[Template:Other uses](/wiki/Template:Other_uses" \o "Template:Other uses) [Template:Pp-move-indef](/wiki/Template:Pp-move-indef) [thumb|Map of Pangaea with modern continental outlines.](/wiki/File:Pangaea_continents.svg)

**Pangaea** or **Pangea** ([Template:IPAc-en](/wiki/Template:IPAc-en)[[1]](#cite_note-1)) was a [supercontinent](/wiki/Supercontinent) that existed during the late [Paleozoic](/wiki/Paleozoic) and early [Mesozoic](/wiki/Mesozoic) eras.[[2]](#cite_note-2)[[3]](#cite_note-3) It assembled from earlier continental units approximately 300 million years ago, and it began to break apart about 175 million years ago.[[4]](#cite_note-4) In contrast to the present [Earth](/wiki/Earth) and its distribution of continental mass, much of Pangaea was in the [southern hemisphere](/wiki/Southern_Hemisphere) and surrounded by a super ocean, [Panthalassa](/wiki/Panthalassa). Pangaea was the last supercontinent to have existed and the first to be reconstructed by geologists.

## Contents

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## Origin of the concept[[edit](/index.php?title=(none)&action=edit&section=1)]

[Template:Life timeline](/wiki/Template:Life_timeline) The name is derived from [Ancient Greek](/wiki/Ancient_Greek) *pan* ([Template:Lang](/wiki/Template:Lang), "all, entire, whole") and [*Gaia*](/wiki/Gaia_(mythology)) ([Template:Lang](/wiki/Template:Lang), "[Mother Earth](/wiki/Mother_goddess), land").<ref name=OnlineEtDict>[Template:Cite web](/wiki/Template:Cite_web)</ref>[Template:Refn](/wiki/Template:Refn) The concept was first proposed by [Alfred Wegener](/wiki/Alfred_Wegener), the originator of the theory of [continental drift](/wiki/Continental_drift), in his 1912 publication *The Origin of Continents* (*Die Entstehung der Kontinente*).[[5]](#cite_note-5) He expanded this hypothesis into his theory in his book *The Origin of Continents and Oceans* (*Die Entstehung der Kontinente und Ozeane*), first published in 1915, in which he postulated that (before breaking up and drifting to their present locations) all the continents had formed a single [supercontinent](/wiki/Supercontinent) that he called the "*Urkontinent*". The name first occurs in the 1920 edition of *Die Entstehung der Kontinente und Ozeane*, but only once, when Wegener refers to the ancient supercontinent as "the Pangaea of the Carboniferous".[[6]](#cite_note-6) Wegener used the Germanized form "Pangäa", but the term entered German and English scientific literature (in 1922[[7]](#cite_note-7) and 1926, respectively) in the Latinized form "Pangaea" (of the Greek "Pangaia"), especially due to a symposium of the American Association of Petroleum Geologists in November 1926.[[8]](#cite_note-8)

## Formation[[edit](/index.php?title=(none)&action=edit&section=2)]

[thumb|left|Appalachian orogeny](/wiki/File:Appalachian_orogeny.jpg) The forming of supercontinents and their breaking up appears to have been [cyclical](/wiki/Supercontinent_cycle) through Earth's history. There may have been [many others](/wiki/List_of_supercontinents) before Pangaea. The fourth-last supercontinent, called [Columbia](/wiki/Columbia_(supercontinent)) or Nuna, appears to have assembled in the period 2.0–1.8 [Ga.](/wiki/Gya)[[9]](#cite_note-9)[[10]](#cite_note-10) Columbia/Nuna broke up and the next supercontinent, [Rodinia](/wiki/Rodinia), formed from the [accretion](/wiki/Accretion_(geology)) and assembly of its fragments. Rodinia lasted from about 1.1 billion years ago (Ga) until about 750 million years ago, but its exact configuration and geodynamic history are not nearly as well understood as those of the later supercontinents, Pannotia and Pangaea.

When Rodinia broke up, it split into three pieces: the supercontinent of [Proto-Laurasia](/wiki/Proto-Laurasia), the supercontinent of [Proto-Gondwana](/wiki/Proto-Gondwana), and the smaller [Congo craton](/wiki/Congo_craton). Proto-Laurasia and Proto-Gondwana were separated by the [Proto-Tethys Ocean](/wiki/Proto-Tethys_Ocean). Next [Proto-Laurasia](/wiki/Proto-Laurasia) itself split apart to form the continents of [Laurentia](/wiki/Laurentia), [Siberia](/wiki/Siberia_(continent)) and [Baltica](/wiki/Baltica). Baltica moved to the east of Laurentia, and Siberia moved northeast of Laurentia. The splitting also created two new oceans, the [Iapetus Ocean](/wiki/Iapetus_Ocean) and [Paleoasian Ocean](/wiki/Paleoasian_Ocean). Most of the above masses coalesced again to form the relatively short-lived supercontinent of [Pannotia](/wiki/Pannotia). This supercontinent included large amounts of land near the poles and, near the equator, only a relatively small strip connecting the polar masses. Pannotia lasted until 540 Ma, near the beginning of the [Cambrian](/wiki/Cambrian) period and then broke up, giving rise to the continents of [Laurentia](/wiki/Laurentia), [Baltica](/wiki/Baltica), and the southern supercontinent of [Gondwana](/wiki/Gondwana).

In the [Cambrian](/wiki/Cambrian) period, the continent of [Laurentia](/wiki/Laurentia), which would later become [North America](/wiki/North_America), sat on the [equator](/wiki/Equator), with three bordering oceans: the [Panthalassic Ocean](/wiki/Panthalassic_Ocean) to the north and west, the [Iapetus Ocean](/wiki/Iapetus_Ocean) to the south and the [Khanty Ocean](/wiki/Khanty_Ocean) to the east. In the Earliest [Ordovician](/wiki/Ordovician), around 480 Ma, the microcontinent of [Avalonia](/wiki/Avalonia) – a landmass incorporating fragments of what would become eastern [Newfoundland](/wiki/Newfoundland_(island)), the southern [British Isles](/wiki/British_Isles), and parts of [Belgium](/wiki/Belgium), northern [France](/wiki/France), [Nova Scotia](/wiki/Nova_Scotia), [New England](/wiki/New_England), [Iberia](/wiki/Iberian_Peninsula) and northwest Africa – broke free from Gondwana and began its journey to [Laurentia](/wiki/Laurentia).[[11]](#cite_note-11) Baltica, Laurentia, and Avalonia all came together by the end of the Ordovician to form a minor supercontinent called [Euramerica](/wiki/Euramerica) or Laurussia, closing the Iapetus Ocean. The collision also resulted in the formation of the northern [Appalachians](/wiki/Appalachians). [Siberia](/wiki/Siberia_(continent)) sat near Euramerica, with the [Khanty Ocean](/wiki/Khanty_Ocean) between the two continents. While all this was happening, Gondwana drifted slowly towards the South Pole. This was the first step of the formation of Pangaea.[[12]](#cite_note-12) The second step in the formation of Pangaea was the collision of Gondwana with [Euramerica](/wiki/Euramerica). By [Silurian](/wiki/Silurian) time, 440 Ma, Baltica had already collided with Laurentia, forming Euramerica. [Avalonia](/wiki/Avalonia) had not yet collided with [Laurentia](/wiki/Laurentia), but as Avalonia inched towards Laurentia, the seaway between them, a remnant of the [Iapetus Ocean](/wiki/Iapetus_Ocean), was slowly shrinking. Meanwhile, [southern Europe](/wiki/Southern_Europe) broke off from Gondwana and began to move towards Euramerica across the newly formed [Rheic Ocean](/wiki/Rheic_Ocean). It collided with southern [Baltica](/wiki/Baltica) in the [Devonian](/wiki/Devonian), though this microcontinent was an underwater plate. The Iapetus Ocean's sister ocean, the Khanty Ocean, shrank as an island arc from Siberia collided with eastern Baltica (now part of Euramerica). Behind this [island arc](/wiki/Island_arc) was a new ocean, the [Ural Ocean](/wiki/Ural_Ocean).

By late Silurian time, [North](/wiki/North_China_(continent)) and [South China](/wiki/South_China_(continent)) split from Gondwana and started to head northward, shrinking the Proto-Tethys Ocean in their path and opening the new [Paleo-Tethys Ocean](/wiki/Paleo-Tethys_Ocean) to their south. In the Devonian Period, Gondwana itself headed towards Euramerica, causing the Rheic Ocean to shrink. In the Early [Carboniferous](/wiki/Carboniferous), northwest [Africa](/wiki/Africa) had touched the southeastern coast of [Euramerica](/wiki/Euramerica), creating the southern portion of the [Appalachian Mountains](/wiki/Appalachian_Mountains), the [Meseta Mountains](/wiki/Meseta_Mountains) and the [Mauritanide Mountains](/wiki/Mauritanide_Belt). [South America](/wiki/South_America) moved northward to southern Euramerica, while the eastern portion of Gondwana ([India](/wiki/India), [Antarctica](/wiki/Antarctica) and [Australia](/wiki/Australia)) headed toward the South Pole from the [equator](/wiki/Equator). North and South China were on independent continents. The [Kazakhstania](/wiki/Kazakhstania) microcontinent had collided with [Siberia](/wiki/Siberia_(continent)). (Siberia had been a separate continent for millions of years since the deformation of the supercontinent [Pannotia](/wiki/Pannotia) in the Middle Carboniferous.)

Western [Kazakhstania](/wiki/Kazakhstania) collided with [Baltica](/wiki/Baltica) in the Late Carboniferous, closing the [Ural Ocean](/wiki/Ural_Ocean) between them and the western Proto-Tethys in them ([Uralian orogeny](/wiki/Uralian_orogeny)), causing the formation of not only the [Ural Mountains](/wiki/Ural_Mountains) but also the supercontinent of Laurasia. This was the last step of the formation of Pangaea. Meanwhile, South America had collided with southern [Laurentia](/wiki/Laurentia), closing the [Rheic Ocean](/wiki/Rheic_Ocean) and forming the southernmost part of the [Appalachians](/wiki/Appalachians) and [Ouachita Mountains](/wiki/Ouachita_Mountains). By this time, Gondwana was positioned near the South Pole and glaciers were forming in Antarctica, India, Australia, southern Africa and South America. The [North China](/wiki/North_China) block collided with [Siberia](/wiki/Siberia) by Late Carboniferous time, completely closing the Proto-Tethys Ocean.

By Early [Permian](/wiki/Permian) time, the [Cimmerian plate](/wiki/Cimmerian_plate) split from [Gondwana](/wiki/Gondwana) and headed towards Laurasia, thus closing the [Paleo-Tethys Ocean](/wiki/Paleo-Tethys_Ocean), but forming a new ocean, the [Tethys Ocean](/wiki/Tethys_Ocean), in its southern end. Most of the landmasses were all in one. By the [Triassic](/wiki/Triassic) Period, Pangaea rotated a little and the Cimmerian plate was still travelling across the shrinking Paleo-Tethys, until the [Middle Jurassic](/wiki/Middle_Jurassic) time. The Paleo-Tethys had closed from west to east, creating the [Cimmerian Orogeny](/wiki/Cimmerian_Orogeny). Pangaea, which looked like a *C*, with the new Tethys Ocean inside the *C*, had rifted by the Middle Jurassic, and its deformation is explained below.

## Evidence of existence[[edit](/index.php?title=(none)&action=edit&section=3)]

[thumb|right|middle|upright=1.25|The distribution of fossils across the continents is one line of evidence pointing to the existence of Pangaea.](/wiki/File:Snider-Pellegrini_Wegener_fossil_map.svg) [Fossil](/wiki/Fossil) evidence for Pangaea includes the presence of similar and identical species on continents that are now great distances apart. For example, fossils of the [therapsid](/wiki/Therapsid) [*Lystrosaurus*](/wiki/Lystrosaurus) have been found in [South Africa](/wiki/South_Africa), [India](/wiki/India) and [Antarctica](/wiki/Antarctica), alongside members of the [*Glossopteris*](/wiki/Glossopteris) flora, whose distribution would have ranged from the polar circle to the equator if the continents had been in their present position; similarly, the freshwater reptile [*Mesosaurus*](/wiki/Mesosaurus) has been found in only localized regions of the coasts of [Brazil](/wiki/Brazil) and [West Africa](/wiki/West_Africa).[[13]](#cite_note-13) Additional evidence for Pangaea is found in the [geology](/wiki/Geology) of adjacent continents, including matching geological trends between the eastern coast of [South America](/wiki/South_America) and the western coast of [Africa](/wiki/Africa). The [polar ice cap](/wiki/Polar_ice_cap) of the [Carboniferous](/wiki/Carboniferous) Period covered the southern end of Pangaea. Glacial deposits, specifically [till](/wiki/Till), of the same age and structure are found on many separate continents which would have been together in the continent of Pangaea.[[14]](#cite_note-14) [Paleomagnetic](/wiki/Paleomagnetic) study of apparent polar wandering paths also support the theory of a supercontinent. Geologists can determine the movement of continental plates by examining the orientation of magnetic minerals in rocks; when rocks are formed, they take on the magnetic properties of the Earth and indicate in which direction the poles lie relative to the rock. Since the magnetic poles [drift](/wiki/Polar_drift) about the rotational pole with a period of only a few thousand years, measurements from numerous lavas spanning several thousand years are averaged to give an apparent mean polar position. Samples of [sedimentary rock](/wiki/Sedimentary_rock) and [intrusive igneous rock](/wiki/Intrusive_igneous_rock) have magnetic orientations that are typically an average of the "secular variation" in the orientation of [magnetic north](/wiki/Magnetic_north) because their [remanent](/wiki/Remanence) magnetizations are not acquired instantaneously. Magnetic differences between sample groups whose age varies by millions of years is due to a combination of [true polar wander](/wiki/True_polar_wander) and the drifting of continents. The true polar wander component is identical for all samples, and can be removed, leaving geologists with the portion of this motion that shows continental drift and can be used to help reconstruct earlier continental positions.[[15]](#cite_note-15) The continuity of mountain chains provides further evidence for Pangaea. One example of this is the [Appalachian Mountains](/wiki/Appalachian_Mountains) chain which extends from the southeastern [United States](/wiki/United_States) to the [Caledonides](/wiki/Caledonides) of Ireland, Britain, Greenland, and Scandinavia.[[16]](#cite_note-16)

## Rifting and break-up[[edit](/index.php?title=(none)&action=edit&section=4)]

[thumb|left|Animation of the rifting of Pangaea](/wiki/File:Pangea_animation_03.gif) There were three major phases in the break-up of Pangaea. The first phase began in the [Early](/wiki/Early_Jurassic)-[Middle Jurassic](/wiki/Middle_Jurassic) (about 175 Ma), when Pangaea began to rift from the Tethys Ocean in the east to the [Pacific](/wiki/Pacific) in the west. The rifting that took place between North America and Africa produced multiple [failed rifts](/wiki/Eastern_North_America_Rift_Basins). One rift resulted in a new ocean, the North [Atlantic Ocean](/wiki/Atlantic_Ocean).[[16]](#cite_note-16) The Atlantic Ocean did not open uniformly; rifting began in the north-central Atlantic. The [South Atlantic](/wiki/South_Atlantic) did not open until the [Cretaceous](/wiki/Cretaceous) when Laurasia started to rotate clockwise and moved northward with North America to the north, and [Eurasia](/wiki/Eurasia) to the south. The clockwise motion of Laurasia led much later to the closing of the Tethys Ocean. Meanwhile, on the other side of Africa and along the adjacent margins of east Africa, Antarctica and [Madagascar](/wiki/Madagascar), new rifts were forming that would lead to the formation of the southwestern [Indian Ocean](/wiki/Indian_Ocean) that would open up in the Cretaceous.

The second major phase in the break-up of Pangaea began in the [Early Cretaceous](/wiki/Early_Cretaceous) (150–140 Ma), when the minor supercontinent of Gondwana separated into multiple continents (Africa, South America, India, Antarctica, and Australia). The subduction at [Tethyan Trench](/wiki/Tethyan_Trench) probably caused Africa, India and Australia to move northward, causing the opening of a "South Indian Ocean". In the Early Cretaceous, [Atlantica](/wiki/Atlantica), today's South America and Africa, finally separated from eastern Gondwana (Antarctica, India and Australia). Then in the Middle Cretaceous, Gondwana fragmented to open up the South Atlantic Ocean as South America started to move westward away from Africa. The South Atlantic did not develop uniformly; rather, it rifted from south to north.

Also, at the same time, [Madagascar](/wiki/Madagascar) and India began to separate from Antarctica and moved northward, opening up the Indian Ocean. Madagascar and India separated from each other 100–90 Ma in the Late Cretaceous. India continued to move northward toward Eurasia at 15 centimeters (6 in) a year (a plate tectonic record), closing the eastern Tethys Ocean, while Madagascar stopped and became locked to the [African Plate](/wiki/African_Plate). [New Zealand](/wiki/New_Zealand), [New Caledonia](/wiki/New_Caledonia) and the rest of [Zealandia](/wiki/Zealandia_(continent)) began to separate from Australia, moving eastward toward the [Pacific](/wiki/Pacific) and opening the [Coral Sea](/wiki/Coral_Sea) and [Tasman Sea](/wiki/Tasman_Sea).

The third major and final phase of the break-up of Pangaea occurred in the early [Cenozoic](/wiki/Cenozoic) ([Paleocene](/wiki/Paleocene) to [Oligocene](/wiki/Oligocene)). [Laurasia](/wiki/Laurasia) split when North America/Greenland (also called [Laurentia](/wiki/Laurentia)) broke free from Eurasia, opening the [Norwegian Sea](/wiki/Norwegian_Sea) about 60–55 Ma. The Atlantic and Indian Oceans continued to expand, closing the Tethys Ocean.

Meanwhile, Australia split from Antarctica and moved rapidly northward, just as India had done more than 40 million years before. Australia is currently on a collision course with [eastern Asia](/wiki/Eastern_Asia). Both Australia and India are currently moving northeast at 5–6 centimeters (2–3 in) a year. Antarctica has been near or at the South Pole since the formation of Pangaea about 280 Ma. India started to collide with [Asia](/wiki/Asia) beginning about 35 Ma, forming the [Himalayan orogeny](/wiki/Himalayan_orogeny), and also finally closing the [Tethys Seaway](/wiki/Tethys_Ocean); this collision continues today. The African Plate started to change directions, from west to northwest toward [Europe](/wiki/Europe), and South America began to move in a northward direction, separating it from Antarctica and allowing complete oceanic circulation around Antarctica for the first time. This motion, together with decreasing atmospheric [carbon dioxide](/wiki/Carbon_dioxide) concentrations, caused a rapid cooling of Antarctica and allowed [glaciers](/wiki/Glacier) to form. This glaciation eventually coalesced into the kilometers-thick ice sheets seen today.[[17]](#cite_note-17) Other major events took place during the [Cenozoic](/wiki/Cenozoic), including the opening of the [Gulf of California](/wiki/Gulf_of_California), the uplift of the [Alps](/wiki/Alps), and the opening of the [Sea of Japan](/wiki/Sea_of_Japan). The break-up of Pangaea continues today in the [Red Sea Rift](/wiki/Red_Sea_Rift) and [East African Rift](/wiki/East_African_Rift).

## Tectonic plate shift[[edit](/index.php?title=(none)&action=edit&section=5)]

[thumb|208x208px|The breakup of Pangaea over time](/wiki/File:Pangaea_to_present.gif) Pangaea's formation is now commonly explained in terms of [plate tectonics](/wiki/Plate_tectonics). The involvement of plate tectonics in Pangaea's[[18]](#cite_note-18) separation helps to show how it did not separate all at once, but at different times, in sequences. Additionally, after these separations, it has also been discovered that the separated land masses may have also continued to break apart multiple times. The formation of each [environment](/wiki/Ecology#Physical_environments) and climate on Pangaea is due to plate tectonics, and thus, it is as a result of these shifts and changes different climatic pressures were placed on the life on Pangaea. Although plate tectonics was paramount in the formation of later land masses, it was also essential in the placement, climate, environments, habitats, and overall structure of Pangaea.[[19]](#cite_note-19) What can also be observed in relation to tectonic plates and Pangaea, is the formations to such plates. Mountains and valleys form due to tectonic collisions as well as earthquakes and chasms. Consequentially, this shaped Pangaea and animal [adaptations](/wiki/Adaptation). Furthermore, plate tectonics can contribute to [volcanic activity](/wiki/Volcano),[[20]](#cite_note-20) which is responsible for extinctions and adaptations which have evidently affected life over time, and without doubt on Pangaea.

## Life[[edit](/index.php?title=(none)&action=edit&section=6)]

[thumb|Example of an Ammonite](/wiki/File:Ammonites_180308.jpg) Over the 100 million years Pangaea existed, many species had fruitful times whereas others struggled. The [Traversodontidae](/wiki/Traversodontidae)[[21]](#cite_note-21) is an example of such prospering animals, eating a diet of only plants. Plants dependent on [spore](/wiki/Spore) reproduction had been taken out of the [ecosystems](/wiki/Ecosystem), and replaced by the [gymnosperm](/wiki/Gymnosperm) plant, which reproduces through the use of seeds instead. These plants were also able to transport water internally, allowing animals that ate it to also improve hydration. Later on, insects (beetles, dragonflies, mosquitos) also thrived during the [Permian](/wiki/Permian) period (250–300) million years ago.[[22]](#cite_note-22) However, the [Permian extinction](/wiki/Permian–Triassic_extinction_event) would eventually come and greatly impact these insects through a mass extinction, being the only mass extinction to affect insects. When the [Triassic](/wiki/Triassic) Period came, many reptiles were able to also thrive, including Archosaurs, which is an ancestor to modern-day crocodiles and birds.

Little is known about marine life back to date during the existence of Pangaea. Scientists are unable to find substantial evidence or fossilized remains in order to assist them in answering such a question. However, a couple of marine animals have been discovered to exist at the time- the [Ammonites](/wiki/Ammonoidea) and [Brachiopods](/wiki/Brachiopod). Additionally, evidence pointing towards massive reefs with varied ecosystems, especially in the species of sponges and coral, has also been discovered.

## Climate change after Pangaea[[edit](/index.php?title=(none)&action=edit&section=7)]

Pangaea has tremendously affected the setup of the world now. We live in a post Pangaea time period where the reconfiguration of continents and oceans has changed the climate of many areas. There is scientific evidence that proves that climate was drastically altered. When the continents separated and reformed themselves, it changed the flow of the oceanic currents and winds. The scientific reasoning behind all of the changes is [Continental Drift](/wiki/Continental_drift). The theory of Continental Drift, created by [Alfred Wegener](/wiki/Alfred_Wegener), explained how the continents shifted Earth’s surface and how that affected many aspects such as climate, rock formations found on different continents and plant and animal fossils.[[23]](#cite_note-23) Wegener studied plant fossils from the frigid Arctic of [Svalbard](/wiki/Svalbard), [Norway](/wiki/Norway). He determined that such plants were not meant to adapt to a glacial climate. The fossils he found were from tropical plants that were meant to adapt and thrive in warmer and tropical climate.[[24]](#cite_note-24) Because we would not assume that the plant fossils were capable of traveling to a different place we suspect that Svalbard possibly had a warmer, less frigid climate in the past.[[25]](#cite_note-25) When Pangaea separated, the reorganization of the continents changed the function of the oceans and seaways. The restructuring of the continents, changed and altered the distribution of warmth and coolness of the oceans. When North America and South America connected, it stopped equatorial currents from passing from the Atlantic Ocean to the Pacific Ocean.[[26]](#cite_note-26) Researchers have found evidence by using computer hydrological models to show that this strengthened the Gulf Stream by diverting more warm currents towards Europe. Warm waters at high latitudes led to an increased evaporation and eventually atmospheric moisture. Increased evaporation and atmospheric moisture resulted in increased precipitation. Evidence of increased precipitation is the development of snow and ice that covers Greenland, which led to an accumulation of the icecap. Greenland’s growing ice cap led to further [global cooling](/wiki/Global_cooling).[[26]](#cite_note-26) Scientists also found evidence of global cooling through the separation of Australia and Antarctica and the formation of the Antarctic Ocean. Ocean currents in the newly formed Antarctic or Southern Ocean created a circumpolar current.[[26]](#cite_note-26) The creation of the new ocean that caused a circumpolar current eventually led to atmospheric currents that rotated from west to east. Atmospheric and oceanic currents stopped the transfer of warm, tropical air and water to the higher latitudes. As a result of the warm air and currents moving northward, it consequently cooled down Antarctica so much that it made it frigid.

Although many of Alfred Wegener’s theories and conclusions were valid, scientists are constantly coming up with new innovative ideas or reasoning behind why certain things happen. Wegener’s theory of Continental Drift was later replaced by the theory of [tectonic plates](/wiki/Plate_tectonics).[[27]](#cite_note-27)

## Implications of extinction[[edit](/index.php?title=(none)&action=edit&section=8)]

There is evidence to suggest that the deterioration of northern Pangaea contributed to the Permian Extinction, one of Earth’s five major mass extinction events which resulted in the loss of over 90% of marine and 70% of terrestrial species. There were three main sources of environmental deterioration which are believed to have had a hand in the extinction event.

The first of these sources is a loss of oxygen concentration in the ocean which caused deep water regions called the lysocline to grow shallower. With the lysocline shrinking, there were fewer places for calcite to dissolve in the ocean, considering calcite only dissolves at deep ocean depths. This led to the extinction of carbonate producers such as brachiopods and corals that relied on dissolved calcite to survive. The second source is the eruption of the Siberian Traps, a large volcanic event which is argued to be the result of Pangaean tectonic movement.[[28]](#cite_note-28) This had several negative repercussions on the environment, including metal loading and excess atmospheric carbon. Metal loading, the release of toxic metals from volcanic eruptions into the environment, led to acid rain and general stress on the environment. These toxic metals are known to infringe on vascular plants’ ability to photosynthesize, which may have resulted in the loss of Permian-era flora. Excess CO2 in the atmosphere is believed to be the main cause of the shrinking of lysocline areas. The third cause of this extinction event that can be attributed to northern Pangaea is the beginnings of anoxic ocean environments, or oceans with very low oxygen concentrations. The mix of anoxic oceans and ocean acidification due to metal loading led to increasingly acidic oceans,[[29]](#cite_note-29) which ultimately led to the extinction of benthic species.[[30]](#cite_note-30)

## See also[[edit](/index.php?title=(none)&action=edit&section=9)]

* [History of the Earth](/wiki/History_of_the_Earth)
* [Supercontinent cycle](/wiki/Supercontinent_cycle)
* [List of supercontinents](/wiki/List_of_supercontinents)
* Potential future supercontinents: [Pangaea Ultima](/wiki/Pangaea_Ultima), [Novopangaea](/wiki/Novopangaea) & [Amasia](/wiki/Amasia_(continent))
* [PANGAEA](/wiki/PANGAEA_(data_library)), a data library for earth system science, operated by the [Alfred Wegener Institute for Polar and Marine Research](/wiki/Alfred_Wegener_Institute_for_Polar_and_Marine_Research) (AWI)

## References[[edit](/index.php?title=(none)&action=edit&section=10)]

[Template:Reflist](/wiki/Template:Reflist)

## External links[[edit](/index.php?title=(none)&action=edit&section=11)]

[Template:Commons](/wiki/Template:Commons) [Template:Wiktionary](/wiki/Template:Wiktionary)

* [USGS Overview](http://pubs.usgs.gov/publications/text/historical.html)
* [Map of Triassic Pangaea at Paleomaps](http://www.scotese.com/newpage8.htm)
* [NHM Gallery](http://www.nhm.ac.uk/visit-us/galleries/red-zone/earths-treasury/index.html)

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