

# Origin of Species & Continent Formation

**A. THE FACT THAT** there was once a Pangean supercontinent, a Panthalassa Ocean, and a Tethys Ocean, has profound implications for the evolution of multicellular life on Earth. These considerations were unknown to the scientists of the 19th century – making their scientific deductions even more remarkable. Quite independently of each other, Charles Darwin and his young contemporary Alfred Russel Wallace reached the conclusion that life had evolved by natural selection. Wallace later wrote in *My Life* of his own inspiration:

**B. Why do some species die and some live?** The answer was clearly that on the whole the best fitted lived. From the effects of disease the most healthy escaped; from enemies the strongest, the swiftest or the most cunning from famine the best hunters – then it suddenly flashed on me that this self-acting process would improve the race, because in every generation the inferior would inevitably be killed off and the superior would remain, that is, the fittest would survive.

**C. Both Darwin's and Wallace's ideas** about natural selection had been influenced by the essays of Thomas Malthus in his *Principles of Population*. Their conclusion, however, had been the direct result of their personal observation of animals and plants in widely separated geographic locations: Darwin from his experiences during the voyage of the *Beagle*, and particularly during the ship's visit to the Galapagos Islands in the East Pacific in 1835; Wallace during his years of travel in the Amazon Basin and in the Indonesia-Australian Archipelago in the 1850s.

**D. Darwin had been documenting his ideas** on natural selection for many years when he received a paper on this selfsame subject from Wallace, who asked for Darwin's opinion and help in getting it published. In July 1858, Charles Lyell and J. D Hooker, close friends of Darwin, pressed Darwin to present his conclusions so that he would not lose priority to an unknown naturalist. Presiding over the hastily called but now historic meeting of the Linnean Society in

London, Lyell and Hooker explained to the distinguished members how “these two gentlemen” (who were absent: Wallace was abroad and Darwin chose not to attend), had “independently and unknown to one another, conceived the same very ingenious theory,”

E. Both Darwin and Wallace had realized that the anomalous distribution of species in particular regions had profound evolutionary significance. Subsequently, Darwin spent the rest of his days in almost total seclusion thinking and writing mainly about the origin of species. In contrast, Wallace applied himself to the science of biogeography, the study of the pattern and distribution of species, and its significance, resulting in the publication of a massive two-volume work the *Geographical Distribution of Animals* in 1876.

F. Wallace was a gentle and modest man, but also persistent and quietly courageous. He spent years working in the most arduous possible climates and terrains, particularly in the Malay archipelago, he made patient and detailed zoological observations and collected a huge number of specimens for museums and collectors—which is how he made a living. One result of his work was the conclusion that there is a distinct faunal boundary, called “Wallace’s line,” between an Asian realm of animals in Java, Borneo and the Philippines and an Australian realm in New Guinea and Australia. In essence, this boundary posed a difficult question: How on Earth did plants and animals with a clear affinity to the Northern Hemisphere meet with their Southern Hemispheric counterparts along such a distinct Malaysian demarcation zone? Wallace was uncertain about demarcation on one particular island—Celebes, a curiously shaped place that is midway between the two groups. Initially, he assigned its flora-fauna to the Australian side of the line, but later he transferred it to the Asian side. Today we know the reason for his dilemma. 200MYA East and West Celebes were islands with their own natural history lying on opposite sides of the Tethys Ocean. They did not collide until about 15 MYA. The answer to the main question is that Wallace’s Line categorizes Laurasia-derived flora-fauna (the Asian) and Gondwana-derived flora-fauna (the Australian), fauna that had evolved on opposing shores of the Tethys. The closure of the Tethys Ocean today is manifested by the ongoing collision of Australia/New Guinea with Indochina/Indonesia and the continuing closure of the Mediterranean Sea – a remnant of the Western Tethys Ocean.

**G. IN HIS ORIGIN OF CONTINENTS AND OCEANS, Wegener quoted at length from Wallace's Geographical Distribution of Animals. According to Wegener's reading, Wallace had identified three clear divisions of Australian animals, which supported his own theory of continental displacement. Wallace had shown that animals long established in southwestern Australia had an affinity with animals in South Africa, Madagascar, India, and Ceylon, but did not have an affinity with those in Asia. Wallace also showed that Australian marsupials and monotremes are clearly related to those in South America, the Moluccas, and various Pacific islands and that none are found in neighboring Indonesia. From this and related data, Wegener concluded that the then broadly accepted "landbridge" theory could not account for this distribution of animals and that only this theory of continental drift could explain it.**

**H. The theory that Wegener dismissed in preference to his own proposed that plants and animals had once migrated across now-submerged intercontinental landbridges. In 1885, one of Europe's leading geologists, Eduard Suess, theorized that as the rigid Earth cools, its upper-crust shrinks and wrinkles like the withering skin of an aging apple. He suggested that the planet's seas and oceans now fill the wrinkles between once-contiguous plateaus.**

**I. Today, we know that we live on a dynamic Earth with shifting, colliding and separating tectonic plates, not a "withering skin", and the main debate in the field of biogeography has shifted. The discussion now concerns "dispersalism" versus "vicarianism": unrestricted radiation of species on the one hand and the development of barriers to migration on the other. Dispersion is a short-term phenomenon – the daily or seasonal migration of species and their radiation to the limits of their natural environment on an extensive and continuous landmass. Vicarian evolution, however, depends upon the separation and isolation of a variety of species within the confines of natural barriers in the form of islands, lakes, or shallow seas – topographical features that take a long time to develop.**

Use the information in the passage to match the people with opinions or deeds below.

Write the appropriate letters A-E in boxes 1-5 on your answer sheet.

- A Sues
- B Wallace
- C Darwin and Wallace
- D Wegener
- E Lyell and Hooker

1. Urged Darwin to publish his scientific findings
2. Depicted physical feature of earth's crust.
3. Believed in continental drift theory while rejecting another one
4. Published works about wildlife distribution in a different region.
5. Evolution of species is based on selection by nature.

Questions 6-8

The Reading Passage has nine paragraphs A-I

Which paragraph contains the following information?

Write the correct letter A-I, in boxes 6-8 on your answer sheet.

6. Best adaptable animal survived on the planet.
7. Boundary called Wallace's line found between Asia and Australia.
8. Animal relevance exists between Australia and Africa.

**Questions 9-13**

**Complete the following summary below.**

**Write NO MORE THAN TWO WORDS for each answer.**

Wegener found that continental drift instead of “land bridge” theory could explain strange species’ distribution phenomenon. In his theory, vegetation and wildlife 9..... intercontinentally. However, Eduard Suess compared the wrinkle of crust to 10..... of an old apple. Now it is well known that we are living on the planet where there are 11..... in constant mobile states instead of what Suess described. Hot spot in biogeography is switched to concerns between two-terms: “12.....” and “13.....”

# Western Immigration of Canada

A. By the mid-1870s Canada wanted an immigrant population of agricultural settlers established in the West. No urban centres existed on the prairies in the 1870s, and rural settlement was the focus of the federal government's attention. The western rural settlement was desired, as it would provide homesteads for the sons and daughters of eastern farmers, as eastern agricultural land filled to capacity. As well, eastern farmers and politicians viewed western Canada, with its broad expanses of unpopulated land, as a prime location for expanding Canada's agricultural output, especially in terms of wheat production to serve the markets of eastern Canada.

B. To bolster Canada's population and agricultural output, the federal government took steps to secure western land. The Dominion of Canada purchased Rupert's Land from the Hudson's Bay Company in 1870. In 1872, the federal government enacted the Dominion Lands Act. This act enabled settlers to acquire 160 acres of free land, as long as settlers remained on their land for a period of three years, made certain minor improvements to the land, and paid a \$10.00 registration fee. The Canadian government also created a Mounted Police Force in 1873. The Mounties *journeyed west* to secure the area for future settlers. By 1876 the NWMP had established themselves in the West. The major posts included Swan River, Fort Saskatchewan, Fort Calgary, Fort Walsh and Fort Macleod. All of these initiatives attracted a number of eastern-Canadian settlers, as well as European and American immigrants, to Canada's West, and particularly to the area of Manitoba.

C. The surest way to protect Canadian territory, and to achieve the secondary goal for joining British Columbia to the rest of the country, was to import large numbers of Eastern Canadian and British settlers. Settling the West also made imperative the building of a transcontinental railway. The railway would work to create an east-west economy, in which western Canada would feed the growing urban industrial population of the east, and in return become a market for eastern Canadian manufactured goods.

**D. Winnipeg became the metropolis of the West during this period. Winnipeg's growth before 1900 was the result of a combination of land speculation, growth of housing starts, and the federal government's solution in 1881 of Winnipeg as a major stop along the CPR. This decision culminated in a land boom between 1881 and 1883 which resulted in the transformation of hamlets like Portage la Prairie and Brandon into towns, and a large increase in Manitoba's population. Soon, Winnipeg stood at the junction of three transcontinental railway lines which employed thousands in rail yards. Winnipeg also became the major processor of agricultural products for the surrounding hinterland.**

**E. The majority of settlers to Winnipeg, and the surrounding countryside, during this early period, were primarily Protestant English-speaking settlers from Ontario and the British Isles. These settlers established Winnipeg upon a British-Ontarian ethos which came to dominate the society's social, political, and economic spirit. This British-Ontarian ethnic homogeneity, however, did not last very long. Increasing numbers of foreign immigrants, especially from Austria-Hungary and Ukraine soon added a new ethnic element to the recent British, the older First Nation Métis, and Selkirk's settler population base. Settling the West with (in particular) Eastern Canadians and British immigrant offered the advantage of safeguarding the 49th parallel from the threat of American take-over, had not the Minnesota legislature passed a resolution which provided for the annexation of the Red River district. The Red River in 1870 was the most important settlement on the Canadian prairies. It contained 11,963 inhabitants of whom 9,700 were Métis and First Nations. But neighbouring Minnesota already had a population of over 100,000.**

**F. Not all of the settlers who came to western Canada in the 1880s, however, desired to remain there. In the 1870s and 1880s, economic depression kept the value of Canada's staple exports low, which discouraged many from permanent settlement in the West. Countries including Brazil, Argentina, Australia, New Zealand and the United States competed with Canada for immigrants. Many immigrants and thousands of Canadians chose to settle in the accessible and attractive American frontier. Canada before 1891 has been called "a huge demographic railway station" where thousands of men, women, and children were constantly going and coming, and where the number of departures invariably exceeded that of arrivals."**

**G.** By 1891 Eastern Canada had its share of both large urban centres and problems associated with city life. While the booming economic centres of Toronto and Montreal were complete with electricity and telephones in the cities' wealthiest areas by the turn of the century, slum conditions characterised the poorest areas like the district known as 'the Ward' in Toronto. Chickens and pigs ran through the streets; privy buckets spilled onto backyards and lanes creating cesspools in urban slums. These same social reformers believed that rural living, in stark contrast to urban, would lead to a healthy, moral, and charitable way of life. Social reformers praised the ability of fresh air, hard work, and open spaces for 'Canadianizing' immigrants. Agricultural pursuits were seen as especially fitting for attaining this 'moral' and family-oriented way of life, in opposition to the single male-dominated atmosphere of the cities. Certainly, agriculture played an important part in the Canadian economy in 1891. One-third of the workforce worked on farms.

**H.** The Canadian government presented Canada's attractions to potential overseas migrants in several ways. The government offered free or cheap land to potential agriculturists. As well, the government established agents and/or agencies for the purpose of attracting emigrants overseas. Assisted passage schemes, bonuses and commissions to agents and settlers and pamphlets also attracted some immigrants to Canada. The most influential form of attracting others to Canada, however, remained the letters home written by emigrants already in Canada. Letters from trusted friends and family members. Letters home often contained exaggerations of the 'wonder of the new world.' Migrant workers and settlers already in Canada did not want to disappoint, or worry, their family and friends at home. Embellished tales of good fortune and happiness often succeeded in encouraging others to come.

**Questions 14-20**

The Reading Passage has eight paragraphs A-H

Choose the correct heading for paragraphs A-H from the list below.

Write the correct number, i-xii, in boxes 14-20 on your answer sheet

## List of Headings

- i Not all would stay in Canada forever
- ii Government's safeguard in the West
- iii Eastern Canada is full
- iv Built-up to the new infrastructure
- v An exclusive British domination in Ontario established ever since
- vi Ethnics and language make-up
- vii Pursuing a pure life
- viii Police recruited from mid-class families
- ix Demand of western immigration
- x Early major urban development of the West
- xi Attracting urban environment
- xii Advertising of Western Canada

*Example:* Paragraph A ix

- 14. Paragraph B
- 15. Paragraph C
- 16. Paragraph D
- 17. Paragraph E
- 18. Paragraph F
- 19. Paragraph G
- 20. Paragraph H

**Questions 21-26**

**Complete the following summary below.**

**Write NO MORE THAN TWO WORDS for each answer.**

**Write your answers in boxes 21-26 on your answer sheet.**

With the saturation of Eastern Canada, the Western rural area would supply 21..... for the descendants of easterners. Politicians also declared that Western is got potential to increase 22..... of Canada according to 23..... crop that consumed in the East. The federal government started to prepare and made it happen. First, the government bought land from a private 24....., and legally offered a certain area to people who stayed for a qualifying period of time. Then, mounted 25..... was found to secure the land. However, the best way to protect citizens was to build a 26..... to transport the migrants and goods between the West and the East.

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# Beyond the Blue Line

A. Much of the thrill of venturing to the far side of the world rests on the romance of difference. So one feels a certain sympathy for Captain James Cook on the day in 1778 that he “discovered” Hawaii. Then on his third expedition to the Pacific, the British navigator had explored scores of islands across the breadth of the sea, from lush New Zealand to the lonely wastes of Easter Island. This latest voyage had taken him thousands of miles north from the Society Islands to an archipelago so remote that even the old Polynesians back on Tahiti knew nothing about it. Imagine Cook’s surprise, then, when the natives of Hawaii came paddling out in their canoes and greeted him in a familiar tongue, one he had heard on virtually every mote of inhabited land he had visited. Marveling at the ubiquity of this Pacific language and culture, he later wondered in his journal: “How shall we account for this Nation spreading itself so far over this vast ocean?”

B. That question, and others that flow from it has tantalized inquiring minds for centuries: Who were these amazing seafarers? Where did they come from, starting more than 3,000 years ago? And how could a Neolithic people with simple canoes and no navigation gear manage to find, let alone colonize, hundreds of far-flung island specks scattered across an ocean that spans nearly a third of the globe? Answers have been slow in coming. But now a startling archaeological find on the island of Éfaté, in the Pacific nation of Vanuatu, has revealed an ancient seafaring people, the distant ancestors of today’s Polynesians, taking their first steps into the unknown. The discoveries there have also opened a window into the shadowy world of those early voyagers.

C. “What we have is a first- or second-generation site containing the graves of some of the Pacific’s first explorers,” says Spriggs, professor of archaeology at the Australian National University and co-leader of an international team excavating the site. It came to light only by luck. A backhoe operator, digging up topsoil on the grounds of a derelict

coconut plantation, scraped open a grave – the first of dozens in a burial ground some 3,000 years old. It is the oldest cemetery ever found in the Pacific islands, and it harbors the bones of an ancient people archaeologists call the Lapita, a label that derives from a beach in New Caledonia where a landmark cache of their pottery was found in the 1950s.

D. They were daring blue-water adventurers who roved the sea not just as explorers but also as pioneers, bringing along everything they would need to build new lives – their families and livestock, taro seedlings and stone tools. Within the span of a few centuries, the Lapita stretched the boundaries of their world from the jungle-clad volcanoes of Papua New Guinea to the loneliest coral outliers of Tonga, at least 2,000 miles eastward in the Pacific. Along the way they explored millions of square miles of an unknown sea, discovering and colonizing scores of tropical islands never before seen by human eyes: Vanuatu, New Caledonia, Fiji, Samoa.

It was their descendants, centuries later, who became the great Polynesian navigators we all tend to think of: the Tahitians and Hawaiians, the New Zealand Maori, and the curious people who erected those statues on Easter Island. But it was the Lapita who laid the foundation – who bequeathed to the island the language, customs, and cultures that their more famous descendants carried around the Pacific.

E. While the Lapita left a glorious legacy, they also left precious few clues about themselves. A particularly intriguing clue comes from chemical tests on the teeth of several skeletons. Then as now, the food and water you consume as a child deposits oxygen, carbon, strontium, and other elements in your still-forming adult teeth. The isotope signatures of these elements vary subtly from place to place, so that if you grow up in, say, Buffalo, New York, then spend your adult life in California, tests on the isotopes in your teeth will always reveal your eastern roots.

Isotope analysis indicates that several of the Lapita buried on Éfaté didn't spend their childhoods here but came from somewhere else. And while isotopes can't pinpoint their precise island of origin, this much is clear: At some point in their lives, these people left the villages of their birth and made a voyage by seagoing canoe, never to return. DNA

teased from these ancient bones may also help answer one of the most puzzling questions in Pacific anthropology: Did all Pacific islanders spring from one source or many? Was there only one outward migration from a single point in Asia, or several from different points? “This represents the best opportunity we’ve had yet,” says Spriggs, “to find out who the Lapita actually were, where they came from, and who their closest descendants are today.”

**F.** There is one stubborn question for which archaeology has yet to provide any answers: How did the Lapita accomplish the ancient equivalent of a moon landing, many times over? No one has found one of their canoes or any rigging, which could reveal how the canoes were sailed. Nor do the oral histories and traditions of later Polynesians offer any insights.

“All we can say for certain is that the Lapita had canoes that were capable of ocean voyages, and they had the ability to sail them,” says Geoff Irwin, a professor of archaeology at the University of Auckland and an avid yachtsman. Those sailing skills, he says, were developed and passed down over thousands of years by earlier mariners who worked their way through the archipelagoes of the western Pacific making short crossings to islands within sight of each other. The real adventure didn’t begin, however, until their Lapita descendants neared the end of the Solomons chain, for this was the edge of the world. The nearest landfall, the Santa Cruz Islands, is almost 230 miles away, and for at least 150 of those miles, the Lapita sailors would have been out of sight of land, with empty horizons on every side.

**G.** The Lapita’s thrust into the Pacific was eastward, against the prevailing trade winds, Irwin notes. Those nagging headwinds, he argues, may have been the key to their success. “They could sail out for days into the unknown and reconnoiter, secure in the knowledge that if they didn’t find anything, they could turn about and catch a swift ride home on the trade winds. It’s what made the whole thing work.” Once out there, skilled seafarers would detect abundant leads to follow to land: seabirds and turtles, coconuts and twigs carried out to sea by the tides and the afternoon pileup of clouds on the horizon that often betokens an island in the distance.

All this presupposes one essential detail, says Atholl Anderson, professor of prehistory at the Australian National

University and, like Irwin, a keen yachtsman: that the Lapita had mastered the advanced art of tacking into the wind. “And there’s no proof that they could do any such thing,” Anderson says. “There has been this assumption that they must have done so, and people have built canoes to re-create those early voyages based on that assumption. But nobody has any idea what their canoes looked like or how they were rigged.”

H. However they did it, the Lapita spread themselves a third of the way across the Pacific, then called it quits for reasons known only to them. Ahead lay the vast emptiness of the central Pacific, and perhaps they were too thinly stretched to venture farther. They probably never numbered more than a few thousand in total, and in their rapid migration eastward they encountered hundreds of islands – more than 300 in Fiji alone. Supplied with such an embarrassment of riches, they could settle down and enjoy what for a time was Earth’s last Edens.

I. Rather than give all the credit to human skill and daring, Anderson invokes the winds of change. El Niño, the same climate disruption that affects the Pacific today, may have helped scatter the first settlers to the ends of the ocean, Anderson suggests. Climate data obtained from slow-growing corals around the Pacific and from lake-bed sediments in the Andes of South America point to a series of unusually frequent El Niño around the time of the Lapita expansion, and again between 1,600 and 1,200 years ago, when the second wave of pioneer navigators made their voyages farther east, to the remotest corners of the Pacific. By reversing the regular east-to-west flow of the trade winds for weeks at a time, these “super El Niño” might have sped the Pacific’s ancient mariners on long, unplanned voyages could have been key to launching Polynesians across the wide expanse of open water between Tonga, where the Lapita stopped, and the distant archipelagoes of eastern Polynesia. “Once they crossed that gap, they could island-hop throughout the region, and from the Marquesas, it’s mostly downwind to Hawaii,” Anderson says. It took another 400 years for mariners to reach Easter Island, which lies in the opposite direction – normally upwind. “Once again this was during a period of frequent El Niño activity.”

### Questions 27-31

Complete the summary with the list of words A-L below

Write the correct letter A-L in boxes 27-31 on your answer sheet.

The question, arisen from Captain Cook's expedition to Hawaii, and others derived from it, has fascinated researchers for a long time. However, a surprising archaeological find on Éfaté began to provide valuable information about the 27..... On the excavating site, a 28.....

Containing 29..... of Lapita was uncovered. Later on, various researches and tests have been done to study the ancient people – Lapita and their 30..... How could they manage to spread themselves so far over the vast ocean? All that is certain is that they were good at canoeing. And perhaps they could take well advantage of the trade wind. But there is no 31..... of it.

|                   |              |               |                      |
|-------------------|--------------|---------------|----------------------|
| A bones           | B co-leader  | C descendents | D international team |
| E inquiring minds | F proof      | G ancestors   | H early seafarers    |
| I pottery         | J assumption | K horizons    | L grave              |

### Questions 32-35

Choose the correct letter, A, B, C or D.

Write your answers in boxes 32-35 on your answer sheet.

- 32. The chemical tests indicate that**
- A the elements in one's teeth varied from childhood to adulthood.**
  - B the isotope signatures of the elements remain the same in different places.**
  - C the result of the study is not fascinating.**
  - D these chemicals can't conceal one's origin.**

- 33. The isotope analysis from the Lapita**
- A exactly locates their birth island.**
  - B reveals that the Lapita found the new place via straits.**
  - C helps researchers to find out answers about the islanders.**
  - D leaves more new questions for anthropologists to answer.**

- 34. According to paragraph F, the offspring of Lapita**
- A were capable of voyages to land that is not accessible to view.**
  - B were able to have the farthest voyage of 230 miles.**
  - C worked their way through the archipelagoes of the western Pacific.**
  - D fully explored the horizons.**

- 35. Once out exploring the sea, the sailors**
- A always found the trade winds unsuitable for sailing.**
  - B could return home with various clues.**
  - C sometimes would overshoot their home port and sail off into eternity.**
  - D would sail in one direction.**

## Questions 36-40

Do the following statements agree with the information given in Reading Passage 3?

In boxes 36-40 on your answer sheet, write

- TRUE**            If the statement is true  
**FALSE**           If the statement is false  
**NOT GIVEN**    If the information is not given in the passage

36. The Lapita could canoe in the prevailing wind.  
37. It was difficult for the sailors to find ways back, once they were out.  
38. The reason why the Lapita stopped canoeing farther is still unknown.  
39. The majority of the Lapita dwelled on Fiji.  
40. The navigators could take advantage of El Nino during their forth voyages.