragona, Spain, with the Open University of Catalonia (UOC). She is the author of [Human Prehistory: Exploring the Past to Understand the Future](#) (Cambridge University Press, 2022).

Credit Line: This article was produced by [Human Bridges](#).