

# *Bathybius haeckelii* and a ‘reign of terror’

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The *Bathybius* affair was one of the first instances of false evidence being used to support Darwin’s theory. It becomes clear that finding such evidence was of utmost importance to men like T.H. Huxley and Ernst Haeckel, and this clouded their judgment. When found out, Huxley admitted his error in 1875, but not whole-heartedly, leaving a measure of doubt in people’s minds even in 1879. Haeckel continued to allow fictitious examples of ‘Monera’ to be used in textbooks for decades afterwards. The Duke of Argyll complained about such lack of integrity in science, that involved a failure to investigate properly, overconfident statements and attempted bullying of critics to gain their silence.

It was Thomas Henry Huxley’s enthusiasm that brought *Bathybius* into the world (figure 1). He was encouraged in this endeavour by Ernst Haeckel, who was one of the foremost supporters of abiogenesis during the latter part of the nineteenth century; the idea that life can arise from non-life. *Bathybius* though was to turn into a real embarrassment for both when it was found to be merely a chemical precipitate (amorphous gypsum). Seemingly their judgment was clouded due to their strong determination to find evidence for Darwin’s new theory. But there is also evidence that Huxley was engaged in a campaign of rhetorical bullying at the time as well to silence critics. The Duke of Argyll (George Douglas Campbell) for instance complained about a ‘reign of terror.’

Like Darwin, Huxley had spent time at sea as a naturalist and was later tasked with examining collected samples, including those collected from the deep sea floor by *H.M.S. Cyclops* in 1857. Sea floor sediment had been collected and preserved in alcohol for later study. The task of the *Cyclops* incidentally had been to lay telegraph cables between Britain and America. Upon examination, Huxley noticed something apparently odd about one sample. He observed that a thin film of jelly like mucus had collected on the top of the sediment as embedded tiny granules. These granules appeared to move when examined under a microscope. As a result he thought he had found the original protoplasm of life in the gelatinous ooze. Protoplasm was at the time believed to be an organic substance that formed the basis of life, and therefore something of this nature, found in ocean sediment, suited the evolutionary speculation of the period (see figure 2). Haeckel had recently proposed that such an entity existed as the precursor of life, and Huxley rather excitedly wrote to Haeckel in October 1868 the following comments offering to name the new ‘Moner’ after him.



Figure 1. Thomas Henry Huxley in 1874.

‘... a new “Moner” which lies at the bottom of the Atlantic to all appearances, and gives rise to some wonderful calcified bodies. I have christened it *Bathybius Haeckelii* [*sic*], and I hope you will not be ashamed of your god-child. I will send you some of the mud with the paper.’<sup>1</sup>

But Huxley’s enthusiasm meant that he had not carried out sufficient chemical tests. Instead he launched into promotion of this precipitate of jelly as the original protoplasm of life. Haeckel, after examining *Bathybius* for himself, agreed with Huxley that it was the original primordial slime, or *Urschleim*, from which all other living things have arisen. In July of 1870 Huxley wrote a letter to *Nature* commenting that Haeckel agreed with all of his main points regarding *Bathybius*.

‘The longest of the papers ... is devoted to a careful study of *Bathybius*, and the associated Cocoliths and Cocospheres; and it is a mattaer [*sic*] of great satisfaction that Prof. Haeckel has arrived at conclusions which, in all the main points, agrees [*sic*] with my own respecting these remarkable organisms.’<sup>2</sup>

It would seem then Huxley’s enthusiasm was partly captivated by comparison with various zooplanktons such as coccoliths, and with penicillin, which was usually seen to develop in the dark. Several years later in February 1874 Haeckel wrote a glowing piece in *Nature*, entitled ‘Scientific Worthies: Thomas Henry Huxley,’ in which he praised Huxley for his contribution to Darwin’s theory.

‘After Charles Darwin had, in 1859, reconstructed this most important biological theory, and by his epoch-making theory of Natural Selection placed it on an entirely new foundation, Huxley was the first who extended it to man, and in 1863, in his celebrated

three Lectures on “Man’s Place in Nature,” admirably worked out its most important developments. With luminous clearness, and convincing certainty, he has here established the fundamental law, that, in every respect, the anatomical differences between man and the highest apes are of less value than those between the highest and the lowest apes. Especially weighty is the evidence adduced for this law, in the most important of all organs, the brain; and by this, the objections of Prof. Richard Owen are, at the same time, thoroughly refuted. Not only has the Evolution Theory received from Prof. Huxley a complete demonstration of its immense importance, not only has it been largely advanced by his valuable comparative researches, but its spread among the general public has been largely due to his well-known popular writings. In these he has accomplished the difficult task of rendering most fully and clearly intelligible, to an educated public of very various ranks, the highest problems of philosophical Biology. From the lowest to the highest organisms, from *Bathybius* up to man, he has elucidated the connecting law of development.<sup>23</sup>

Such written evidence shows that Haeckel and Huxley were thinking of evolution as a complete and unified theory extending from protoplasm to mankind. The establishment of *Bathybius* then was a foundational part of this process. In order to find further samples of *Bathybius* two other surveying ships were despatched, *HMS Lightning*, and *HMS Porcupine*. They failed to find samples of *Bathybius*. However, the *Challenger* expedition, which left Portsmouth in 1872, was more successful. After two years sailing towards Japan the scientists aboard noted that samples of sea floor sediment preserved in alcohol displayed evidence of *Bathybius*. However, what was also noteworthy was that samples stored in seawater did not contain the gelatinous ooze. This led John Buchanan, who was the ship’s chemist, to test the samples and he discovered that what was found was in fact hydrated calcium sulphate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ), a precipitated ‘jelly’ that was a reaction to the presence of alcohol on the mud. The Duke of Argyll later commented on this episode.

‘One of Mr. Murray’s assistants poured a large quantity of spirits of wine into a bottle containing some pure sea-water, when lo! the wonderful protoplasm *Bathybius* appeared. It was the chemical precipitate of sulphate of lime produced by the mixture of alcohol and sea-water.’<sup>24</sup>

This information was later relayed back to Huxley. He began to realise that he had made a mistake and wrote an open letter to the journal *Nature* in August 1875 reporting the view of the *Challenger*’s naturalists that *Bathybius* may not be organic after all.

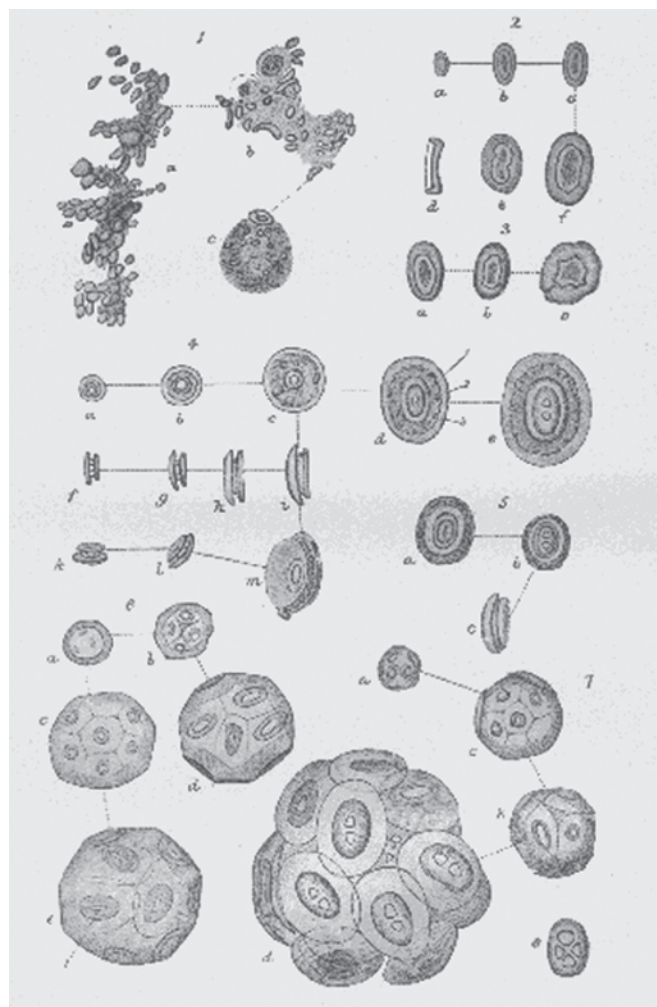
‘Prof. Wyville Thomson further informs me that the best effort of the *Challenger*’s staff have

failed to discover *Bathybius* in a fresh state, and that it is seriously suspected that the thing to which I gave that name is little more than sulphate of lime, precipitated in a flocculent state from the sea-water by the strong alcohol in which the specimens of the deep-sea soundings which I examined were preserved.’<sup>25</sup>

He seems to have realised the unfortunate predicament he was in during August 1875, writing to Michael Foster that

‘I have just had a long letter from Wyville Thomson. The *Challenger* inclines to think that *Bathybius* is a mineral precipitate! in which case some enemy will probably say that it is a product of my precipitation. So mind, I was the first to make that “goak.” Old Ehrenberg suggested something of the kind to me, but I have not his letter here. I shall eat my leek handsomely, if any eating has to be done.’<sup>26</sup>

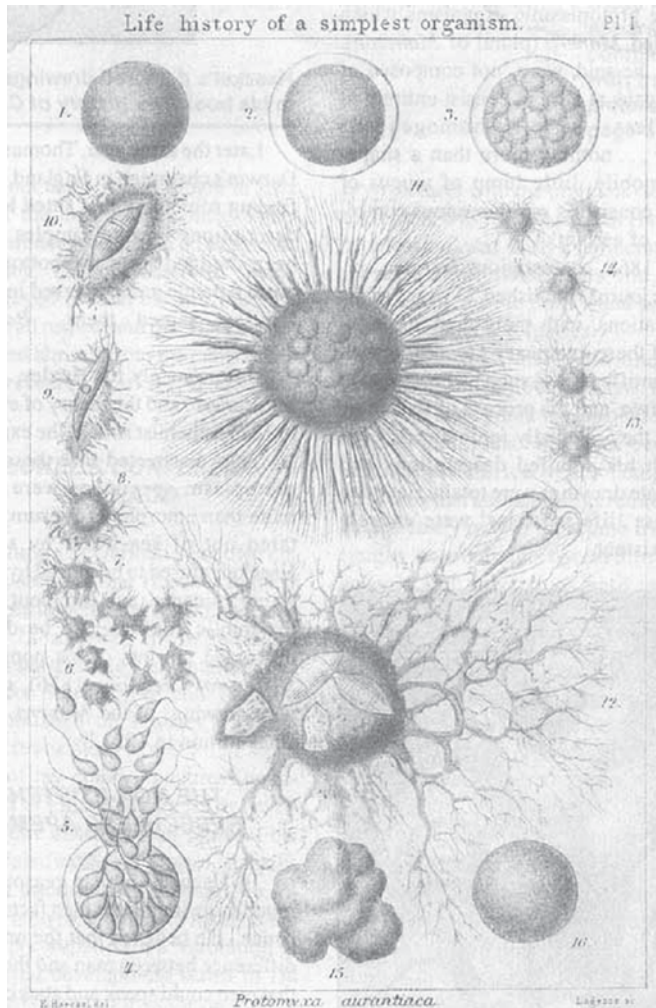
So Huxley, in August 1875, appeared to accept that *Bathybius* was an embarrassing mistake. However, even



**Figure 2.** Drawings of *Bathybius*, top left, alongside various plankton.

Drawing from <http://aleph0.clarku.edu/huxley/SM3/bathy.htm>





**Figure 3.** One such drawing used in Haeckel's book *The History of Creation*, of the life cycle of a fictional Moneron name, *Protomyxa aurantiaca*.

as late as August 1879 he continued to leave a measure of doubt in people's minds, perhaps though for social reasons. This equivocation was on the basis that the matter of his 'friend' was not settled, stating that 'my own judgment is in an absolute state of suspension about it', and that the matter could not be settled without a further voyage of discovery.<sup>7</sup> It would seem that the reason for such ambiguous statements at this time was because the President of the British Association for the Advancement of Science (BAAS) of that year had argued in his address that *Bathybius* was the protoplasm of life. Huxley was apparently careful to spare the President embarrassment. Haeckel for his part continued to argue that *Bathybius* was real until 1883 despite Huxley's comments, and for some further 50 years a popular book of Haeckel's, *The History of Creation*, (first published 1876) contained evidence for various Monera with entirely fictional drawings until the final edition of 1923 (figure 3).<sup>8</sup> In 1868 Haeckel had first published 73 pages in a prestigious German journal on various fictional Monera with scientific sounding names

such as *Protamoeba primitiva*, even giving his fraudulent creations their own detailed life cycles.<sup>9</sup> It was in the same year of 1868 that Huxley identified *Bathybius*. One recent historian of science, Angela Colling, has recently commented that the reason there was reluctance to accept that *Bathybius* was not organic was because it was seen as playing a key role in the development of the theory of evolution, and therefore many scientists wanted it to be true.<sup>10</sup>

While many leading scientists such as Huxley and Haeckel wanted to believe that *Bathybius* was real, the Duke of Argyll later commented upon the find and was critical of the scientific establishment for being caught up in a wave of secular enthusiasm that blinded their critical capacity. In an article in 1887 entitled 'A Great Lesson', he comments that the 'naturalists of the *Challenger* began their voyage in the full Bathybian faith,' but Argyll praised John Murray for keeping his mental balance when no evidence for 'the pelagic protoplasm' was found as the *Challenger* continually brought fresh material up from the 'bathysmal bottoms'.<sup>11</sup> The Duke noted that *Bathybius* was only ever found in specimens located within Huxley's laboratory in Jermyn Street and that Huxley was its chief sponsor, but it was only by an accident that the eminent scientists on board the *Challenger* solved the mystery. He commented that this 'was bathos indeed' and that the episode provided 'a great lesson ...' for science.<sup>4</sup>

The Duke of Argyll commented also that there was no logical reason for the acceptance of *Bathybius* by the science community. Argyll noted that *Bathybius* was merely a 'slimy mucus,' that was 'structureless to all microscopic examination.'<sup>11</sup> As such it was much like other sedimentary material dredged from the ocean bottom, but according to the Duke some were so driven by enthusiasm to find evidence for the beginning of life that their scientific integrity failed them, or worse it was a deliberate conspiracy to deceive. The Duke of Argyll commented that the 'ultra-Darwinian enthusiasts were enchanted.'<sup>11</sup>

'Here was a grand idea. It would be well to find missing links; but it would be better to find the primordial pabulum out of which all living things had come. ... Haeckel clapped his hands and shouted out "Eureka" loudly. Even the cautious and discriminating mind of Professor Huxley was caught by this new and grand generalization of the "physical basis of life." It was announced by him to the British Association in 1868. Dr. Will Carpenter took up the chorus. He spoke of "a living expanse of protoplasmic substance," penetrating with its living substance the "whole mass" of the "oceanic mud." A fine new Greek name was devised for this mother slime, and it was christened "*Bathybius*," from the consecrated deeps in which it lay. The conception ran like wildfire through the popular literature of science, and here again there was something like a coming Plebiscite in its

favour. Expectant imagination soon played its part. Wonderful movements were seen in this mysterious slime. It became an “irregular network,” and it could be seen gradually “altering its form,” so that “entangled granules gradually changed their relative positions . . . . This is a case in which a ridiculous error and a ridiculous credulity were the direct results of theoretical preconceptions. *Bathybius* was accepted because of its supposed harmony with Darwin’s speculations.”<sup>11</sup>

Huxley had made a very basic mistake as a result of his clouded judgement in attempting to find evidence to prove his Darwinian hypothesis, and the science community was swept along with similar enthusiasm. Ironically such lack of care by Huxley is in sharp contrast to his own statement that ‘The man of science, in fact, simply uses with scrupulous exactness the methods which we all, habitually and at every moment, use carelessly.’<sup>12</sup> However, it would seem that his careless mistake had served a useful purpose in promoting Darwin’s theory as truth for at least seven years.

Huxley though objected to the Duke of Argyll’s criticism that he was so driven by evolution to accept *Bathybius*, and in private correspondence commented that the Duke of Argyll had been making capital out of the circumstances surrounding *Bathybius*. He complained that ‘... the theologians cannot get it out of their heads, that as they have creeds, to which they must stick at all hazards, so have the men of science. There is no more ridiculous delusion.’<sup>13</sup> Even in 1890 Huxley was still complaining that ‘*Bathybius* is too convenient a stick to beat this dog with to be ever given up’.<sup>14</sup> A few years earlier in 1887 Huxley wrote.

‘What is meant by my being caught by a generalization about the physical basis of life I do not know; still less can I understand the assertion that *Bathybius* was accepted because of its supposed harmony with Darwin’s speculations. That which interested me in the matter was the apparent analogy of *Bathybius* with other well-known forms of lower life, such as the plasmodia of the Myxomycetes and the Rhizopods. Speculative hopes or fears had nothing to do with the matter; and if *Bathybius* were brought up alive from the bottom of the Atlantic tomorrow the fact would not have the slightest bearing, that I can discern, upon Mr. Darwin’s speculations, or upon any of the disputed problems of biology. It would merely be one elementary organism the more added to the thousands already known.’<sup>15</sup>

Should this error be recognised as a simple mistake or a deliberate one? Such a level of carelessness does not tie in with Huxley’s own statements and his high-ranking position as a scientist, and the error did have the effect of promoting evolution in the late nineteenth century. It would seem though that many leading scientists, including

Huxley, were swept away with enthusiasm to believe that the chemical jelly was in fact a primitive life form. The fallout from *Bathybius* though rumbled on for a number of years following. Huxley protested his innocence of charges that it was a deliberate mistake, but his own statements and those of Haeckel show how important something like *Bathybius* was towards the development of a universal evolutionary theory. As already noted, Haeckel commented that from the ‘lowest to the highest organisms, from *Bathybius* up to man, [Huxley] has elucidated the connecting law of development.’<sup>16</sup> And Huxley stated that ‘Haeckel has arrived at conclusions which, in all the main points, agrees with my own respecting these remarkable organisms.’<sup>17</sup>

### Reign of terror

While the Duke of Argyll was critical of the way the evidence for *Bathybius* was handled, he also complained of a ‘reign of terror’ that was evident in the Royal Society against those who disagreed with Darwin’s theory. The Duke for instance commented on Huxley’s use of personal attacks in arguing his case. ‘My sincere respect for Professor Huxley forbids me from following him into the field of personal polemics, even if this Review were a fitting place for such exertions.’<sup>16</sup>

The main cause of his accusation of a ‘reign of terror’ was to do with Darwin’s findings relating to the formation of coral that were questioned by John Murray. Murray was apparently ‘strongly advised against the publication of his views in derogation of Darwin’s long-accepted theory of the coral islands, and was actually induced to delay it for two years.’<sup>17</sup> Darwin had followed Lyell in arguing that coral grew upwards on volcanic outcrops of rock as a great continent in the Pacific had slowly subsided into the ocean floor. They did not believe that coral could grow on softer sediment. However, Murray, with support from Sir Wyville Thomson and other scientists on the *Challenger*, had argued instead that coral could grow on softer sediment and further that it was possible for coral on the sea bottom to be elevated towards the surface as reefs build upwards. This was in contradiction of Darwin’s ideas of coral formation. The Duke of Argyll commented that Darwin’s theory was a dream, and with regard to this episode that:

‘In a recent article in this Review I had occasion to refer to the curious power which is sometimes exercised on behalf of certain accepted opinions . . . in establishing a sort of Reign of Terror in their own behalf, sometimes in philosophy, sometimes in science.’<sup>17</sup>

The former President of the British Association, the Duke of Argyll, continued to argue that all was not well with the way science was being presented, with evidence that Huxley and others were engaged in rhetorical and inconsistent arguments, this because of a perceived commitment to Darwinian presuppositions. Of course Huxley protested his innocence of any such charge of

bullying. In a paper entitled, *Science falsely so called*, the Duke observed that Huxley moved from science to metaphysics without acknowledging the switch in reasoning that he makes.

‘The first of these [points] concerns the use which Professor Huxley makes of the word “science.” In common parlance this word is now very much confined to the physical sciences, some of which may be called specially experimental sciences, such as chemistry, and others exact sciences, such as astronomy. But Professor Huxley evidently uses it in that wider sense in which it includes metaphysics and philosophy. Under cover of this wide sweep of his net, he assumes to speak with the special authority of a scientific expert upon questions respecting which no such authority exists either in him or in anyone else. It seems to be on the strength of this assumption that he designates as pseudo-science any opinion, or teaching, or belief, different from his own.’<sup>16</sup>

The Duke used as an example one of Huxley’s more elaborate works, his volume on *The Elements of Comparative Anatomy*, published around 1864. Huxley was considered an expert in this area, but the Duke considered that such branches of evolutionary science really belong in the ‘region of metaphysics’. The problem was that Huxley was using his authority to gain acceptance that there was ‘a complete “unity of organisation” between [for instance] all vertebrate skulls, from the skull of a man down to the skull of a pike.’ There was concern then that use of authority in science was liable to intimidate men ‘when in reality no sort of authority exists’ and that there were many good scientists who disagreed with Huxley’s ‘metaphysics and philosophy’ and were not ‘inclined to accept his expositions, even in physical science’ when Huxley was going beyond his observations. The Duke also questioned a rather cryptic comment by Huxley, that with evolution there was a tendency for such new ideas to ‘degenerate into fanaticism’, although the Duke of Argyll insisted that there was not just a tendency, but ‘a pronounced development of it, and a widespread infection from it in the language of science.’<sup>16</sup>

### Conclusion

Whether or not *Bathylbius* was a deliberate plan to deceive, as the Duke of Argyll suggests it was, this episode certainly exposes Huxley and Haeckel to the charge that they were so driven by their own presuppositions that they were unable to conduct scientific research in a purely objective fashion. In other words, they were indeed misled by their own preconceptions about the truthfulness of a universal theory of evolution. Their own words also show how important the discovery of *Bathylbius* was in establishing the truth of this grand evolutionary progression in the late nineteenth century despite their protestations to the

contrary.<sup>18</sup> What may also be noted from this affair is that a pattern can be identified that appears to be repeated through history. Flimsy evidence for Darwin’s theory is found and then promoted with an unhealthy zeal that may blind the public to the real nature of scientific discovery. With overconfident statements and pressure to conform to scientific consensus, a ‘reign of terror’ can be seen to develop against those with honest objections to a particular theory. Anyone who dares to object to Darwin’s theory, for instance, may be treated with fierce and personal attacks. Arguments for evolution are also based on rhetoric and presented to the public on the basis of authority with little attempt at presenting real evidence.

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