**Geologic Time Scale**

From Wikipedia, the free encyclopedia

This clock representation shows some of the major units of geological time and definitive events of Earth history. The Hadean eon represents the time before fossil record of life on Earth; its upper boundary is now regarded as 4.0 [Ga](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers) ([billion](https://en.wikipedia.org/wiki/1000000000_%28number%29) years ago). Other subdivisions reflect the evolution of life; the Archean and Proterozoic are both eons, the Paleozoic, Mesozoic and Cenozoic are eras of the Phanerozoic eon. The two million year Quaternary period, the time of recognizable humans, is too small to be visible at this scale.

The **geological time scale** (**GTS**) is a system of [chronological](https://en.wikipedia.org/wiki/Chronology) [measurement](https://en.wikipedia.org/wiki/Metrology) that relates [stratigraphy](https://en.wikipedia.org/wiki/Stratigraphy) to time, and is used by [geologists](https://en.wikipedia.org/wiki/Geology), [paleontologists](https://en.wikipedia.org/wiki/Paleontology), and other [Earth scientists](https://en.wikipedia.org/wiki/Earth_sciences) to describe the timing and relationships between events that have occurred throughout [Earth’s history](https://en.wikipedia.org/wiki/History_of_the_Earth). The table of geologic time spans presented here agrees with the [nomenclature](https://en.wikipedia.org/wiki/Scientific_classification), dates and standard color codes set forth by the [International Commission on Stratigraphy](https://en.wikipedia.org/wiki/International_Commission_on_Stratigraphy).

Evidence from [radiometric dating](https://en.wikipedia.org/wiki/Radiometric_dating) indicates that Earth is about [4.54 billion years old](https://en.wikipedia.org/wiki/Age_of_the_Earth). The geology or [*deep time*](https://en.wikipedia.org/wiki/Deep_time) of Earth’s past has been organized into various units according to events which took place in each period. Different spans of time on the GTS are usually delimited by changes in the composition of strata which correspond to them, indicating major geological or [paleontological](https://en.wikipedia.org/wiki/Paleontology) events, such as [mass extinctions](https://en.wikipedia.org/wiki/Mass_extinction). For example, the boundary between the [Cretaceous](https://en.wikipedia.org/wiki/Cretaceous) period and the [Paleogene](https://en.wikipedia.org/wiki/Paleogene) period is defined by the [Cretaceous–Paleogene extinction event](https://en.wikipedia.org/wiki/Cretaceous%E2%80%93Paleogene_extinction_event), which marked the demise of the non-avian [dinosaurs](https://en.wikipedia.org/wiki/Dinosaur) and many other groups of life. Older time spans which predate the reliable fossil record (before the [Proterozoic Eon](https://en.wikipedia.org/wiki/Proterozoic_Eon)) are defined by the absolute age.

**Terminology**

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| --- |
| **Units in geochronology and stratigraphy** |
| **Segments of rock (**[**strata**](https://en.wikipedia.org/wiki/Stratum)**) in** [**chronostratigraphy**](https://en.wikipedia.org/wiki/Chronostratigraphy) | **Time spans in** [**geochronology**](https://en.wikipedia.org/wiki/Geochronology) | **Notes togeochronological units** |
| [Eonothem](https://en.wikipedia.org/wiki/Eonothem) | [Eon](https://en.wikipedia.org/wiki/Eon_%28geology%29) | 4 total, half a billion years or more |
| [Erathem](https://en.wikipedia.org/wiki/Erathem) | [Era](https://en.wikipedia.org/wiki/Era_%28geology%29) | 10 defined, several hundred million years |
| [System](https://en.wikipedia.org/wiki/System_%28stratigraphy%29) | [Period](https://en.wikipedia.org/wiki/Period_%28geology%29) | 22 defined, tens to ~one hundred million years |
| [Series](https://en.wikipedia.org/wiki/Series_%28stratigraphy%29) | [Epoch](https://en.wikipedia.org/wiki/Epoch_%28geology%29) | tens of millions of years |
| [Stage](https://en.wikipedia.org/wiki/Stage_%28stratigraphy%29) | [Age](https://en.wikipedia.org/wiki/Age_%28geology%29) | millions of years |
| [Chronozone](https://en.wikipedia.org/wiki/Chronozone) | [Chron](https://en.wikipedia.org/wiki/Chron) | subdivision of an age, not used by the ICS timescale |

The largest defined unit of time is the supereon, composed of eons. Eons are divided into [eras](https://en.wikipedia.org/wiki/Era_%28geology%29), which are in turn divided into [periods](https://en.wikipedia.org/wiki/Period_%28geology%29), [epochs](https://en.wikipedia.org/wiki/Epoch_%28geology%29) and [ages](https://en.wikipedia.org/wiki/Age_%28geology%29). The terms [eonothem](https://en.wikipedia.org/wiki/Eonothem), [erathem](https://en.wikipedia.org/wiki/Erathem), [system](https://en.wikipedia.org/wiki/System_%28stratigraphy%29), [series](https://en.wikipedia.org/wiki/Series_%28stratigraphy%29), and [stage](https://en.wikipedia.org/wiki/Stage_%28stratigraphy%29) are used to refer to the layers of rock that correspond to these periods of geologic time in Earth's history.

Geologists qualify these units as Early, Mid, and Late when referring to time, and Lower, Middle, and Upper when referring to the corresponding rocks. For example, the Lower Jurassic Series in [chronostratigraphy](https://en.wikipedia.org/wiki/Chronostratigraphy) corresponds to the Early Jurassic Epoch in [geochronology](https://en.wikipedia.org/wiki/Geochronology). The adjectives are capitalized when the subdivision is formally recognized, and lower case when not; thus "early Miocene" but "Early Jurassic."

Geologic units from the same time but different parts of the world often look different and contain different fossils, so the same period was historically given different names in different locales. For example, in North America the Lower [Cambrian](https://en.wikipedia.org/wiki/Cambrian) is called the Waucoban series that is then subdivided into zones based on succession of [trilobites](https://en.wikipedia.org/wiki/Trilobita). In [East Asia](https://en.wikipedia.org/wiki/East_Asia) and [Siberia](https://en.wikipedia.org/wiki/Siberia), the same unit is split into [Alexian](https://en.wikipedia.org/wiki/Alexian), [Atdabanian](https://en.wikipedia.org/wiki/Atdabanian), and [Botomian](https://en.wikipedia.org/wiki/Botomian) stages. A key aspect of the work of the International Commission on Stratigraphy is to reconcile this conflicting terminology and define universal [horizons](https://en.wikipedia.org/wiki/Horizon_%28geology%29) that can be used around the world.

**History and nomenclature of the time scale**

Main articles: [History of geology](https://en.wikipedia.org/wiki/History_of_geology) and [History of paleontology](https://en.wikipedia.org/wiki/History_of_paleontology)

Graphical representation of Earth’s history as a spiral

A comparative geological timescale

In [Ancient Greece](https://en.wikipedia.org/wiki/Ancient_Greece), [Aristotle](https://en.wikipedia.org/wiki/Aristotle) saw that [fossils](https://en.wikipedia.org/wiki/Fossils) of seashells from rocks were similar to those found on the beach and inferred that the fossils were once part of living animals. He reasoned that the positions of land and sea had changed over long periods of time. [Leonardo da Vinci](https://en.wikipedia.org/wiki/Leonardo_da_Vinci) concurred with Aristotle’s view that fossils were the remains of ancient life.

The 11th-century [Persian geologist](https://en.wikipedia.org/wiki/Islamic_geography) [Avicenna](https://en.wikipedia.org/wiki/Avicenna) (Ibn Sina) and the 13th century [Dominican](https://en.wikipedia.org/wiki/Dominican_Order) [bishop](https://en.wikipedia.org/wiki/Bishop) [Albertus Magnus](https://en.wikipedia.org/wiki/Albertus_Magnus) (Albert of Saxony) extended Aristotle's explanation into a theory of a [petrifying](https://en.wikipedia.org/wiki/Petrification) fluid. Avicenna also first proposed one of the principles underlying geologic time scales, the [law of superposition](https://en.wikipedia.org/wiki/Law_of_superposition) of strata, while discussing the origins of mountains in [*The Book of Healing*](https://en.wikipedia.org/wiki/The_Book_of_Healing) in 1027. The [Chinese naturalist](https://en.wikipedia.org/wiki/History_of_science_and_technology_in_China) [Shen Kuo](https://en.wikipedia.org/wiki/Shen_Kuo) (1031–1095) also recognized the concept of ‘[deep time](https://en.wikipedia.org/wiki/Deep_time)’.

The principles underlying geologic (geological) time scales were later laid down by [Nicholas Steno](https://en.wikipedia.org/wiki/Nicholas_Steno) in the late 17th century. Steno argued that rock layers (or strata) are laid down in succession, and that each represents a "slice" of time. He also formulated the law of superposition, which states that any given stratum is probably older than those above it and younger than those below it. While Steno’s principles were simple, applying them to real rocks proved complex. Over the course of the 18th century geologists realized that:

1. Sequences of strata were often eroded, distorted, tilted, or even inverted after deposition;
2. Strata laid down at the same time in different areas could have entirely different appearances;
3. The strata of any given area represented only part of Earth’s long history.

The first serious attempts to formulate a geological time scale that could be applied anywhere on Earth were made in the late 18th century. The most influential of those early attempts (championed by [Abraham Werner](https://en.wikipedia.org/wiki/Abraham_Werner), among others) divided the rocks of Earth’s crust into four types: Primary, Secondary, Tertiary, and Quaternary. Each type of rock, according to the theory, formed during a specific period in Earth history. It was thus possible to speak of a "Tertiary Period" as well as of "Tertiary Rocks." Indeed, "Tertiary" (now Paleogene and Neogene) and "Quaternary" (now Pleistocene and Holocene) remained in use as names of geological periods well into the 20th century.

The [Neptunist](https://en.wikipedia.org/wiki/Neptunist) theories popular at this time (expounded by Werner) proposed that all rocks had precipitated out of a single enormous flood. A major shift in thinking came when [James Hutton](https://en.wikipedia.org/wiki/James_Hutton) presented his *Theory of the Earth; or, an Investigation of the Laws Observable in the Composition, Dissolution, and Restoration of Land Upon the Globe* before the [Royal Society of Edinburgh](https://en.wikipedia.org/wiki/Royal_Society_of_Edinburgh) in March and April 1785. It has been said that "as things appear from the perspective of the 20th century, James Hutton in those readings became the founder of modern geology". Hutton proposed that the interior of Earth was hot, and that this heat was the engine which drove the creation of new rock: land was eroded by air and water and deposited as layers in the sea; heat then consolidated the sediment into stone, and uplifted it into new lands. This theory was called "Plutonist" in contrast to the "Neptunist" flood-oriented theory.

The identification of strata by the fossils they contained, pioneered by [William Smith](https://en.wikipedia.org/wiki/William_Smith_%28geologist%29), [Georges Cuvier](https://en.wikipedia.org/wiki/Georges_Cuvier), [Jean d'Omalius d'Halloy](https://en.wikipedia.org/w/index.php?title=Jean_Baptiste_Julien_d%E2%80%99Omalius_d%E2%80%99Halloy&action=edit&redlink=1), and [Alexandre Brogniart](https://en.wikipedia.org/wiki/Alexandre_Brogniart) in the early 19th century, enabled geologists to divide Earth history more precisely. It also enabled them to correlate strata across national (or even continental) boundaries. If two strata (however distant in space or different in composition) contained the same fossils, chances were good that they had been laid down at the same time. Detailed studies between 1820 and 1850 of the strata and fossils of Europe produced the sequence of geological periods still used today.

The process was dominated by British geologists, and the names of the periods reflect that dominance. The "Cambrian", (the classical name for [Wales](https://en.wikipedia.org/wiki/Wales)) and the "Ordovician", and "Silurian", named after ancient Welsh tribes, were periods defined using stratigraphic sequences from Wales. The "Devonian" was named for the English county of [Devon](https://en.wikipedia.org/wiki/Devon), and the name "Carboniferous" was simply an adaptation of "the Coal Measures", the old British geologists’ term for the same set of strata. The "Permian" was named after [Perm](https://en.wikipedia.org/wiki/Perm), Russia, because it was defined using strata in that region by Scottish geologist [Roderick Murchison](https://en.wikipedia.org/wiki/Roderick_Murchison). However, some periods were defined by geologists from other countries. The "Triassic" was named in 1834 by a German geologist [Friedrich Von Alberti](https://en.wikipedia.org/wiki/Friedrich_Von_Alberti) from the three distinct layers (Latin *trias* meaning triad) —[red beds](https://en.wikipedia.org/wiki/Red_bed), capped by [chalk](https://en.wikipedia.org/wiki/Chalk), followed by black [shales](https://en.wikipedia.org/wiki/Shale) — that are found throughout Germany and Northwest Europe, called the ‘Trias’. The "Jurassic" was named by a French geologist Alexandre Brogniart for the extensive marine [limestone](https://en.wikipedia.org/wiki/Limestone) exposures of the [Jura Mountains](https://en.wikipedia.org/wiki/Jura_Mountains). The "Cretaceous" (from Latin *creta* meaning ‘[chalk](https://en.wikipedia.org/wiki/Chalk)’) as a separate period was first defined by Belgian geologist [Jean d’Omalius d’Halloy](https://en.wikipedia.org/w/index.php?title=Jean_d%E2%80%99Omalius_d%E2%80%99Halloy&action=edit&redlink=1) in 1822, using strata in the [Paris basin](https://en.wikipedia.org/wiki/Paris_Basin_%28geology%29) and named for the extensive beds of chalk ([calcium carbonate](https://en.wikipedia.org/wiki/Calcium_carbonate) deposited by the shells of marine [invertebrates](https://en.wikipedia.org/wiki/Invertebrate)).

British geologists were also responsible for the grouping of periods into Eras and the subdivision of the Tertiary and Quaternary periods into epochs. In 1841 [John Phillips](https://en.wikipedia.org/wiki/John_Phillips_%28geologist%29) published the first global geological time scale based on the types of fossils found in each era. Phillips’ scale helped standardize the use of terms like [*Paleozoic*](https://en.wikipedia.org/wiki/Paleozoic) ("old life") which he extended to cover a larger period than it had in previous usage, and [*Mesozoic*](https://en.wikipedia.org/wiki/Mesozoic) ("middle life") which he invented.

When William Smith and [Sir Charles Lyell](https://en.wikipedia.org/wiki/Sir_Charles_Lyell) first recognized that rock strata represented successive time periods, time scales could be estimated only very imprecisely since various kinds of rates of change used in estimation were highly variable. While [creationists](https://en.wikipedia.org/wiki/Creationist) had been proposing dates of around six or seven thousand years for the age of Earth based on the [Bible](https://en.wikipedia.org/wiki/Bible), early geologists were suggesting millions of years for geologic periods with some even suggesting a virtually infinite age for Earth. Geologists and paleontologists constructed the geologic table based on the relative positions of different strata and fossils, and estimated the time scales based on studying rates of various kinds of [weathering](https://en.wikipedia.org/wiki/Weathering), [erosion](https://en.wikipedia.org/wiki/Erosion), [sedimentation](https://en.wikipedia.org/wiki/Sedimentation), and [lithification](https://en.wikipedia.org/wiki/Lithification). Until the discovery of [radioactivity](https://en.wikipedia.org/wiki/Radioactive_decay) in 1896 and the development of its geological applications through [radiometric dating](https://en.wikipedia.org/wiki/Radiometric_dating) during the first half of the 20th century (pioneered by such geologists as [Arthur Holmes](https://en.wikipedia.org/wiki/Arthur_Holmes)) which allowed for more precise absolute dating of rocks, the ages of various rock strata and the age of Earth were the subject of considerable debate.

The first geologic time scale that included absolute dates was published in 1913 by the British geologist [Arthur Holmes](https://en.wikipedia.org/wiki/Arthur_Holmes). He greatly furthered the newly created discipline of [geochronology](https://en.wikipedia.org/wiki/Geochronology) and published the world-renowned book *The Age of the Earth* in which he estimated Earth’s age to be at least 1.6 billion years.

In 1977, the *Global Commission on Stratigraphy* (now the [International Commission on Stratigraphy](https://en.wikipedia.org/wiki/International_Commission_on_Stratigraphy)) started an effort to define global references known as GSSP ([Global Boundary Stratotype Sections and Points](https://en.wikipedia.org/wiki/Global_Boundary_Stratotype_Section_and_Point))for geologic periods and faunal stages. The commission's most recent work is described in the 2004 geologic time scale of Gradstein et al. A [UML](https://en.wikipedia.org/wiki/Unified_Modeling_Language) model for how the timescale is structured, relating it to the GSSP, is also available.

**Condensed graphical timelines**

The following four timelines show the geologic time scale. The first shows the entire time from the formation of the Earth to the present, but this compresses the most recent eon. Therefore, the second scale shows the most recent eon with an expanded scale. The second scale compresses the most recent era, so the most recent era is expanded in the third scale. Since the [Quaternary](https://en.wikipedia.org/wiki/Quaternary) is a very short period with short epochs, it is further expanded in the fourth scale. The second, third, and fourth timelines are therefore each subsections of their preceding timeline as indicated by asterisks. The [Holocene](https://en.wikipedia.org/wiki/Holocene) (the latest [epoch](https://en.wikipedia.org/wiki/Epoch_%28geology%29)) is too small to be shown clearly on the third timeline on the right, another reason for expanding the fourth scale. The Pleistocene (P) epoch. Q stands for the Quaternary period.

Millions of Years

**Table of geologic time**

The following table summarizes the major events and characteristics of the periods of time making up the geologic time scale. As above, this time scale is based on the International Commission on Stratigraphy. (See [lunar geologic timescale](https://en.wikipedia.org/wiki/Lunar_geologic_timescale) for a discussion of the geologic subdivisions of Earth's moon.) This table is arranged with the most recent geologic periods at the top, and the most ancient at the bottom. The height of each table entry does not correspond to the duration of each subdivision of time.

The content of the table is based on the current official geologic time scale of the International Commission on Stratigraphy, with the epoch names altered to the early/late format from lower/upper as recommended by the ICS when dealing with [chronostratigraphy](https://en.wikipedia.org/wiki/Chronostratigraphy).

A service providing a [Resource Description Framework](https://en.wikipedia.org/wiki/Resource_Description_Framework)/[Web Ontology Language](https://en.wikipedia.org/wiki/Web_Ontology_Language) representation of the timescale is available through the [Commission for the Management and Application of Geoscience Information](https://en.wikipedia.org/wiki/Commission_for_the_Management_and_Application_of_Geoscience_Information) [GeoSciML](https://en.wikipedia.org/wiki/GeoSciML) project as a service and at a [SPARQL](https://en.wikipedia.org/wiki/SPARQL) end-point.

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| [**Supereon**](https://en.wikipedia.org/wiki/Supereon_%28geology%29) | [**Eon**](https://en.wikipedia.org/wiki/Eon_%28geology%29) | [**Era**](https://en.wikipedia.org/wiki/Era_%28geology%29) | [**Period**](https://en.wikipedia.org/wiki/Period_%28geology%29) | [**Epoch**](https://en.wikipedia.org/wiki/Epoch_%28geology%29) | [**Age**](https://en.wikipedia.org/wiki/Age_%28geology%29) | **Major events** | **Start, million years ago** |
|  | [Phanerozoic](https://en.wikipedia.org/wiki/Phanerozoic) | [Cenozoic](https://en.wikipedia.org/wiki/Cenozoic) | [Quaternary](https://en.wikipedia.org/wiki/Quaternary) | [Holocene](https://en.wikipedia.org/wiki/Holocene) | [chrons](https://en.wikipedia.org/wiki/Chronozone): [Subatlantic](https://en.wikipedia.org/wiki/Subatlantic) **·** [Subboreal](https://en.wikipedia.org/wiki/Subboreal) **·** [Atlantic](https://en.wikipedia.org/wiki/Atlantic_%28period%29) **·** [Boreal](https://en.wikipedia.org/wiki/Boreal_%28period%29) **·** [Preboreal](https://en.wikipedia.org/wiki/Preboreal) | [Quaternary Ice Age](https://en.wikipedia.org/wiki/Quaternary_glaciation) recedes, and the current [interglacial](https://en.wikipedia.org/wiki/Interglacial) begins; rise of human [civilization](https://en.wikipedia.org/wiki/Civilization). [Sahara](https://en.wikipedia.org/wiki/Sahara) forms from savannah, and [agriculture](https://en.wikipedia.org/wiki/Agriculture) begins. [Stone Age](https://en.wikipedia.org/wiki/Stone_Age) cultures give way to [Bronze Age](https://en.wikipedia.org/wiki/Bronze_Age) (3300 BC) and [Iron Age](https://en.wikipedia.org/wiki/Iron_Age) (1200 BC), giving rise to [many pre-historic cultures](https://en.wikipedia.org/wiki/Synoptic_table_of_the_principal_old_world_prehistoric_cultures) throughout the world. [Little Ice Age](https://en.wikipedia.org/wiki/Little_Ice_Age) ([stadial](https://en.wikipedia.org/wiki/Stadial)) causes brief cooling in [Northern Hemisphere](https://en.wikipedia.org/wiki/Northern_Hemisphere) from 1400 to 1850. Following the [Industrial Revolution](https://en.wikipedia.org/wiki/Industrial_Revolution), [atmospheric](https://en.wikipedia.org/wiki/Atmosphere_of_Earth) [CO2](https://en.wikipedia.org/wiki/Carbon_dioxide_in_the_Earth%27s_atmosphere) levels rise from around 280 [parts per million](https://en.wikipedia.org/wiki/Parts_per_million) volume (ppmv) to the current level of 400 ppmv.  | 0.0117 |
| [Pleistocene](https://en.wikipedia.org/wiki/Pleistocene) | [Late](https://en.wikipedia.org/wiki/Late_Pleistocene) (locally [Tarantian](https://en.wikipedia.org/wiki/Tarantian) **·** [Tyrrhenian](https://en.wikipedia.org/wiki/Tyrrhenian_Stage) **·** [Eemian](https://en.wikipedia.org/wiki/Eemian) **·** [Sangamonian](https://en.wikipedia.org/wiki/Sangamonian_Stage)) | Flourishing and then extinction of many large [mammals](https://en.wikipedia.org/wiki/Mammal) ([Pleistocene megafauna](https://en.wikipedia.org/wiki/Pleistocene_megafauna)). Evolution of anatomically modern [humans](https://en.wikipedia.org/wiki/Human). [Quaternary Ice Age](https://en.wikipedia.org/wiki/Last_glacial_period) continues with [glaciations](https://en.wikipedia.org/wiki/Glacial_period) and [interstadials](https://en.wikipedia.org/wiki/Interstadial) (and the accompanying fluctuations from 100 to 300 ppmv in [atmospheric](https://en.wikipedia.org/wiki/Atmosphere_of_Earth) CO2 levels), further intensification of [Icehouse Earth](https://en.wikipedia.org/wiki/Greenhouse_and_Icehouse_Earth) conditions, roughly 1.6 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). [Last glacial maximum](https://en.wikipedia.org/wiki/Last_glacial_maximum) (30000 [years ago](https://en.wikipedia.org/wiki/Before_present)), [last glacial period](https://en.wikipedia.org/wiki/Last_glacial_period) (18000–15000 years ago). Dawn of human [stone-age cultures](https://en.wikipedia.org/wiki/Lower_Paleolithic#Cultures), with [increasing technical complexity](https://en.wikipedia.org/wiki/Middle_Paleolithic#Cultures) relative to previous ice age cultures, such as [engravings and clay statues](https://en.wikipedia.org/wiki/Upper_Paleolithic#Cultures) (e.g. [Venus of Lespugue](https://en.wikipedia.org/wiki/Venus_of_Lespugue)), particularly in the [Mediterranean](https://en.wikipedia.org/wiki/Mediterranean) and Europe. [Lake Toba](https://en.wikipedia.org/wiki/Lake_Toba) [supervolcano](https://en.wikipedia.org/wiki/Supervolcano) erupts 75000 years before present, causing a [volcanic winter](https://en.wikipedia.org/wiki/Volcanic_winter) that [pushes humanity to the brink of extinction](https://en.wikipedia.org/wiki/Toba_catastrophe_theory). Pleistocene ends with [Oldest Dryas](https://en.wikipedia.org/wiki/Oldest_Dryas), [Older Dryas](https://en.wikipedia.org/wiki/Older_Dryas)/[Allerød](https://en.wikipedia.org/wiki/Aller%C3%B8d_Oscillation) and [Younger Dryas](https://en.wikipedia.org/wiki/Younger_Dryas) climate events, with Younger Dryas forming the boundary with the Holocene. | 0.126 |
| [Middle](https://en.wikipedia.org/wiki/Middle_Pleistocene) (formerly Ionian) | 0.781 |
| [Calabrian](https://en.wikipedia.org/wiki/Early_Pleistocene) | 1.8\* |
| [Gelasian](https://en.wikipedia.org/wiki/Gelasian) | 2.58\* |
| [Neogene](https://en.wikipedia.org/wiki/Neogene) | [Pliocene](https://en.wikipedia.org/wiki/Pliocene) | [Piacenzian](https://en.wikipedia.org/wiki/Piacenzian)/[Blancan](https://en.wikipedia.org/wiki/Blancan) | Intensification of present [Icehouse conditions](https://en.wikipedia.org/wiki/Greenhouse_and_Icehouse_Earth), [present (Quaternary) ice age](https://en.wikipedia.org/wiki/Quaternary_glaciation) begins roughly 2.58 Ma; cool and dry [climate](https://en.wikipedia.org/wiki/Climate). [Australopithecines](https://en.wikipedia.org/wiki/Australopithecine), many of the existing genera of mammals, and recent [mollusks](https://en.wikipedia.org/wiki/Mollusk) appear. [*Homo habilis*](https://en.wikipedia.org/wiki/Homo_habilis) appears. | 3.6\* |
| [Zanclean](https://en.wikipedia.org/wiki/Zanclean) | 5.333\* |
| [Miocene](https://en.wikipedia.org/wiki/Miocene) | [Messinian](https://en.wikipedia.org/wiki/Messinian) | [Moderate Icehouse climate](https://en.wikipedia.org/wiki/Greenhouse_and_Icehouse_Earth), punctuated by [ice ages](https://en.wikipedia.org/wiki/Ice_age); [Orogeny](https://en.wikipedia.org/wiki/Orogeny) in [Northern Hemisphere](https://en.wikipedia.org/wiki/Northern_Hemisphere). Modern [mammal](https://en.wikipedia.org/wiki/Mammal) and [bird](https://en.wikipedia.org/wiki/Bird) families become recognizable. [Horses](https://en.wikipedia.org/wiki/Equidae) and [mastodons](https://en.wikipedia.org/wiki/Mastodon) diverse. [Grasses](https://en.wikipedia.org/wiki/Grass) become ubiquitous. First [apes](https://en.wikipedia.org/wiki/Ape) appear (for reference see the article: "[Sahelanthropus tchadensis](https://en.wikipedia.org/wiki/Sahelanthropus_tchadensis)"). [Kaikoura Orogeny](https://en.wikipedia.org/wiki/Kaikoura_Orogeny) forms [Southern Alps](https://en.wikipedia.org/wiki/Southern_Alps) in New Zealand, continues today. Orogeny of the Alps in Europe slows, but continues to this day. [Carpathian orogeny](https://en.wikipedia.org/w/index.php?title=Carpathian_orogeny&action=edit&redlink=1) forms [Carpathian Mountains](https://en.wikipedia.org/wiki/Carpathian_Mountains) in [Central](https://en.wikipedia.org/wiki/Central_Europe) and [Eastern Europe](https://en.wikipedia.org/wiki/Eastern_Europe). [Hellenic orogeny](https://en.wikipedia.org/w/index.php?title=Hellenic_orogeny&action=edit&redlink=1) in Greece and Aegean Sea slows, but continues to this day. [Middle Miocene Disruption](https://en.wikipedia.org/wiki/Middle_Miocene_Disruption) occurs. Widespread forests slowly [draw in](https://en.wikipedia.org/wiki/Photosynthesis) massive amounts of CO2, gradually lowering the level of atmospheric CO2 from 650 ppmv down to around 100 ppmv.  | 7.246\* |
| [Tortonian](https://en.wikipedia.org/wiki/Tortonian) | 11.63\* |
| [Serravallian](https://en.wikipedia.org/wiki/Serravallian) | 13.82\* |
| [Langhian](https://en.wikipedia.org/wiki/Langhian) | 15.97 |
| [Burdigalian](https://en.wikipedia.org/wiki/Burdigalian) | 20.44 |
| [Aquitanian](https://en.wikipedia.org/wiki/Aquitanian_age) | 23.03\* |
| [Paleogene](https://en.wikipedia.org/wiki/Paleogene) | [Oligocene](https://en.wikipedia.org/wiki/Oligocene) | [Chattian](https://en.wikipedia.org/wiki/Chattian) | [Warm but cooling climate](https://en.wikipedia.org/wiki/Greenhouse_and_Icehouse_Earth), moving towards Icehouse; Rapid [evolution](https://en.wikipedia.org/wiki/Evolution) and diversification of fauna, especially [mammals](https://en.wikipedia.org/wiki/Mammal). Major evolution and dispersal of modern types of [flowering plants](https://en.wikipedia.org/wiki/Flowering_plant) | 28.1 |
| [Rupelian](https://en.wikipedia.org/wiki/Rupelian) | 33.9\* |
| [Eocene](https://en.wikipedia.org/wiki/Eocene) | [Priabonian](https://en.wikipedia.org/wiki/Priabonian) | [Moderate, cooling climate](https://en.wikipedia.org/wiki/Greenhouse_and_Icehouse_Earth). Archaic [mammals](https://en.wikipedia.org/wiki/Mammal) (e.g. [Creodonts](https://en.wikipedia.org/wiki/Creodont), [Condylarths](https://en.wikipedia.org/wiki/Condylarth), [Uintatheres](https://en.wikipedia.org/wiki/Uintatheriidae), etc.) flourish and continue to develop during the epoch. Appearance of several "modern" mammal families. Primitive [whales](https://en.wikipedia.org/wiki/Cetacea) diversify. First [grasses](https://en.wikipedia.org/wiki/Grass). Reglaciation of Antarctica and formation of its [ice cap](https://en.wikipedia.org/wiki/Ice_cap); [Azolla event](https://en.wikipedia.org/wiki/Azolla_event) triggers [ice age](https://en.wikipedia.org/wiki/Ice_age), and the [Icehouse Earth](https://en.wikipedia.org/wiki/Greenhouse_and_Icehouse_Earth) climate that would follow it to this day, from the settlement and decay of [seafloor](https://en.wikipedia.org/wiki/Seafloor) [algae](https://en.wikipedia.org/wiki/Algae) drawing in massive amounts of atmospheric [carbon dioxide](https://en.wikipedia.org/wiki/Carbon_dioxide), lowering it from 3800 [ppmv](https://en.wikipedia.org/wiki/Parts_per_million) down to 650 ppmv. End of [Laramide](https://en.wikipedia.org/wiki/Laramide_Orogeny) and [Sevier Orogenies](https://en.wikipedia.org/wiki/Sevier_orogeny) of the [Rocky Mountains](https://en.wikipedia.org/wiki/Rocky_Mountains) in North America. [Orogeny](https://en.wikipedia.org/wiki/Orogeny) of the [Alps](https://en.wikipedia.org/wiki/Alps) in Europe begins. [Hellenic Orogeny](https://en.wikipedia.org/w/index.php?title=Hellenic_Orogeny&action=edit&redlink=1) begins in Greece and [Aegean Sea](https://en.wikipedia.org/wiki/Aegean_Sea). | 37.8 |
| [Bartonian](https://en.wikipedia.org/wiki/Bartonian) | 41.2 |
| [Lutetian](https://en.wikipedia.org/wiki/Lutetian) | 47.8\* |
| [Ypresian](https://en.wikipedia.org/wiki/Ypresian) | 56\* |
| [Paleocene](https://en.wikipedia.org/wiki/Paleocene) | [Thanetian](https://en.wikipedia.org/wiki/Thanetian) | [Climate tropical](https://en.wikipedia.org/wiki/Greenhouse_and_Icehouse_Earth). Modern [plants](https://en.wikipedia.org/wiki/Plant) appear; [Mammals](https://en.wikipedia.org/wiki/Mammal) diversify into a number of primitive lineages following the extinction of the dinosaurs. First large mammals (up to [bear](https://en.wikipedia.org/wiki/Bear) or small [hippo](https://en.wikipedia.org/wiki/Hippopotamus) size). [Alpine orogeny](https://en.wikipedia.org/wiki/Alpine_orogeny) in Europe and Asia begins. [Indian Subcontinent](https://en.wikipedia.org/wiki/Indian_Subcontinent) collides with Asia 55 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers), [Himalayan Orogeny](https://en.wikipedia.org/wiki/Geology_of_the_Himalaya) starts between 52 and 48 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). | 59.2\* |
| [Selandian](https://en.wikipedia.org/wiki/Selandian) | 61.6\* |
| [Danian](https://en.wikipedia.org/wiki/Danian) | 66\* |
| [Mesozoic](https://en.wikipedia.org/wiki/Mesozoic) | [Cretaceous](https://en.wikipedia.org/wiki/Cretaceous) | [Late](https://en.wikipedia.org/wiki/Late_Cretaceous) | [Maastrichtian](https://en.wikipedia.org/wiki/Maastrichtian) | [Flowering plants](https://en.wikipedia.org/wiki/Flowering_plant) proliferate, along with new types of [insects](https://en.wikipedia.org/wiki/Insect). More modern [teleost](https://en.wikipedia.org/wiki/Teleost) fish begin to appear. [Ammonoidea](https://en.wikipedia.org/wiki/Ammonoidea), [belemnites](https://en.wikipedia.org/wiki/Belemnoidea), [rudist](https://en.wikipedia.org/wiki/Rudist) [bivalves](https://en.wikipedia.org/wiki/Bivalvia), [echinoids](https://en.wikipedia.org/wiki/Echinoidea) and [sponges](https://en.wikipedia.org/wiki/Porifera) all common. Many new types of [dinosaurs](https://en.wikipedia.org/wiki/Dinosaur) (e.g. [Tyrannosaurs](https://en.wikipedia.org/wiki/Tyrannosauridae), [Titanosaurs](https://en.wikipedia.org/wiki/Titanosauridae), [duck bills](https://en.wikipedia.org/wiki/Hadrosauridae), and [horned dinosaurs](https://en.wikipedia.org/wiki/Ceratopsidae)) evolve on land, as do [Eusuchia](https://en.wikipedia.org/wiki/Eusuchia) ([modern crocodilians](https://en.wikipedia.org/wiki/Crocodilia)); and [mosasaurs](https://en.wikipedia.org/wiki/Mosasaur) and modern [sharks](https://en.wikipedia.org/wiki/Shark) appear in the sea. Primitive [birds](https://en.wikipedia.org/wiki/Bird) gradually replace [pterosaurs](https://en.wikipedia.org/wiki/Pterosaurs). [Monotremes](https://en.wikipedia.org/wiki/Monotremes), [marsupials](https://en.wikipedia.org/wiki/Marsupial) and [placental](https://en.wikipedia.org/wiki/Eutheria) mammals appear. Break up of [Gondwana](https://en.wikipedia.org/wiki/Gondwana). Beginning of [Laramide](https://en.wikipedia.org/wiki/Laramide_Orogeny) and [Sevier Orogenies](https://en.wikipedia.org/wiki/Sevier_Orogeny) of the [Rocky Mountains](https://en.wikipedia.org/wiki/Rocky_Mountains). [atmospheric](https://en.wikipedia.org/wiki/Atmosphere_of_Earth) CO2 close to present-day levels. | 72.1 ± 0.2\* |
| [Campanian](https://en.wikipedia.org/wiki/Campanian) | 83.6 ± 0.2 |
| [Santonian](https://en.wikipedia.org/wiki/Santonian) | 86.3 ± 0.5\* |
| [Coniacian](https://en.wikipedia.org/wiki/Coniacian) | 89.8 ± 0.3 |
| [Turonian](https://en.wikipedia.org/wiki/Turonian) | 93.9\* |
| [Cenomanian](https://en.wikipedia.org/wiki/Cenomanian) | 100.5\* |
| [Early](https://en.wikipedia.org/wiki/Early_Cretaceous) | [Albian](https://en.wikipedia.org/wiki/Albian) | ~113 |
| [Aptian](https://en.wikipedia.org/wiki/Aptian) | ~125 |
| [Barremian](https://en.wikipedia.org/wiki/Barremian) | ~129.4 |
| [Hauterivian](https://en.wikipedia.org/wiki/Hauterivian) | ~132.9 |
| [Valanginian](https://en.wikipedia.org/wiki/Valanginian) | ~139.8 |
| [Berriasian](https://en.wikipedia.org/wiki/Berriasian) | ~145 |
| [Jurassic](https://en.wikipedia.org/wiki/Jurassic) | [Late](https://en.wikipedia.org/wiki/Late_Jurassic) | [Tithonian](https://en.wikipedia.org/wiki/Tithonian) | [Gymnosperms](https://en.wikipedia.org/wiki/Gymnosperm) (especially [conifers](https://en.wikipedia.org/wiki/Conifer), [Bennettitales](https://en.wikipedia.org/wiki/Bennettitales) and [cycads](https://en.wikipedia.org/wiki/Cycad)) and [ferns](https://en.wikipedia.org/wiki/Fern) common. Many types of [dinosaurs](https://en.wikipedia.org/wiki/Dinosaur), such as [sauropods](https://en.wikipedia.org/wiki/Sauropod), [carnosaurs](https://en.wikipedia.org/wiki/Carnosaur), and [stegosaurs](https://en.wikipedia.org/wiki/Stegosaur). Mammals common but small. First [birds](https://en.wikipedia.org/wiki/Bird) and [lizards](https://en.wikipedia.org/wiki/Squamata). [Ichthyosaurs](https://en.wikipedia.org/wiki/Ichthyosaur) and [plesiosaurs](https://en.wikipedia.org/wiki/Plesiosaur) diverse. [Bivalves](https://en.wikipedia.org/wiki/Bivalvia), [Ammonites](https://en.wikipedia.org/wiki/Ammonite) and [belemnites](https://en.wikipedia.org/wiki/Belemnoidea) abundant. [Sea urchins](https://en.wikipedia.org/wiki/Sea_urchin) very common, along with [crinoids](https://en.wikipedia.org/wiki/Crinoid), starfish, [sponges](https://en.wikipedia.org/wiki/Porifera), and [terebratulid](https://en.wikipedia.org/wiki/Terebratulida) and [rhynchonellid](https://en.wikipedia.org/wiki/Rhynchonellida) [brachiopods](https://en.wikipedia.org/wiki/Brachiopod). Breakup of [Pangaea](https://en.wikipedia.org/wiki/Pangaea) into [Gondwana](https://en.wikipedia.org/wiki/Gondwana) and [Laurasia](https://en.wikipedia.org/wiki/Laurasia). [Nevadan orogeny](https://en.wikipedia.org/wiki/Nevadan_orogeny) in North America. [Rantigata](https://en.wikipedia.org/wiki/Rangitata_Orogeny) and [Cimmerian Orogenies](https://en.wikipedia.org/wiki/Cimmerian_Orogeny) taper off. Atmospheric CO2 levels 4–5 times the present day levels (1200–1500 ppmv, compared to today's 385 ppmv). | 152.1 ± 0.9 |
| [Kimmeridgian](https://en.wikipedia.org/wiki/Kimmeridgian) | 157.3 ± 1.0 |
| [Oxfordian](https://en.wikipedia.org/wiki/Oxfordian_stage) | 163.5 ± 1.0 |
| [Middle](https://en.wikipedia.org/wiki/Middle_Jurassic) | [Callovian](https://en.wikipedia.org/wiki/Callovian) | 166.1 ± 1.2 |
| [Bathonian](https://en.wikipedia.org/wiki/Bathonian) | 168.3 ± 1.3\* |
| [Bajocian](https://en.wikipedia.org/wiki/Bajocian) | 170.3 ± 1.4\* |
| [Aalenian](https://en.wikipedia.org/wiki/Aalenian) | 174.1 ± 1.0\* |
| [Early](https://en.wikipedia.org/wiki/Early_Jurassic) | [Toarcian](https://en.wikipedia.org/wiki/Toarcian) | 182.7 ± 0.7\* |
| [Pliensbachian](https://en.wikipedia.org/wiki/Pliensbachian) | 190.8 ± 1.0\* |
| [Sinemurian](https://en.wikipedia.org/wiki/Sinemurian) | 199.3 ± 0.3\* |
| [Hettangian](https://en.wikipedia.org/wiki/Hettangian) | 201.3 ± 0.2\* |
| [Triassic](https://en.wikipedia.org/wiki/Triassic) | [Late](https://en.wikipedia.org/wiki/Late_Triassic) | [Rhaetian](https://en.wikipedia.org/wiki/Rhaetian) | [Archosaurs](https://en.wikipedia.org/wiki/Archosaur) dominant on land as [dinosaurs](https://en.wikipedia.org/wiki/Dinosaur), in the oceans as [Ichthyosaurs](https://en.wikipedia.org/wiki/Ichthyosaur) and [nothosaurs](https://en.wikipedia.org/wiki/Nothosaur), and in the air as [pterosaurs](https://en.wikipedia.org/wiki/Pterosaur). [Cynodonts](https://en.wikipedia.org/wiki/Cynodont) become smaller and more mammal-like, while first [mammals](https://en.wikipedia.org/wiki/Mammal) and [crocodilia](https://en.wikipedia.org/wiki/Crocodilia) appear. [*Dicroidium*](https://en.wikipedia.org/wiki/Dicroidium)flora common on land. Many large aquatic [temnospondyl](https://en.wikipedia.org/wiki/Temnospondyli) amphibians. [Ceratitic ammonoids](https://en.wikipedia.org/wiki/Ammonite) extremely common. [Modern corals](https://en.wikipedia.org/wiki/Scleractinia) and [teleost](https://en.wikipedia.org/wiki/Teleost) fish appear, as do many modern [insect](https://en.wikipedia.org/wiki/Insect) clades. [Andean Orogeny](https://en.wikipedia.org/wiki/Andes_Mountains) in South America. [Cimmerian Orogeny](https://en.wikipedia.org/wiki/Cimmerian_Orogeny) in Asia. [Rangitata Orogeny](https://en.wikipedia.org/wiki/Rangitata_Orogeny) begins in New Zealand. [Hunter-Bowen Orogeny](https://en.wikipedia.org/wiki/Hunter-Bowen_Orogeny) in [Northern Australia](https://en.wikipedia.org/wiki/Northern_Australia), Queensland and [New South Wales](https://en.wikipedia.org/wiki/New_South_Wales) ends, (c. 260–225 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)) | ~208.5 |
| [Norian](https://en.wikipedia.org/wiki/Norian) | ~227 |
| [Carnian](https://en.wikipedia.org/wiki/Carnian) | ~237\* |
| [Middle](https://en.wikipedia.org/wiki/Middle_Triassic) | [Ladinian](https://en.wikipedia.org/wiki/Ladinian) | ~242\* |
| [Anisian](https://en.wikipedia.org/wiki/Anisian) | 247.2 |
| [Early](https://en.wikipedia.org/wiki/Early_Triassic) | [Olenekian](https://en.wikipedia.org/wiki/Olenekian) | 251.2 |
| [Induan](https://en.wikipedia.org/wiki/Induan) | 252.17 ± 0.06\* |
| [Paleozoic](https://en.wikipedia.org/wiki/Paleozoic) | [Permian](https://en.wikipedia.org/wiki/Permian) | [Lopingian](https://en.wikipedia.org/wiki/Lopingian) | [Changhsingian](https://en.wikipedia.org/wiki/Changhsingian) | [Landmasses](https://en.wikipedia.org/wiki/Landmass) unite into [supercontinent](https://en.wikipedia.org/wiki/Supercontinent) [Pangaea](https://en.wikipedia.org/wiki/Pangaea), creating the [Appalachians](https://en.wikipedia.org/wiki/Appalachian_Mountains). End of Permo-Carboniferous glaciation. [Synapsid](https://en.wikipedia.org/wiki/Synapsida) [reptiles](https://en.wikipedia.org/wiki/Reptilia) ([pelycosaurs](https://en.wikipedia.org/wiki/Pelycosaur) and [therapsids](https://en.wikipedia.org/wiki/Therapsid)) become plentiful, while [parareptiles](https://en.wikipedia.org/wiki/Parareptile) and [temnospondyl](https://en.wikipedia.org/wiki/Temnospondyli) [amphibians](https://en.wikipedia.org/wiki/Amphibian) remain common. In the mid-Permian, [coal](https://en.wikipedia.org/wiki/Coal)-age flora are replaced by [cone](https://en.wikipedia.org/wiki/Conifer_cone)-bearing [gymnosperms](https://en.wikipedia.org/wiki/Gymnosperm) (the first true [seed plants](https://en.wikipedia.org/wiki/Seed_plants)) and by the first true [mosses](https://en.wikipedia.org/wiki/Moss). [Beetles](https://en.wikipedia.org/wiki/Beetles) and [flies](https://en.wikipedia.org/wiki/Fly) evolve. Marine life flourishes in warm shallow reefs; [productid](https://en.wikipedia.org/w/index.php?title=Productida&action=edit&redlink=1) and [spiriferid](https://en.wikipedia.org/wiki/Spiriferida) brachiopods, bivalves, [forams](https://en.wikipedia.org/wiki/Foraminifera), and [ammonoids](https://en.wikipedia.org/wiki/Orthocerid) all abundant. [Permian-Triassic extinction event](https://en.wikipedia.org/wiki/Permian-Triassic_extinction_event) occurs 251 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers): 95% of life on Earth becomes extinct, including all [trilobites](https://en.wikipedia.org/wiki/Trilobite), [graptolites](https://en.wikipedia.org/wiki/Graptolite), and [blastoids](https://en.wikipedia.org/wiki/Blastoid). [Ouachita](https://en.wikipedia.org/wiki/Ouachita_Orogeny) and [Innuitian orogenies](https://en.wikipedia.org/wiki/Innuitian_orogeny) in North America. [Uralian orogeny](https://en.wikipedia.org/wiki/Uralian_orogeny) in Europe/Asia tapers off. [Altaid](https://en.wikipedia.org/wiki/Altai_Mountains) orogeny in Asia. [Hunter-Bowen Orogeny](https://en.wikipedia.org/wiki/Hunter-Bowen_Orogeny) on [Australian continent](https://en.wikipedia.org/wiki/Australia_%28continent%29) begins (c. 260–225 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)), forming the [MacDonnell Ranges](https://en.wikipedia.org/wiki/MacDonnell_Ranges). | 254.14 ± 0.07\* |
| [Wuchiapingian](https://en.wikipedia.org/wiki/Wuchiapingian) | 259.8 ± 0.4\* |
| [Guadalupian](https://en.wikipedia.org/wiki/Guadalupian) | [Capitanian](https://en.wikipedia.org/wiki/Capitanian) | 265.1 ± 0.4\* |
| [Wordian](https://en.wikipedia.org/wiki/Wordian)/Kazanian | 268.8 ± 0.5\* |
| [Roadian](https://en.wikipedia.org/wiki/Roadian)/Ufimian | 272.3 ± 0.5\* |
| [Cisuralian](https://en.wikipedia.org/wiki/Cisuralian) | [Kungurian](https://en.wikipedia.org/wiki/Kungurian) | 283.5 ± 0.6 |
| [Artinskian](https://en.wikipedia.org/wiki/Artinskian) | 290.1 ± 0.26 |
| [Sakmarian](https://en.wikipedia.org/wiki/Sakmarian) | 295 ± 0.18 |
| [Asselian](https://en.wikipedia.org/wiki/Asselian) | 298.9 ± 0.15\* |
| [Carbon-iferous](https://en.wikipedia.org/wiki/Carboniferous) | [Pennsylvanian](https://en.wikipedia.org/wiki/Pennsylvanian_%28geology%29) | [Gzhelian](https://en.wikipedia.org/wiki/Gzhelian) | [Winged insects](https://en.wikipedia.org/wiki/Pterygota) radiate suddenly; some (esp. [Protodonata](https://en.wikipedia.org/wiki/Protodonata) and [Palaeodictyoptera](https://en.wikipedia.org/wiki/Palaeodictyoptera)) are quite large. [Amphibians](https://en.wikipedia.org/wiki/Amphibian) common and diverse. First [reptiles](https://en.wikipedia.org/wiki/Reptile) and [coal](https://en.wikipedia.org/wiki/Coal) forests ([scale trees](https://en.wikipedia.org/wiki/Lepidodendron), ferns, [club trees](https://en.wikipedia.org/wiki/Sigillaria), [giant horsetails](https://en.wikipedia.org/wiki/Calamites), [*Cordaites*](https://en.wikipedia.org/wiki/Cordaites), etc.). Highest-ever [atmospheric](https://en.wikipedia.org/wiki/Atmosphere_of_Earth) [oxygen](https://en.wikipedia.org/wiki/Oxygen) levels. [Goniatites](https://en.wikipedia.org/wiki/Goniatite), brachiopods, bryozoa, bivalves, and corals plentiful in the seas and oceans. Testate [forams](https://en.wikipedia.org/wiki/Foram) proliferate. [Uralian orogeny](https://en.wikipedia.org/wiki/Uralian_orogeny) in Europe and Asia. [Variscan orogeny](https://en.wikipedia.org/wiki/Variscan_orogeny) occurs towards middle and late Mississippian Periods. | 303.7 ± 0.1 |
| [Kasimovian](https://en.wikipedia.org/wiki/Kasimovian) | 307 ± 0.1 |
| [Moscovian](https://en.wikipedia.org/wiki/Moscovian_%28Carboniferous%29) | 315.2 ± 0.2 |
| [Bashkirian](https://en.wikipedia.org/wiki/Bashkirian) | 323.2 ± 0.4\* |
| [Mississippian](https://en.wikipedia.org/wiki/Mississippian_age) | [Serpukhovian](https://en.wikipedia.org/wiki/Serpukhovian) | Large [primitive trees](https://en.wikipedia.org/wiki/Lycopodiophyta), first [land vertebrates](https://en.wikipedia.org/wiki/Tetrapoda), and amphibious [sea-scorpions](https://en.wikipedia.org/wiki/Eurypterid) live amid [coal](https://en.wikipedia.org/wiki/Coal)-forming coastal [swamps](https://en.wikipedia.org/wiki/Brackish_water). Lobe-finned [rhizodonts](https://en.wikipedia.org/wiki/Rhizodont) are dominant big fresh-water predators. In the oceans, early [sharks](https://en.wikipedia.org/wiki/Chondrichthyes) are common and quite diverse; [echinoderms](https://en.wikipedia.org/wiki/Echinoderm) (especially [crinoids](https://en.wikipedia.org/wiki/Crinoid) and [blastoids](https://en.wikipedia.org/wiki/Blastoid)) abundant. [Corals](https://en.wikipedia.org/wiki/Coral), [bryozoa](https://en.wikipedia.org/wiki/Bryozoa), [goniatites](https://en.wikipedia.org/wiki/Goniatitida) and brachiopods ([Productida](https://en.wikipedia.org/w/index.php?title=Productida&action=edit&redlink=1), [Spiriferida](https://en.wikipedia.org/wiki/Spiriferida), etc.) very common, but [trilobites](https://en.wikipedia.org/wiki/Trilobita) and [nautiloids](https://en.wikipedia.org/wiki/Nautiloid) decline. [Glaciation](https://en.wikipedia.org/wiki/Glaciation) in East [Gondwana](https://en.wikipedia.org/wiki/Gondwana). [Tuhua Orogeny](https://en.wikipedia.org/wiki/Mayor_Island/Tuhua) in New Zealand tapers off. | 330.9 ± 0.2 |
| [Viséan](https://en.wikipedia.org/wiki/Vis%C3%A9an) | 346.7 ± 0.4\* |
| [Tournaisian](https://en.wikipedia.org/wiki/Tournaisian) | 358.9 ± 0.4\* |
| [Devonian](https://en.wikipedia.org/wiki/Devonian) | [Late](https://en.wikipedia.org/wiki/Late_Devonian) | [Famennian](https://en.wikipedia.org/wiki/Famennian) | First [clubmosses](https://en.wikipedia.org/wiki/Lycopodiopsida), [horsetails](https://en.wikipedia.org/wiki/Equisetophyta) and [ferns](https://en.wikipedia.org/wiki/Fern) appear, as do the first [seed](https://en.wikipedia.org/wiki/Seed)-bearing plants ([progymnosperms](https://en.wikipedia.org/wiki/Progymnosperm)), first [trees](https://en.wikipedia.org/wiki/Tree) (the progymnosperm [*Archaeopteris*](https://en.wikipedia.org/wiki/Archaeopteris)), and first (wingless) [insects](https://en.wikipedia.org/wiki/Insect). [Strophomenid](https://en.wikipedia.org/wiki/Strophomenida) and [atrypid](https://en.wikipedia.org/w/index.php?title=Atrypida&action=edit&redlink=1) [brachiopods](https://en.wikipedia.org/wiki/Brachiopod), [rugose](https://en.wikipedia.org/wiki/Rugosa) and [tabulate](https://en.wikipedia.org/wiki/Tabulata) corals, and [crinoids](https://en.wikipedia.org/wiki/Crinoid) are all abundant in the oceans. [Goniatite](https://en.wikipedia.org/wiki/Goniatite) [ammonoids](https://en.wikipedia.org/wiki/Ammonite) are plentiful, while squid-like [coleoids](https://en.wikipedia.org/wiki/Coleoidea) arise. Trilobites and armored agnaths decline, while jawed fishes ([placoderms](https://en.wikipedia.org/wiki/Placodermi), [lobe-finned](https://en.wikipedia.org/wiki/Sarcopterygii) and [ray-finned](https://en.wikipedia.org/wiki/Osteichthyes) fish, and early [sharks](https://en.wikipedia.org/wiki/Chondrichthyes)) rule the seas. First [amphibians](https://en.wikipedia.org/wiki/Amphibian) still aquatic. "Old Red Continent" of [Euramerica](https://en.wikipedia.org/wiki/Euramerica). Beginning of [Acadian Orogeny](https://en.wikipedia.org/wiki/Acadian_Orogeny) for [Anti-Atlas Mountains](https://en.wikipedia.org/wiki/Atlas_Mountains) of [North Africa](https://en.wikipedia.org/wiki/North_Africa), and [Appalachian Mountains](https://en.wikipedia.org/wiki/Appalachian_Mountains) of North America, also the [Antler](https://en.wikipedia.org/wiki/Antler_Orogeny), [Variscan](https://en.wikipedia.org/wiki/Variscan_Orogeny), and [Tuhua Orogeny](https://en.wikipedia.org/wiki/Mayor_Island/Tuhua) in New Zealand. | 372.2 ± 1.6\* |
| [Frasnian](https://en.wikipedia.org/wiki/Frasnian) | 382.7 ± 1.6\* |
| [Middle](https://en.wikipedia.org/wiki/Middle_Devonian) | [Givetian](https://en.wikipedia.org/wiki/Givetian) | 387.7 ± 0.8\* |
| [Eifelian](https://en.wikipedia.org/wiki/Eifelian) | 393.3 ± 1.2\* |
| [Early](https://en.wikipedia.org/wiki/Early_Devonian) | [Emsian](https://en.wikipedia.org/wiki/Emsian) | 407.6 ± 2.6\* |
| [Pragian](https://en.wikipedia.org/wiki/Pragian) | 410.8 ± 2.8\* |
| [Lochkovian](https://en.wikipedia.org/wiki/Lochkovian) | 419.2 ± 3.2\* |
| [Silurian](https://en.wikipedia.org/wiki/Silurian) | [Pridoli](https://en.wikipedia.org/wiki/Pridoli_epoch) | First [Vascular plants](https://en.wikipedia.org/wiki/Vascular_plant) (the [rhyniophytes](https://en.wikipedia.org/wiki/Rhyniophytes) and their relatives), first [millipedes](https://en.wikipedia.org/wiki/Millipede) and [arthropleurids](https://en.wikipedia.org/wiki/Arthropleurida) on land. First [jawed fishes](https://en.wikipedia.org/wiki/Jawed_fish), as well as many [armoured](https://en.wikipedia.org/wiki/Ostracoderm) [jawless fish](https://en.wikipedia.org/wiki/Agnatha), populate the seas. [Sea-scorpions](https://en.wikipedia.org/wiki/Eurypterid) reach large size. [Tabulate](https://en.wikipedia.org/wiki/Tabulate_coral) and [rugose](https://en.wikipedia.org/wiki/Rugosa) corals, [brachiopods](https://en.wikipedia.org/wiki/Brachiopod) (*Pentamerida*, [Rhynchonellida](https://en.wikipedia.org/wiki/Rhynchonellida), etc.), and [crinoids](https://en.wikipedia.org/wiki/Crinoid) all abundant. [Trilobites](https://en.wikipedia.org/wiki/Trilobite) and [mollusks](https://en.wikipedia.org/wiki/Mollusk) diverse; [graptolites](https://en.wikipedia.org/wiki/Graptolite) not as varied. Beginning of [Caledonian Orogeny](https://en.wikipedia.org/wiki/Caledonian_Orogeny) for hills in England, Ireland, Wales, Scotland, and the [Scandinavian Mountains](https://en.wikipedia.org/wiki/Scandinavian_Mountains). Also continued into Devonian period as the [Acadian Orogeny](https://en.wikipedia.org/wiki/Acadian_Orogeny), above. [Taconic Orogeny](https://en.wikipedia.org/wiki/Taconic_Orogeny) tapers off. [Lachlan Orogeny](https://en.wikipedia.org/wiki/Lachlan_Orogeny) on [Australian continent](https://en.wikipedia.org/wiki/Australia_%28continent%29) tapers off. | 423 ± 2.3\* |
| [Ludlow](https://en.wikipedia.org/wiki/Ludlow_epoch)/[Cayugan](https://en.wikipedia.org/w/index.php?title=Cayugan&action=edit&redlink=1) | [Ludfordian](https://en.wikipedia.org/wiki/Ludfordian) | 425.6 ± 0.9\* |
| [Gorstian](https://en.wikipedia.org/wiki/Gorstian) | 427.4 ± 0.5\* |
| [Wenlock](https://en.wikipedia.org/wiki/Wenlock_epoch) | [Homerian](https://en.wikipedia.org/wiki/Homerian)/[Lockportian](https://en.wikipedia.org/w/index.php?title=Lockportian&action=edit&redlink=1) | 430.5 ± 0.7\* |
| [Sheinwoodian](https://en.wikipedia.org/wiki/Sheinwoodian)/[Tonawandan](https://en.wikipedia.org/w/index.php?title=Tonawandan&action=edit&redlink=1) | 433.4 ± 0.8\* |
| [Llandovery](https://en.wikipedia.org/wiki/Llandovery_epoch)/[Alexandrian](https://en.wikipedia.org/wiki/Silurian) | [Telychian](https://en.wikipedia.org/wiki/Telychian)/[Ontarian](https://en.wikipedia.org/wiki/Ontarian) | 438.5 ± 1.1\* |
| [Aeronian](https://en.wikipedia.org/wiki/Aeronian) | 440.8 ± 1.2\* |
| [Rhuddanian](https://en.wikipedia.org/wiki/Rhuddanian) | 443.8 ± 1.5\* |
| [Ordovician](https://en.wikipedia.org/wiki/Ordovician) | [Late](https://en.wikipedia.org/wiki/Late_Ordovician) | [Hirnantian](https://en.wikipedia.org/wiki/Hirnantian) | [Invertebrates](https://en.wikipedia.org/wiki/Invertebrate) diversify into many new types (e.g., long [straight-shelled](https://en.wikipedia.org/wiki/Orthoconic) [cephalopods](https://en.wikipedia.org/wiki/Orthocerida)). Early [corals](https://en.wikipedia.org/wiki/Coral), articulate [brachiopods](https://en.wikipedia.org/wiki/Brachiopod) (*Orthida*, *Strophomenida*, etc.), [bivalves](https://en.wikipedia.org/wiki/Bivalvia), [nautiloids](https://en.wikipedia.org/wiki/Nautiloid), [trilobites](https://en.wikipedia.org/wiki/Trilobite), [ostracods](https://en.wikipedia.org/wiki/Ostracod), [bryozoa](https://en.wikipedia.org/wiki/Bryozoa), many types of [echinoderms](https://en.wikipedia.org/wiki/Echinoderms) ([crinoids](https://en.wikipedia.org/wiki/Crinoid), [cystoids](https://en.wikipedia.org/wiki/Cystoidea), [starfish](https://en.wikipedia.org/wiki/Asteroidea), etc.), branched [graptolites](https://en.wikipedia.org/wiki/Graptolite), and other taxa all common. [Conodonts](https://en.wikipedia.org/wiki/Conodont) (early [planktonic](https://en.wikipedia.org/wiki/Plankton) [vertebrates](https://en.wikipedia.org/wiki/Vertebrate)) appear. First [green plants](https://en.wikipedia.org/wiki/Embryophyte) and [fungi](https://en.wikipedia.org/wiki/Fungus) on land. Ice age at end of period. | 445.2 ± 1.4\* |
| [Katian](https://en.wikipedia.org/wiki/Katian) | 453 ± 0.7\* |
| [Sandbian](https://en.wikipedia.org/wiki/Sandbian) | 458.4 ± 0.9\* |
| [Middle](https://en.wikipedia.org/wiki/Middle_Ordovician) | [Darriwilian](https://en.wikipedia.org/wiki/Darriwilian) | 467.3 ± 1.1\* |
| [Dapingian](https://en.wikipedia.org/wiki/Dapingian) | 470 ± 1.4\* |
| [Early](https://en.wikipedia.org/wiki/Early_Ordovician) | [Floian](https://en.wikipedia.org/wiki/Floian)(formerly [Arenig](https://en.wikipedia.org/wiki/Arenig)) | 477.7 ± 1.4\* |
| [Tremadocian](https://en.wikipedia.org/wiki/Tremadocian) | 485.4 ± 1.9\* |
| [Cambrian](https://en.wikipedia.org/wiki/Cambrian) | [Furongian](https://en.wikipedia.org/wiki/Furongian) | [Stage 10](https://en.wikipedia.org/wiki/Cambrian_Stage_10) | Major diversification of life in the [Cambrian Explosion](https://en.wikipedia.org/wiki/Cambrian_Explosion). Numerous fossils; most modern [animal](https://en.wikipedia.org/wiki/Animalia) [phyla](https://en.wikipedia.org/wiki/Phylum) appear. First [chordates](https://en.wikipedia.org/wiki/Chordate) appear, along with a number of extinct, problematic phyla. Reef-building [Archaeocyatha](https://en.wikipedia.org/wiki/Archaeocyatha) abundant; then vanish. [Trilobites](https://en.wikipedia.org/wiki/Trilobite), [priapulid](https://en.wikipedia.org/wiki/Priapulid) worms, [sponges](https://en.wikipedia.org/wiki/Porifera), inarticulate [brachiopods](https://en.wikipedia.org/wiki/Brachiopod) (unhinged lampshells), and many other animals numerous. [Anomalocarids](https://en.wikipedia.org/wiki/Anomalocarid) are giant predators, while many Ediacaran fauna die out. [Prokaryotes](https://en.wikipedia.org/wiki/Prokaryote), [protists](https://en.wikipedia.org/wiki/Protist) (e.g., [forams](https://en.wikipedia.org/wiki/Foram)), [fungi](https://en.wikipedia.org/wiki/Fungus) and [algae](https://en.wikipedia.org/wiki/Algae) continue to present day. [Gondwana](https://en.wikipedia.org/wiki/Gondwana) emerges. [Petermann Orogeny](https://en.wikipedia.org/wiki/Petermann_Orogeny) on the [Australian continent](https://en.wikipedia.org/wiki/Australia_%28continent%29) tapers off (550–535 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)). Ross Orogeny in Antarctica. [Adelaide Geosyncline (Delamerian Orogeny)](https://en.wikipedia.org/wiki/Adelaide_Geosyncline), majority of orogenic activity from 514–500 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). [Lachlan Orogeny](https://en.wikipedia.org/wiki/Lachlan_Orogeny) on [Australian continent](https://en.wikipedia.org/wiki/Australia_%28continent%29), c. 540–440 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). [Atmospheric](https://en.wikipedia.org/wiki/Atmosphere_of_Earth) CO2 content roughly 20–35 times present-day ([Holocene](https://en.wikipedia.org/wiki/Holocene)) levels (6000 ppmv compared to today's 385 ppmv)  | ~489.5 |
| [Jiangshanian](https://en.wikipedia.org/wiki/Jiangshanian) | ~494\* |
| [Paibian](https://en.wikipedia.org/wiki/Paibian) | ~497\* |
| [Series 3](https://en.wikipedia.org/wiki/Cambrian_Series_3) | [Guzhangian](https://en.wikipedia.org/wiki/Guzhangian) | ~500.5\* |
| [Drumian](https://en.wikipedia.org/wiki/Drumian) | ~504.5\* |
| [Stage 5](https://en.wikipedia.org/wiki/Cambrian_Stage_5) | ~509 |
| [Series 2](https://en.wikipedia.org/wiki/Cambrian_Series_2) | [Stage 4](https://en.wikipedia.org/wiki/Cambrian_Stage_4) | ~514 |
| [Stage 3](https://en.wikipedia.org/wiki/Cambrian_Stage_3) | ~521 |
| [Terreneuvian](https://en.wikipedia.org/wiki/Terreneuvian) | [Stage 2](https://en.wikipedia.org/wiki/Cambrian_Stage_2) | ~529 |
| [Fortunian](https://en.wikipedia.org/wiki/Fortunian) | 541 ± 1.0\* |
| [Precambrian](https://en.wikipedia.org/wiki/Precambrian) | [Proterozoic](https://en.wikipedia.org/wiki/Proterozoic) | [Neoproterozoic](https://en.wikipedia.org/wiki/Neoproterozoic) | [Ediacaran](https://en.wikipedia.org/wiki/Ediacaran) | Good [fossils](https://en.wikipedia.org/wiki/Fossil) of the first [multi-celled animals](https://en.wikipedia.org/wiki/Metazoa). [Ediacaran biota](https://en.wikipedia.org/wiki/Ediacaran_biota) flourish worldwide in seas. Simple [trace fossils](https://en.wikipedia.org/wiki/Trace_fossil) of possible worm-like [*Trichophycus*](https://en.wikipedia.org/wiki/Trichophycus_pedum), etc. First [sponges](https://en.wikipedia.org/wiki/Porifera) and [trilobitomorphs](https://en.wikipedia.org/wiki/Trilobita). Enigmatic forms include many soft-jellied creatures shaped like bags, disks, or quilts (like [*Dickinsonia*](https://en.wikipedia.org/wiki/Dickinsonia)). [Taconic Orogeny](https://en.wikipedia.org/wiki/Taconic_Orogeny) in North America. [Aravalli Range](https://en.wikipedia.org/wiki/Aravalli_Range) [orogeny](https://en.wikipedia.org/wiki/Orogeny) in [Indian Subcontinent](https://en.wikipedia.org/wiki/Indian_Subcontinent). Beginning of [Petermann Orogeny](https://en.wikipedia.org/wiki/Petermann_Orogeny) on [Australian continent](https://en.wikipedia.org/wiki/Australia_%28continent%29). Beardmore Orogeny in Antarctica, 633–620 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). | ~635\* |
| [Cryogenian](https://en.wikipedia.org/wiki/Cryogenian) | Possible "[Snowball Earth](https://en.wikipedia.org/wiki/Snowball_Earth)" period. [Fossils](https://en.wikipedia.org/wiki/Fossil) still rare. [Rodinia](https://en.wikipedia.org/wiki/Rodinia) landmass begins to break up. Late Ruker / Nimrod Orogeny in Antarctica tapers of<bef. | 720 |
| [Tonian](https://en.wikipedia.org/wiki/Tonian) | [Rodinia](https://en.wikipedia.org/wiki/Rodinia) supercontinent persists. [Trace fossils](https://en.wikipedia.org/wiki/Trace_fossil) of simple [multi-celled](https://en.wikipedia.org/wiki/Multicellular) [eukaryotes](https://en.wikipedia.org/wiki/Eukaryota). First radiation of [dinoflagellate](https://en.wikipedia.org/wiki/Dinoflagellate)-like [acritarchs](https://en.wikipedia.org/wiki/Acritarch). [Grenville Orogeny](https://en.wikipedia.org/wiki/Grenville_Orogeny) tapers off in North America. [Pan-African orogeny](https://en.wikipedia.org/wiki/Pan-African_orogeny) in Africa. Lake Ruker / Nimrod Orogeny in Antarctica, 1000 ± 150 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). Edmundian Orogeny (c. 920 – 850 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)), [Gascoyne Complex](https://en.wikipedia.org/wiki/Gascoyne_Complex), Western Australia. [Adelaide Geosyncline](https://en.wikipedia.org/wiki/Adelaide_Geosyncline) laid down on [Australian continent](https://en.wikipedia.org/wiki/Australia_%28continent%29), beginning of [Adelaide Geosyncline (Delamerian Orogeny)](https://en.wikipedia.org/wiki/Adelaide_Geosyncline) in that continent. | 1000 |
| [Mesoproterozoic](https://en.wikipedia.org/wiki/Mesoproterozoic) | [Stenian](https://en.wikipedia.org/wiki/Stenian) | Narrow highly [metamorphic](https://en.wikipedia.org/wiki/Metamorphic_rock) belts due to [orogeny](https://en.wikipedia.org/wiki/Orogeny) as [Rodinia](https://en.wikipedia.org/wiki/Rodinia) forms. Late Ruker / Nimrod Orogeny in Antarctica possibly begins. Musgrave Orogeny (c. 1080 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)), [Musgrave Block](https://en.wikipedia.org/wiki/Musgrave_Block), [Central Australia](https://en.wikipedia.org/wiki/Central_Australia). | 1200 |
| [Ectasian](https://en.wikipedia.org/wiki/Ectasian) | [Platform covers](https://en.wikipedia.org/wiki/Platform_cover) continue to expand. [Green algae](https://en.wikipedia.org/wiki/Green_algae) [colonies](https://en.wikipedia.org/wiki/Colony_%28biology%29) in the seas. [Grenville Orogeny](https://en.wikipedia.org/wiki/Grenville_Orogeny) in North America. | 1400 |
| [Calymmian](https://en.wikipedia.org/wiki/Calymmian) | [Platform covers](https://en.wikipedia.org/wiki/Platform_cover) expand. Barramundi Orogeny, [McArthur Basin](https://en.wikipedia.org/wiki/McArthur_Basin), [Northern Australia](https://en.wikipedia.org/wiki/Northern_Australia), and Isan Orogeny, [c.](https://en.wikipedia.org/wiki/Circa)1600 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers), Mount Isa Block, Queensland | 1600 |
| [Paleoproterozoic](https://en.wikipedia.org/wiki/Paleoproterozoic) | [Statherian](https://en.wikipedia.org/wiki/Statherian) | First [complex single-celled life](https://en.wikipedia.org/wiki/Eukaryote): [protists](https://en.wikipedia.org/wiki/Protist) with nuclei. [Columbia](https://en.wikipedia.org/wiki/Columbia_%28supercontinent%29) is the primordial supercontinent. Kimban Orogeny in Australian continent ends. Yapungku Orogeny on [Yilgarn craton](https://en.wikipedia.org/wiki/Yilgarn_craton), in Western Australia. Mangaroon Orogeny, 1680–1620 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers), on the [Gascoyne Complex](https://en.wikipedia.org/wiki/Gascoyne_Complex) in Western Australia. Kararan Orogeny (1650– [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)), Gawler Craton, [South Australia](https://en.wikipedia.org/wiki/South_Australia). | 1800 |
| [Orosirian](https://en.wikipedia.org/wiki/Orosirian) | The [atmosphere](https://en.wikipedia.org/wiki/Atmosphere_of_Earth) becomes [oxygenic](https://en.wikipedia.org/wiki/Oxygen). [Vredefort](https://en.wikipedia.org/wiki/Vredefort_crater) and [Sudbury Basin](https://en.wikipedia.org/wiki/Sudbury_Basin) asteroid impacts. Much [orogeny](https://en.wikipedia.org/wiki/Orogeny). [Penokean](https://en.wikipedia.org/wiki/Penokean_orogeny) and [Trans-Hudsonian Orogenies](https://en.wikipedia.org/wiki/Trans-Hudsonian_Orogeny) in North America. Early Ruker Orogeny in Antarctica, 2000–1700 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). Glenburgh Orogeny, [Glenburgh Terrane](https://en.wikipedia.org/wiki/Gascoyne_Complex), [Australian continent](https://en.wikipedia.org/wiki/Australia_%28continent%29) [c.](https://en.wikipedia.org/wiki/Circa) 2005–1920 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). Kimban Orogeny, [Gawler craton](https://en.wikipedia.org/wiki/Gawler_craton) in Australian continent begins. | 2050 |
| [Rhyacian](https://en.wikipedia.org/wiki/Rhyacian) | [Bushveld Igneous Complex](https://en.wikipedia.org/wiki/Bushveld_Igneous_Complex) forms. [Huronian](https://en.wikipedia.org/wiki/Huronian) glaciation. | 2300 |
| [Siderian](https://en.wikipedia.org/wiki/Siderian) | [Oxygen catastrophe](https://en.wikipedia.org/wiki/Oxygen_catastrophe): [banded iron formations](https://en.wikipedia.org/wiki/Banded_iron_formation) forms. Sleaford Orogeny on [Australian continent](https://en.wikipedia.org/wiki/Australia_%28continent%29), [Gawler Craton](https://en.wikipedia.org/wiki/Gawler_Craton) 2440–2420 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). | 2500 |
| [Archean](https://en.wikipedia.org/wiki/Archean) | [Neoarchean](https://en.wikipedia.org/wiki/Neoarchean) | Stabilization of most modern [cratons](https://en.wikipedia.org/wiki/Craton); possible [mantle](https://en.wikipedia.org/wiki/Mantle_%28geology%29) overturn event. Insell Orogeny, 2650 ± 150 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). [Abitibi greenstone belt](https://en.wikipedia.org/wiki/Abitibi_greenstone_belt) in present-day [Ontario](https://en.wikipedia.org/wiki/Ontario) and [Quebec](https://en.wikipedia.org/wiki/Quebec) begins to form, stabilizes by 2600 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). | 2800 |
| [Mesoarchean](https://en.wikipedia.org/wiki/Mesoarchean) | First [stromatolites](https://en.wikipedia.org/wiki/Stromatolite) (probably [colonial](https://en.wikipedia.org/wiki/Colony_%28biology%29) [cyanobacteria](https://en.wikipedia.org/wiki/Cyanobacteria)). Oldest [macrofossils](https://en.wikipedia.org/wiki/Macrofossil). Humboldt Orogeny in Antarctica. [Blake River Megacaldera Complex](https://en.wikipedia.org/wiki/Blake_River_Megacaldera_Complex) begins to form in present-day [Ontario](https://en.wikipedia.org/wiki/Ontario) and [Quebec](https://en.wikipedia.org/wiki/Quebec), ends by roughly 2696 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). | 3200 |
| [Paleoarchean](https://en.wikipedia.org/wiki/Paleoarchean) | First known [oxygen-producing](https://en.wikipedia.org/wiki/Phototroph) [bacteria](https://en.wikipedia.org/wiki/Bacteria). Oldest definitive [microfossils](https://en.wikipedia.org/wiki/Microfossils). Oldest [cratons](https://en.wikipedia.org/wiki/Craton) on Earth (such as the [Canadian Shield](https://en.wikipedia.org/wiki/Canadian_Shield) and the [Pilbara Craton](https://en.wikipedia.org/wiki/Pilbara_Craton)) may have formed during this period. Rayner Orogeny in Antarctica. | 3600 |
| [Eoarchean](https://en.wikipedia.org/wiki/Eoarchean) | [Simple single-celled life](https://en.wikipedia.org/wiki/Prokaryote) (probably [bacteria](https://en.wikipedia.org/wiki/Bacteria) and [archaea](https://en.wikipedia.org/wiki/Archaea)). Oldest probable [microfossils](https://en.wikipedia.org/wiki/Microfossil). | 4000 |
| [Hadean](https://en.wikipedia.org/wiki/Hadean)  | [Early Imbrian](https://en.wikipedia.org/wiki/Early_Imbrian)  | Indirect [photosynthetic](https://en.wikipedia.org/wiki/Photosynthetic) evidence (e.g., [kerogen](https://en.wikipedia.org/wiki/Kerogen)) of primordial life. This era overlaps the end of the [Late Heavy Bombardment](https://en.wikipedia.org/wiki/Late_Heavy_Bombardment) of the [Inner](https://en.wikipedia.org/wiki/Inner_Solar_System) [Solar System](https://en.wikipedia.org/wiki/Solar_System). | ~4100 |
| [Nectarian](https://en.wikipedia.org/wiki/Nectarian)  | This unit gets its name from the [lunar geologic timescale](https://en.wikipedia.org/wiki/Lunar_geologic_timescale) when the [Nectaris Basin](https://en.wikipedia.org/wiki/Nectaris_Basin) and other greater [lunar basins](https://en.wikipedia.org/wiki/Lunar_basin) form by big [impact events](https://en.wikipedia.org/wiki/Impact_event). | ~4300 |
| [Basin Groups](https://en.wikipedia.org/wiki/Basin_Groups)  | Oldest known rock (4030 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)). The first [life forms](https://en.wikipedia.org/wiki/Organism) and [self-replicating](https://en.wikipedia.org/wiki/Self-replication) [RNA](https://en.wikipedia.org/wiki/RNA) [molecules](https://en.wikipedia.org/wiki/Molecule) evolve around 4000 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers), after the [Late Heavy Bombardment](https://en.wikipedia.org/wiki/Late_Heavy_Bombardment) ends on Earth. [Napier](https://en.wikipedia.org/wiki/Napier_Mountains) Orogeny in Antarctica, 4000 ± 200 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers). | ~4500 |
| [Cryptic](https://en.wikipedia.org/wiki/Cryptic_era)  | Oldest known [mineral](https://en.wikipedia.org/wiki/Mineral) ([Zircon](https://en.wikipedia.org/wiki/Zircon), 4404 ± 8 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)). Formation of [Moon](https://en.wikipedia.org/wiki/Moon) (4533 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)), probably from [giant impact](https://en.wikipedia.org/wiki/Giant_impact_hypothesis). Formation of [Earth](https://en.wikipedia.org/wiki/Earth) (4567.17 to 4570 [Ma](https://en.wikipedia.org/wiki/Year#SI_prefix_multipliers)) | ~4567 |

**Proposed Precambrian timeline**

The ICS's *Geologic Time Scale 2012* book which includes the new approved time scale also displays a proposal to substantially revise the Precambrian time scale to reflect important events such as the [formation of the Earth](https://en.wikipedia.org/wiki/Formation_of_the_Earth) or the [Great Oxidation Event](https://en.wikipedia.org/wiki/Great_Oxidation_Event), among others, while at the same time maintaining most of the previous chronostratigraphic nomenclature for the pertinent time span.

* [Hadean](https://en.wikipedia.org/wiki/Hadean) Eon – 4600–4030 MYA
	+ [Chaotian](https://en.wikipedia.org/wiki/Chaotian_%28geology%29) Era – 4600–4404 MYA – the name alluding both to the [mythological Chaos](https://en.wikipedia.org/wiki/Chaos_%28cosmogony%29) and the [chaotic](https://en.wikipedia.org/wiki/Chaos_theory) phase of [planet formation](https://en.wikipedia.org/wiki/Planet_formation)
	+ [Jack Hillsian](https://en.wikipedia.org/w/index.php?title=Jack_Hillsian&action=edit&redlink=1) or [Zirconian](https://en.wikipedia.org/w/index.php?title=Zirconian&action=edit&redlink=1) Era – 4404–4030 MYA – both names allude to the [Jack Hills Greenstone Belt](https://en.wikipedia.org/w/index.php?title=Jack_Hills_Greenstone_Belt&action=edit&redlink=1) which provided the oldest mineral grains on Earth, [zircons](https://en.wikipedia.org/wiki/Zircons)
* [Archean](https://en.wikipedia.org/wiki/Archean) Eon – 4030–2420 MYA
	+ [Paleoarchean](https://en.wikipedia.org/wiki/Paleoarchean) Era – 4030–3490 MYA
		- [Acastan](https://en.wikipedia.org/w/index.php?title=Acastan&action=edit&redlink=1) Period – 4030–3810 MYA – named after the [Acasta Gneiss](https://en.wikipedia.org/wiki/Acasta_Gneiss)
		- [Isuan](https://en.wikipedia.org/w/index.php?title=Isuan&action=edit&redlink=1) Period – 3810–3490 MYA – named after the [Isua Greenstone Belt](https://en.wikipedia.org/wiki/Isua_Greenstone_Belt)
	+ [Mesoarchean](https://en.wikipedia.org/wiki/Mesoarchean) Era – 3490–2780 MYA
		- [Vaalbaran](https://en.wikipedia.org/w/index.php?title=Vaalbaran&action=edit&redlink=1) Period – 3490–3020 MYA – a [portmanteau](https://en.wikipedia.org/wiki/Portmanteau) based on the names of the [Kapvaal](https://en.wikipedia.org/wiki/Kapvaal_craton) (Southern Africa) and [Pilbara](https://en.wikipedia.org/wiki/Pilbara_Craton) (Western Australia) [cratons](https://en.wikipedia.org/wiki/Craton)
		- [Pongolan](https://en.wikipedia.org/w/index.php?title=Pongolan&action=edit&redlink=1) Period – 3020–2780 MYA – named after the [Pongola Supergroup](https://en.wikipedia.org/w/index.php?title=Pongola_Supergroup&action=edit&redlink=1)
	+ [Neoarchean](https://en.wikipedia.org/wiki/Neoarchean) Era – 2780–2420 MYA
		- [Methanian](https://en.wikipedia.org/w/index.php?title=Methanian&action=edit&redlink=1) Period – 2780–2630 MYA – named for the inferred predominance of [methanotrophic](https://en.wikipedia.org/wiki/Methanotrophic) [prokaryotes](https://en.wikipedia.org/wiki/Prokaryotes)
		- [Siderian](https://en.wikipedia.org/wiki/Siderian) Period – 2630–2420 MYA – named for the voluminous banded iron formations formed within its duration
* [Proterozoic](https://en.wikipedia.org/wiki/Proterozoic) Eon – 2420–541 MYA
	+ [Paleoproterozoic](https://en.wikipedia.org/wiki/Paleoproterozoic) Era – 2420–1780 MYA
		- [Oxygenian](https://en.wikipedia.org/w/index.php?title=Oxygenian&action=edit&redlink=1) Period – 2420–2250 MYA – named for displaying the first evidence for a global oxidizing atmosphere
		- [Jatulian](https://en.wikipedia.org/w/index.php?title=Jatulian&action=edit&redlink=1) or [Eukaryian](https://en.wikipedia.org/w/index.php?title=Eukaryian&action=edit&redlink=1) Period – 2250–2060 MYA – names are respectively for the Lomagundi–Jatuli δ13C isotopic excursion event spanning its duration, and for the first fossil appearance of [eukaryotes](https://en.wikipedia.org/wiki/Eukaryota)
		- [Columbian Period](https://en.wikipedia.org/w/index.php?title=Columbian_Period&action=edit&redlink=1) – 2060–1780 MYA – named after the supercontinent [Columbia](https://en.wikipedia.org/wiki/Columbia_%28supercontinent%29)
	+ [Mesoproterozoic](https://en.wikipedia.org/wiki/Mesoproterozoic) Era – 1780–850 MYA
		- [Rodinian](https://en.wikipedia.org/w/index.php?title=Rodinian&action=edit&redlink=1) Period – 1780–850 MYA – named after the supercontinent [Rodinia](https://en.wikipedia.org/wiki/Rodinia), stable environment
	+ [Neoproterozoic](https://en.wikipedia.org/wiki/Neoproterozoic) Era – 850–541 MYA
		- [Cryogenian](https://en.wikipedia.org/wiki/Cryogenian) Period – 850–635 MYA – named for the occurrence of several glaciations
		- [Ediacaran](https://en.wikipedia.org/wiki/Ediacaran) Period – 635–541 MYA

Shown to scale:

Compare with the current official one:

**See also**

* [Age of the Earth](https://en.wikipedia.org/wiki/Age_of_the_Earth)
* [Anthropocene](https://en.wikipedia.org/wiki/Anthropocene)
* [Bubnoff unit](https://en.wikipedia.org/wiki/Bubnoff_unit)
* [Deep time](https://en.wikipedia.org/wiki/Deep_time)
* [Evolutionary history of life](https://en.wikipedia.org/wiki/Evolutionary_history_of_life)
* [Geological history of Earth](https://en.wikipedia.org/wiki/Geological_history_of_Earth)
* [Geology of Mars](https://en.wikipedia.org/wiki/Geology_of_Mars)/areology
* [Geon](https://en.wikipedia.org/wiki/Geon_%28geology%29)
* [Graphical timeline of the universe](https://en.wikipedia.org/wiki/Graphical_timeline_of_the_universe)
* [History of the Earth](https://en.wikipedia.org/wiki/History_of_the_Earth)
* [History of geology](https://en.wikipedia.org/wiki/History_of_geology)
* [History of paleontology](https://en.wikipedia.org/wiki/History_of_paleontology)
* [List of fossil sites](https://en.wikipedia.org/wiki/List_of_fossil_sites)
* [Logarithmic timeline](https://en.wikipedia.org/wiki/Logarithmic_timeline)
* [Lunar geologic timescale](https://en.wikipedia.org/wiki/Lunar_geologic_timescale)
* [Natural history](https://en.wikipedia.org/wiki/Natural_history)
* [New Zealand geologic time scale](https://en.wikipedia.org/wiki/New_Zealand_geologic_time_scale)
* [Prehistoric life](https://en.wikipedia.org/wiki/Prehistoric_life)
* [Timeline of the Big Bang](https://en.wikipedia.org/wiki/Timeline_of_the_Big_Bang)
* [Timeline of evolution](https://en.wikipedia.org/wiki/Timeline_of_evolution)
* [Timeline of the geologic history of the United States](https://en.wikipedia.org/wiki/Timeline_of_the_geologic_history_of_the_United_States)
* [Timeline of human evolution](https://en.wikipedia.org/wiki/Timeline_of_human_evolution)
* [Timeline of natural history](https://en.wikipedia.org/wiki/Timeline_of_natural_history)
* [Timeline of paleontology](https://en.wikipedia.org/wiki/Timeline_of_paleontology)

**Further reading**

* Aubry, Marie-Pierre; Van Couvering, John A; Christie-Blick, Nicholas; Landing, Ed; Pratt, Brian R; Owen, Donald E; & Ferrusquia-Villafranca, Ismael (2009). ["Terminology of geological time: Establishment of a community standard"](http://www.agiweb.org/nacsn/40890_articles_article_file_1641.pdf) (PDF). *Stratigraphy* **6** (2): 100–105. Retrieved 18 November 2011.
* Gradstein, F. M.; Ogg, J. G. (2004). [*A Geologic Time scale 2004 – Why, How and Where Next!*](http://msee140lnx10.ecn.purdue.edu/~astacy/projects/stratigraphy/old_ics_site_source/scale04.pdf) (PDF). Retrieved 18 November 2011.
* Gradstein, Felix M., Ogg, James G. & Smith, Alan G. (2004). [*A Geologic Time Scale 2004*](http://books.google.com/?id=rse4v1P-f9kC&printsec=frontcover&dq=geologic+time#v=onepage&q&f=false). New York; Cambridge, UK: Cambridge University Press. [ISBN](https://en.wikipedia.org/wiki/International_Standard_Book_Number) [0-521-78142-6](https://en.wikipedia.org/wiki/Special%3ABookSources/0-521-78142-6). Retrieved 18 November 2011 Paperback [ISBN 0-521-78673-8](https://en.wikipedia.org/wiki/Special%3ABookSources/0521786738)
* Gradstein, Felix M., Ogg, James G., Smith, Alan G., Bleeker, Wouter & Laurens, Lucas, J. (June 2004). ["A new Geologic Time Scale, with special reference to Precambrian and Neogene"](http://www.episodes.co.in/www/backissues/272/Time%20Scale.pdf) (PDF). *Episodes* **27** (2): 83–100. Retrieved 18 November 2011.
* [Knoll, Andrew H.](https://en.wikipedia.org/wiki/Andrew_H._Knoll), Walter, Malcolm R., Narbonne, Guy M., Christie-Blick, Nicholas (30 July 2004). ["A New Period for the Geologic Time Scale"](http://www.ldeo.columbia.edu/~ncb/Selected_Articles_all_files/17_Science%20305.621.pdf) (PDF). [*Science*](https://en.wikipedia.org/wiki/Science_%28journal%29) **305** (5684): 621–622. [doi](https://en.wikipedia.org/wiki/Digital_object_identifier):[10.1126/science.1098803](https://dx.doi.org/10.1126/science.1098803). [PMID](https://en.wikipedia.org/wiki/PubMed_Identifier) [15286353](https://www.ncbi.nlm.nih.gov/pubmed/15286353). Retrieved 18 November 2011.
* Levin, Harold L. (2010). ["Time and Geology"](http://books.google.com/books?id=D0yl7Cqsu78C&pg=PA29&dq=%22time+and+geology%22&hl=en&ei=c3TGTqTtL-qZiAf0kpz4Dw&sa=X&oi=book_result&ct=result&resnum=2&sqi=2&ved=0CDIQ6AEwAQ#v=onepage&q=%22time%20and%20geology%22&f=false). [*The Earth Through Time*](http://books.google.com/?id=D0yl7Cqsu78C&printsec=frontcover&dq=%22earth+through+time%22#v=onepage&q&f=false). Hoboken, New Jersey: John Wiley & Sons. [ISBN](https://en.wikipedia.org/wiki/International_Standard_Book_Number) [978-0-470-38774-0](https://en.wikipedia.org/wiki/Special%3ABookSources/978-0-470-38774-0). Retrieved 18 November 2011.

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