Charles Darwin and *Pax Britannica*: How British Dominance Ushered in a New Era of Biology

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During his voyage on the Beagle, Charles Darwin made observations that would alter the course of biological thinking for the rest of time. This is an unquestioned pillar in the scientific and historical community, but what enabled Darwin to make these discoveries? Certainly, he was an intelligent man who thought outside of the box, but he made these observations and discoveries across the globe from his home on the British Isles. What were some of the factors that enabled Darwin to be in the right place at the right time in history that made this possible for him to alter biological thinking forever? First, there had to be a way to cross vast oceans, and a fleet of ships made that possible. There were geopolitical factors such as *Pax Britannica*, a great peace of approximately one hundred years that Britain achieved after Napoleon's defeat at Waterloo and, therefore, Britain's greatest rivals' defeat.[1] The British had control to put scientists anywhere in the world they wanted to. It was also safe enough for some scientists to travel independently.[2] Intellectual factors also had to come into play first, such as geological concepts like uniformitarianism and gradualism. These concepts would set the stage for Darwin to formulate the theory of evolution.

It is important first to ask why evolution had not been discovered already. Sometimes, the fact that something happened when it did is taken for granted; this is not to start on the endeavor of predicting alternate history. However, assessing the zeitgeist of centuries before the event, it is clear that even if evolution had been discovered, it would have likely been challenged or outright banned as for centuries prior, any interpretation of the world that did not follow strict biblical

1 N.A.M. Rodger, *The Command of The Ocean: A Naval History of Britain 1649-1815* (New York: W. W. Norton & Company, 2004), 577

2 Alfred Russel Wallace, *Travels on the Amazon and Rio Negro* (London: Ward, Lock and Co. 1890), 4

literalism was heavily contested by the Catholic Church, like in the cases of Galileo and Copernicus.[3] On the same note, biological understanding was not mature in the eighteenth century. The Age of Reason opened the door for many scientific innovations and thinking to be accepted as "[The] Age of Reason was a period in European history when reason was accepted as the sole test of truth."[4] This does not mean that old ideas immediately vanished and were replaced by a worldview of pure reason. Old ideas still persisted, and this was a problem for early biology as it suffered from Aristotelian themes of placing humans at the top of the "pyramid of life."[5] Other ideas, such as spontaneous generation, prevented a critical analysis of living organisms and their changes. It was commonly assumed that flies and eels, among other animals, spontaneously emerged into existence as no one could figure out where these animals came from.[6] The Enlightenment was a growth spurt for thinking, not a complete maturity, and therefore, some ideas had not been outgrown.

One of the biggest nonscientific problems of the day was the populace's reliance on biblical literalism. As mentioned earlier, the Catholic Church supported biblical literalism. However, they did not always have to enforce it. Some of these old ideas were so deeply entrenched into the thinking of the eighteenth-century person that it was accepted as self-evident. Ideas like extinction were completely tossed aside or not even considered, as people believed that God would never allow one of his own creatures to go extinct. The rejection of extinction was not confined to a small group of theologians and philosophers either. Founding father, deist, and writer of The

3 Nicholas P. Leveillee, "Copernicus, Galileo, and the Church: Science in a Religious World." *Inquiries Journal/Student Pulse* 3.05 (2011), http://www.inquiriesjournal.com/a?id=1675.

4 Field Enterprises Educational Corporation, *The World Book Encyclopedia* (Chicago: Field Enterprises Educational Corporation, 1969), Volume A, 131.

5 Maurice Caullery. *A History of Biology* (New York: Walker and Company, 1966), 13.

6 Maurice Caullery. *A History of Biology* (New York: Walker and Company, 1966), 13.

Declaration of Independence, Thomas Jefferson considered this idea.[7] Darwin himself even noted that almost all naturalists at the time had believed that each species was divinely created.[8] So, if the species were divinely created, why would God let His creations go extinct? This belief was able to be held partly because the Earth is resilient, and humanity also did not fully realize their effect on the climate and environment at the time as they understood this world as perfectly created for humanity and abundant in resources.

Up to that point, the Earth reflected that view. An entirely new continent had been discovered recently, and it had rich resources that would last seemingly forever. Overpopulation would not become an issue until the twentieth century.[9] Death, disease, and childhood mortality were all much higher than in the modern era, and these factors kept the population down, so the type of boom that was seen could not have been predicted.[10] Thomas Jefferson did not believe that the United States would sprawl across the entire North American continent for a thousand years![11] The Industrial Revolution was not yet in full swing, so this type of speculation on population was warranted. Some environmental issues had been encountered in the past, such as The Great Beaver Wars, but were viewed solely as a land dispute, and not as an environmental crisis like it also was.[12] The unsustainable rate at which beavers were being killed caused them to disappear from areas in New York for over 200 years, just recently being spotted again in 2004

7 Elizabeth Kolbert, *The Sixth Extinction: an Unnatural History* (New York: Henry Holt and Company, 2014), Chapter 2

8 Charles Darwin, *On The Origins of Species, 6th Edition* (Project Gutenberg, 1867, 1999), 1

9 J. Van Bavel, "The world population explosion: causes, backgrounds and -projections for the future." Facts Views Vis Obgyn. 2013; 5(4):281-91. PMID: 24753956; PMCID: PMC3987379.

10 J. Van Bavel. "The world population explosion: causes, backgrounds and -projections for the future." Facts Views Vis Obgyn. 2013; 5(4):281-91. PMID: 24753956; PMCID: PMC3987379.

11 Edward Van Dyke Robinson. *Commercial Geography* (Chicago: Rand Mcnally & Company, 1910), 165.

12 Nick Evans, "The Great Beaver Wars" Ohio History Connection, 2017, https://www.ohiohistory.org/the-great-beaver-wars/.

after environmental policies resulted in their return.[13] The full realization of the impact that humans could have on the Earth and the environment was still developing. The famous example of the black and white peppered bark of birch trees being turned completely black from the burning coals of London and the previously rare black moths completely replacing the peppered moths was still decades away from being noticed.[14] Humanity had not had to grapple with the thought that the Earth existed for any other purpose than to serve their interests up to this point.

The unpolluted New World was discovered in the Age of Exploration and colonized during the colonial period, and with it came all sorts of new people, plants, and animals that had never been seen before.[15] Sir Charles Lyell, another famous British naturalist, noted that the terrain of the New World was nothing new. Each "biome" was seen in the Old World as well, but the flora and fauna were massively different in the New World.[16] The British were not the only country interested in the New World. Other countries had colonies, especially France and Spain. Once they had a foothold, they would ship items back to their mother country, which used more shipping than ever before. This was the state of the increasingly globalizing world at the time. The discovery of the New World and the spice trade had most countries scrambling to establish colonies and open trade forcefully or peacefully with as many peoples as they could.

The next step in increasing globalization was The Industrial Revolution, which began in Britain. This also led to increased trade between countries and saw Britain become a producer and exporter of textiles to countries all across the globe.[17] This highly interconnected world and

13 "Beaver," NYC.GOV, https://www.nyc.gov/site/wildlifenyc/animals/beavers.page

14 , The Editors of Encyclopaedia Britannica "industrial melanism". *Encyclopedia Britannica*, January 21, 2015. https://www.britannica.com/science/industrial-melanism.

15 Field Enterprises Educational Corporation, "*The World Book Encyclopedia*" (Chicago: Field Enterprises Educational Corporation, 1969), Volume A, 130.

16 Sir Charles Lyell, *Principles of Geology: The Modern Changes of The Earth and Its Inhabitants* (New York: D Appleton and CO, 1830, 2010).

17 Field Enterprises Educational Corporation, *The World Book Encyclopedia* (Chicago: Field Enterprises Educational Corporation, 1969), Volume 1, 184.

globalized economy meant that with the exchange of goods often came the exchange of ideas, people, and specimens. This is the nature of two cultures interacting. Eventually, they will blend and share. "Things," in the most general sense of the word possible, were easier than ever to transport to wherever someone with an interest in the item wanted it to go.

Ships were the backbone of global interconnectivity, and there was none with a bigger backbone than the British. The British Royal Navy has a rich history of its own; its ship-building tradition goes all the way back to the Vikings who built longships, then eventually the famous dragon ships that sailed the treacherous waters of the North Atlantic and Arctic Seas. Then, this was passed down through the Normans, who were themselves Vikings, to the English when the Normans invaded and assimilated with the English in 1066.[18] This tradition retained an important role since England was an island nation. The English had to have a strong ability to sail if they wanted to initiate contact with the outside world. To take control of their destiny, they had to take control of the seas. The military importance of having total freedom in moving troops cannot be understated. Having a strong military presence everywhere and being able to keep pirates and other countries at bay was vital to control trade and, consequently, their economy.[19]

Another aspect that cannot be overlooked is the necessity to do God's will and spread the good news of Christ to the world. Especially to spread the political power of Protestantism, or in the case of England: Anglicanism, and to not let Catholicism further its reach.[20] The British have a long history of fighting with Catholics that started when Henry VIII established the Anglican Church and divided the Anglicans and the Catholics. The identity of being "not Catholic" is so deeply engrained into Britain that they have fought several wars over it, and even replaced their

18 Kenneth W. Harl, "The Vikings" The Great Courses 2013.

19 Kenneth W. Harl, "The Vikings" The Great Courses 2013.

20 N.A.M. Rodger, *The Command of The Ocean: A Naval History of Britain 1649-1815* (New York: W. W. Norton & Company, 2004), 577.

monarch in the "Glorious Revolution of 1688-'89" to stop the Catholic James II from ascending to the throne, then again by switching to the Windsor line when William and Mary did not produce an heir. The disputes between Britain and Spain in the sixteenth century during the Spanish Inquisition also demonstrated how the navy, monarchy, and Anglican identity were deeply bound together. Britain used their highly skilled navy to defeat the much more numerous and generally more powerful Spain and save their queen as well as their Protestantism.

Although Britain was undoubtedly the juggernaut of the ocean, they were not uncontested for control of the seas. Their primary rival after the decline of the Spanish was France who also had a massive and formidable navy that challenged Britain for dominance of the seas often. As mentioned, France and Britain have a long, varied political history, but they also have a long intellectual history, down to the language the British speak; after all, the Normans were French speakers and ushered in Middle English with their invasion.[21] Much of the Enlightenment took place in France. French scientists such as Georges Cuvier (who is considered the father of paleontology) influenced their fields immensely during this time while philosophical thinkers were writing their theses. Darwin himself has entire paragraphs of text in French[22] in the first edition of *On the Origin of Species*, as French was a language of the sciences.[23] Although the countries were often at war, their thinkers and intellectuals still communicated quite frequently. Darwin acknowledges the contributions of Lamarck, a French Naturalist, on the first page of the sixth edition of *On the Origin of Species*, a version with minor edits and reflection some years after the initial publishing.

21 The Editors of Encyclopaedia Britannica. "Middle English language". *Encyclopedia Britannica*, October 13, 2023. https://www.britannica.com/topic/Middle-English-language

22 Charles Darwin, *On The Origins of Species, 6th Edition* (Project Gutenberg, 1867,1999).

23 Elizabeth Kolbert, *The Sixth Extinction: an Unnatural History* (New York: Henry Holt and Company, 2014).

Since the French also had great naturalists, colonial power, colonies, and naval strength to put these naturalists where they needed to go. Why were they not the ones to ultimately discover evolution? After all, it was two different British scientists who theorized on evolution at almost exactly the same time and not one British and one French, or two French. The two countries were comparable economically, intellectually, and militarily. The one advantage Britain had over France was stability. The French populace was at the peak of The Enlightenment, and they believed that they were on the brink of something amazing when they killed essentially their entire government in the French Revolution and replaced it with what would prove to be a weaker, corrupt government.[24] The French Revolution of 1789 sent France into chaos. It was a self-eating movement, killing the very people who believed in the cause. Meanwhile, Britain was rather stable on the mainland. They always had issues to quell as they controlled a global empire, but the British Isles were peaceful, and life continued as normal for their citizens while France was destroying itself. Napoleon and the Napoleonic Wars set France and the European continent into even more turmoil while Britain was only involved militarily; their people, universities, scientists, and arts were all safe on the mainland.[25]

The safety that British people experienced on the Isles was not an uncommon experience for them. From The Glorious Revolution to World War Two (and even long before that, but especially during this period of time), the British people had a relatively more stable and safer existence than most of the rest of the continent did. The British had rights all the way back to the Magna Carta, and they had a constitutional monarchy as a result of the Glorious Revolution.[26]

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24 Field Enterprises Educational Corporation, *The World Book Encyclopedia* (Chicago: Field Enterprises Educational Corporation, 1969), Volume F, 404.

25 N.A.M. Rodger, *The Command of The Ocean: A Naval History of Britain 1649-1815* (New York: W. W. Norton & Company, 2004), 577.

26 The Editors of Encyclopaedia Britannica. "Bill of Rights". *Encyclopedia Britannica*, October 26, 2023. https://www.britannica.com/topic/Bill-of-Rights-British-history.

They were not under an absolutist monarch like France was until the French Revolution, and then after that, a military dictator like Napoleon. The British had a stable, well-understood relationship with their monarch and parliament. One other factor that allowed Britain so much stability was the financial competency gained from having a centralized banking system. France eventually did have a centralized bank as well, but not until 104 years after Britain.[27] The national bank in Britain allowed it more flexibility in pursuing whatever endeavors the country needed; it had solvency. This cannot be stressed enough. Britain had a tremendous advantage over other countries because they had a bank. It stabilized economic fluctuations and controlled the fallout. It also allowed investors to gain faith in the monetary system, which allowed them to borrow money much easier and finance wars sustainably, rather than forcibly seizing property from their people.[28] This, combined with the Industrial Revolution, created massive amounts of stable wealth in Briain, which allowed for extra funds to support government-sponsored research missions such as the Voyage of the Beagle.

The factors listed above cumulated in one specific era, the time from Napoleon's defeat at Waterloo to the beginning of World War One, *Pax Britannica*. This peace was characterized by British hegemony and amplified all previously mentioned points; the peace was even more peaceful, and their prior wealth grew with the maturing Industrial Revolution. The dominance of the seas through the massively powerful British Royal Navy protected the trade interests of Britain. They were able to keep their shipping protected and safe all over the globe by keeping other powers in check.[29] The conditions of unrestrained British power created the perfect environment for the

27 The Editors of Encyclopaedia Britannica. "Banque de France". Encyclopedia Britannica, September 19, 2023. https://www.britannica.com/topic/Banque-de-France.
28 The Editors of Encyclopaedia Britannica. "Bank of England". *Encyclopedia Britannica*, December 6, 2023. https://www.britannica.com/money/topic/Bank-of-England.
29 Barry Gough, *Pax Britannica: Ruling the Waves and Keeping the Peace before Armageddon*. (London: Palgrave MacMillan, 2014).

British to want to expand their empire and survey the entire world because who would not want to take a look at all the land they owned? Darwin's mission on the Beagle was not for him to go and do whatever he pleased. The mission was to "complete the survey of Patagonia and Tierra del Fuego, commenced under Captain King in 1826 to 1830, —to survey the shores of Chile, Peru, and of some islands in the Pacific—and to carry a chain of chronometrical measurements round the World."[30] The purpose of this mission was to further the interests of the empire. The safety net created by *Pax Britannica* allowed for scientists to be abroad on these research vessels and travel in relative safety. This safety led to a boom in cataloging and research vessels.

The last element that allowed Britain such great success was the rich history it has of scientific and philosophical thinkers. These thinkers were easily able to express themselves without the fear of persecution in the British Isles as they had rights as British citizens, and this produced a lot of these thinkers. Sir Isaac Newton, Robert Boyle, and John Locke, just to name a few.[31] In fact, the Enlightenment is often looked at through two lenses, the French Enlightenment Figures, and the Scottish Enlightenment Figures.

The geopolitical and economic pieces for Darwin were clearly in place for him to be in the right place at the right time. There was one movement in the zeitgeist of the scientific world that was forming before Darwin was fully able to grab hold and make it synonymous with his name and that is the idea of an ancient Earth. This idea was first proposed by James Hutton in his *Theory of the Earth*.[32] This was an idea more revolutionary than anything in natural science since Copernicus said that the sun does not orbit the Earth. The West is a historically Christian society, so they examined things through the lens of the Bible as it was what they considered to be supreme

30 Charles Darwin, Engel Leonard, *The Voyage of The Beagle* (New York: Anchor Book, 1962), 1.
31 Susan Wise Bauer, *The Story of Science: From the Writings of Aristotle to the Big Bang Theory*. (New York: W. W. Norton and Company, 2015), 141.
32 James Hutton, *Theory of The Earth*, (Global Grey, 1788, 2018).

knowledge. After all, 6,000 years is still a really long time for a human with an average lifespan of several decades, and with a lack of carbon dating or other dating methods, there was no way to confirm for certain that things actually were very old at all.[33] That is until Hutton proposed the idea of uniformitarianism. This is the idea that current geological processes also drove the geological processes of the past. This suddenly made the Earth older, much older. In fact, at a conservative estimate of 3 million years that someone may have guessed the Earth to be (Hutton never did provide an exact number that he thought it to be), uniformitarianism had aged the Earth 500 times over. Charles Lyell and his "Principals of Geology" also expanded uniformitarianism.[34] Lyell built off the ideas that Hutton had laid out prior and especially expanded on the idea of gradualism. Gradualism is the idea that geological changes take place slowly and not all at once. Not only are the rocks old, but the rocks are old and changing slower than one hundred human lifetimes could ever notice outside of a catastrophe.[35] This was in contrast to the ideas of catastrophism that prevailed prior. Catastrophism argued that the major changes to the geological record had to happen rapidly and suddenly, causing massive changes in a matter of minutes to days.[36] This type of gradual thinking influenced Darwin far more than catastrophism. Catastrophism still had notes of creationism in it. For example, Noah's Flood would be an event that would dramatically and quickly alter the face of the Earth and all the rocks on it.

Here a detour is necessary to step back and consider the practical side of why all the previously described factors were so critical. A global empire was needed to put people in the

33 James Barr, 1984-85. "Why the World Was Created in 4004 BC: Archbishop Ussher and Biblical Chronology", *Bulletin of the John Rylands University Library of Manchester.* 67**:** 579-580.

34 Sir Charles Lyell, "*Principles of Geology: The Modern Changes of The Earth and Its Inhabitants*" (New York: D Appleton and CO. 1830, 2010).

35 Sir Charles Lyell, *Principles of Geology: The Modern Changes of The Earth and Its Inhabitants* (New York: D Appleton and CO. 1830, 2010).

36 The Editors of Encyclopaedia Britannica. "catastrophism," *Encyclopedia Britannica*, June 24, 2013. https://www.britannica.com/science/catastrophism-geology.

correct places at the correct times, but why could not evolution be discovered from only the British Isles? This is due to the ever-changing nature of the planet. One reason is plate tectonics. Plate tectonics is the driving force that creates and destroys mountains, shifts continents, and vastly alters the face of the planet.[37] Humans are a short-lived species, living an average of eighty years. This may seem long, but it is not even a blink in geological terms.[38] The continents have been the same for all of human history. No one has ever had to worry about the British Isles drifting and then sinking into the Atlantic Ocean. The British Isles are where they are and will be for millions of more years. However, they have not always been where they are, and neither have the other continents. Continents shift and become more or less interconnected. For example, the supercontinent Pangaea that existed in the Permian and Triassic periods approximately 252 million years ago had all the landmasses on Earth in one giant cluster and a massive sea on the other side of the Earth.[39] As the continents break up and drift apart, they carry evidence that they were connected with them.

The same is true about the life that lives on the land. Life of all varieties has always used the resources that they had at their disposal. The borders created by humans, rivers, and geography were not the same as they were in the past, and animals migrated and used vast swaths of land just as they do today. To fully understand the animal, the full picture of what it is and what its ancestors were, is needed. Similar to understanding a civilization, the history of how that civilization came to be must be understood. The evidence that these animals leave is in the form of fossils, which come in a few varieties, but the most famous and relevant fossils are their fossilized bones.

37 Brendan J. Murphy and Tjeerd H. van. Andel, "plate tectonics". *Encyclopedia Britannica*, December 12, 2023. https://www.britannica.com/science/plate-tectonics.

38 Robert M. Hazen, *The Story of Earth: The First 4.5 Billion Years, from Stardust to Living Planet.* (Gildan Media LLC, 2012).

39 Robert M. Hazen, "*The Story of Earth: The First 4.5 Billion Years, from Stardust to Living Planet*. (Gildan Media LLC, 2012).

Understanding a fossil in an isolated setting where the scientist is limited to just that fossil or other similar fossils makes the scientist's job much harder. For example, the iconic *Triceratops*. *Triceratops* was one of the earlier dinosaurs discovered in the American West. *Triceratops* was discovered and named by American paleontologist Othniel Marsh.[40] But in order to understand where Triceratops came from and how it came to have the massive three-horned face that it did, one must travel all the way across the massive Pacific Ocean to China and Mongolia. Here is a small, unassuming dinosaur around the size of a pig.[41] The dinosaur is *Psittacosaurus*, a primarily bipedal creature with no frill and a larger beak. This small dinosaur was one of the earliest ancestors to the line of *Triceratops* and all other "ceratopsians," as the clade that they belong to is called.[42] *Psittacosaurus* fossils are so plentiful that they have been studied in large enough numbers to give insights into why their descendants, *Triceratops* included, are the way they are. This demonstrates that when pursuing the history of Earth, all the sources are needed. Just practicing from the British Isles, France, or New York, would be like trying to write the history of America from a township archive in Casper, Wyoming. There may be bits and pieces, but only a foggy picture with limited accuracy is possible. The full beauty and depth of the history would not be fully appreciated as there is too much information missing.

Darwin frequently commented on his missing information. In fact, he dedicated the entirety of chapter ten in "On the Origin of Species" to this fact.[43] When this book was written and published, paleontology was still in its infancy. Reconstructions of animals were highly

40 Keiron Pim, *Dinosaurs - The Grand Tour: Everything Worth Knowing About Dinosaurs From Aardonyx to Zuniceratops*. (New York: Workman Publishing Company, 2014), 316.
41 Barry Cox. R. J. G. Savage. Gardinger, Brian. *The Illustrated Dinosaur Encyclopedia.* (London: Quarto Publishing, 1998), 162.
42 Keiron Pim. *Dinosaurs - The Grand Tour: Everything Worth Knowing About Dinosaurs From Aardonyx to Zuniceratops*. (New York: Workman Publishing Company, 2014), 183.
43 Charles Darwin, *On The Origins of Species, 6th Edition* (Project Gutenberg, 1867, 1999), Chapter 10.

speculative and often very crude.[44] Take, for example, the "Magdeburg Unicorn." This was a pre-Enlightenment reconstruction and pre-paleontology reconstruction that is absolutely ridiculous. While outside of the scope of this paper to fully discuss, it is still important to note that fossil reconstruction is never an easy process. Fossils are often fragmentary with only a few bits and pieces from the entire animal remaining. Today, the process is accelerated by the fact that such a massive collection of fossils has been amassed so that an animal in the same clade can be compared to its cousins quite easily for a good idea of what the animal looked like. Early reconstructors did not have this luxury and could only make educated guesses. While the Magdeburg Unicorn is an extreme and unfortunate example, it is a good example to show how little these early pioneers had to work with. While there were a good number of fossils discovered, Darwin was acutely aware of how the record they had at the time was lacking as well and accurately predicted that better, more accurate fossils would be found in the future.[45]

The last major aspect of naturalists needing to be all over the world was actually seeing the variety of the flora and fauna and making observations. The British Isles and much of Europe have many of the same animals. There is diversity, but not nearly the biodiversity of many tropical ecosystems. So, sending these scientists and thinkers to these locations with such high biodiversity and seeing all of the solutions that life has created to deal with the problems that it faces was thought-provoking. During these voyages, Darwin saw more of the world in five years than ninety-nine

44 "The Magdeburg Unicorn: The Worst Fossil Reconstruction Ever," *DesignYouTrust*, 2022, https://designyoutrust.com/2022/08/the-magdeburg-unicorn-the-worst-fossil-reconstruction-ever/.

45 Charles Darwin, *On The Origins of Species, 6th Edition* (Project Gutenberg, 1867, 1999), Chapter 10.

percent of the population in his time did. He noticed patterns emerge among species.[46] For example, in Darwin's famous Galapagos finches, he noticed similarities to the ones on the South American mainland, but the ones on the Galapagos were so adapted to their own environment that they must have shared common ancestry but changed over time to adapt to island life. Darwin also noticed the opposite, especially in the case of some ducks, "the logger-headed duck, which has wings incapable of flight, in nearly the same condition as in the domestic duck."[47] Or the wood duck with feet so perfectly adapted for swimming yet did not swim.[48] He noticed these forms and noted that they could be considered transitional. These observations were only possible off the British Isles and after noticing previous patterns of animal adaptation. Darwin was looking at the products of the natural history of Earth in the greatest sample size that he possibly could, and in large data sets there are often outliers. Outliers are hard to pick out from smaller data sets, and the small data set, in this case, is the biodiversity level of Britain and France. Meaning that with only the biodiversity of animals in Britain and France finding something that is weird would be harder than somewhere with more to look at in terms of total species.

To shift the focus off of Darwin temporarily, as previously mentioned, he was not the only British naturalist who came up with the theory of evolution; he was simply the most famous. Wallace may be an even better example of the protection that *Pax Britannica* offered travelers in the nineteenth century, as he did not take a British Royal Navy ship as Darwin did on the Beagle.

46 Charles Darwin, Engel Leonard, "*The Voyage of The Beagle*" (New York: Anchor Book, 1962) Chapter 17.

47 Charles Darwin, *On The Origins of Species, 6th Edition* (Project Gutenberg, 1867, 1999), Conclusion.

48 Charles Darwin, *On The Origins of Species, 6th Edition* (Project Gutenberg, 1867, 1999), Conclusion.

Wallace, in a joint expedition, took a "small trading vessel."[49] The Beagle had cannons.[50] It is not mentioned whether or not Wallace's ship was outfitted with guns.[51] However, it was unlikely as it was a trade ship. Wallace independently observed South America and the tropics, just as Darwin did, noting similar ideas, but had unique observations, such as the "Wallace Line." The Wallace Line is a boundary through the Lombok Strait separating the Polynesian Archipelago of islands into two. On the two sides of this line are very different sets of fauna. On the west side, the fauna resembles that of Australia very much and features Kangaroos. On the east side, the fauna resembles that of the Asian mainland much more and features tigers.[52] Wallace correctly assumed that these island inhabitants migrated from the mainland of Australia and mainland Asia before evolving on the newer landmasses of the Islands.

In conclusion, the discovery of evolution was a highly complex endeavor that required many pieces to fall into place. The discoverers first had to be free from the grip of the pre-enlightenment Catholic Church. This required the Protestant Reformation, but more importantly, the creation of the Church of England. The zeitgeist of the people had to change, and the deeply engrained Aristotelean influence had to be challenged. Biblical literalism had to be overcome, and ideas like extinction had to be introduced into the intellectual sphere. Other thinkers and scientists had to come before Darwin and Wallace to introduce uniformitarianism and gradualism and the thought that the Earth was incredibly old, not only 6,000 years as had been accepted by nearly all of the West for the previous 1,800 years.

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49 Alfred Russel Wallace. *Travels on the Amazon and Rio Negro* (London: Ward, Lock and Co. 1890), 4.

50 Charles Darwin, Engel Leonard, *The Voyage of The Beagle* (New York: Anchor Book, 1962), Introduction.

51 Alfred Russel Wallace, *Travels on the Amazon and Rio Negro* (London: Ward, Lock and Co. 1890), 4.

52 The Editors of Encyclopaedia Britannica. "Wallace Line". *Encyclopedia Britannica*, December 13, 2022. https://www.britannica.com/science/Wallace-Line.

The geopolitical and technological aspects had to be well developed as well. Britain overcame many challenges throughout its history to secure such a dominant role. Factors such as its strong navy they received through its Viking heritage and the national bank that allowed them to stay solvent and finance operations and wars in a sustainable fashion were critical. The Glorious Revolution put Britain in a spot where the people had rights to express themselves freely without worrying about being arbitrarily jailed. The buildup of the French Enlightenment, where the English shared and were able to reap the benefits of the Enlightenment, both French and Scottish, while the climax of the French Enlightenment in France sent them plummeting into chaos with the French Revolution. Then, the Napoleonic Wars plunged mainland Europe into chaos. Britain gained all of the good aspects of the Enlightenment with much less chaos. So, after the dust settled, Britain emerged as the global protector of free trade under *Pax Britannica*.

All of these factors were necessary and responsible for putting the right people in the right place at the right time. Earth's history needs the full archive of everything it has to offer to fully understand it. Like the example of *Triceratops* and *Psittacosaurus*. These two fossils needed a global perspective to fully understand them in their proper context. This is a worrying aspect of the future decade. Border disputes are happening all over the world, Russia and Ukraine, China and Taiwan, Israel and Palestine, and recently, Venezuela and Guyana. All of these countries are picking sides and drawing lines in the sand or walking over the lines on purpose. Locking scientists out of the country is a terrifying prospect, as many corners of the world are becoming war zones. Evolution may have been discovered when it was because of the great peace brought on through *Pax Britannica*. When geopolitics locks parts of Earth's archives behind military blockades, it can slow down the process of science and limit the speed at which understanding can be achieved.

These scenarios have yet to fully develop, and the era of *Pax Americana* and the science that has come along will hopefully hold on for longer. Many paleontologists consider the close work with Chinese

paleontologists, as well as the abundance of excellent American fossils, to have put this era into the dinosaur golden ages.[53] The peace of *Pax Britannica* created the stage for Paleontology and Evolutionary Biology to be born and the archives of the Earth to be opened. The most that can be hoped for is that they stay that way.

53 "Why Now is the Golden age of Paleontology," 2020, https://www.nationalgeographic.com/science/article/why-now-is-the-golden-age-of-paleontology.

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