

Wegener and continental drift

Juan Segurola

Core question

How did Wegener turn scattered geological, palaeontological and geographical correspondences into the hypothesis of moving continents, and why did the hypothesis remain incomplete without a convincing mechanism?

Historical and evolutionary context

Geologists had long noticed similarities between opposite Atlantic coastlines and debated vanished land bridges, vertical crustal movements and changing seas. In 1912 Alfred Wegener publicly presented continental displacement and published papers arguing that continents had once been joined and later moved apart. His book *Die Entstehung der Kontinente und Ozeane* appeared in 1915 and was repeatedly revised. The proposal reorganised evidence from geography, fossils, stratigraphy and palaeoclimate into a mobile-Earth hypothesis.

What could communities know before this transition?

Nineteenth-century geology could reconstruct deep time, correlate strata and map fossils across continents. The limitation was explanatory integration. Similar fossil assemblages, mountain belts and palaeoclimatic indicators were often explained separately through land bridges or vertical movements rather than through large horizontal displacement.

What changed?

Multiple evidence streams were forced into one spatial history

Wegener compared continental shapes, geological structures, fossil distributions and climatic indicators. The power of the hypothesis lay in consilience: different observations could be explained by a common reconstruction of formerly connected landmasses.

Maps became arguments about motion

Continental outlines and geological correspondences were no longer static descriptions. They became evidence for a temporal transformation of Earth's surface. This extended the deep-time framework of PIO-060 from changing environments to changing continental positions.

The mechanism problem remained open

Wegener proposed forces that were not adequate to move continents through oceanic crust. Many geophysicists therefore rejected the theory despite accepting some of its evidence. This distinction is essential: a hypothesis can organise evidence fruitfully while remaining mechanistically incomplete.

Why could this capability emerge?

Global geological mapping, palaeontology, improved cartography and increasingly international data collections made cross-continental comparison possible. Wegener's interdisciplinary background in meteorology and polar research encouraged him to combine evidence that disciplinary specialists often treated separately.

What later forms of knowledge did it enable?

Continental drift preserved the question of horizontal mobility until ocean-floor mapping, palaeomagnetism, seafloor spreading and global seismology supplied the evidence and mechanism that converged in plate tectonics during the 1950s and 1960s.

New limits and risks

A compelling visual fit can be overinterpreted if reconstructions ignore continental shelves, deformation and quantitative uncertainty. Wegener's early force mechanisms were weak, and retrospective accounts risk portraying later plate tectonics as if it were already contained in the 1912 hypothesis.

What changed in the architecture of knowledge?

Earth history acquired a **mobile spatial framework**. Geological observations from distant continents could be interpreted as fragments of a changing global geometry rather than as isolated local histories.

Loss, exclusion and uncertainty

Wegener was not the first person to suggest displaced continents, and earlier contributions from Ortelius, Taylor and others matter. Non-European geological observations also entered European synthesis through imperial and colonial survey systems whose local contributors were often poorly credited. The boundary with PIO-089 must remain clear: Wegener proposed continental drift; plate tectonics later supplied a different, mechanism-rich synthesis.

Dependency map

- DIRECT ← PIO-060 Geology and deep time
- DIRECT → PIO-089 Plate tectonics: mechanism, synthesis and converging evidence

References

1. Wegener, A. *Die Entstehung der Kontinente und Ozeane*. Vieweg (first ed. 1915; later revised editions).
2. Meinhold, G. & Şengör, A. M. C. "A historical account of how continental drift and plate tectonics provided the framework for our current understanding of palaeogeography." *Geological Magazine* 156(2), 182-207 (2019). DOI: 10.1017/S0016756818000043.
3. Oreskes, N. *The Rejection of Continental Drift: Theory and Method in American Earth Science*. Oxford University Press (1999).