The Annotated
OLD FOURLEGS

The Story of the Coelacanth

Mike Bruton

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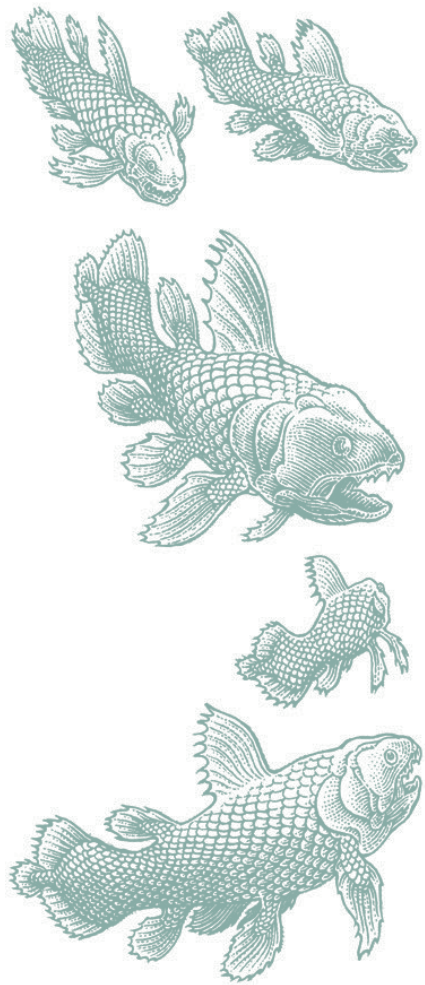

Chapter Two

THIRTY MILLION GENERATIONS

WHEN it was said that Coelacanths had been thought to be extinct for 50 million years, many people found it fantastic that scientists should even be prepared to make statements of that type. Such a period of time is of course enormous, but it is short compared with the time that covers the full history of our earth. Before we can show where the Coelacanth fits, it would be advantageous to make a rapid survey of what scientists now believe lies behind us.

Although fossils have been known for quite a long time, it is astonishing that their true significance has been realised only in comparatively recent times. One of the earliest fossils to be described was an almost perfect skeleton of a large salamander, found in rock strata in Germany, and it was regarded as the remains of 'a poor sinner overwhelmed by the [Biblical] flood'.

The science of 'Palaeontology' (knowledge of old life) is in one sense quite new, and in the last half-century it has developed in a manner that the first workers could scarcely have foreseen. In less than a century of intensive work some of the most remarkable intellects of all time have, from often only fragmentary remains, been able to unravel much of the history of life from the most remote past until today, and to present an almost complete picture of the main forms of life that have inhabited the earth. With this has come a rapidly increasing perception of the vast ages that lie behind us, and methods have been developed by which it has become possible to construct a scale to measure past time in a manner undreamt of not so long ago. The methods by which this is done are highly technical, and still newer and finer techniques are continually being developed.

Many people are curious about this. Here is one method by which the approximate age of a rock may be found. Uranium

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The concept of dating fossils or fossil-bearing rocks is now accepted by the lay public in most Western countries but not in many Muslim countries (or in parts of Europe and the USA where creationists abound) . When I taught science in Bahrain from 2012 to 2015 I found that most people (scientists and non-scientists alike) did not believe (or were not allowed to believe) that we could accurately date fossils from the past and establish a chronological sequence of their existence.

The discoverer of the first coelacanth fossil, Dr Louis Agassiz, who described Coelacanthus granulatus from England in 1836, was a well-respected palaeontologist who later established the Museum of Comparative Zoology at Harvard University in the U.S.A. Despite his stature as a scientist he never accepted Darwin's theory of evolution by natural selection and believed that species were "ideas in the mind of God".

Louis Agassiz

While living in Bahrain in 2012 I found a coelacanth fossil, discovered by oil prospectors, on display in the Oil Museum in the Sakhir Desert. Coelacanth fossils are now known from all continents, including Antarctica.

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Fish fossil, labelled as a coelacanth, in the Oil Museum in Bahrain

Smith's knowledge of chemistry and geology enabled him to understand the intricacies of uranium-lead dating, carbon isotopes and radiocarbon dating better than most ichthyologists. In an age of increasing specialization his knowledge spanned many disciplines, which allowed him to reach insights that were beyond the ken of ordinary scientists.

In 1976, during my post-doctoral year at the British Museum (Natural History), the Piltdown Man hoax was often discussed. The perpetrator of the hoax has never been identified but some of the suspects include the respected French philosopher and palaeontologist, Pierre Teilhard de Chardin, and even Sir Arthur Conan Doyle, the creator of the fictional detective, Sherlock Holmes.

Replica of the Piltdown Man skull

gives off radiations and small particles (of helium), thereby changing into a special kind of lead. The time that uranium takes to do this is known—it is many millions of years. By measuring the amount of lead in the uranium, the time that has passed can be estimated. When this takes place right inside a rock, the amount of helium (a gas) also gives a confirmatory figure. There are several other methods as well, one involving 'isotopes'.*

It is interesting to note that while, with all advances in technique, readjustments of estimated past time occur, they are on the whole of a comparatively minor order, so that it appears likely that we really do know a good deal about the relatively enormous stretches of time that have passed in our making.

Almost everyone today accepts that our sun is a star, that in the universe there are countless billions of other similar stars, and that our sun started, somewhere and somehow, as an enormous mass of very hot gas. This, whirling and moving at an enormous speed through space, gradually cooled. Portions flew off at intervals, and these are now the planets, of which our earth is one. These smaller masses cooled more quickly than the sun itself. Originally, of course, our earth was so hot it was almost all gas. As it cooled liquid first formed at the centre; then the surface became

* A method that is proving of great value in dating remains of once-living organisms has been evolved in recent times. It is based on the fact that carbon in the structure of living organisms, both plants and animals, has been found (1946) to contain a constant small amount of a radioactive isotope of atomic weight 14. Compared with uranium this has a short life, the period of half change being only 5,600 years. Because of its presence the carbon in organic remains such as the bones of a skeleton, or of a tree trunk preserved by some means such as being buried in a swamp, will steadily show less and less radioactivity as time goes on. The amount is so very small that its measurement demands great skill and many precautions. It has been possible to test the method by the use of remains of accurately known age, and in the hands of an expert it yields remarkable results. A striking application of this method has recently caused a considerable scientific sensation. Early this century the biological world was aroused by the discovery in deposits at Piltdown in England of the bones of a skull claimed by many experts to be of an early type of man since named the 'Piltdown Man', dating back close on a million years. While some doubts were expressed about its validity, most British experts accepted this view, and the bones remained a treasured possession in the British Museum. The carbon-isotope method has led to the discovery that this skull is made up of bones of different ages, all comparatively recent, none really old. The whole thing was a deliberate fraud, there never was any 'Piltdown Man'. A book has recently (1955) been published giving the whole story.

solid, still entirely surrounded by a gigantic dense atmosphere of whirling vapours and gases.

All the enormous amount of water now liquid on the earth was then gas. There came a time when the whole mass had cooled so far that the cold of outer space caused 'rain' to form in the dense clouds that covered the whole earth. At first this rain never touched the earth, it was too hot, but eventually it did reach the solid crust, only to sizzle off at once again as gas. For a long time, probably thousands of years, all over the whole earth it never stopped 'raining', literally pouring, a process which caused quite rapid cooling. One can well imagine that there must have been continual 'storms' of violence undreamt of today. In passing, we may note that at present the main part of our earth is still liquid and very hot under its solid crust. There is, of course, abundant liquid water and the atmosphere of gas. The earth is cooling all the time, and it is steadily losing water and air to outer space. If the earth survives long enough there will come a time in the far-distant future when any water or 'air' that may be left will all be solid. One way and another, life as we know it now, free life on the surface of the earth that needs water and air, can only be a passing phenomenon in the infinite time span of the universe.

The sciences of Geology and Palaeontology go together and scientists in those fields have divided the time of existence of the earth into different eras, systems, and periods, which have for convenience been given names.

The table overleaf (p. 14) giving a Geological Time-scale is a summary of what is more or less generally accepted.

On the earth there is a sharp distinction between dead, or 'inorganic', matter and living things which nobody has yet been able to bridge. The earliest forms of life on the earth were doubtless preceded by the formation in some fashion of 'organic' matter; that is, non-living compounds containing carbon and other elements essential to living organisms of the type we know on the earth, that in some fashion came to be alive. Nobody has as yet succeeded in pushing any types of non-living 'organic' compounds over the borderline to 'life', but it is not impossible that suitable compounds are constantly being produced in nature, that the transition to living matter may still occur, so that even if

JLB's succinct description of the evolution of the planet would probably have been the first introduction that many lay people had to these ground-breaking scientific concepts (unless they chose to peruse the relevant sections of encyclopaedias of the time). JLB was writing at a time when South Africa was in the grip of a Nationalist government bent on imposing conservative, often anti-evolutionist, religious views on the populace, and in the throes of implementing the repressive regime of apartheid.

His far-reaching opinions on the eventual extinction of life on Earth came as a shock to some readers, especially those who regarded life as sacrosanct and infinite according to the religious teachings to which they were exposed.

The time frames on the Geological Timescale given by Smith have inevitably been revised in the light of more recent research. Perhaps the most startling change is that early humans (Homo sapiens) may have arisen as early as 115,000 to 90,000 years ago (rather than 25,000 years ago) based on discoveries in Border Cave in northern Zululand and elsewhere.

It is still widely believed that all life started in water. To a certain extent even animals that live on land are still 'aquatic' in that they were only able to make the trek from water to land because they took some of their alma mater with them in the form of their blood and cell fluids.

JLB's idea that radioactivity might have triggered the transformation of inorganic matter into organic life was well ahead of its time and may still prove to be true.

GEOLOGICAL TIME-SCALE

Eras	*Systems*	*Periods*	*Years Ago*	*Types of Life*
ORIGIN OF EARTH			3,000,000,000 at least	
PRE-CAMBRIAN	Eozoic Archaeozoic Proterozoic	. .	1,700,000,000	First lowly forms of life.
PALEOZOIC	Cambrian .	. .	500,000,000	Invertebrates
	Ordovician .	. .	400,000,000	Invertebrates
	Silurian .	. .	350,000,000	Vertebrate fishes
	Devonian .	. .	320,000,000	Rhipidistia Coelacanths Various fishes Amphibians
	Carboniferous	. .	280,000,000	Primitive plants on land Amphibians
	Permian .	. .	220,000,000	Amphibians
MESOZOIC	Triassic .	. .	190,000,000	Reptiles Mammal-like reptiles
	Jurassic .	. .	150,000,000	Birds
	Cretaceous .	. .	120,000,000	Flowering plants Mammals
CAINOZOIC	Tertiary	Eocene .	70,000,000	Mammals
		Oligocene	50,000,000	Mammals
		Miocene .	25,000,000	Mammals
	Quaternary	Pleistocene	1,000,000	Ape-man Stone-Age man
		Holocene.	. 25,000	Modern man

all life on the earth were to be obliterated, there is at least a chance that it might start all over again.*

It is universally accepted that life started in the water, and the first living things are presumed to have been very lowly, something small and soft, like the simple, tiny protozoa that zoologists

* The constant presence and proportion of the radioactive C_{14} isotope in living matter inclines me to believe that the 'creation of life', or the 'animation' of matter, probably took place in suitable non-living matter under the influence of a special type and density of radioactivity. It may well eventually be possible to deduce what this was and to carry out the process in the laboratory, though the living matter so produced may not necessarily be the same as that which originally appeared on earth.