

'The World-Renowned Ichthyosaurus': A Nineteenth-Century Problematic and Its Representations

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I

The first edition in English of Jules Verne's *Voyage au centre de la Terre* (1864), published in 1871 as *A Journey to the Centre of the Earth*, like the original features an epic combat between two enormous marine reptiles but identifies one of them as "the world-renowned ichthyosaurus".¹ One of many alterations this British rendition imposes upon the second, expanded edition of Verne's novel (1867), the spurious "world-renowned" was added not only to heighten interest, but also, quite likely, to appeal to nationalism since ichthyosaur fossils were first identified, described, and publicized in England. The story of early ichthyosaur discoveries has been told often enough, with recent stress upon the scientific acumen and potential, once downplayed because of gender and class, of fossil collector Mary Anning.² At Lyme Regis, Dorset—the epicenter of paleontological shocks and excitement that radiated out to Britain and beyond—beginning in 1811 Anning discovered and excavated the first fossilized ichthyosaur skeletons recognizable as "an important new kind of animal".³ Her once undervalued scientific credentials, however, represent but one of the ways in which the ichthyosaur of scientific and popular imagination swam in unsettled cultural waters.

As the first large prehistoric reptile discovered and identified in England, the ichthyosaur ("fish-lizard") built upon and furthered the British enthusiasm for natural history, geology, and fossil collecting that flourished especially in the first half of the nineteenth century. It also participated in the century's contentious scientific-religious confusions about the earth's age, the origins of species, the causes of extinctions, and how to comprehend ancient, gigantic animals unaccounted for by the Bible. This essay concerns how the nineteenth-century idea of the ichthyosaur "evolved", changing as scientific discovery overlapped other cultural arenas. Fossilized ichthyosaur remains, initially almost inexplicable, haltingly but progressively took on the flesh of scientific knowledge about the form and behavior of the thing itself, while

¹ Jules Verne, *A Journey to the Centre of the Earth*. London: Griffith, 1871,

<<http://www.gutenberg.org/dirs/1/8/8/5/18857/18857.txt>>, 15 Sept. 2009, Chapter 30. n. pag.

² Anning became widely known as a fossil collector, but her background and gender meant that she was in no position to publish or address learned societies; there is much evidence that she would have been capable of doing both under less discouraging circumstances. On Anning's abilities and obstacles, see: Christopher McGowan, *The Dragon Hunters: How an Extraordinary Circle of Fossilists Discovered the Dinosaurs and Paved the Way for Darwin*. Cambridge, Massachusetts: Perseus, 200, pp.16-20; Deborah Cadbury, *The Dinosaur Hunters: A Story of Scientific Rivalry and the Discovery of the Prehistoric World*. London: Fourth Estate, 2000, pp.3-12, 25-32; and especially Hugh Torrens, 'Mary Anning (1799-1847) of Lyme: 'The Geatest Fossilist the World Ever Knew'.' *The British Journal for the History of Science*, 28 (1995), pp.257-84.

³ See: Christopher McGowan, *The Dragon Hunters*, p.23. Fossilized ichthyosaur remains had been found before but were interpreted "as belonging to some sort of crocodile" (22). See also: Dennis R. Dean, *Gideon Mantell and the Discovery of Dinosaurs*. Cambridge: Cambridge University Press, 1999, pp. 58-60 for the early descriptions of ichthyosaurs based on Anning's finds.

broader cultural shaping of the creature's supposed nature and significance lost ground. I will give some attention to scientific findings about the ichthyosaur, from the early nineteenth century to the present. My focus, however, is upon the variable interplay between nineteenth-century scientific and literary-artistic understandings of "the ichthyosaur", a text that interacted in various ways with its societal context to influence how it could be read. Verne's mid-century *Journey* introduces the trends and contingencies that informed ichthyosaur representations, including pictures and models, while references in novels by Thomas Hardy and Joseph Conrad suggest the ichthyosaur's significance at century's end. This creature, like other radically new phenomena at odds with familiar categories of thought, presented a compelling problem, one both entangled with human aspirations and anxieties and receptive to the interpretive imagination.

II

Although early investigators soon recognized the ichthyosaur's skeletal structure as reptilian, one of the first things that struck observers about the specimens being disinterred from cliffs and quarries was the similarity the streamlined shape of the living animal must have borne to those of present-day dolphins and fast-swimming fish.⁴ Of even more obvious note were immense jaws lined with scores of conical teeth. Equally apparent were its enormous eye sockets, which of themselves indicated to early analysts their predatory nature, causing one commentator to style it "the tyrant of the deep".⁵ With imposing teeth and eyes, the largest of the early specimens—Mary Anning's initial find of a nearly complete fossil measured thirty feet—suggested a creature out of myth and legend; Verne heightened this effect by making his version a hundred feet long and spectacularly ferocious. This mythic quality coupled with the realization that it actually existed made the ichthyosaur particularly strange and interesting—as was the case for the other great extinct reptiles, frequently described as "dragons" and "monsters" that soon followed it in being first described in the early nineteenth century: the plesiosaur, megalosaur, iguanodon, and pterodactyl.⁶

This strangeness is subtly enhanced by the best-known translation of *Journey*,² which attaches ichthyosaurs and other prehistoric animals to the bible-based strangeness implicit in the theory known as pre-Adamism. The following discussion of this and related ideas entails a temporary detour away from ichthyosaurs in order to consider some of the scientific and religious issues that swirled around these animals and lay behind Verne's description of one.

Rendered by a scientifically-minded Anglican priest, Frederick Amadeus Malleson (1819-97), the 1877 English translation entitled *A Journey into the Interior of Earth*, the basis of many later editions, is far more accurate than the 1871 version but nevertheless makes emendations that, by responding theologically to the mass of

⁴ Although the earliest discovered specimens, dating from the Jurassic, were dolphin or fish shaped, not all ichthyosaurs, especially the early ones, fit that description. For discussion of ichthyosaurs from the early to late Mesozoic, see: Christopher McGowan, *Dinosaurs, Spitfires, and Sea Dragons*. Cambridge: Harvard University Press, 1991, pp.219-56.

⁵ See: Anon., 'Abstract of a Paper on the Fossil Ichthyosaurus Lately Purchased for the Birmingham Philosophical Institution, Read on the 1st of May, 1837.' *The Analyst: A Quarterly Journal of Science, Literature, Natural History, and the Fine Arts*, 7 (1837), 233-40., p.236.

⁶ Besides the ichthyosaur, Anning discovered the first plesiosaur and the first English remains of a pterodactyl (pterosaur).

geological information and misinformation Verne weaves into his narrative, bear upon the ichthyosaur and its nineteenth-century significance. In this vein, on four occasions when Verne employs the term "antediluvians", Malleon translates it as "preadamite" rather than as the obvious cognate "antediluvian".⁷ For example, in leading up to the reptilian combat, the narrator muses upon "the monsters of the preadamite world, who . . . preceded the animals of mammalian race upon the earth".⁸ In the nineteenth-century "pre-Adamite", or preadamite, assumed as one of its meanings the generalized idea of "ancient" or of the later "prehistoric", although not quite to the degree that "antediluvian" and its French equivalent had done, terms that also had a somewhat wider circulation. But as used by Malleon, "preadamite" also recalls the Genesis-based notion that God created the earth and various life forms, including humans, long before He did Adam and Eve—an implication that "antediluvian" does not carry. While "pre-Adamite", without necessary biblical reference, became attractive to nineteenth-century geologists who believed in an ancient earth—since "antediluvian" originally meant only the comparatively short period of time between the biblical Great Flood and the Creation—the word's theological history tinges Malleon's handling of Verne's novel.

Pre-Adamatism was given prominence by Isaac de la Peyrère (1596-1676). The theological core of his position was that a New Testament passage ascribed to Paul about divine law and the sinfulness that preexisted Law (Romans 5:12-14) refers to commandments given to Adam rather than Moses, and therefore that humans must have existed before Adam; de la Peyrère elaborated upon this theory to argue that Gentiles were descended from Pre-Adamites, Jews from Adam and Eve. Advocates of pre-Adamatism sometimes founded their beliefs upon the two creation stories in Genesis: the first, Genesis 1:1-2:4, in which the names Adam and Eve do not appear, was thought to cover a vast expanse of time that witnessed God's pre-Adamite creations, while the succeeding one concerned the creation of Adam and Eve and the "Adamite" world. Pre-Adamite humans were sometimes employed to explain the multiplicity of races, and in the nineteenth century the idea was enlisted to support pseudo-scientific racism with the idea that non-white races were descended from ancient Pre-Adamites inferior to the Caucasian Adam and Eve; however, Pre-Adamites sometimes were imagined as superior to Adamites—Adam and Eve's descendants. Sanctioned by literalist readings of the Bible, the belief that the earth was only a few thousands of years old had prevailed until challenged by late eighteenth- and early nineteenth-century geology, but pre-Adamatism had already posited the idea of the world's ancientness.

When used in more restricted senses, rather than as what developed into a widely employed synonym for "ancient", "antediluvian" also had an involved history. As described in Genesis, the antediluvians were Adam's descendants who preceded the great flood, and many stories elaborated upon the Biblical account (Genesis 1-6)

⁷ I learned of departures from Verne's language via the Project Gutenberg e-text of Malleon's translation, the headnote to which cites Christien Sánchez for detecting inconsistencies and providing examples. Forewarned, I noticed other inaccuracies, along with the "pre-Adamite" translation of "antediluvians", and subsequently Mr. Sanchez kindly sent me further instances of the clergyman's Bible-related adjustments to Verne's text.

⁸ Jules Verne, *Journey to the Interior of the Earth*, trans. Frederick Amadeus Malleon. London: Ward, 1877, < <http://www.gutenberg.org/dirs/etext03/8jrm10.txt> >, 15 Sept. 2009, Chapter 33. n. pag. Subsequent references to Malleon's translation are to this online edition and are given by chapter within the text.

of their natures and the why and wherefore of their destruction. The non-canonical *Book of Enoch* presents such an account. There was general agreement that antediluvians were different from modern humans—Genesis reports their immense ages—and sometimes the whole antediluvian world was comprehended as in various ways fundamentally different from the current one. The great comparative anatomist and seminal paleontologist Georges Cuvier (1769-1832) understood the biblical flood as the last of a series of extermination events that had wiped out many species of flora and fauna; others, including some geologists, were comfortable in asserting the biblical flood as a singular occurrence that obliterated antediluvian humans and many animal species. The Great Flood fit well with catastrophism, the idea, primarily the legacy of Cuvier, that violent events such as floods, earthquakes, and eruptions fashioned the Earth in its current form. It appealed to geologists who sought to interpret the Bible literally and thus, in support of biblical authority and a recent Creation, thereby oppose the new wave of early nineteenth-century geologists who accepted evidence of an ancient earth; however, as Ralph O'Connor's *The Earth on Show* (2007) demonstrates in its extensive examination of "science as literature" in the first half of the nineteenth century, this opposition, at its most intense in the 1830s, was not always clear cut, with positions overlapping in complicated ways.⁹

Pre-Adamatism did not initially have anything to do with geology, but early nineteenth-century geologists used "pre-Adamite" to refer generally to an ancient Earth and, since most geologists considered themselves devout Christians, to differentiate that immense epoch from the recent, relatively brief one of human occupation that included the Great Flood. The idea that pre-Adamite humans existed was far less acceptable to scientists, since verified non-modern human remains were not discovered until mid-century, although Cuvier left room for such speculation, on the basis of which William Beckford's novel *Vathek* (1786) refers to Pre-Adamites, thereby influencing Lord Byron to do likewise in his closet drama *Cain* (1822).¹⁰

A relatively minor but resilient force through the nineteenth-century, pre-Adamatism appeared in new versions published not long before Malleson's translation of *Journey: Isabelle Duncan's Pre-Adamite Man* (1860), popular enough to

⁹ See: Ralph O'Connor, *The Earth on Show: Fossils and the Poetics of Popular Science, 1802-1856*. Chicago: University of Chicago Press, 2007, p.393. In general, O'Connor's project complicates binary oppositions conventionally applied to nineteenth-century positions relevant to earth history—science and literature, science and religion, amateur and professional, and so forth. Subsequent references are to this edition and are given in the text.

¹⁰ In Beckford's novel, the corrupt Caliph Vathek descends into Hell to obtain "the treasures of the pre-adamite sultans, who had been monarchs of the whole earth" but now lie as "fleshless forms" in a doleful state of suspended animation, punished for their pride and crimes, as Vathek will be as well. See: William Beckford, *Vathek*. Third rev. ed. London: Clark, 1816, pp.210-15. In Byron's *Cain*, the title character says to Lucifer, who has presented him with a dispiriting vision of earth history replete with death and extinction, "Thou hast shown me wonders: thou hast shown me those / Mighty Pre-Adamites who walked the earth / Of which ours is the wreck". See Lord George Gordon Byron, *Cain, A Mystery*, in *The Complete Poetical Works*. ed. Jerome McGann and Barry Weller. Oxford: Clarendon, 1991, vi: 227-95, pp.2.2.358-60. In his Preface, Byron states that he "partly adopted . . . the notion of Cuvier, that the world had been destroyed several times before the creation of man", but although this idea derives from "different strata and the bones of enormous and unknown animals found in them", the fact that no human remains had been found in them means that "The assertion of Lucifer, that the pre-adamite world was also peopled by rational beings much more intelligent than man, and proportionately powerful to the mammoth . . . is, of course, a poetical fiction . . ." (229-30). Byron expresses the intimidation that the idea of extinction, as disseminated especially through Cuvier's influence, exercised on the nineteenth-century mind.

warrant multiple printings over the course of several years, and Dominick M'Causland's *Adam and the Adamite: The Harmony of Scripture and Ethnology* (1864).¹¹ Both attempted to reconcile religion with science, biblically assimilating geological evidence for an ancient earth. Paschal Beverly Randolph's 1863 *Pre-Adamite Man*, however, eschewed reconciliation between the two spheres and instead attempted a strictly scientific approach.¹² Tracing pre-Adamatism from its theological origins through its science-related manifestations in the nineteenth century, David N. Livingstone, in his detailed expositions of the idea's complex history, presents the theory as an important instance, especially in its nineteenth-century form, of "the harmonizing tactics that have been deployed to keep alive the marriage of science and religion."¹³

While not overtly religious, Verne apparently also was interested in such harmonizing, especially regarding an ancient earth to which both pre-Adamatism and nineteenth-century geology attested.¹⁴ To some degree the balancing of science and religion occurs in Chapter 32 when Axel, Verne's narrator, recounts a lengthy waking dream in which he retrogresses through time, witnessing various stages of the earth's history back to its creation—an instance of a tradition of visionary time travel that O'Connor notes as part of a pervasive nineteenth-century penetration of geological writing and representations by literary approaches (246-56, 272-75).¹⁵ In Axel's vision, the earth's development comes about through natural processes, but he supplements his descriptions with biblical references. For example, in Malleson's translation, Axel says, "I return to the scriptural periods or ages of the world, conventionally called 'days,' long before the appearance of man when the unfinished world was as yet unfitted for his support" (ch.32). A French version of the phrase "conventionally called 'days'", however, does not appear in Verne's original. Verne is willing, via Axel, to employ, perhaps with a touch of irony, the belief that over a great expanse of time the pre-human world was directed toward conditions that would allow human habitation. Malleson adds the well known idea, sometimes adopted by partisans of pre-Adamatism, that the six days of creation of Genesis were in fact six ages or epochs each of enormous duration.

Elsewhere Axel's vision is overtly touched by Verne's skeptical treatment of Genesis-derived beliefs. This occurs when he has Axel ironically describe an extinct creature, "the Anoplothere", as "a singular animal taking after the rhinoceros, the horse, the hippopotamus, and the camel, as if the Creator, in too much of a hurry in the first hours of the world, had put together several animals in one".¹⁶ Apparently not appreciating Verne's fanciful disrespect, Malleson censors the reference to divine fallibility, reducing the passage to "the anoplotherium (unarmed beast), a strange

¹¹ Although *Vathek* and *Cain* present Pre-Adamites as once mighty humans, M'Causland believed them to be degenerate precursors of modern inferior races.

¹² See: David N. Livingstone, *Adam's Ancestors: Race, Religion, and the Politics of Human Origins*. Baltimore: Johns Hopkins University Press, 2008, p.111.

¹³ David N. Livingstone, 'The Preadamite Theory and the Marriage of Science and Religion.' *Transactions of the American Philosophical Society*, 82.3 (1992), i-81., pp.ix-x.

¹⁴ Verne's long-time editor, Pierre-Jules Hetzel, pressed him to display, or at least not violate, Christian piety in his various narratives.

¹⁵ O'Connor's book discusses many scientific texts and exhibits that appeal to readers' and viewers' imaginations by conducting them to various stages of earth history.

¹⁶ Jules Verne, *Journey to the Centre of the Earth*. trans. William Butcher. Oxford: Oxford University Press, 1998, p.152.

creature, which seemed a compound of horse, rhinoceros, camel, and hippopotamus" (ch.32). Verne's willingness to reconcile science and religion is limited, unlike that of Malleson with his beliefs in part deriving from, or at least consistent with, pre-Adamatism.

In Chapter 39 Malleson again promotes "preadamite" over "antediluvian" for his translation of Verne's "antediluvians" when the appearance of one of the protagonists, afflicted by a violent storm and strange electrical phenomena, suggests "a comparison with preadamite man, the contemporary of the ichthyosaurus and the megatherium". Malleson provides a corrective footnote, "Rather of the mammoth and the mastodon. (Trans.)", but leaves intact the possibility of a literal "preadamite man", an implication the retention of "antediluvian" would not have made. As is evident elsewhere in his novel, Verne knows that humans did not coexist with ichthyosaurs but the idea, perhaps explained by the excitement with which Axel recalls the episode, fits with the imaginative thrust of science fiction that makes Verne's explorers encounter ichthyosaurs and other extinct creatures mixed together from different geological eras. Indeed, Verne supplies a specimen of a human who lives in the midst of prehistoric animals and contemporaneously with ichthyosaurs and other extinct animals: a gigantic herder of mastodons, glimpsed from afar, whom Malleson, again pushing his biblical notions beyond what Verne warrants, identifies as "preadamite" rather than as Verne's "antediluvian" (ch.39). *Voyage* galvanized the novelistic tradition of confronting characters with extinct prehistoric animals; it occurs, for instance, in early twentieth-century novels by Arthur Conan Doyle and Edgar Rice Burroughs, in *Jurassic Park* (1990) and its movie spin-offs, and in numerous cartoons, printed and animated, stretching from the mid-nineteenth century to today.

Verne's minor efforts, and Malleson's stronger ones, to harmonize science and religion is part of the complicated story of nineteenth-century geology—its many discoveries, competing and overlapping theories, and interactions with society at large. For example, John Breyer and William Butcher point out that Verne's novel adopts the theories of both progressionism and directionalism (48). Progressionism means that geological and fossil evidence illustrates a trajectory of increased biological complexity leading to humans and the modern world, a pattern informing *Voyage* throughout; until after Darwin's *Origin of Species* (1859) even geologists generally understood progressionism to entail a form of special or separate creations, with ever more sophisticated species independently appearing across the ages, via divine agency, in consonance with changing environments. At the same time, however, progressionism sometimes accommodated the idea that individual species themselves tend toward degeneration, as evidenced in Axel's statements that fossils show "both fish and reptiles alike are more perfect the further back they were created" and—anticipating the upcoming encounter with the enormous crocodile-like ichthyosaur—that "even the largest and most formidable crocodiles and alligators, are but feeble reductions of their fathers of the first ages".¹⁷ Mid-nineteenth century directionalism held that ancient geological processes, whether acting catastrophically or gradually, represent changes caused by the cooling of the earth from an early

¹⁷Quoted in: John Breyer and William Butcher, 'Nothing New Under the Earth: The Geology of Jules Verne's *Journey to the Centre of the Earth*.' *Earth Sciences History*, 22.1 (2003), 36-54., pp.49-50; *Journey to the Centre of the Earth*. trans. William Butcher. Oxford: Oxford University Press, 1998, pp.151,156. Subsequent references in each case are to these editions and are given in the text.

condition of great heat. It was a natural complement to progressionism for those wishing to reconcile geology and religion, since a cooling earth could be understood as divinely mandated progress toward habitation suitable for humans. Breyer and Butcher note that directionalism also informs a number of Axel's statements (48-49).

Some religious orientations accepted both the idea of directional history as progress—the world becoming more suitable for mammalian and ultimately human life—and of species degeneration—individual groups of animals falling off in sophistication or complexity. Louis Figuier's popular *La terre avant le deluge* (1863, 1872) articulates the orderly scheme in which God perfects individual life forms while replacing lower with higher ones. Of late Jurassic ichthyosaurs and their reptilian contemporaries, he says, "Nature seems to have wished to bring this class of animals to the highest state of development", and he asserts that all prehistoric animals demonstrate that "the organization and physiological functions go on improving unceasingly, and that each of the extent genera which preceded the appearance of man, present, for each organ, modifications which always tend towards greater perfection". Figuier ends his discussion of ichthyosaurs and plesiosaurs by stating, "let us learn . . . to recognise, with admiration, the divine proofs of design which they display, and in their organisation to see only the handiwork of the Creator".¹⁸

This injunction appears to express the influence of natural theology, most famously advanced in the works of William Paley and his analogical "argument from design": that design proves the existence of a designer, and copious evidence of design in nature proves the existence of God. Natural theology directly or indirectly influenced most early geologists and other naturalists, who perceived instances of divine handiwork consistent with their scientific findings. William Buckland's *Geology and Mineralogy: Considered with Reference to Natural Theology* (1837), in one of the earliest published descriptions of ichthyosaurs, discusses the perfection of design in the ichthyosaur species that had been discovered to that point and concludes that "we cannot but recognise throughout them all, the workings of one and the same eternal principle of Wisdom and Intelligence, presiding from first to last over the total fabric of Creation"¹⁹. In Britain natural theology sometimes merged with directionalism and progressionism, promoting as "an article of faith among natural theologians [the belief] that both the history of the Earth and the history of life represented the unfolding of a divine plan designed to produce an Earth perfectly suited for human habitation".²⁰

In the following passage James A. Secord, while challenging the simplistic story of nineteenth-century science vs. religion, argues that geologists used progressionist earth history to wean Christians away from a biblical literalism opposed to the implications of geological evidence:

The vast majority of the public continued to believe that the Creation, the Fall, and the Flood were defining moments in the physical history of the world. If geologists were to change this, some compelling account would

¹⁸ Louis Figuier, *The World Before the Deluge*. ed. H. W. Bristow. London: Cassel, 1872, pp.220,223. All subsequent references are to this edition and are given in the text.

¹⁹ Buckland, William, *Geology and Mineralogy: Considered with Reference to Natural Theology*, 1836. 2 vols. Philadelphia: Carey, 1837, I: p.146.

²⁰ A Bowdoin Van Riper, *Men among the Mammoths: Victorian Science and the Discovery of Human Prehistory*. Chicago: University of Chicago Press, 199, p.65.

have to take their place. Their findings challenged some interpretations of the Flood and the Creation, but could offer instead a divinely directed story of progress, preparing the earth for humans. Scripture and science were never locked in inherent conflict; had they been, introductions to geology would have been consigned to the gutter press. Rather, geologists (many of whom were clerics) wished to create a space for a science that was in danger of being reabsorbed into theological exegesis.²¹

Many non-scientists followed the progressionist line. For example, John Harris's popular *The Pre-Adamite Earth: Contribution to Theological Science* (1846) uses geological discoveries as part of its detailed description of "how the development of the earth constituted an extended preparation for its later human occupants" while going out of its way to reject biological evolution.²² Harris agreed with the chief geologists of his time in accepting an ancient earth coupled with the recent creation of humans while strenuously rejecting "transmutation", the pre-Darwinian term for evolution, as being unbiblical and counter to geological evidence. Thus he quotes from geologist and paleontologist Louis Agassiz on the subject of ichthyosaurs: "One of the first observations to be made on the ichthyological fauna of the old red sandstone is, that it is wholly peculiar to this formation".²³ Progress is observed from geological system to system, era to era, but each constitutes a separate sphere of divine creation with no evolutionary overlaps.

While progressionism could be reconciled with divine wisdom, to some, as the vigorous rejections of Harris and others suggest, it indeed strongly suggested transmutation, an idea with which naturalists were familiar in the first half of the century and which most dismissed out of hand as unbiblical and dangerous. This connection caused some pious naturalists to reject any sort of progressionism. For example, the Presbyterian minister George Young, who in 1819 gained notoriety for his ichthyosaur discoveries, acknowledges the idea of evolution but draws back: "Some have alleged, in support of the pre-Adamite theory, that . . . we discern . . . a gradual progress from the more rude and simple creatures, to the more perfect and completely organised; as if the Creator's skill had improved by practice. But for this strange idea there is no foundation: creatures of the most perfect organization occur in the lower beds as well as the higher".²⁴ The idea that God, the perfect designer, needed to improve on imperfect designs struck some as preposterous.

Verne draws on the geological theories of his time, often with much the same expression of awe fostered by natural theology, but without the argument from design or any other clear theological investment. Adopting the idea of temporally localized biological degeneration within the context of overall long-term improvement, he presents his ichthyosaur as not only "the most frightful of all the antediluvian reptiles" but as a supreme expression of nature's creative power. It reigned for ages when

²¹ James A. Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of Vestiges of the Natural History of Creation*. Chicago: University of Chicago Press, 2000, p.57.

²² David N. Livingstone, *Adam's Ancestors*, p.82.

²³ John Harris, *The Pre-Adamite Earth: Contributions to Theological Science*. London: Ward, 1846, p.219.

²⁴ Quoted in: Simon Winchester, *The Map that Changed the World: William Smith and the Birth of Modern Geology*. New York: Harper-Perennial, 2002, p.113.

"hideous monsters held absolute sway" and were provided "with the most complete structures. What gigantic organisms! What exceptional strength!" (159,156). Verne dignifies the ichthyosaur as both the high point of reptilian development and a dramatic moment in the development of life on earth, an expression of both progressionism and directionalism.

Both doctrines, however, soon had to contend with Charles Lyell's uniformitarianism, which as presented in his influential *Principles of Geology* (1830-33) argued for the continuity of natural processes, operating in a steady-state fashion, while denying progress or directionality in either geological or biological spheres. In this regard, Lyell unguardedly speculated that ichthyosaurs, along with other extinct reptiles, might someday return when environments again become suitable for their habitation.²⁵ This flight of fancy could be simply rhetorical, but since the *Principles* holds that God created different species at different times (in specific "centres of creation" from which they then spread out), it is possible Lyell indeed believed that God, in the mystery of his ways, might similarly recreate an extinct species.

In *Journey to the Centre of the Earth* the ichthyosaur does return, in fictional form, an embodiment of lurid sublimity with "huge jaws," "rows of aggressive teeth," and "bloody eye as big as a man's head" (158, 159). And having already returned via the excavations of Mary Anning and others and the reconstructions of paleontologists and artists, this creature—the first great extinct reptile identified in England and soon represented by many specimens—became an iconic focal point in nineteenth-century speculations about the history of life on earth. From early in the century it was interpreted and reinterpreted through scientific research and speculation and through popular imaginings.

III

Studying ichthyosaur fossils turned up by Mary Anning and others, William Conybeare and his colleague Henry De la Beche, a clergyman, drew inferences about the appearance and behavior of the living animals while going out of their way to reject the idea that they might have evolved.²⁶ Perhaps Conybeare's most culturally resonant insight or imaginative leap, expressed in an 1824 letter to De la Beche, was that ichthyosaurs might have taken advantage of the long, vulnerable-looking necks of plesiosaurs, which "must have kept as much as possible out of reach of ichthyosauri, a very junior member of whom with his long powerful jaws would have bit his neck in two without ceremony". Martin J. S. Rudwick quotes this passage in his book *Scenes from Deep Time*, which surveys nineteenth-century visual representations of the distant past, many of them showing ichthyosaurs in their imagined environments.²⁷ Rudwick's earliest example is an 1830 drawing by De la Beche that was lithographed to raise money for the financially strapped Mary Anning, whose discoveries near

²⁵ Charles Lyell, *The Principles of Geology*. 3 Vols. 1830-33. Chicago: University of Chicago Press, 1990, I, p.123.

²⁶ Regarding the links noted between ichthyosaurs and crocodiles, in 1821 Conybeare and De la Beche wrote that "some physiologists . . . have most ridiculously imagined" that such connections support evolutionary theory but that "nothing less than the credulity of a material philosophy could have been brought for a single moment to entertain it—nothing less than its bigotry to defend it". Quoted in: Ellis, Richard, *Sea Dragons: Predators of the Prehistoric Oceans*. Lawrence: University Press of Kansas, 2003, pp.66-67.

²⁷ See: Martin J. S. Rudwick, *Scenes from Deep Time: Early Pictorial Representations of the Prehistoric World*. Chicago: University of Chicago Press, 1992, p.44.

Lyme Regis had helped propel his career along with those of other prominent geologists such as Connybear, William Buckland, and Richard Owen. "[R]eproduced endlessly" and "serving as a model . . . for almost all later artists",²⁸ *Duria antiquior* ("ancient Dorset") depicts various extinct marine animals but is dominated by ichthyosaurs. One is seizing a fish, a second spouts water from the top of its head, and a third basks on a rock. The most prominent ichthyosaur, however, is biting into the neck of a plesiosaur in accordance with Conybeare's suggestion. Stephen Jay Gould calls this "the image par excellence of early-nineteenth-century reconstruction" of prehistoric animals (9).

As established early on by fossilized stomach contents and coprolites, the ichthyosaurs ate fish, and recent finds had shown Conybeare and De la Beche that the animals propelled themselves with paddles as depicted in the latter's design. They did not, however, spout or leave the water, they did not—at least those whose remains were recovered early in the century—have the lizard-like tails shown in the picture, and the nineteenth century offered no evidence that they fought with plesiosaurs. There was still much to learn about these creatures but, consequently, much scope for imagination in reproducing their appearance and activities. In particular, the nineteenth-century imagination was captured by the idea of the ichthyosaur's ferocity, which for all anyone knew might have caused it to attack plesiosaurs.

De la Beche began the tradition of visually presenting the ichthyosaur as a supreme killer—not just eating fish but attacking plesiosaurs—although with its enormous jaws lined with phalanxes of teeth, over two hundred of them in some specimens, it is inevitable in any case that it would be visually and verbally promoted as such.²⁹ This legacy of violent aggression indirectly leads to Verne's scene in which the ichthyosaur and plesiosaur fight, although there the plesiosaur is presented as a frightening and worthy opponent—but not as prey, since the ichthyosaur will abandon the carcass of its slain opponent: "These animals attack one another with indescribable fury. They raise mountains of water. . . . Hisses of frightening volume reach our ears. The two animals are tightly embraced. . . . Everything is to be feared from the rage of the victor" (159). Verne indirectly inherits this scene from De la Beche via a print by Edouard Riou, one of a series accompanying Louis Figuier's *La terre avant le deluge*—from which, as Breyer and Butcher show in their analysis, Verne extensively plagiarized in his novel's scientific passages. A powerful rendition of ferocity, the picture shows the animals facing off, rising up out of churned up sea, the ichthyosaur spouting two jets of water that arch back over its head and the plesiosaur, with its long curved neck, looking as if about to strike like a snake as it rears up above its adversary (231).³⁰ Of the ichthyosaur Figuier says, "Its destructiveness and voracity must have been prodigious" (220).

Also commissioned to illustrate Verne's *Journey*, published the next year, Riou contributed two scenes of reptilian combat that, in the appearance of the animals, follow his illustration in Figuier's book. The first of the *Voyage* prints featured in Chapter 33 shows the plesiosaur's jaws clamped onto the back of the other's head, while the second has the ichthyosaur biting into the neck of the plesiosaur, which appears to be screeching. They are powerful images capturing the dynamism of

²⁸ Stephen Jay Gould, 'Preface,' in *The Book of Life*. ed. Stephen Jay Gould. New York: Norton, 1993, 6-21., p.9. All subsequent references are to this edition and are given in the text.

²⁹ O'Connor suggests other reasons why ancient animals were depicted as vicious (422-28).

³⁰ See Louis Figuier, *Before the Deluge*, p.231.

Verne's scene by showing the combatants writhing about and splashing up masses of water from a turbulent sea. As in the earlier picture, the ichthyosaur closely resembles a crocodile. Understandably, early on artists often modeled ichthyosaurs on crocodiles and alligators, the largest extant reptiles, whose aggressiveness was well known.³¹

Vicious aggression is one of several qualities signified by most, though not all, nineteenth-century ichthyosaur representations; extinction and scientific progress are two others that I will discuss. Regarding violence and the popularity of depicted fights between great extinct reptiles, Gould simplistically asserts that "Victorians loved Tennyson's description of 'nature red in tooth and claw'" (8). Victorians, however, had ambivalent feelings about natural violence, often appreciating its portrayal but also, for example, founding societies to eliminate blood sports.³² Indeed, the famous "red in tooth and claw" phrase in *In Memoriam, A. H. H.* (1850) and its reference to prehistoric creatures as "Dragons of the prime, / That tare each other in their slime"³³ address Tennyson's horror at nature's ways, and some late Victorians felt this abhorrence all the more after confronting Darwin's amoral vision of "the conflict of nature", "the survival of the fittest", and the massive death and extinction of the less fit.

In the nineteenth century ichthyosaurs were, along with other prehistoric reptiles, frequently called "monsters" in both scientific and nonscientific writing. In envisioning the new and strange, the imagination generally draws upon, then magnifies and distorts, what it already knows. Thus ichthyosaurs were long connected with monstrous versions of crocodiles. But they were also consistently presented as hodge-podges of features belonging to various animals, the connection of dissimilar parts also being an index of monstrosity. For example, Figuier, citing Georges Cuvier, assigns the ichthyosaur "the snout of a dolphin, the head of a lizard, the jaws and teeth of a crocodile, the vertebrae of a fish, the head and sternum of a lizard, the paddles like those of a whale, and the trunk and tail of a quadruped" (221).

Also monstrous was their image as mechanisms of mindless predation. In 1840 Thomas Hawkins, following a passage in which he draws reasonable inferences about the function of the ichthyosaur eye, slides into a garish rendition of the animal's behavior, a reanimation consistent with the "spectacular display" that Ralph O'Connor has shown to dominate popular science in the nineteenth century: "By such inductions we revive the habits of Creatures long vanished away, and recolor the ardent Monster fleeing through the expanse of Sea like lightning to his distant prey, with a lust quenchable alone in gore". (14) The author of an 1850 article calls ichthyosaurs "the tyrants of the deep" (312). For H. N. Hutchinson, in his review of what had been known and thought about ichthyosaurs up until the 1890s, they are still "hungry formidable monsters" (61). Contributing to their negative image was the belief, held by many throughout the nineteenth century, that they were cannibals. Originating in the influential inferences of William Buckland, the idea primarily was

³¹ Conybeare and de la Beche, however, who in 1821 published the first scientifically respectable descriptions of ichthyosaur skeletons, had noted a number of crocodile-like features coupled with those of fish. See: Deborah Cadbury *The Dinosaur Hunters*, pp.28-29.

³² James Turner describes "the startling upsurge of [British] animal welfare activity in the decade after 1800" connected with increasingly romantic and sentimental conceptions of nature (24, 31-33), a trend that continued throughout the century. Some, of course, continued to enjoy animal violence and, no doubt, its representation.

³³ Alfred Tennyson, *In Memoriam A. H. H.* ed. Erik Gray. New York: Norton, 2004, p.41. All subsequent references are to this edition and are given in the text.

based on the small fossilized ichthyosaur skeletons sometimes found inside those of larger ones. Although some naturalists believed, correctly as it turned out, that most or all of these were offspring as well as evidence that ichthyosaurs gave live birth, the idea fit too neatly with the general prejudice against reptiles—that their behavior, appropriate for cold-blooded animals, represented a monstrous inversion of human sensibilities.

The nineteenth-century's negative view of ichthyosaurs was not limited to their seemingly monstrous appearance and behavior. They also represented extinction and did so powerfully, since the greater its size and the longer it survived as a species, the more impressive the fact that a prehistoric creature had died out and the more extinction might also be associated with the fate of humans. Another of Henry De la Beche's pictures, drawn about the same time as *Duria antiquior* and frequently reproduced and discussed in recent years because of its historical and entertainment value, is a cartoon entitled "Awful Changes" that shows an upright "Professor Ichthyosaurus," dressed in long coat, wearing spectacles, and standing on a rock, lecturing to a group of other ichthyosaurs gathered attentively around and below him, some of them partially submerged in water. Referring to a sample human skull, he says that the feeble jaws show why the species became extinct. The picture was long thought to represent geologist William Buckland, famous for his histrionic lecturing style, but Martin J. S. Rudwick has argued convincingly that it parodies Charles Lyell and his belief that ichthyosaurs might someday return under environmental conditions conducive to their existence.³⁴ Although De la Beche "lithographed [it] for distribution among his friends",³⁵ and Buckland apparently used a version of it in his lectures at Oxford, which were attended by "eager crowds of genteel students",³⁶ the picture was not widely distributed. Nevertheless, it touches a cultural nerve. The picture not only satirizes Lyell and what struck some as a visionary form of geology consistent with an imagined return of ichthyosaurs, but also draws attention to the fraught subject of extinction as the possible, or even inevitable, fate of humans.

De la Beche's cartoon characters are humorous and harmless, reversing the aura of monstrosity more often than not attached to verbal and visual treatments of ichthyosaurs, but the inversion involving extinct humans and extant ichthyosaurs broaches the idea that humans are not a special case, central to God's universe, but rather just another species destined for a limited tenure on earth. This disturbing prospect was expressed most famously in Tennyson's *In Memoriam*, in which human significance is subverted by evidence "[f]rom scarp'd cliff and quarried stone" indicating a future in which humans become merely debris or fossils "blown about the desert dust, / Or sealed within the iron hills" (41). As more and more fossils were identified it became increasingly clear that most fossil species were no longer around. Ichthyosaurs, which by late in the century had turned up by the scores in the form of multiple genera and species, and which geological evidence showed had survived as a group for a vast time span, over 150 million years, only to disappear, offered a particularly strong reminder of extinction.

³⁴ See: Martin J. S. Rudwick, 'Caricature as a Source for the History of Science: De la Beche's Anti-Lyellian Sketches of 1831.' *Isis*, 66 (1975), 534-60; *Scenes*, p.48-50.

³⁵ Martin J. S. Rudwick, *Worlds Before Adam: A Reconstruction of Geohistory in the Age of Reform*. Chicago: University of Chicago Press, 2008, p.327.

³⁶ See: Ralph O'Connor, *The Earth on Show*, pp.77,74.

At times the ichthyosaur, along with other of the great extinct reptiles, evoked other, more indeterminate moods from authors and no doubt readers as well. For instance, such creatures might elicit a sense of strangeness or uncanniness or, as O'Connor notes in calling attention to "Thanatos to Kenelm" by the early nineteenth-century poet Thomas Lovell Beddoes, a mood of nostalgia for ages past. In a poem embedded in the text, the speaker, Thanatos, tells that "The mighty thoughts of an old world / Fan, like a dragon's wing unfurled, / The surface of my yearnings deep; / And solemn shadows then awake. . . ." But these shadows speak not only to yearning or nostalgia but to unease: they "awake, / Like the fish-lizard in the lake, / Troubling a planet's morning sleep". Thanatos says the ancient earth "Haunts shadowy my domestic mood"³⁷. Here the ichthyosaur attaches itself to a dream vision of an ancient world whose strangeness unsettles a contemporary sense of what is real and true, making our world, and ourselves, strange as well. Who are we and our everyday world in relation to the vast, alien, only dimly perceived expanses of the past?

Although Ichthyosaur representations often pointed to ferociousness and the process of extinction—both potentially disturbing and especially so in light of evolutionary theories that associated humans with "lower" and often seemingly bestial life forms—and sometimes simply to a feeling of strangeness, they also assumed other, more positive significations, occasionally overlapping less congenial ones and sometimes prominent enough to mark a distinction. As already noted regarding De la Beche's "Awful Changes", despite its implications about human extinction, the ichthyosaur occasionally served as a source of humor or whimsy that could render it, at least superficially, less "awful"—in its original sense of fearful and awesome. As the ichthyosaur became better known to a general public, light references to it became possible. For instance, an anonymous author in Charles Dickens's *All the Year Round*, his weekly journal directed toward a general readership, begins an 1865 essay about hobby horses by asking, "Is there anyone who does not keep a hobby-horse? . . . I should like to see such a man, as a curiosity not equaled even by a living specimen of the dodo, or a yearling ichthyosaurus making its first clumsy essays towards amphibious perfection".³⁸ With its apparent post-Darwinian nod toward evolution, something the reader would not have to take seriously in this context, the author also touches on both extinction and reconstructions of ancient animals, his own brief reconstruction a humorously vivid one.

In 1885 the humor magazine *Punch* published another response to ichthyosaurs. May Kendall's "Ballad of the Ichthyosaurus" begins with an explanatory headnote—"The Ichthyosaurus laments his incomplete development and imperfect education. He aspires to better things"—and is accompanied by a picture of an upright ichthyosaur standing next to a globe and wearing a mortarboard. The evolutionarily disadvantaged speaker laments his condition as a relic: "I ABIDE in a goodly museum, / Frequented by sages profound: / In a kind of a strange mausoleum, / Where the beasts that have vanished abound". Speaking on behalf of his extinct compeers, and as in Dickens's scenario humorously supplying an evolutionary context but this time an expressly Darwinian one, Kendall's ichthyosaur says that "Ere Man was developed, our brother, / We swam, and we ducked, and we dived, / And we

³⁷ See: Ralph O'Connor, *The Earth on Show*, p.453; Beddoes, Thomas Lovell, 'Thanatos to Kenelm, and The Song by Thanatos,' in *The Works of Thomas Lovell Beddoes*. ed. H. W. Donner. Oxford: Oxford University Press, 1935, 141-42., p.142.

³⁸ Anon., 'Hobby-Horses.' *All the Year Round*, 9 Sept. 1865, 163-66., p.163.

dined, as a rule, on each other— / What matter, the toughest survived!". Appropriately for the conservative *Punch*, the silliness of a talking museum exhibit undercuts ideas of human evolution and survival of the fittest, and it softens that of extinction by pointing to a cause of non-survival that need not worry our brainy species: "the brain of the Ichthyosaurus / Was never a match for its eye"³⁹—and the average reader presumably was familiar enough with ichthyosaurs by this point in the century to know it was famous for its enormous eyes. Late in the century H. N. Hutchinson credits a Professor Blackie with the following effort: "Behold, a strange monster our wonder engages! / If dolphin or lizard your wit may defy. / Some thirty feet long, on the shore of Lyme-Regis, / With a saw for a jaw, and a big staring eye"—and with "a very small brain" as well.⁴⁰

The idea of engaging wonder suggests another way in which ichthyosaurs could be comprehended as relatively benign. Consistent with the nineteenth-century's enthusiasm for the educational and edifying, and for knowledge responsibly disseminated to various social classes, ichthyosaur descriptions or reproductions were sometimes advanced as simply interesting educational phenomena representative of scientific progress; as such they were presented as unproblematic, theologically or otherwise. For example, an 1848 article in *The Saturday Magazine* entitled "The Ichthyosaurus, or Fish Lizard" accompanies an illustration of an ichthyosaur skeleton with a text that addresses "readers [who] have no opportunity of seeing the fossil remains of this gigantic reptile"; implicit is awareness that, through increasing numbers of museum exhibits and publicly accessible private fossil collections, some readers would in fact have seen such remains in person. Directed at the common reader, the article first explains the meaning of the word "fossil" and then, citing and quoting from Buckland's *Geology and Mineralogy* for authority, describes the fossil remains and what they suggest about the creature's behavior. It concludes by contending that "this curious relic of a former period . . . highly illustrates the handy works of that ALL-POWERFUL BEING who 'made heaven and earth, the seas, and all that in them is'".⁴¹ This passage recalls Buckland's and Figuier's admiring descriptions that evidence the advance of scientific knowledge and celebrate the sophistication of God's creations. It also suggests that the museum, "that strange mausoleum", had become what seemed the natural and authoritative environment for viewing ichthyosaur remains or reproductions, bringing them alive for the imaginative observer-adventurer.

Regarding the reconstruction of ichthyosaurs, probably the most significant symbolic moment in the pageant of scientific advancement staged for the public occurred in 1854 at Sydenham, on the southern outskirts of London, where the Crystal Palace had been relocated from its original site in Hyde Park following the Great Exhibition that it had housed. The 1851 Great Exhibition of the Works of Industry of All Nations featured exhibits meant to teach visitors about mid-nineteenth-century fruits of knowledge, especially in the areas of science, technology, and history, and especially British knowledge and its application. The Crystal Palace at Sydenham continued the task of public edification and continued, in its revolutionary glass and cast-iron construction as well as in its contents, to celebrate the advancement of

³⁹ May Kendall, 'Ballad of the Ichthyosaurus.' *Punch*, 14 Feb. 1885, 82.

⁴⁰ Quoted in: H. N. Hutchinson, *Extinct Monsters and Creatures of Other Days: A Popular Account of Some of the Larger Forms of Ancient Animal Life*. London: Chapman, 1892, p.61.

⁴¹ J. G. C., 'The Ichthyosaurus, or Fish-Lizard.' *The Saturday Magazine*, 8 April 1843, 136.

human knowledge and capabilities. Upon the Palace's 1854 reopening, visitors to its grounds encountered a new display that exhibited such advancement and became very popular: a collection of full-sized models of various extinct Mesozoic reptiles situated in a reconstruction of their original environment complete with vegetation and an artificial lake with islands on which the reptile reproductions were situated. They had been created by sculptor Waterhouse Hawkins under the guidance of Richard Owen, the greatest of British comparative anatomists and an early describer of fossilized vertebrate remains. This exhibit has been much written about in recent years.⁴²

Except perhaps for the two pterodactyls, the most accurate, in light of present day understanding, of the species displayed are the three ichthyosaurs; by mid-century ichthyosaurs were known through many specimens, some of which were complete or nearly so. Its relatively accurate reconstruction contrasts with that of the exhibit's dinosaurs, known through fewer and quite incomplete fossil remains. For example, the massive iguanodon stands on four legs rather than two, its form and stature mammalian. According to Adrian Desmond, Owen wanted the models to look more advanced than extant reptiles, undercutting pre-Darwinian evolutionary theory by suggesting that the creatures represented at Sydenham had, rather than evolved into mammals, long before already reached the high point of reptilian development and then degenerated into the present-day reptiles that seemed so clearly inferior.⁴³

A notable characteristic of the Sydenham models is that they abandon the tradition of making extinct saurians look ferocious and predatory and pursue instead the goal of public edification for all, a goal that perhaps could best be achieved by not disturbing women and children or inciting the lower class through representations of mindless aggression. The ichthyosaurs simply bask on land after having emerged or half emerged from the water. The generally unthreatening appearance and peaceful activities of the creatures might reflect as well their creators' wish to deliver them, because of Owens's antipathy to evolutionary theory, from the imputation of reptilian primitiveness that teeth-bearing or predatory gestures would have conveyed. At the same time, in keeping with natural theology, they might speak to God's beneficence as the creator of admirably sophisticated creatures rather than monsters. A number of such considerations consciously or unconsciously must have influenced their design.

In any event, the Sydenham installations demonstrated scientific knowledge and admirably participated in the scientific and technological triumphalism of the Great Exhibition, and they also show that there are always mistakes to make and undo. As Professor Lidenbrock says in *Journey to the Centre of the Earth*, "Science . . . is composed of errors, but errors that it is right to make, for they lead step by step to the truth" (146). The errors and rectifications involve the ideal, never entirely attainable, of scientific objectivity and rigor as well as their interpenetration by subjective understandings and those of a wider culture. Gould asserts not only that the genre of fossil iconography combines scientific objectivity with the fact that "we

⁴² See especially: James A Secord., 'Monsters at the Crystal Palace,' in *Models: The Third Dimension of Science*. ed. Soraya de Chadarevian and Nick Hopwood. Stanford: Stanford University Press, 2004, 238-69.

⁴³ Adrian Desmond, 'Designing the Dinosaur: Richard Owen's Response to Robert Edmond Grant.' *Isis*, 70 (1979), 224-34., p.228. See also: Adrian Desmond, *The Politics of Evolution: Morphology, Medicine, and Reform in Radical London*. Chicago: University of Chicago Press, 1989. Here Desmond gives a detailed account of the resistance of British scientists to pre-*Origin* evolutionary theory, especially Lamarckism with its support among British radicals.

reconstruct according to our own prejudices and our standard images", but also that "the interplay of these two factors—the externally empirical and the internally social—captures the central dynamic of change in the history of science" (7).

The dynamic of change operated more readily in the case of the ichthyosaur than it often does. A chief prejudice to be overcome was that the ichthyosaur was simply or merely a vicious killer consistent with the popular understanding of crocodiles. The ichthyosaurs at Sydenham had moved away from this image, since they do not resemble crocodiles as do some early reconstructions. Incomplete and misinterpreted evidence, however, led to mistakes. For example, they are depicted as having crawled from the water upon their paddles, whereas they were not amphibious—a notion apparently still prevalent in 1865 when Dickens playfully referred to the ichthyosaur's evolution toward terrestrial living. Also, the features known as sclerotic rings, circles of bone around the eye, were depicted as exposed, but in fact they were embedded in the eyes themselves, apparently to help them withstand water pressure. Most importantly, they lack fleshy features not known until late in the century when fossils from the Holzmaden deposits in Germany revealed the outline of complete bodies. Presented with this new evidence, scientists recognized that most of the ichthyosaurs they had been studying had dorsal fins and vertical, fish-like tails, making them resemble dolphins more than ever and establishing them as a textbook case of convergent evolution in which different species independently assume similar forms in response to similar environmental conditions.

Richard Owen, however, deserves credit for his recognition that the tails of the ichthyosaurs he studied were not simply pointed like those of crocodiles, although most nineteenth-century visual representations, judging from Martin Rudwick's examples in *Scenes from Deep Time*, presented them that way. Early specimens consistently showed the same abrupt downward turn in the tail portion of the spine, and Owen concluded it must have resulted from force exerted by a vertical tail. Therefore under his influence the Sydenham ichthyosaurs feature tails ending in vertical spade-shaped configurations, since he understandably had failed to realize that the downward bend had in fact supported the lower fluke of a forked tail.⁴⁴ The process of scientific discovery also led to recognition that the small ichthyosaur skeletons embedded in larger ones probably do not indicate habitual cannibalism, as distastefully attractive as that idea had been.⁴⁵ It also led to the late nineteenth-century triumph of evolutionary theory, although many found that theory more distasteful than attractive because of the Darwinian stress on natural selection and survival of the fittest.

IV

By the end of the century the ichthyosaur had become commonplace enough that its significance was often reduced from that of something wondrous, whether fearful or not, to mere representative of a defunct species, something like the dodo. In *The Time*

⁴⁴ It was thought by some that the bends, perhaps at a weak point in the skeletons, might have happened as the result of pressures exercised after death. For discussions of Owen, ichthyosaur reconstruction and convergent evolution, see: Stephen Jay Gould, 'Bent Out of Shape,' in *Eight Little Piggies: Reflections in Natural History*. New York: Norton, 1993, 79-94.

⁴⁵ The research of Roland Böttcher concludes that ichthyosaurs do not merit their cannibalistic reputation. See: Michael Benton, 'The Myth of the Mesozoic Cannibals.' *New Scientist*, October 12, 1991, 40-44.

Machine (1895), for instance, H. G. Wells has his narrator say of the distant future "that horses, cattle, sheep, dogs, had followed the ichthyosaurus into extinction".⁴⁶ But for scientists and many late nineteenth-century non-scientists the ichthyosaur also necessarily carried evolutionary meaning. Earlier in the century evolutionary theory was available but spurned by naturalists and knowledgeable laymen like Jules Verne, who never entertained the concept even though *Journey to the Centre of the Earth* appeared after the *Origin*. The primary evolutionary theories available prior to Darwin's were Lamarckism, denigrated for being unbiblical and for its association with the freethinking and radicalism of the French Revolution era out of which it emerged, and Robert Chambers's "developmental hypothesis", which, as set forth in the widely read *Vestiges of the Natural History of Creation* (1844), was notorious with scientists and rejected on any number of grounds.⁴⁷ By later in the century the situation had changed especially because of Darwin, and scientists unwilling to accept his explanation for evolution generally did accept the masses of evidence he offered for evolution itself. This same attitude held true for much of the well-educated population, but Thomas Hardy and Joseph Conrad accepted both Darwin's evidence and his theory of evolution via natural selection.⁴⁸

Therefore, in the 1890s, application of Darwinian theory imbues two references to ichthyosaurs, each part of a simile, found in Thomas Hardy's *The Woodlanders* (1887) and Joseph Conrad's *Heart of Darkness* (1902; serially published in 1899). Of the three primary but not invariable registers of meaning I have attached to nineteenth-century understanding of these animals—aggressiveness, extinction, and scientific progress—these instances most focus on extinction or, more precisely, on death, since extinction is death writ large, and they do so in a manner reminiscent of Tennyson's gloomy meditation on the fossil record. They register a pessimistic adoption of Darwinism in which death dominates life. The passages take for granted a degree of reader familiarity with ichthyosaurs, which as we have seen were widely known to Victorians even though their fame gradually had been eclipsed by that of the dinosaurs whose fossils scientists had been discovering and identifying since the 1830s. The two novelists, however, eschew the celebration of science that is so central to Verne's *Journey*. And as atheists, Hardy and Conrad have no interest in reconciling science with religion. Rather, at a point in history not long before ichthyosaurs largely leave popular consciousness, the representative value of Hardy's and Conrad's ichthyosaurs is that, for all their alien strangeness, they are inflected with basic human apprehensions and thus in some ways represent us.

The novelists' references, taken in their narrative and thematic contexts, involve three interrelated concepts that connect ichthyosaurs, and through them evolutionary thinking, to the human condition: death/extinction along with both the destructive conflict and the inadequate adaptation that helps produce them. In *The Woodlanders* these factors apply to the woods in which the novel is set. Part wild and

⁴⁶ H. G. Wells *The Time Machine*. London, 1895, p.15.

⁴⁷ Predictably, Chambers placed the ichthyosaur in an evolutionary sequence: "The first remove from the fish is the ichthyosaur. . . . With piscine body and tail, and fins advanced into a paddle form, it has a true crocodilian head". See: Robert Chambers, *Explanations: A Sequel to Vestiges of the Natural History of Creation*. 1845.

Vestiges of the Natural History of Creation and Other Evolutionary Writings. ed. James Secord. Chicago: University of Chicago Press, 1994, p.82.

⁴⁸ See: John Glendening, *The Evolutionary Imagination in Late-Victorian Novels: An Entangled Bank*. Aldershot: Ashgate, 2007, pp.72-73, 228.

part cultivated for the timber that sustains the local economy, they evidence the Darwinian sort of competition, struggle, and death that for Hardy informs both nature and culture. For instance, from the woods arises "the creaking sound of two overcrowded branches . . . which were rubbing each other into wounds on old trees".⁴⁹ The personification is appropriate, for the locals struggle in much the same way as they try to make their living from timber. The narrator also describes trees from which:

huge lobes of fungi grew like lungs. Here, as everywhere, the Unfulfilled Intention, which makes life what it is, was as obvious as it could be among the depraved crowds of a city slum. The leaf was deformed, the curve was crippled, the taper was interrupted; the lichen ate the vigor of the stalk, and the ivy slowly strangled to death the promising sapling. (41)

In Hardy's world there is little that fulfills the aspirations of humans, beset as they are by consciousness of self and mortality and no longer at ease, because of the dictates of society, with the nature out of which they arose but can never fully escape.

Constraints with Darwinian overtones also affect the main character, Grace Melbury. Having been sent away by her timber-merchant father to be educated above the level of her former associates, she returns a polished lady no longer well suited to the cultural milieu and setting that produced her—an instance of faulty adaptation to environment, social more than natural. When the man her father had intended her to marry, the noble and self-sacrificing laborer Giles Winterbourne, loses his house and prospects through an unfortunate stroke of luck, with her father's encouragement she marries instead the young doctor, Edgar Fitzpiers, who wins her especially because of his education and prestigious family. Soon she realizes her social ambitions have connected her to an unsuitable spouse and it is the devoted Giles—simple, at ease with nature, and natural-seeming himself—whom she loves. But, this being a Hardy novel, it is too late. After a series of complications enveloping various characters, Giles dies as the result of trying to protect Grace's reputation after she abandons her adulterous husband. Before this occurs, however, Grace spends a long night and day alone waiting for Giles to return to his house.

It is at this point that Hardy produces a Darwinian scenario that leads to his allusion to ichthyosaurs. While waiting for Giles, Grace looks out on trees:

jacketed with lichen and stockinged with moss. At their roots were stemless yellow fungi like lemons and apricots, and tall fungi with more stem than stool. Next were more trees close together, wrestling for existence, their branches disfigured with wounds resulting from their mutual rubbings and blows. It was the struggle between these neighbors that she had heard in the night. Beneath them were the rotting stumps of those of the group that had been vanquished long ago, rising from their mossy setting like decayed teeth from green gums.

The narrator has slipped from Grace's point of view into his own, as he does in describing one tree in particular: "Above stretched an old beech, with vast armpits,

⁴⁹ Thomas Hardy, *The Woodlanders*. 1887. Oxford: Oxford University Press, 1985, p.13. All subsequent references are to this edition and given in the text.

and great pocket-holes in its sides where branches had been amputated in past times; a black slug was trying to climb it. Dead boughs were scattered about like ichthyosauri in a museum. . ." (234).

The old beech is reminiscent of Darwin's metaphorical "Tree of Life", whose branches and twigs represent not only species arising from a common source and ramifying as they stretch upward through time, but also, as they die and fall off, extinct species that have lost the struggle for survival.⁵⁰ In this scheme ichthyosaurs are losers, castoffs from the tree of life. But they are so only through the interpretive imagination, which endows them with human significance by associating them with mutually antagonistic anthropomorphic trees and reconstructing them within the cultural space of a museum. But in Hardy's vision, human culture—the cause of the "amputations"—conspires with nature to human detriment, for struggle becomes all the more destructive because people have to adjust themselves to immensely complicated conditions, internal and external, constituted of both social and natural orders. Like the imagined ichthyosaurs, Grace and Giles fail to adapt or compete with the forces arrayed against them; essentially, Grace has failed to reconcile culture with nature while Giles has failed to do the opposite. Unfairly perceived in terms of non-adaptation rather than their extremely long-term evolutionary success, extinct ichthyosaurs signify the extinction of Grace's hopes and Giles's life, with the novel analogous to a bone-filled museum in so far as both strongly suggest the connection between the fates of ichthyosaurs and humans. Ultimately the ichthyosaurs represent humanity, self-consciously aware of "the Unfulfilled Intention", unfulfilled because of the impossibility that life can evade loss and limitation or defeat death.

In context, Conrad's reference also expresses Darwinian pessimism in which the import of ichthyosaurs is deflected toward the human. Marlow, the narrator of *Heart of Darkness*, recalls his long-ago experience as a captain employed by a Continental trading company to take a steamboat far up a great African river to relieve Kurtz, the trader at the Company's most interior station who, word has it, is very sick. But when Marlow arrives at the place he is to assume command, he finds the boat is at the bottom of the river, supposedly the result of an accident but in fact scuttled under orders of the local company manager. The official's motive is that Kurtz, although the Company's most successful supplier of ivory, appears destined to take over his job because he represents a faction at the European headquarters that wants the African operation to treat natives humanely. The Manager's behavior, however, represents more a rape of Africa than a trading operation, and he has delayed the trip meant to help Kurtz—something Marlow does not suspect until much later—hoping that he will have died in the meantime.

Marlow's involvement in repairing the boat leads up to his vision of an ichthyosaur. He has already seen appalling evidence of the death and destruction wrought by imperialist greed, but he also interprets the jungle and the natives as primitive forces just as inimical, in their way, to civilized ethical standards as the behavior of the Company, which he detests but in whose activities he finds himself implicated. Therefore, alienated and appalled, he attempts to deaden anxiety and secure meaning through a well-developed work ethic, single-mindedly dedicating himself to the task of retrieving and repairing the steamboat. At the same time he

⁵⁰ Charles Darwin, *On the Origin of Species*. 1859. facsim. ed. Cambridge: Harvard University Press, 1964, pp.129-30.

distantly hopes that Kurtz, purportedly a morally enlightened man, will somehow redeem him when the recovered boat arrives at the ivory trader's base of operations far up the river.⁵¹

In restoring the boat, however, Marlow and his helper are held up by a lack of rivets, the supply of which, unsuspected by Marlow at the time, the manager makes sure is long delayed. One night, in a kind of hysteria induced by frustration and anxiety, Marlow and his fellow worker dance on the deck of the vessel, now raised from the water, celebrating their fantasy that the longed-for rivets surely must be about to arrive:

[W]e behaved like lunatics. We capered on the iron deck. A frightful clatter came out of that hulk and the virgin forest on the other bank of the creek sent it back in a thundering roll The great wall of vegetation, an exuberant and entangled mass of trunks, branches, leaves, boughs, festoons, motionless in the moonlight, was like a rioting invasion of soundless life, a rolling wave of plants piled up, crested, ready to topple over the creek to sweep every little man of us out of his little existence. And it moved not. A deadened burst of mighty splashes and snorts reached us from afar as though an ichthyosaurus had been taking a bath of glitter in the great river.⁵²

Here the ichthyosaur plays a much different role than in *The Woodlanders*, although again it functions within the context of Darwinian theory viewed darkly.

In his early fiction Conrad uses vegetation to depict a Darwinian struggle for existence, much as does Hardy, but he also imagines vegetation, in the form of jungle, as an alien force fundamentally antagonistic toward humans and something against which, if they are to survive, they must struggle but are ill equipped to do so.⁵³ For implicit within wilderness, understood as non-human reality, figures the greater enemy, an entire cosmos unconcerned with and uncongenial to human ambitions, making the accomplishments of civilization seem petty and transient. With its decentering of humans, now seemingly just another species with no special sanction, Darwinism plays into this anxiety. Marlow feels all this, but at the same time he also reads into nature a disquiet, heightened by his sense of moral culpability, that makes him into the alien, one not adapted to his environment and not well fitted to the struggle for survival. He displays these attitudes throughout the novel, as he does when on occasion he senses, in contrast, how admirably suited the natives are to the wilderness. They are non-modern, however, and Marlow, typical of his time, connects

⁵¹ So eager is he to find meaning in the anarchic destruction he witnesses at the hands of the whites that he is willing, once the steamboat arrives at Kurtz's trading station, to downplay the man's degeneration into a moral monster who, in his domination of local tribes, had violated Western ethical standards even more thoroughly than had the Company. Thus Marlow interprets Kurtz's famous last words, "the Horror, the Horror," whose actual meaning is unclear, as Kurtz's last minute moral victory upon recognition of what he had done. In fact, Marlow needs to redeem himself for his involvement in moral darkness and meaninglessness by redeeming the man he once had looked to as a beacon of civilized values.

⁵² Joseph Conrad, *Heart of Darkness*. ed. Paul B. Armstrong. New York: Norton, 2006, pp.29-30. All subsequent references are to this edition and are given in the text.

⁵³ The jungle as site of a vegetative Darwinian struggle for existence appears in Conrad's *Almayer's Folly* (1895), *An Outcast of the Islands* (1896), and *Tales of Unrest* (1898). See: John Glendening, *The Evolutionary Imagination*, pp. 241-43, 247.

the "primitive" with savagery—with the abandonment of moral restraints that he fears as an atavistic potential in modern humans and modern civilization. This is another haunting idea that Darwinism helped fuel—that vestiges of earlier stages of evolutionary development not only linger but constitute a potential for degeneration.

Nature as epistemic phenomenon, then, is an antagonist, ultimately residing within as much as without, something alien-seeming but uncanny because imbued with repressed or partially repressed human fears, including the fear—consistent with pervasive fin-de-siècle pessimism about the future—that neither the individual nor modernity itself can survive.⁵⁴ Dark nature threatens to "sweep every little man of us out of his little existence". The wilderness "moves not", however, because in fact it is humankind—via a form of extinction Darwin did not anticipate—that through greed and fear and self-alienation someday will produce its own destruction. In dramatizing these anxieties Conrad employs the same conditions as Hardy—extinction, struggle, and failed adaptation—and he too could have made his ichthyosaurus representative of a grim human destiny. He does something else instead.

Marlow's remarkable simile transmutes a noise, perhaps a hippo disturbed by the commotion on the boat, into the whimsical image of an ichthyosaurus "taking a bath of glitter in the great river". Marlow's disordered state of mind while dancing on the deck partially explains the fanciful scene, but it is so out of keeping with what precedes it, the threat of human extinction, that there must be more going on if the passage is to make sense. Stripped of overtones of extinction, conflict, and failed adaptation, the ichthyosaurus stands out in contrast to the preceding evocation of hostile nature and to Marlow's and his species' dilemmas. What Marlow has done, perhaps in the retelling of his experience rather than at the time, is invest the animal with what Marlow himself lacks during his traumatic African experiences. Whereas he feels alienated and morally sullied, the creature seems pristine, vital, and at home in its world, engaged in the salutary activity of "taking a bath". The ichthyosaurus is a success rather than something that has failed, its bones consigned to a museum. Snorting turns into a grace note and a brute animal into a fairytale being. This is a relapse to the childhood romance that, briefly surfacing again in early adulthood, had caused Marlow to sign onto the steamboat job in anticipation of splendid and unproblematic adventure (7-8).

But the story then immediately returns to the need for rivets, to the truth that they would not come anytime soon, to the folly and fear of the rest of the novel, and to Marlow's dubious battle to construct a positive meaning that, like rivets, might hold his world together. Conrad's ichthyosaurus conveys such a meaning: a dream of human freedom and ease, of release from fear of death and the burden of consciousness.

⁵⁴ British confidence had fallen off since mid-century and the self-celebratory Great Exhibition. By the century's end doubts had arisen in many people's minds stemming from imperial setbacks, the rise of powerful international economic and military rivals, a depressed economy, scientific and sociological theories concerning entropy and degeneration, the approach of a new century with unknown challenges, and—focusing these anxieties—the imminent death of Queen Victoria and the end of the age named after her. Anxiety about social, political, moral, and physical degeneration especially influenced creative writers of the time, including Conrad and Hardy, as did the somewhat kindred phenomenon of literary naturalism, with its focus on the social and hereditary forces that dominate people's lives and suppress free will. Neither Conrad nor Hardy, however, assumes the clinical, scientific sort of detachment from their characters and stories promoted by naturalism.

V

The ichthyosaur was not alone among extinct species in presenting scientific and religious challenges to nineteenth-century thinkers and educated readers, but as one of the first of the great reptiles recognized and soon found in considerable numbers, it was in the forefront of concerns about the creation and careers of species, offering many opportunities for scientific and artistic revisions, and it appeared in many guises as scientific knowledge colluded with extra-scientific influences. Verne, Hardy, and Conrad put their ichthyosaurs to different uses, while visual representations differed in response to new discoveries and oftentimes to the desire to appeal to both scientific and general audiences. Meanwhile scientific knowledge continued to accumulate.

More and more species of ichthyosaurs have been discovered, some as small as several feet in length, while recent finds suggest that one species produced individuals of over seventy feet—more along the lines of Verne's gigantic version.⁵⁵ The evolution of ichthyosaurs is better understood as well. For example, early species are now known to have had the pointed lizard-like tails incorrectly assigned, in most nineteenth-century reconstructions, to the later porpoise-shaped Jurassic specimens that were the first discovered and only late in the century recognized as having dorsal fins and forked tails.⁵⁶ Based upon a remarkable fossil that shows the details of soft tissue, a recent discovery indicates that later ichthyosaurs had skins containing collagen fibers, like those of sharks, which made their bodies rigid and slick to assist in high-speed swimming, evidence that it most likely fed in deep waters by chasing down prey at speeds perhaps up to twenty-five miles per hour.⁵⁷ In a related development, various discoveries have established that the narrow spines of early ichthyosaurs evolved into the thick, stiff backbones of later ones as part of a change from undulating movement to the rapid propulsion enabled by well-developed vertical tails.⁵⁸ It now also appears that ichthyosaurs indeed might have attacked plesiosaurs.⁵⁹ But mysteries linger about the relationship of these two animals and about much else, including why ichthyosaurs became extinct and did so before the demise of plesiosaurs.⁶⁰ No longer thought of as "the world-renowned ichthyosaurus", it nevertheless remains an ongoing and productive problem offering, for anyone interested, scope for both scientific reasoning and the imaginative investment of reality with human significance.

⁵⁵ A specimen of *Shonisaurus sikanniensis* was first discovered in British Columbia in 1991.

⁵⁶ Expert Ryosuke Motani, as part of his "Ichthyosaur Page" website, provides a chart demonstrating "a general transition from lizard-shaped body plan to fish-shaped one through the evolution of ichthyosaurs. See: Ryosuke, Motani, *Ichthyosaur Page*. 03 July 2001.

<<http://www.ucmp.berkeley.edu/people/motani/ichthyo/intro.html>>, 1. Introduction.

⁵⁷ This finding was reported in 2008 by Theagarten Lingham-Soliar, who along with his team at the University of KwaZulu-Natal investigated the fossilized skin with an electron microscope.

⁵⁸ See Ryosuke Motani, 'Rulers of the Jurassic Seas.' *Scientific American*, Dec. 2000, 53-59., p.57.

⁵⁹ BBC news reported that ichthyosaur and plesiosaur fossils found on an Arctic island include a tooth of the former creature embedded in the neck bone of the latter. See: Paul Rincon, "'Monster' Fossil Find in Arctic.' BBC News. 5 Oct. 2006. <<http://news.bbc.co.uk/2/hi/science/nature/5403570.stm>> .

⁶⁰ It has been suggested that plesiosaurs became adept at eating young ichthyosaurs.

Bibliography

- Anon., 'Abstract of a Paper on the Fossil Ichthyosaurus Lately Purchased for the Birmingham Philosophical Institution, Read on the 1st of May, 1837.' *The Analyst: A Quarterly Journal of Science, Literature, Natural History, and the Fine Arts*, 7 (1837), 233-40
- Anon., 'Hobby-Horses.' *All the Year Round*, 9 Sept. 1865, 163-66
- Anon., 'The Extinct Saurians.' *Friends' Weekly Intelligencer*, 21 Dec. 1850, 311-12
- Beckford, William, *Vathek*. 3rd rev. ed. London: Clark, 1816
- Beddoes, Thomas Lovell, 'Thanatos to Kenelm, and The Song by Thanatos,' in *The Works of Thomas Lovell Beddoes*. ed. H. W. Donner. Oxford: Oxford University Press, 1935, 141-42
- Benton, Michael, 'The Myth of the Mesozoic Cannibals.' *New Scientist*, October 12, 1991, 40-44
- Breyer, John and William Butcher, 'Nothing New Under the Earth: The Geology of Jules Verne's *Journey to the Centre of the Earth*.' *Earth Sciences History*, 22.1 (2003), 36-54
- Buckland, William, *Geology and Mineralogy: Considered with Reference to Natural Theology*. 1836. 2 vols. Philadelphia: Carey, 1837
- Byron, George Gordon, Lord., *Cain, A Mystery*, in *The Complete Poetical Works*. ed. Jerome McGann and Barry Weller. Oxford: Clarendon, 1991, VI: 227-95
- Cadbury, Deborah, *The Dinosaur Hunters: A Story of Scientific Rivalry and the Discovery of the Prehistoric World*. London: Fourth Estate, 2000
- Chambers, Robert, *Explanations: A Sequel to Vestiges of the Natural History of Creation*. 1845, in *Vestiges of the Natural History of Creation and Other Evolutionary Writings*. ed. James Secord. Chicago: University of Chicago Press, 1994
- . *Vestiges of the Natural History of Creation*. 1844, in *Vestiges of the Natural History of Creation and Other Evolutionary Writings*. ed. James Secord. Chicago: University of Chicago Press, 1994
- Conrad, Joseph, *Almayer's Folly: A Story of an Eastern River*. London: Unwin, 1895
- , *Heart of Darkness*. ed. Paul B. Armstrong. New York: Norton, 2006
- , *An Outcast of the Islands*. London: Unwin, 1896
- , *Tales of Unrest*. London: Unwin, 1898
- Dean, Dennis R., *Gideon Mantell and the Discovery of Dinosaurs*. Cambridge: Cambridge University Press, 1999
- Darwin, Charles. *On the Origin of Species*. 1859. facsim. ed. Cambridge: Harvard University Press, 1964
- Desmond, Adrian, 'Designing the Dinosaur: Richard Owen's Response to Robert Edmond Grant.' *Isis*, 70 (1979), 224-34
- . *The Politics of Evolution: Morphology, Medicine, and Reform in Radical London*. Chicago: University of Chicago Press, 1989
- Duncan, Isabelle, *Pre-Adamite Man; or, The Story of Our Old Planet and Its Inhabitants, Told by Scripture and Science*. London: Saunders, 1860
- Ellis, Richard, *Sea Dragons: Predators of the Prehistoric Oceans*. Lawrence: University Press of Kansas, 2003
- Figuiet, Louis, *The World Before the Deluge*. ed. H. W. Bristow. London: Cassel, 1872

- Glendening, John, *The Evolutionary Imagination in Late-Victorian Novels: An Entangled Bank*. Aldershot: Ashgate, 2007
- Gould, Stephan Jay, 'Bent Out of Shape,' in *Eight Little Piggies: Reflections in Natural History*. New York: Norton, 1993, 79-94
- , 'Preface,' in *The Book of Life*. ed. Stephen Jay Gould. New York: Norton, 1993, 6-21
- Harris, John, *The Pre-Adamite Earth: Contributions to Theological Science*. London: Ward, 1846
- Hawkins, Thomas *The Book of the Great Sea-Dragons, Ichthyosauri and Plesiosauri*. London: Pickering, 1840
- Hutchinson, H. N., *Extinct Monsters and Creatures of Other Days: A Popular Account of Some of the Larger Forms of Ancient Animal Life*. London: Chapman, 1892
- J. G. C., 'The Ichthyosaurus, or Fish-Lizard.' *The Saturday Magazine*, 8 April 1843, 136
- Kendall, May, 'Ballad of the Ichthyosaurus.' *Punch*, 14 Feb. 1885, 82
- Lingham-Soliar, Theagarten, 'First Investigation of the Collagen D Band Ultrastructure in Fossilized Vertebrae Integument.' *Proceedings of the Royal Society B* 275, (2008), 2207-12
- Livingstone, David N., *Adam's Ancestors: Race, Religion, and the Politics of Human Origins*. Baltimore: Johns Hopkins University Press, 2008
- , 'The Preadamite Theory and the Marriage of Science and Religion.' *Transactions of the American Philosophical Society*, 82.3 (1992), i-81
- Lyell, Charles, *The Principles of Geology*. 3 Vols. 1830-33. Chicago: University of Chicago Press, 1990
- M'Causland, Dominick. *Adam and the Adamite; or, The Harmony of Scripture and Ethnology*. London: Bentley, 1864
- McGowan, Christopher, *Dinosaurs, Spitfires, and Sea Dragons*. Cambridge: Harvard University Press, 1991
- , *The Dragon Hunters: How an Extraordinary Circle of Fossilists Discovered the Dinosaurs and Paved the Way for Darwin*. Cambridge, M: Perseus, 2001
- Motani, Ryosuke, *Ichthyosaur Page*. 03 July 2001.
<<http://www.ucmp.berkeley.edu/people/motani/ichthyo/intro.html>>
- , 'Rulers of the Jurassic Seas.' *Scientific American*, Dec. 2000, 53-59
- O'Connor, Ralph, *The Earth on Show: Fossils and the Poetics of Popular Science, 1802-1856*. Chicago: University of Chicago Press, 2007
- Randolph, Paschal Beverly, *Pre-Adamite Man: Demonstrating the Existence of the Human Race upon This Earth 100,000 Years Ago!* New York: Tousey, 1863
- Rincon, Paul, '“Monster” Fossil Find in Arctic.' BBC News. 5 Oct. 2006.
<<http://news.bbc.co.uk/2/hi/science/nature/5403570.stm>>
- Rudwick, Martin J. S., 'Caricature as a Source for the History of Science: De la Beche's Anti-Leyellian Sketches of 1831.' *Isis*, 66 (1975), 534-60
- , *Scenes from Deep Time: Early Pictorial Representations of the Prehistoric World*. Chicago: University of Chicago Press, 1992
- , *Worlds Before Adam: A Reconstruction of Geohistory in the Age of Reform*. Chicago: University of Chicago Press, 2008
- Secord, James A., 'Monsters at the Crystal Palace,' in *Models: The Third Dimension of Science*. ed. Soraya de Chadarevian and Nick Hopwood. Stanford: Stanford

- University Press, 2004, 238-69
- , *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of Vestiges of the Natural History of Creation*. Chicago: University of Chicago Press, 2000
- Tennyson, Alfred, *In Memoriam A. H. H.* London, 1850
- Torrens, Hugh, 'Mary Anning (1799-1847) of Lyme: 'The Geatest Fossilist the World Ever Knew'.' *The British Journal for the History of Science*, 28 (1995), 257-84
- Turner, James, *Reckoning with the Beast: Animals, Pain, and Humanity in the Victorian Mind*. Baltimore: Johns Hopkins University Press, 1980
- Van Riper, A. Bowdoin, *Men among the Mammoths: Victorian Science and the Discovery of Human Prehistory*. Chicago: University of Chicago Press, 1993
- Verne, Jules, *A Journey to the Centre of the Earth*. London: Griffith, 1871
- . *Journey to the Centre of the Earth*. trans. William Butcher. Oxford: Oxford University Press, 1998
- . *Journey to the Interior of the Earth*, trans. Frederick Amadeus Malleon. London: Ward, 1877
- . *Voyage au centre de la Terre*. Paris: Hetzel, 1867.
- Wells, H. G., *The Time Machine*. London, 1895
- Winchester, Simon, *The Map that Changed the World: William Smith and the Birth of Modern Geology*. New York: Harper-Perennial, 2002