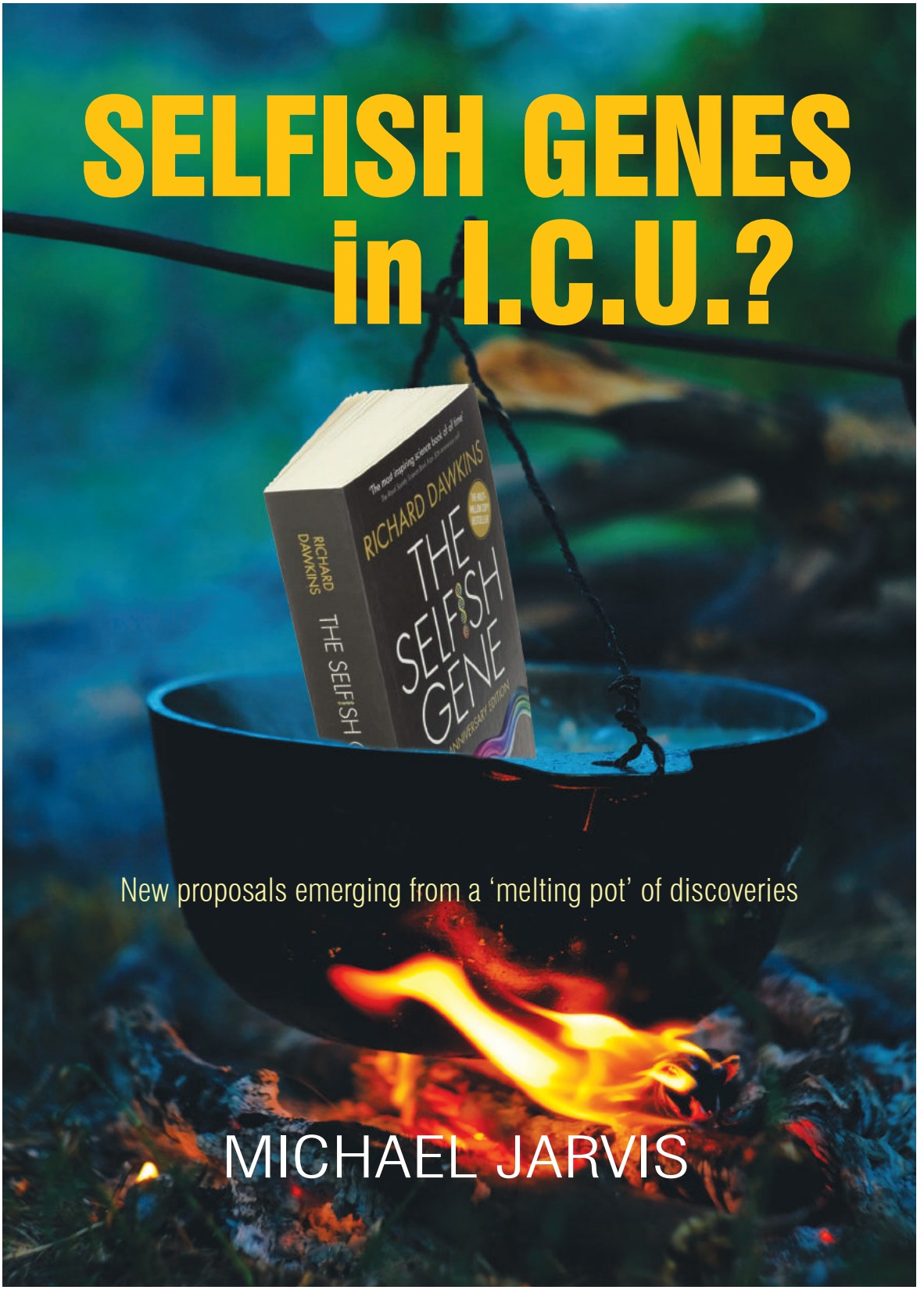
SELFISH GENES in I.C.U.?



New proposals emerging from a 'melting pot' of discoveries

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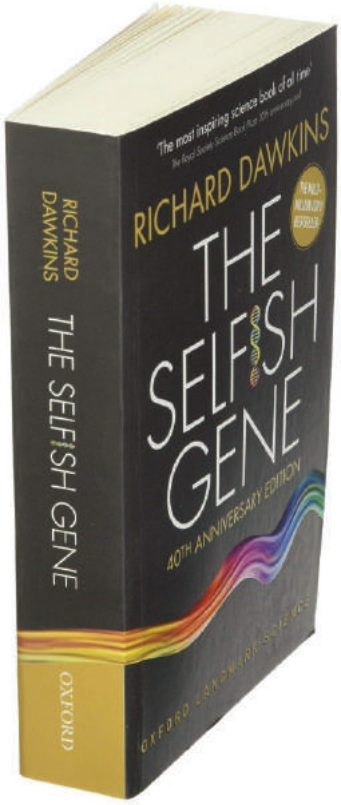
PREFACE



Professor Richard Dawkins wrote *The Selfish Gene* in 1976 and 40 years later he published a 40th Anniversary Edition. On-going scientific research has enabled major new understandings and discoveries that throw light on how life processes function and some of these discoveries lead to re-examination of 'Selfish Genes' and their significance, as proposed by Richard Dawkins.

Chapters 1 to 28 of my book, present important background information that can help readers better understand chapter 30 where I outline some key aspects of Richard Dawkins 'Selfish Genes' proposals and why I believe we have reached the stage in biological research where we can accept that the 'Selfish Genes' proposals – at least in their original form – are in serious trouble.

Major discoveries include a vastly expanded fossil record, discoveries relating to the DNA codes of life, the intricate complexities within living things, epigenetics, orphan genes, hox genes, mitochondrial DNA, Quantum Biology and the complexities of human consciousness.

In fact, **we have reached a stage when many biologists are asking whether our understanding of how evolution works needs major revision.** That is why chapter 31 is titled 'Put it all in the 'melting pot'. We need to put all the new discoveries relating to life and life processes into a scientific **'melting pot'**. The *Cambridge English Dictionary* defines **'melting pot'** as 'A place where many different people and ideas exist together, often mixing and producing something fundamentally new'.

This 'melting pot' leads us to some fascinating possibilities requiring us to think **'outside the box'**. Scientific knowledge has been faced with previous revelations requiring us to accept proposals that initially seemed most unlikely. For instance, Albert Einstein's formulas that are now the basis for our understanding of relationships between mass, energy and the speed of light. His formulas initiated the Atomic Age in human history. We now apply these formulas, such as $e=mc^2$,

even though we still do not know why the speed of light is so fundamental to our understanding of mass and energy.

Our biological 'melting pot' is showing us that the strange realities revealed by Quantum Mechanics actually impact on biological processes. The fastest growing branch of biological research is **Quantum Biology**. These quantum realities reveal that things can be in more than one place at the same time and information can be exchanged between quantum 'particles' instantaneously, even when separated by vast distances.

Some Nobel Prize winning scientists are even suggesting that the mystery of **human consciousness** may be explained by interactions between the neuron cells in our brains and the quantum energy that seems to operate outside the limitations of time. These possibilities are prompting some scientists to ask the question – **"Is the universe conscious?"**

All these 'mind bending' possibilities lead me to chapter 32 where I outline a proposal that the quantum dimensions of reality may be the driving force of biological evolution.

I am personally challenged to seriously consider this possibility that requires us to 'think outside the box'. Are we prepared to consider discoveries and proposals that may radically impact our present 'world view' and challenge decades of thought relating to how biological evolution has been understood and promoted?

ACKNOWLEDGEMENTS

- **Professor George Branch**, Emeritus Professor of Biological Science, University of Cape Town, for undertaking a detailed review of the pre-publication manuscript and making very valuable suggestions.
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- Amanda Carstens of **Red Mouse Design and Publication** for final formatting of manuscript and arranging publication.
- **Wikimedia Commons** for providing a great service to scientists operating on very restricted budgets, enabling them to include more illustrations in publications.

ABOUT THE AUTHOR

Dr Michael John Fulford Jarvis was born in Tanzania on 19 June 1942, schooled in Nairobi, Kenya and graduated with a PhD in zoology from the University of Cape Town in 1971.

His background has similarities to those of Richard Dawkins. Both were born to British parents residing in East Africa and both studied zoology, with an initial emphasis on ethology but later diversifying into other zoological disciplines, including the role of evolution in the history of life on Earth.

Michael has written 100 scientific and popular science articles, authored or co-authored 6 books and presented papers at 26 scientific conferences. A full CV can be downloaded from www.QuantumEvolutionTheory.com.

Michael is now a South African citizen. He has spent his life in Africa, mostly researching wild life, its relationship to conservation and to interactions with human populations. He and his late wife Anna moved to Wellington in the Cape Province of South Africa, where Michael now continues his research and provides consultations on a variety of topics.

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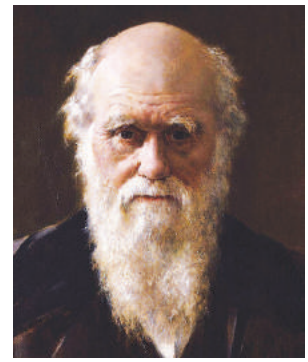
Chapter 1

INTRODUCTION



Since 1859 much biological research has revolved around ideas put together by Charles Darwin (right) in his book *On the Origin of Species by Means of Natural Selection*. Since then new discoveries have led to substantial changes to Darwin's original ideas but the proposal that all life has evolved from simpler forms of life and ultimately from a single original life form, has been the motivation for a vast body of scientific research.

Over the past 150 years there have been many important contributors to the study of biological evolution, including Richard Dawkins who has become known as someone who has championed attempts to explain evolution in ways that can be better understood by people without training in biological sciences.

His 1976 book *The Selfish Gene* has influenced many biologists over the past 40 years. However, the progress of scientific research inevitably leads to new discoveries with the potential to modify or even reject previous understandings about how the mechanisms of evolution work.

Major discoveries include a vastly expanded fossil record, discoveries relating to the DNA codes of life, research exposing the intricate complexities within living things, 'epigenetics', 'orphan genes', 'hox genes', 'importance of mitochondrial DNA', 'Quantum Mechanics', 'Quantum Biology' and the complexities of human consciousness.

My book aims to be understandable by readers who may not have training in any scientific discipline but I also hope the book will be challenging and informative to all scientists.

We have reached a stage in knowledge that necessitates placing many of these new discoveries into a scientific 'melting pot', from which we can extract radically new ideas. The *Cambridge English Dictionary* defines 'melting pot' as: ***A place where many different people and ideas exist together, often mixing and producing something new.***

I hope you enjoy reading this scientific journey of discovery, as outlined in consecutive chapters of the book. I suggest that you start at the beginning to get a complete picture.

Information outlined in each chapter is presented in order to better illustrate the need for a 'melting pot' evaluation, with the potential for emergence of radically new ideas.

I trust this book will inspire many young people to venture out from the 'world views' that they were born into and dare to research and pursue knowledge without fear and to experience the excitement of discovering new realities and ideas.

Image Credit

Darwin photograph. Wikimedia Commons Credit: D. Coetzee for this digitally enhanced production of a painting is in Public Domain. D. Coetzee's work based on original artwork by John Collier (1850-1934), held at National Portrait Gallery, London.

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Chapter 2

UNIVERSE BEFORE LIFE

Brief introduction to our universe (Reference: 1, 2, 3)

Our universe is billions of years old!

I briefly summarise what we know about the origin and evolution of the universe because this can help us understand how amazing it is that we exist today on this tiny spec of cosmic dust that we call Earth. This 'island of life' exists within a vast expanse of stars that we call the Milky Way galaxy. Our sun is one of more than 100 billion stars in our galaxy, some with their own orbiting planets, and our galaxy is just one of more than 100 billion other galaxies, each consisting of billions of stars!

As we look at light coming to us from far away galaxies, situated billions of Light Years away from us, we realise that this light has been hurtling through space at the speed of light, at nearly 300,000km per second, for at least 13.7 billion earth years. This tells us how immense and old our universe is. It is billions of years old!

Studies of the fundamental forces holding our universe together have revealed that the relationships between these forces had to be almost unbelievably precise; otherwise our universe could not have existed with characteristics enabling life to survive.

In the image on the above right, we see the Andromeda Galaxy. It is the closest large galaxy to our own but is situated about 2.5 million light years away. This galaxy consists of about a trillion (1×10^{12}) stars and from edge to edge stretches about 220,000 light years! Today we are looking at light that left that galaxy 2.48 million earth years ago!

Our own Milky Way galaxy has a diameter of about 100,000 light years and contains somewhere between 100 and 400 billion stars and probably many planets orbiting stars. It is hard to determine the actual number of stars because we are situated inside the galaxy.

We have discovered that our own planet started out as a place totally unsuited for life and we are increasingly discovering that most, and possibly all of the rest of the universe, is without biological life as we experience 'life'.

Scientific studies clearly reveal that our universe and our Earth have gone through long evolutionary changes and as we search the vastness of space with our powerful telescopes, we can see that many evolutionary changes are still taking place in the universe.

For instance, we have very strong evidence that the whole universe is expanding outwards at great speed and this leads us to conclude that there was a time long ago when the universe was created from a minute 'singularity', caused by a dramatic event that we call The Big Bang!

In this book I am not detailing the scientific evidences for the Big Bang or the evolutionary processes taking place in the physical universe. The origin and evolution of the physical universe is a fascinating subject, but this book is tasked with detailing the equally fascinating history of life on our planet Earth.

Early earth covered with dark ocean (Reference: 4, 5, 6, 7, 8)

With reference to our home planet Earth, we know that it started out very hot and not suitable for life. Gradually it cooled enough for water to condense and slowly a stage came when the whole surface of our world was covered with hot mineral-rich ocean. The heat of the early Earth caused much water to vaporise, creating a dense cloud layer in the upper atmosphere. This thick cloud layer probably prevented sunlight from reaching the water surface. Available evidence suggests that it was a very dark 'Water World'.

This Water World is where our history of life starts.

Image Credits

Earth pictured from Space. Wikimedia Commons Credit: and NASA

Andromeda Galaxy. Wikimedia Commons Credit: NASA

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Chapter 3

THE AGE OF OUR EARTH

It is important to place studies of life and its changes over time within the context of the age of our earth. Evidence for an ancient earth is given under the following headings:

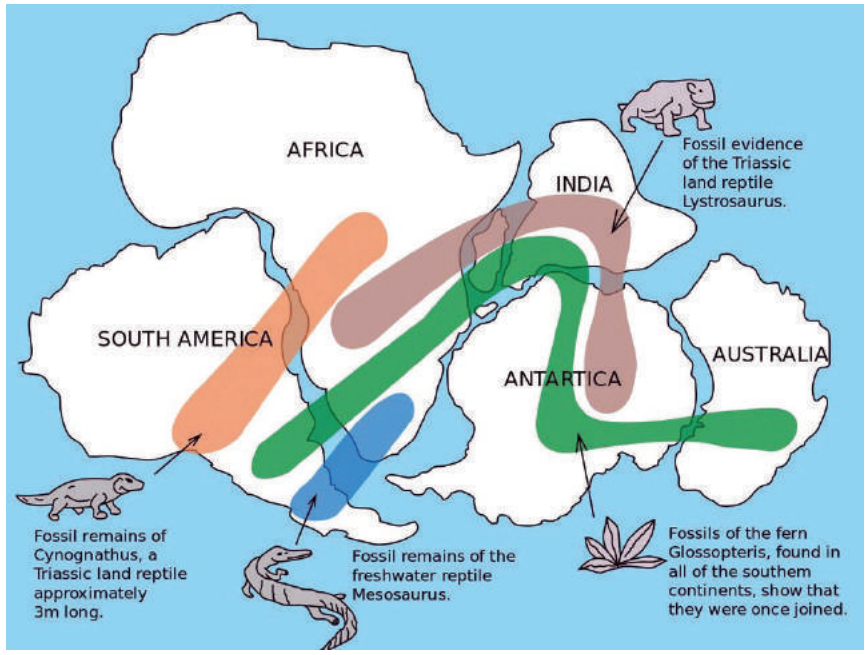
1. Continental drift caused by plate tectonics.
2. Distribution of plants and animals around the world.
3. The origin of oxygen in our atmosphere.
4. Coal deposits and coal formation.
5. Speed of mountain erosion and up-liftment.
6. Ice cores drilled in Antarctica.
7. Rock cores drilled in Antarctica.
8. Radiometric dating of rocks.
9. The fossil record shows stages in life complexity over time.

1. Continental drift caused by plate tectonics (Reference: 1, 2, 3, 4, 5, 6, 7, 8, 9)

About 400 million years ago all the southern continents were joined together. How do we know that this was the case? One way is to measure the movements of continents which are still taking place today.

The evidence for continental drift included the fit of the continent shapes; the distribution of ancient fossils, rocks, and mountain ranges; and the locations of ancient climatic zones.

The map on the next page shows how the super continent Gondwana, which united all the southern continents, looked about 400 million years ago. The later separation of the land masses through processes of plate tectonics has been studied in various ways.



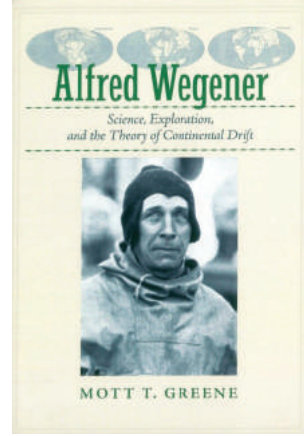
The discovery of continent movements

Continental movements, caused by processes called plate tectonics, was originally proposed as a theory by Alfred Wegener.

In 1911 Wegener learned that fossils of several species were present in both Brazil and western Africa. This evidence suggested to him that South America and Africa were in physical contact when the fossilized animals and plants were alive.

His study of geological data gave him evidence that similar rock formations existed on the two continents. In 1912, age 32, Wegener delivered talks at German universities and published two papers proposing that Earth's continents moved.

His work on continental drift then suffered two interruptions: his participation in an expedition to Greenland, followed by the outbreak of World War 1, when Wegener was conscripted into the German Army.



While recovering from a wound in 1915, he wrote and published his ground-breaking book *The Origin of Continents and Oceans*, in which he discussed the movement of Earth's continents. He proposed that many millions of years ago Earth consisted of a single great continent surrounded by ocean. Very slowly portions of this huge continent moved apart to form the continents we see today. Unfortunately, nobody took much notice of his proposal!

Marie Tharp's undersea maps proved Alfred Wegener was correct

Today we recognize that Wegener's ancient continent truly existed. We call it by the name Wegener gave it – *Pangaea* – which joined Gondwana to Laurasia (the northern continents of North America and Eurasia). Major proof of continental drift came from research by **Marie Tharp**. She was a pioneering American geologist and oceanographic cartographer.

Marie was born in 1920 and died in 2006 after a lifetime of research as a geologist and oceanographer, based at Lamont-Doherty Earth Observatory and Columbia University. She is mainly known for her extensive mapping of the sea floor.

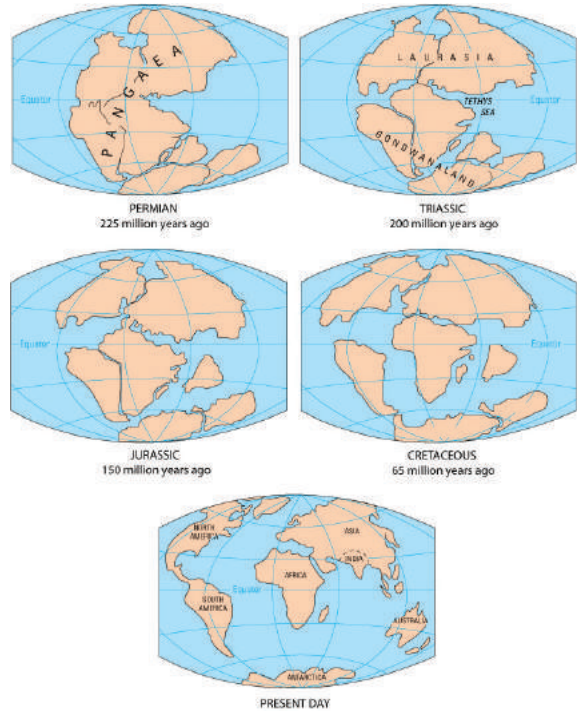
Marie Tharp created the first detailed bathymetric maps of the Atlantic Ocean floor. The data used to make these bathymetric maps typically comes from an echo sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor. The amount of time it takes for the sound to travel through the water, bounce off the seafloor, and return to the sounder provides information on the depth of the seafloor.

Causes of movements?

The Mid-Atlantic Ridge was formed by volcanic activity pushing molten lava upwards, causing the sea floor and continents to spread sideways, leaving an undersea mountain ridge. This map clearly revealed the geological forces that have slowly pushed Africa and South America apart. Continental movements continue today and are very accurately measured from satellites.

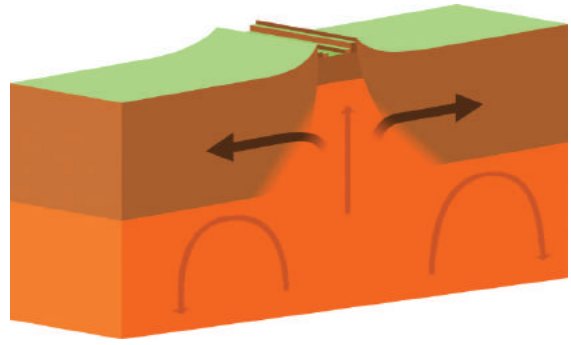
Plotting the movements of continents and studying undersea features such as the mid-Atlantic Ridge, has enabled scientists to map the approximate appearance of land masses millions of years ago. This is based on measured speeds of movement, the shape of continents today, and studies of fossils and rock formations on adjacent continents.

The movements of land masses has resulted in species of life developing different characteristics in separated parts of the world, now identified as Zoogeographical Regions.



Satellites have enabled very accurate measurements of continuing movement of continents. For instance, Africa and South America are still moving apart at about 2.5cm per year (That's about the same speed as your finger nails grow!). At this slow rate of movement it would have taken 160 million years for these two continents to reach their present positions.

However, there is some evidence that at times during geological history continents may have moved up to 20 times faster than today; but this is still a very slow movement.

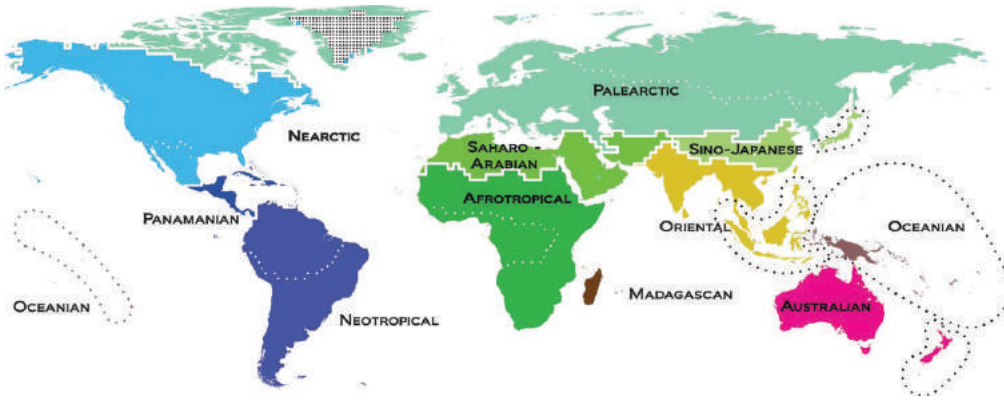


To answer the question about speed of movements, studies of Plate Tectonics have shown the causes of continental movements. Basically, these are caused by molten mantle welling up from deep within the earth and then spreading sideways, pushing the continents apart.

2. Distribution of plants and animals around the world (Zoogeographical region Reference: 10, 11)

Studies of the distribution of animals and plants reveal distinct regions. Each region has different animals. The most dramatic example is Australia. According to the studies of continental drift, Australia broke away from other land masses before the earth contained placental mammals that brought most marsupials to extinction. This enabled marsupial mammals like Kangaroos to survive.

Later in this book I look at how the complexity of life on our earth has changed over time. The most ancient rocks (spanning ages of about 3.5 to 1.0 billion years) contain only traces of single-celled microbes. Younger rocks contain multicellular

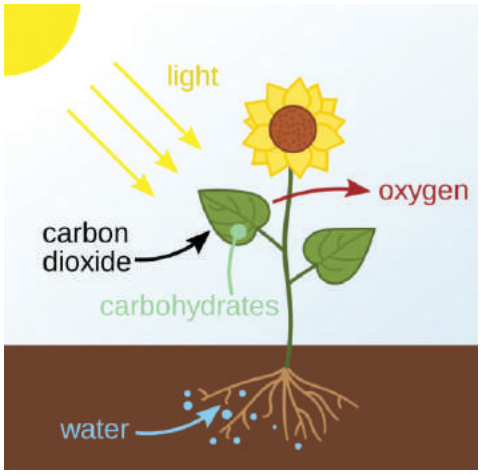


fossils, followed by creatures with external skeletons, such as arthropods that appeared quite abruptly around 540 million years ago, and animals with internal skeletons such as fishes, which became dominant about 420 million years ago. These periods were followed by successively younger times in which amphibians, reptiles and finally mammals were the major forms of animal life.

3. The origin of oxygen in our atmosphere (Reference: 12)

The early earth's atmosphere contained very little oxygen. We know that nearly all of the oxygen was created by living organisms using the complex process that we call photosynthesis. This process was initially undertaken in a particular group of bacteria known as cyanobacteria. Photosynthesis has been described by some biologists as the most complex known to biology and yet it appeared in early life forms.

In the following illustration we see that sunlight is used as an energy source enabling plants to absorb CO^2 from the atmosphere, and in combination with water and mineral salts absorbed by plant roots, creates carbohydrates such as sugars within plants and as a by-product releases oxygen into the air.



We can calculate that, even if the world was totally covered with plants, it would have taken at least 300 million years for the atmospheric oxygen to reach the levels needed for sustaining higher life forms.

I look further into the complex process of photosynthesis in chapter 12 and outline recent discoveries showing how it works in relation to Quantum Physics.

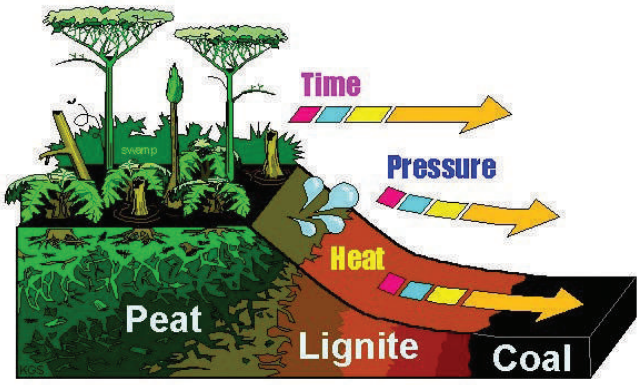
4. Coal deposits and coal formation (Reference: 13)

Studies of coal formation and coal distribution have shown that the vast deposits found in many places, did not all originate from a single catastrophic event.

In this picture of coal deposits we see that there was more than one major coal formation period separated by large deposits of materials that turned into stone over time.

Furthermore, analysis of the various coal deposits shows that they were formed from vegetation that differed from deposit to deposit.

Clearly, not all coal deposits were formed by a single event in time.



We know that the process of coal formation from dead and compressed vegetation takes long periods of time.

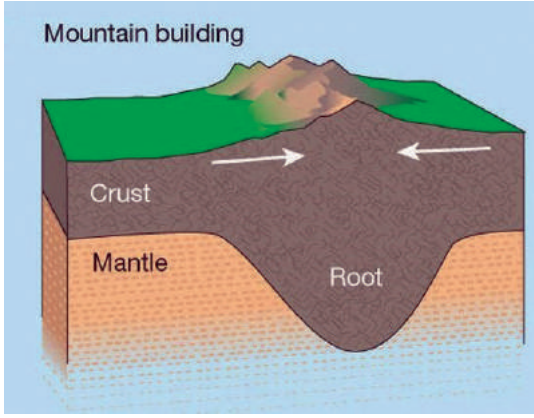
It involves creation of peat from dead vegetation. The early earth had vast forests of early types of trees and the death of these resulted in formation of major coal deposits during the Carboniferous period between 359 and 299 million years ago.

When peat layers became covered with other deposits they underwent extensive periods of heating and compression, finally resulting in coal.

In summary, our coal deposits were formed over a period of millions of years.

5. Speed of mountain erosion and up-liftment (Reference: 14, 15)

Our continents are composed of solid materials floating on a semi-molten mantle. These solid materials are lighter than the more dense mantle. In a similar way that boats on water have a portion of the hull under the water and a portion above the water, continents show this same characteristic.



In other words, a mountain may extend thousands of meters above sea level but below such mountains the continent has a corresponding 'root' extending down into the mantle.

Wind and plant growth slowly wear away rocks, but despite this, mountains rise very slowly, so as to balance the mass above with the mass of the 'root' below.

In addition, continental drift has caused some land masses to collide, such as India hitting Asia relatively rapidly and thrusting up the Himalayan mountain range. As a result, some rocks that used to be at sea level have now landed up high above sea level. This is one reason why we can find sea shells and other signs of sea life high up on some mountains.

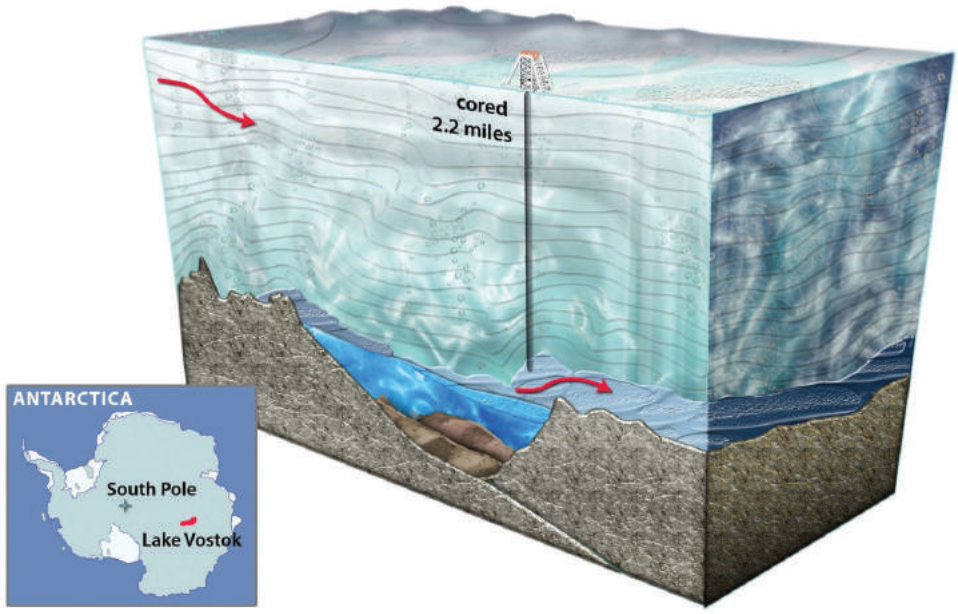
Another way of looking at these very slow processes is to study how soils are formed. Nearly all our soils are the result of a long process of breaking down rocks, so as to release their trapped minerals and so make these available for growth of plants.

6. Ice cores drilled into Antarctica (Reference: 16, 17, 18)

In recent years it has been possible to drill deep into Antarctic ice that has accumulated over hundreds of thousands of years. Analysis of the ice cores extracted from these boreholes has revealed fascinating things. Each year's snow deposits can be seen in the extracted ice cores.

Early studies revealed annual ice deposits going back at least 800,000 years. The deposits of snow from each winter are determined by changes in composition between summer and winter deposits. By counting the number of winter deposits (like rings in a tree) scientists can say how many years are involved.

In addition, we have historical records of major volcanic eruptions in various places and each volcano emits ash with a characteristic mineral composition. This ash becomes distributed worldwide by wind and weather and some has reached Antarctica, to become trapped in the ice layers.



Volcanic ash within these ice cores has enabled the scientists to check their analysis of how many years of deposits they are looking at.

These studies are not telling us the age of our earth but at least it should be telling us that it is more than a few thousand years old.

However, below this 800,000 year accumulation of ice we find rocks containing fossils, including amphibians and reptiles. One Antarctic fossil is the amphibian *temnospondyl* shown here, which has also been found in the Karoo fossil beds.

This tells us that the Antarctic continent once lay close to the equator and used to have a much warmer climate – and was at one time united with Africa. These fossils add further evidence for continental drift and the great ages of time.

7. Sediment cores drilled in Antarctica (Reference: 19, 20, 21, 22)

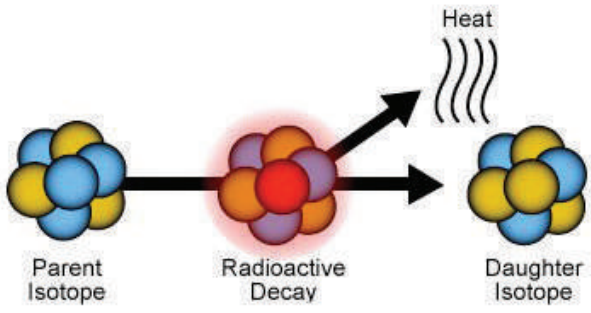
An article by Coghlan (2016) summarises research in Antarctica that is detailed in various scientific journals. This research has involved drilling down through accumulated layers of sediment and analysing plant material and other items.

One core was taken from the sea floor off Wilkes Land in East Antarctica as part of the Integrated Ocean Drilling Programme. Pollen grains within the cores show how vegetation on the continent has changed over the past 54 million years.

The cores reveal that Antarctica was much warmer 54 million years back and the climate could be described as subtropical. The predominant vegetation was palms and trees like monkey-puzzles, looking much like is shown in this painting. The vegetation of that time included some species that still thrive as 'living fossils' in New Zealand and Tasmania.

The sediment cores reveal that the climate slowly became colder and the predominant vegetation ended up with species typical of treeless tundra. By about 12 million years back even the tundra disappeared. At that time glaciers took over and Antarctica became the white frozen 'desert' it is today.

8. Radiometric dating of rocks (Reference: 23, 24, 25)



Radiometric dating utilizes the fact that radioactive elements (parent isotope) periodically give off 'particles' of energy as radiation and this changes the structure of the parent element into the daughter isotope.

The rate that this radiation is given off is different for each radioactive element.

The time it takes for half of the 'parent element' to change to its new form is called the 'half-life' and the 'half-lives' differ for each radioactive material. For example, radioactive carbon-14 has a half-life of 5730 years, whereas uranium-238 takes 4.5 billion years. By measuring how much change has occurred (shown by the amount of daughter isotopes formed), we can obtain a reliable measure of the length of time since the element was originally formed.

Each method has known margins of error but many rocks can be dated accurately enough to show their great age with certainty, and to show if they are older or younger than other rocks.

Some of the oldest rocks are in Greenland and have been studied by using five different radiometric dating methods. All the methods gave an age of between 3.5 and 3.7 billion years.

The skeptic may ask how sure we are that the rate of radioactive decay has not changed over time, resulting in us thinking rocks are much older than they are. However, any suggestion that we could reduce a 3.7 billion-year-old rock to a mere 6000 years would mean speeding up radioactive decay by at least 500,000 times. Since each decay event gives off radiation and radiation causes heating, such a massive **speeding up of radioactive decay would have reduced our world to a ball of molten rock!**

In other words, radioactive (radiometric) dating gives us another major method for studying the great age of our world and to date the rocks in which we find fossils of past life forms. Its great benefit is that it provides absolute dates, not just relative dates that tell whether a layer in the Earth is relatively older or younger than another layer, but not how old it actually is.

The fossil record reveals that the oldest rocks contain relatively simple life forms such as bacteria, and that as we look at the geological record, we find that more recent rocks contain more advanced life forms.

9. The fossil record shows stages in life complexity over time (Reference: 26, 27)

Ray Troll is a very talented young artist and the following is just one of many artistic creations he has made on a variety of topics. You can visit his website at www.trollart.com

In this art on the next page we can see his summary of scientific names given to stages in the geological column; the hand written numerals on the right indicate ages in millions of years and on the left the changes in the fossil record are shown.

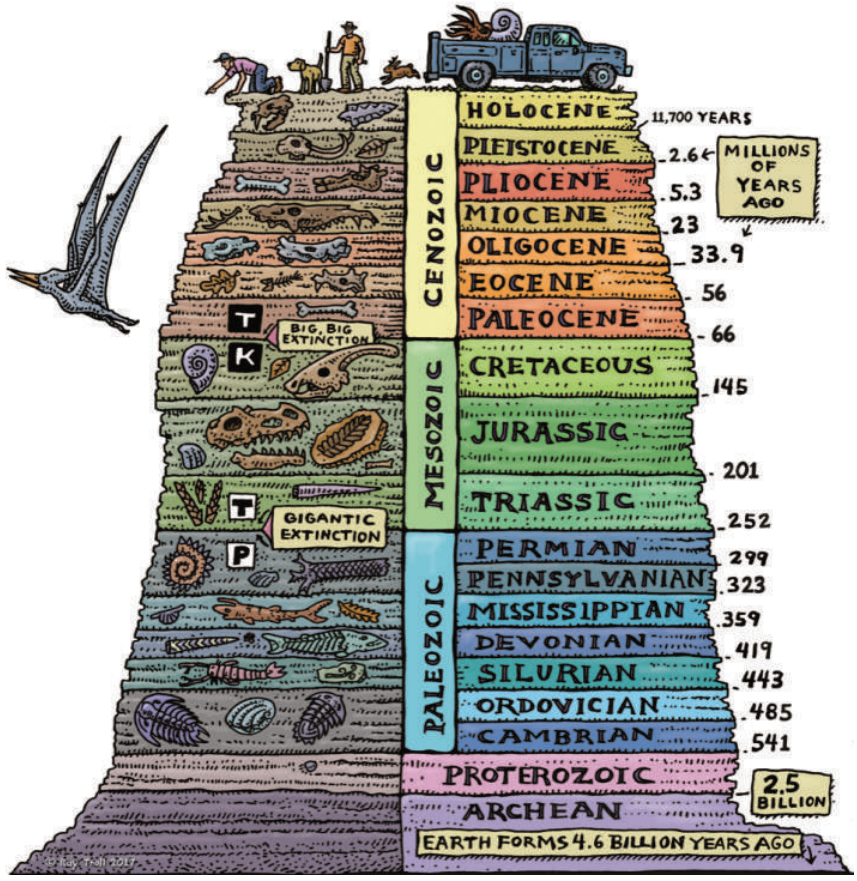


Image Credits

Map of Gondwana and fossil links. Credit: United States Geological Survey.

Cover of book by Mott Greene: *Alfred Wegener: science, exploration, and the theory of continental drift*, Johns Hopkins University: Baltimore, 2015; xiv + 675 pp.: ISBN 978 1 4214 1712 7,

Photo of Marie Tharp. Image taken in July 1920. Credit: Lamont-Doherty Earth Observatory.

Mid-Atlantic Ridge. Map by Marie Tharp. Credit: Lamont-Doherty Earth Observatory.

This Dynamic Earth display. Credit: Kious, Jacquelyne; Tilling, Robert I; Kiger, Martha, Russel, Jane. United States Geological Survey. ISBN 0-16-048220-8. http://pubs.usgs.gov/gip/dynamic/historical.html

Diagram of continental plate separation. Wikimedia Commons Credit: domdomegg

Zoogeographical regions. https://commons.wikimedia.org/wiki/File:Biogeography.jpg. Wikimedia Commons.

Photosynthesis image. Wikimedia Commons.

Coal deposits in Alaska. Credit: Department of Natural Resources State of Alaska

Coal formation diagram. Credit: Kentucky Geological Survey, Gktoday.in

Mountain building diagram. Credit: quora.com

Ice core drilling in Antarctica. Credit: Sarah Del Ben Foundation UGR at University of Georgia

Ice core drilling diagram. This image is a work of a National Science Foundation employee, taken or made as part of that person's official duties. As a work of the U.S. federal government, the image is in the public domain.

Amphibian. Credit: Ghedoghedo, CC BY-SA 3.0, via Wikimedia Commons. Same species as discovered via United States Antarctic Programme

Temperate forest in Antarctica reconstruction. Credit: J McKay/ Alfred-Wegener-Institut: Creative Commons license CC-BY 4.0

Radioactive decay diagram. Credit: NOAA Ocean Exploration; US Department of Commerce Office of Ocean Exploration and Research National Oceanic and Atmospheric Administration.

Art work depicting the geological column and life complexity. Credit: Ray Troll at www.trollart.com

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