Caricature as a Source for the History of Science: De la Beche's Anti-Lyellian Sketches of 1831

By Martin J. S. Rudwick*

The value of contemporary caricatures for the understanding of political and social history has long been recognized by general historians. The libelous lampoons of James Gillray, for example, can give not only amusement but also valuable insight into the affairs (in both senses) of the Prince Regent and into the way in which those affairs were viewed by the social class that bought the caricatures. Perhaps because of a concern to outgrow an anecdotal and antiquarian past, historians of science have been reluctant to give attention to the analogous resources that might help us to understand the scientific thought of other periods. There is much to suggest that these resources are substantial and still largely unused, at least within the period that saw the flowering of the political caricature. It might be felt, however, that caricatures relating to the history of science could hardly do more than illuminate the social circumstances in which the activity of science was carried out: for example, Gillray's entertainingly vulgar caricature of a Royal Institution lecture in 1802, showing Garnett and Davy demonstrating the properties of gases, is a valuable comment on the way in which science was seen by the fashionable classes at that period. The purpose of this article, on the other hand, is to give an example of a caricature which throws light not only on the social context but also the substantive content of a scientific dispute of major importance. Furthermore, the discovery of the draft sketches which led up to this caricature enriches our understanding of its meaning and throws unexpected light on the mode of thought of the scientist who drew it.

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*Unit for History and Social Aspects of Science, Centrum Algemene Vorming, Vrije Universiteit, De Boelelaan 1083, Amsterdam-Buitenveldert, the Netherlands. I am grateful to Dr. Roy Porter for some valuable comments on a draft of this article.

The publication of the *Principles of Geology* by Charles Lyell between 1830 and 1833 provoked a far-reaching discussion among British geologists about the fundamental methods and theories of their science.\(^2\) To some historians Lyell's work has even seemed to mark the effective foundation of geology as a genuine science, or at least to introduce a radically new "paradigm" of explanation,\(^3\) whereas other historians have stressed the continuity of method and approach between Lyell and his opponents, while emphasizing the specific points on which they differed.\(^4\) In either case, however, there is agreement that the publication of the *Principles* stimulated a period of active self-reflection by geologists about the foundations of their science.

The Lyellian debate needs to be seen in terms that encompass more than a simple conflict between enlightened Lyellians and scientifically conservative geologists motivated by theological concerns. The traditional historiography of "conflict" between science and religion in this period fails to account adequately for some of the most important figures in the opposition to Lyell's geological system.\(^5\) Among such opponents was Henry Thomas De la Beche (1796–1855), Lyell's almost exact contemporary.\(^6\) De la Beche was a prominent member of the small circle of active geologists who formed the core of the Geological Society of London and a distinctive subgroup within the Royal Society. Like most other members of that circle, he was a gentleman with sufficient private means—derived from a Jamaican sugar plantation he had inherited—to indulge his taste for geology as he wished. But by 1832 his income from this source had been so reduced that he was forced to apply to the government for a grant to continue the geological fieldwork he had already begun in southwest England. It was this work that led eventually to the foundation of the Geological Survey and to De la Beche's appointment as the Survey's first director-general—

\(^1\)Charles Lyell, *Principles of Geology, Being an Attempt to Explain the Former Changes of the Earth's Surface, by Reference to Causes Now in Operation* (London, 1830–1833).


\(^4\)A classic source is Andrew D. White, *A History of the Warfare of Science with Theology in Christendom* (New York: D. Appleton, 1901, reprinted 1955), Ch. 5, "From Genesis to Geology." The more recent standard account, though far more sophisticated historically, still sees the debate in essentially the same terms, as a gradual retreat of a "providentialist" view of nature, backed by natural theology, before the advance of objective science: Charles Coulston Gillispie, *Genesis and Geology, A Study in the Relations of Scientific Thought, Natural Theology, and Social Opinion in Great Britain, 1790–1850* (Cambridge, Mass.: Harvard University Press, 1951).

\(^5\)Almost alone among the group of outstanding English geologists of his generation, De la Beche did not receive the standard Victorian "Life and Letters" treatment after his death. For a brief account, see V. A. Eyles' entry on him in the *Dictionary of Scientific Biography*, Vol. IV (New York: Scribner's, 1971), pp. 9–11. He was not French, and his name is correctly spelled with a capital D (as in his own autograph signature) and should be indexed under that letter.
The first English field geologist to be in permanent full-time employment by the state. There are hints in De la Beche's correspondence, and in Lyell's, that there was some personal antipathy between them. This may have aggravated their methodological and substantive disagreements, but the latter cannot be dismissed simply as the products of that antipathy. Nor is there any sign in De la Beche's published or unpublished work that his criticism of Lyell's geology was motivated by any religious desire to maintain, for example, the reality of geological "catastrophes" in the past. On the contrary, in early-nineteenth-century Britain De la Beche is almost a paradigm of the self-consciously "professional" scientist, concerned above all for the autonomy of the science from extra-scientific concerns and for its scientific and philosophical respectability. If the geology of this period is to be interpreted at all in ideological terms (and I do not deny the possible validity of such interpretations), then Lyell should be grouped with some of his catastrophist opponents, as those who were aware of the wider implications of the science for human self-understanding, while De la Beche should be placed against them as a prototypical modern scientist who was more concerned with the progress of geology as an autonomous source of objective and useful knowledge. Indeed, Lyell himself seems to have held such a view of De la Beche's work, admiring its professional thoroughness and reliability but finding it heavy reading. He told his fiancée, for example, "If you are not frightened by De la Beche, I think you are in a fair way to be a geologist; though it is in the field only that a person can really get to like the stiff part of it."

De la Beche's criticisms of Lyell's geology were primarily criticisms of his methodology and of his specific theoretical conclusions. This is clearly evident in all his published work after 1830, particularly in his important and—by historians—underrated volume of Researches in Theoretical Geology. It is confirmed, I suggest, by the series of anti-Lyellian sketches which form the subject of this article.

De la Beche was a talented amateur artist who used his skills primarily to develop the range and efficacy of the visual "language" of geology—maps,
sections, geological landscape views, and so on. But he also embellished his scientific correspondence with lively caricatures that comment on current geological debates; some of these he then drew on stone and distributed as lithographs to his friends and colleagues.

One of the more entertaining of these lithographs, which has already been reproduced in a modern work, is entitled "Awful Changes" (Fig. 1). It shows a "Professor Ichthyosaurus" lecturing to an audience of Jurassic reptiles and demonstrating a human skull. Hitherto this has seemed to be a straightforward humorous comment on the most popular and entertaining geological lecturer of the period, William Buckland, whose Oxford lectures were well known for their use of visual aids in the form of spectacular fossil specimens. The caricature has appeared to be a fantasy of the tables turned on Buckland, with an ichthyosaur analyzing human functional morphology as effectively and entertainingly as Buckland in his lectures analyzed that of the Jurassic reptiles and other fossils. The interpretation I shall offer here will suggest that it embodies a much more serious scientific meaning, and that the ichthyosauran lecturer was not Buckland but Lyell.

The evidence for this interpretation is found in a geological notebook compiled by De la Beche around 1830–1831 while he was doing fieldwork in southwest England. The front of the notebook is filled with geological notes, probably written after each day's work, and illustrated with fine sketches of significant rock outcrops, sections of strata, and so on. At the back of the notebook are many pages of more informal sketches and caricatures. Among these is a sequence of ten sketches, the last of which is unmistakably a rough draft for the drawing that he lithographed. I shall argue from an analysis of their captions and iconography—if the term is not too pretentious for caricatures—that they embody an important critique of Lyell's Principles.

In any case there is circumstantial evidence that De la Beche drew the preliminary sketches at least within about a year of the publication of the first volume of the Principles. In De la Beche's notebook these sketches are flanked on one side by a sequence of three political caricatures, entitled "John

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11See particularly his Sections and Views, Illustrative of Geological Phaenomena (London, 1830), entirely illustrated with his own lithographed drawings.
12Fig. 1 is reproduced from a copy in a scrapbook which belonged to Roderick Murchison and was probably sent to him by De la Beche (Archives of the Institute of Geological Sciences, London, GSM1/558, p. 3). The lithograph is also reproduced (much reduced in size) in Richard J. Chorley, Anthony J. Dunn, and Robert P. Beckinsale, The History of the Study of Landforms (London: Methuen, 1964), Vol. I, p. 104, and as the frontispiece to Francis T. Buckland, Curiosities of Natural History (London, 1859).
13See the engraving reproduced in Chorley et al., Landforms, Vol. I, p. 103. The existence of an enlarged reproduction of the caricature (now in the Bodleian Library in Oxford), evidently intended as a visual aid for Buckland's own lectures, makes this interpretation improbable, and lends further support to my contention that the caricature was a visual comment on Lyell's theories, which would have been useful for Buckland's public critique of that work.
14Archives of the Institute of Geological Sciences, London (GSM 1/123). I am indebted to the librarian of the Institute for access to the archives and for permission to publish some sketches from the notebook in this article, and to Mr. John Thackray for much helpful assistance.
“[Bull] and the Grandees.” This series shows a group of aristocrats dressed as clowns or jesters, insisting on their right to live off the hard-won earnings of the ordinary Englishman but being thrown into disarray in the final scene by the inexorable progress of “The Knowledge Locomotive Engine” hauling a wagon loaded with globes and other scientific apparatus (Fig. 2). The series surely reflects the contemporary agitation over the Reform Bill (as well as being perhaps a comment on the Society for the Diffusion of Useful Knowledge); and the final scene may have been prompted by the untimely end of the unfortunate William Huskisson at the opening of the Manchester and Liverpool Railway in 1830.

Flanking the geological sketches on the other side are two dated caricatures. One is entitled “Receive the bread of life” and shows a publication of the Religious Tract Society being offered to an apparently undernourished young woman, while others kneel in the background bearing other tracts in their upturned hands as if receiving the Sacrament. With its appended note “Sketch from real life, Totness, Sept. 1831,” this would seem to be a sharp comment on one of the establishment’s most approved responses to the acute social problems of the time.15

The other dated sketch shows a geologist, probably De la Beche himself, in a sitting room, with his hammer and collecting bag on the table behind him, looking disconsolately at the pouring rain outside the window and evidently fretting at his inability to get out into the field. The caption refers sardonically to the only scientific opportunity the situation offered: “Opportunity of studying the effects of rain on glass. Devon. Oct. 1831.” Since a similar figure appears in the first of the geological sketches, it is possible that they were drawn on this occasion in October 1831; that is, that De la Beche used his enforced confinement indoors to reflect on the most important theoretical challenge to his own geological synthesis and to express his thoughts in a characteristic visual form. This date would be consistent with my inference later in the article that the “Professor Ichthyosaurus” of the final caricature should be identified as Lyell; for in April 1831 Lyell had been appointed Professor of Geology at the newly established King’s College in London—the first teaching position in geology outside Oxford and Cambridge.16

There is one serious problem, however, about dating the final lithograph to 1831; this is that some (but not all) copies bear the date 1830 after De la Beche’s signature. But this is probably a mistake which De la Beche made in all innocence when redrawing the caricature for a second edition, believing

15 Such sketches of social and political comment are worth stressing for the light they throw on De la Beche’s broader attitudes. His Reformist position is not invalidated by the fact that he was the proprietor of a slave-owning plantation. He was evidently uneasy about the slavery question, yet could not feel disinterested. A year’s residence in Jamaica had impressed upon him the need for reform in the treatment of slave labor, but he favored legislative reform rather than immediate abolition. His attempt to describe the “facts” of slave labor objectively forms an instructive parallel to his Baconian attitude to the precedence of facts over theories in geology. H. T. De la Beche, Notes on the Present Condition of the Negroes in Jamaica (London, 1825).

Figure 1. "Awful Changes." "Man only found in a fossil state.—Reappearance of Ichthyosauri. 'A change came o'er the spirit of my dream.' Byron." "A Lecture.—'You will at once perceive,' continued Professor Ichthyosaurus, 'that the skull before us belonged to some of the lower order of animals, the teeth are very insignificant, the power of the jaws trifling, and altogether it seems wonderful how the creature could have procured food.'"
that he had first drawn it in the year that the first volume of the *Principles* was published. On the other hand, apparently he did draw another anti-Lyellian caricature at the earlier date, for on September 15, 1830, Buckland wrote to him as follows:

Many thanks and much praise to you for your Caricature of Actual Causes & the Huttonian Theory rediviva. The book is written in a very seductive Style & will no doubt make many Converts. I wish Conybeare wd take it in hand & be stirred up to a Reply. I shall probably be going to see him in about 10 Days & shall stimulate Him if I can to resume his Pen on Geology.18

The Lyellian reference in this passage is unmistakable. The first volume of the *Principles* had been published only a few weeks earlier, and William Conybeare was indeed prevailed upon to write a long critique of the work—one of the first to be published and one of the most important.19 But Buckland's description of this earlier caricature does not at all fit the lithograph “Awful Changes,” and I am therefore inclined to prefer for the latter a dating in 1831. In any case, however, the appearance of only one volume in the geological sketches suggests that they date at the latest from before the publication of the second volume of the *Principles* in February 1832.

I turn now to the analysis of the main series of sketches. Although they are superficially diverse, they can be understood as a connected sequence linked by common themes and images. I suggest that De la Beche started the series intending to devise an anti-*Principles* caricature that he could circulate among other geologists, and that he experimented with several related themes before finding the one that he finally used.

The first theme to come to De la Beche's mind was a comment on the methodology of Lyell's work. The first three sketches all reflect Lyell's own emphasis on the need to find the proper way of seeing the phenomena of geology. Lyell had emphasized that geological theorizing had been distorted by a failure to correct for our human viewpoint as subaerial terrestrial beings whose existence was of fleeting duration compared with the history of the earth.20 To De la Beche, as to other geologists, much of Lyell's argument seemed aprioristic. The Geological Society's president, Adam Sedgwick, was

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17 There are copies of both versions in the Institute of Geological Sciences in London. A close comparison of them shows that the later version must have been traced with some care from the earlier, but that the shading was redrawn; in other words the later version was not simply a second impression from the original stone. This is also indicated by the inversion of two words in the subtitle. I am inclined to think that the undated version reproduced here was the original, and that its success with his friends led De la Beche to redraw it again later—adding an incorrectly remembered date—in order to have more copies to distribute.

18 William Buckland to De la Beche, Sept. 15, 1830 (minimal punctuation added), De la Beche papers, Department of Geology, National Museum of Wales, Cardiff. I am indebted to Dr. Douglas Bassett for access to these MSS. I have not been able to trace the letter to which this was a reply.


not alone in feeling that Lyell had borrowed from his barrister’s training too much of the “language of an advocate,” and had distorted facts to suit his own theory.21

De la Beche’s first sketch (Fig. 3) shows an elegantly dressed figure wearing a barrister’s wig—inferentially Lyell himself. He is significantly without a hammer or any other symbol of the working geologist. Instead he is holding a pair of spectacles, like those worn in fact by Lyell, who had bad eyesight. He is standing on ground marked “Theory,” which forms a spectacular viewpoint looking out over a broad valley to a range of mountains. He is offering his tinted spectacles to a “genuine” geologist—perhaps De la Beche himself—who

holds a hammer in his hand and has a collecting bag over his shoulder. Lyell is saying to the geologist, “Take a view, my dear Sir, through these glasses, and you will see that the whole face of nature is as blue as indigo.” In other words De la Beche felt that Lyell’s perception of the geological scene was systematically colored by the theoretical presuppositions inherent in his viewpoint (the double meanings were surely intentional).22 The choice of indigo possibly symbolizes Lyell’s argument that even the loftiest mountain ranges (such as that in the background) have been elevated at some time from beneath the sea, and that even such apparently “primitive” rocks as granite and gneiss, often found in the cores of mountain regions, were nothing but the metamorphosed remains of ordinary marine sedimentary rocks.23 Alternatively, or in addition, the blue of indigo may represent the conventional cartographic color for rivers and water generally and may refer to Lyell’s “Huttonian” claim that even the deepest valleys (such as that in the middle distance) have been excavated entirely by the slow erosive action of the rivers now flowing in them.

But while the figure of Lyell claims to be offering with one hand an aid to better perception, which might be interpreted as his methodological principles (the title Principles of Geology was not idly chosen), in fact he possesses an unacknowledged theory, which he is holding with his other hand but concealing behind his back—a volume marked “Theory of the Earth.” This was the label, deliberately reminiscent of James Hutton’s work, that many of Lyell’s critics applied to the Principles in order to stress not only its all-explanatory theoretical ambitions, which seemed out of date in the Baconian atmosphere of the 1830s, but also the neo-Huttonian steady-state content of Lyell’s system. This becomes explicit later in the series of sketches.

The second sketch (Fig. 4) pursues the perceptual theme with an implicit accusation that Lyell’s way of seeing geological nature involves not merely the systematic interpretative coloring of phenomena, but also a deliberate blindness to certain aspects of them. Lyell (my identification of the figure is still inferential) now appears in the guise of a doctor, though he is still wearing his barrister’s wig. He is applying an eye cover to a decrepit hammer-bearing geologist and reassuring him: “There, there, my dear Sir, don’t you see far far clearer than before,—the whole force of vision being properly directed there is not that danger of stumbling that there was previous to the application of the plaster.” And on the following page is the additional comment: “By blocking one eye, the whole power of vision is directed through the other—the confusion caused by two is avoided and all is clear.” De la Beche surely did not think that the ordinary geologist was in fact decrepit—that

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23 Blue not only suggests the sea, but had become a standard conventional color on geological maps for depicting limestone formations. Granite, by contrast, was almost always depicted by a bright red tint.
"Here, here, my dear Sir, don't you see far far clearer now before,—the whole force of vision being properly directed there is not that danger of stumbling that there was previous to the application of the plaster."

Figure 4. "How to see clearly." "There, there, my dear Sir, don't you see far far clearer than before,—the whole force of vision being properly directed there is not that danger of stumbling that there was previous to the application of the plaster."

is, in need of Lyell's theoretical ministrations—for in the previous sketch he had been depicted as in perfect health, and indeed much better equipped than Lyell for the practical rigors of fieldwork. Rather, it reflects De la Beche's belief that the geologist would be better off without this "medical" attention.

With its title "How to see clearly," this caricature probably represents De la Beche's criticism of Lyell's refusal to accept the observable phenomena of the past as a valid source of theoretical inference in themselves, but only as interpreted in the light of the phenomena of the present. De la Beche and others among Lyell's critics had no quarrel with actualistic reasoning (i.e., from
present to past) as a prescriptive methodology—on the contrary, they used it much of the time themselves—but they felt that in certain cases the observable products of past geological events indicated that “actual causes” (i.e., processes operating in the present) were not wholly adequate for causal explanation. Thus for example the observed deformations of strata in many mountain regions (such as that depicted in the first sketch) seemed to De la Beche to be inexplicable in terms of very gradual and relatively gentle forces, no matter how long the periods of time during which those forces were inferred to have operated.24

The third sketch (Fig. 5) refers again to the impaired vision induced by Lyell’s conception of geology but alludes more directly to its persuasive power within the geological community. The central figure—again inferentially Lyell—is here leading a crowd of others, and all without exception are wearing colored spectacles. Even an owl, the very symbol of wisdom, who contemplates the scene from a perch in the background, is similarly disadvantaged. Furthermore, the other figures are dressed in period costume and seem to be intended to suggest Guy Fawkes and his fellow conspirators, or some such historical episode. Verging on the libelous, De la Beche entitled this cartoon, “One fool makes many, or green glasses the go [i.e., the fashion].” In other words, he is suggesting that the superficial attractiveness of Lyell’s work is such that everyone is in danger of having their geological vision systematically distorted in the same way, and perhaps that there is even a conspiracy to promote Lyell’s viewpoint.25

The figure I am identifying in Figure 5 as Lyell—he is now wearing a chef’s cap over his barrister’s wig—is bearing a large bowl of steaming food, perhaps toward the convivial table of the Geological Society Club,26 and it is the delightful aroma of what he has cooked which is luring the others to follow him. The ingredients of his cookery are too small to be easily identifiable, but probably represent components of his theory. For example, at the back of the bowl is a miniature scythe-bearing Father Time (an identification that might seem precarious were it not for the undoubted reappearance of this figure in a later sketch), and to the right is a tiny representation of one of the four winds in their traditional cartographic form—perhaps a reference to the major explanatory work done in Lyell’s system by such agents as winds and ocean currents.

It is probable that De la Beche fully intended the notion of cookery to be understood in its pejorative metaphorical sense; that is, that Lyell had to some extent “cooked” his results. De la Beche may also have known Gillray’s famous cartoon in which the political world was represented as a pudding, a product of cookery, to be carved up between Pitt and Napoleon.27 But there is some

24 See his later arguments on this point in his Researches, Ch. 6; see also Rudwick, “Uniformity and Progression.”
25 The letter already quoted (n. 18) shows that Buckland shared this view.
26 The independent dining club formed in 1824, at which the elite of the society could (and still do) dine together informally on the days of the meetings.
27 Reproduced in Hill, Fashionable Contrasts, Plt. 39: “The Plumb-pudding in danger;—or—State Epicures taking un Petit Souper.”
Figure 5. "One fool makes many, or green glasses the go."
evidence that Lyell had laid himself open to the application of the metaphor of cookery in a much more specific sense.

Earlier, in 1830, he had described his "grand new theory of climate," which played a pivotal role in the strategy of the Principles, as a "receipt," a recipe in the cookery sense. This was in a private letter to Gideon Mantell. But Mantell may have passed the notion on to others, or Lyell himself may have boasted quite openly in these terms about his forthcoming work. In either case it is at least possible that Lyell's own description of his work in terms of cooking had become generally known in the Geological Society circle.

The cooking "receipt" that Lyell had offered Mantell (and perhaps others) was "for growing tree ferns at the pole, or if it suits me, pines at the equator"; in other words, for explaining the production of any kind of climate at any latitude, with the appropriate organisms, simply as a result of alterations of the configuration of land and sea. If this boast had become generally known, the emphasis on growing might perhaps account for De la Beche's choice of green for the colored spectacles in this sketch.

De la Beche's next sketch was to refer unambiguously to Lyell's steady-state theoretical synthesis, and at first sight this seems to form a major break from the first three, more methodological drawings. But if, as I have suggested, De la Beche was already thinking of Lyell's climatic theory when he drew the third sketch, the continuity of thought would be complete. For the function of Lyell's climatic theory in the strategy of the Principles was to undermine the validity of the current "directionalist" interpretation of the climatic history of the earth—in other words, to argue that the fossil record did not necessarily imply that the earth's surface had gradually become cooler and climatically more diverse. This was an important part of Lyell's broader aim of replacing the directionalist synthesis as a whole with a steady-state interpretation of every aspect of geology. The third drawing thus forms a natural transition from methodological to substantive criticism.

The fourth sketch (Fig. 6) refers clearly to Lyell's steady-state tectonic hypothesis of oscillating crustal blocks in dynamic equilibrium (a hypothesis later developed by the young Charles Darwin, notably in his work on coral reefs). It shows "Europe and Africa" lying in one pan of a chemical balance and "America" in the other, the two being almost exactly balanced. Lyell argued that such continental blocks of the earth's crust were gradually rising or falling, but almost "insensibly" to human observers. As if to emphasize the fanciful foundations of this hypothesis of balanced crustal blocks, De la Beche attached a small winged fairy to each pan of the balance. But perhaps these also


30 E.g., Principles, Vol. I, pp. 472–479 (the conclusion of the volume). The sketch shows some misunderstanding of Lyell's hypothesis, which supposed continental blocks undergoing erosion to be oscillating with temporarily oceanic blocks receiving the extra weight of sedimentation.
represented the "dusky melancholy sprite" (Alexander Pope’s Umbriel) that Lyell himself imagined as the being whose subterranean viewpoint could serve to correct the human perspective on geological phenomena. If so, this image would be another transitional feature, linking De la Beche’s thought back to the preceding drawings. In any case, one fairy seems to be lending its insubstantial lift to Europe and Africa, while the other is apparently lending its equally insubstantial weight to America. Only such fanciful disturbances to the alleged balance across the Atlantic, De la Beche seems to be saying, could produce Lyell’s system of crustal blocks slowly oscillating in steady-state equilibrium.

For the fifth sketch (Fig. 7), De la Beche redrew the continents suspended from a balance, and the accompanying text has the form of a see-sawing nursery rhyme:

Here we go up, up, up,
Here we go down, down, down.

The balance is now held by the figure of Father Time, seated on clouds, complete with his traditional scythe and hour glass. But he is viewing his

31 Ibid., p. 82.
balance through colored spectacles, like those worn by everyone in the third sketch. He also has a more nineteenth-century piece of equipment, a large pendulum clock, on which perches an owl (carried over from the third sketch). But the clock is driven, not by anything as mundane as the weight which would normally be suspended below such a clock, but by an animated pendulum with a pair of angelic wings (perhaps transmuted from the fairies' wings of the previous sketch). In other words, time itself is being measured—or even driven—by forces far more fanciful than those in any ordinary clock. This reference to the specific character of Lyellian time is made more explicit by the fact that the face of the clock is marked not in hours but in "Millions of Centuries." Like other geologists, De la Beche felt that Lyell tended to use a vastly extended scale of time as an almost material force, the mere
invocation of which was held to be adequate to explain even the most catastrophic phenomena in geology. In this sketch the particular reference is again to Lyell’s explanation of continental elevation and subsidence. The title, “The balance of power—or how to keep the sea at its proper level,” uses the political phrase to refer to Lyell’s insistence that changes in relative sea level are to be explained in terms of endogenous movements of the earth’s crust rather than in the more traditional terms of eustatic changes in the level of the sea itself.

Father Time reappears in the sixth sketch (Fig. 8), but he is now accompanied by an iconographically more original figure representing Space. Approaching these demiurgic beings is an ordinary mortal—again inferentially Lyell—apparently wearing his barrister’s gown as well as his wig. He is thrusting toward them a book—inferentially the Principles—and crying, “Behold my book, Sirs, Time & Space.” This is probably De la Beche’s somewhat cynical comment on the vast explanatory ambitions of the Principles, and it seems to anticipate the grandiloquent passage, comparing time in geology with space in astronomy, with which Lyell concluded his third and culminating volume three years later.32

De la Beche and other critics of Lyell were not of course averse to a geological time scale of millions of years, so long as it was genuinely required for the explanation of phenomena. What they objected to was Lyell’s ad hoc use of time to explain away features that did not fit his overall theory of the earth. Prominent among such features was the “diluvium,” the irregularly distributed and peculiar deposits (in modern terms, of glacial origin) that were generally attributed to an unusual diluvial episode or episodes in the geologically recent past.33 The diluvium lay above (and was therefore more recent than) the huge thickness of “regular strata”; but in turn it was overlain by the still more recent “alluvium,” which was manifestly the product of ordinary “actual causes.” The peculiarity of the diluvium thus seemed to belie Lyell’s claim that there had been an unbroken continuity of ordinary causation since the most remote periods of the earth’s history. To overcome this objection, Lyell characteristically used a vast time scale to iron out the apparently violent origin of the diluvium into a much longer period of normal causes. He regarded it as a natural connecting link between an alluvial period—also vastly extended in duration—and the ordinary Tertiary strata. Most other geologists, however, even if they did not share Buckland’s earlier belief that there had been only a single diluvial episode and that this could be equated with the biblical flood, still felt that to eliminate the peculiar character of the diluvium altogether was an implausible and ad hoc maneuver.34

De la Beche’s seventh sketch (Fig. 9) reflects this feeling. “Alluvium,” which most geologists at the time (like their successors today) considered as the product

Figure 9. "Diluvium" and "Alluvium."
of merely the few thousand years of post-diluvial (i.e., post-glacial) history, is personified as Father Time himself, whose clock, in the previous sketch, had been calibrated in “Millions of Centuries.” In accordance with this fanciful concept, Father Time has now sprouted a pair of angelic wings—perhaps those previously attached to the pendulum of his clock.

If the alluvium was of such unimaginable antiquity, what conception could be attached to the age of the diluvium, let alone the proportionately far greater time represented by the still older “regular strata”? De la Beche made this point by drawing alongside “Alluvium” a figure of “Diluvium,” personified as the “Ancient of Days” Himself—the figure is perhaps based on the Creation scene in William Blake’s *Book of Job*—over whom tiny hammer-bearing geologists are clambering irreverently.35

Perhaps the thought of all those geologists puzzling over the diluvium provided the connecting link to De la Beche’s eighth sketch (Fig. 10), which takes up the social theme again by depicting an argument at a formal scientific meeting, probably of the Geological Society, which was the institutional setting for the main Lyellian debate. The characters are however transmuted into animal form. A long-snouted ichthyosaur is addressing the chair, saying, “Mr. President crocodile, Allow me to . . . .” The president, who has a lion[?] and an elephant as secretaries by his side, apparently interrupts by saying, to a different figure, “Allow me to state, Mr. Plesiosaurus, that Mr. Longirostrus Ichthyosaurus’s remarks were confined—.” The long-necked plesiosaur replies, “I bow Mr. President.”

Both the iconography and the meaning of the dialogue are obscure. I am inclined to think that the scene may be based on De la Beche’s recollection of an earlier encounter between Lyell and his opponents, at which the diluvial question was central to the debate. Even before the first volume of the *Principles* had been published, Lyell’s Playfairian arguments for the very gradual erosion of valleys by the rivers flowing in them—a test case for his whole approach—had been countered by Conybeare, who termed the debate one of “Fluvialists” versus “Diluvialists”; and another of Lyell’s critics had summarized the Lyellian position as “Give us time, and we will work wonders.”36 If De la Beche was indeed recollecting this or a similar exchange at the Geological Society, at least some of the iconography would become intelligible.

Conybeare is an obvious candidate for the plesiosaur in the sketch, since the reconstruction of that reptile had been one of his most distinguished pieces of research.37 The plesiosaur’s apparent concession of defeat would then

35 William Blake, *Illustrations of the Book of Job* (London, 1826); see the engraving entitled “When the morning Stars sang together & all the Sons of God shouted for joy” (Job 38:6—the conclusion of the passage in which God asks Job, “Where wast thou when I laid the foundations of the earth?”). The border of the engraving is decorated with six small vignettes of the days of creation, which of course many geologists at this period regarded as a symbolic summary of the long history revealed by their science. The figure of the Creator is strikingly similar in pose to De la Beche’s sketch. That De la Beche should have known Blake’s work is not implausible in view of his strong artistic interests.


37 W. D. Conybeare and H. T. De la Beche, “Notice of a Discovery of a New Fossil Animal,
Figure 10. "Mr. President crocodile, Allow me to." "Allow me to state, Mr. Plesiosaurus, that Mr. Longirostrus Ichthyosaurus's remarks were confined—." "I bow Mr. President."

This suggests Lyell himself as the ichthyosaur, though I do not know what prompted that characterization, unless he had a reputation for snapping ferociously at his opponents. During the relevant period the president was Sedgwick and later Roderick Murchison, one of whom would thus be the crocodile, and the secretaries were (at different times) William Broderip, Murchison, and Edward Turner; but again I do not know why any of them should have been characterized by the animals shown. De la Beche might have depicted himself as the only human figure, the onlooker in the foreground.

Obviously this interpretation is highly conjectural. There are other possibilities. A few years later De la Beche caricatured the prominence of his own nose; this might be taken to suggest that in the present sketch he was depicting


himself as the ichthyosaur, to whom the president gives the otherwise superfluous epithet of "Longirostrus." But then his opponent would either be Conybeare—which is clearly improbable—or if the plesiosaur was Lyell, then Lyell would be shown in an attitude of defeat—which is equally improbable. I am therefore inclined to prefer the first interpretation I have suggested, without claiming that it is more than a conjecture.

But whatever persons are represented by the various animals, they are curiously mixed in geological age. In the terminology of the time, the ichthyosaur and plesiosaur were Secondary, the crocodile, lion, and elephant Tertiary, and the human being Recent. Thus the scene cannot be attributed imaginatively to any single geological epoch. This confusion of epochs is unlikely to be accidental, for most geologists felt strongly that fossils were above all a record of the history of progressively higher forms of life on earth. The mixture would be understandable, however, if it were De la Beche's comment on Lyell's idiosyncratic denial that successive epochs had been characterized by any such distinctive sequence of faunas.

In any case it is obvious that the sketch as a whole is incomplete, and perhaps the most plausible conclusion is that De la Beche became dissatisfied with it and abandoned it before he had drawn enough, and written in enough of the dialogue, to enable us fully to understand the scene. A temporary mental block is suggested also by the fact that on the page facing this sketch De la Beche drew what is little more than a doodle (Fig. 11). Yet even this is worth analysis. Here a book appears again, and I infer once more that this was the Principles. But now it has left Lyell's hand and is being borne freely upwards, wafted by a pair of angel's wings and buoyed up by a balloon—at this date perhaps still a hot air balloon! This may be a comment on the lack of solid, empirical, down-to-earth foundations in Lyell's work; its proper place, in De la Beche's view, is up in the realms of fantasy.

After this pause (assuming he did draw the sketches in the order in which they appear), De la Beche made a second attempt to characterize Lyellian theory in terms of animal representation (Fig. 12). This time he was more successful: the last sketch is unmistakably the precursor of the lithograph of
Figure 12. “Return of Ichthyosauri &c.” “‘Principles &c.’” “You will at once perceive that the [skull] before us belonged [to] some of the lower order of animals, the teeth are very insignificant, the power of the jaws trifling, and altogether it seems wonderful how the creature could have procured food.”

“Awful Changes,” and the sketch itself was left unfinished, evidently because he completed the drawing on stone.

Up to this point, as I have admitted repeatedly, my identification of Lyell and Lyellian theory in the sketches has been based on inference from what we know from other sources about Lyell’s work and De la Beche’s attitude to it. But in this last sketch the theme is at last stated unambiguously: for after the title “Return of Ichthyosauri &c” De la Beche wrote “Principles &c.” Taken together with the internal consistency of the iconography and the external
evidence (from the rest of the notebook) that the sketches were drawn some
time after the first volume of the *Principles* was published, I consider that
there is a strong case for believing that the whole series was indeed an anti-Lyellian
polemic.

The reference to the *Principles* in the caption of the last sketch was not
repeated on the lithographed versions which De la Beche distributed. But
the discovery of this vital clue forces us to reassess the possible meaning of
the final caricature. I have already mentioned that it has seemed hitherto
to be a simple humorous comment on Buckland’s lectures, with the tables
turned and the Jurassic reptiles in command. But the discovery of its context
as the culmination of a series of sketches that seem to comment on Lyell’s
steady-state system of geology forces us to reconsider the identification of
the professorial lecturer.

If I am right in suggesting that Lyell had been a central figure in all the
earlier sketches, it would be improbable that Buckland should take over that
position in the final version. It is surely more likely that Lyell himself was
the lecturer. Certainly he had an appropriate position by 1831 (if the later
date for the sketches is adopted), Professor of Geology at King’s College in
London. In other words, the “Mr. Longirostrus Ichthyosaurus” at the Geological
Society (in the previous sketch) could have been transmuted into the “Professor
Ichthyosaurus” at King’s College in the final caricature—both figures represent-
ing Lyell himself. If on the other hand the caricature dates from 1830, before
Lyell’s appointment, the lecturer could still represent Lyell, as a fanciful successor
(or usurper?) of Buckland at Oxford. De la Beche’s choice of a human skull
for the lecturer’s object of attention, and the caricature’s provisional title “Return
of Ichthyosauri,” now force us to take the future reference of the drawing
more seriously, as a comment on Lyell’s work.

An important section of the first volume of the *Principles* was devoted to
an attempt to undermine the validity not only of the evidence for directional
change in the inorganic environment during the history of the earth, but
also that for a similarly directional or progressionist history of life.40 In other
words, as mentioned earlier, Lyell extended his steady-state theory even to
the fossil record. To most geologists this seemed to be particularly implausible.
It involved a complete rejection of the clear trend of palaeontological discovery,
which seemed to be uncovering a broadly progressive history from the simpler
or lower organisms, through the successive appearance of more complex or
higher forms of life, to the geologically recent creation of man himself. It
is well known that Lyell circumvented this evidence by attributing it to differential
preservation, and that he asserted that even the higher forms of life (e.g.,
mammals) had existed at the remotest known periods.

In this Lyellian setting the text of De la Beche’s ichthyosauran lecturer takes
on new meaning, as a comment not on Buckland’s methods of functional
analysis of fossils (which were indeed followed by Lyell), but rather on Lyell’s
denial of any trend from lower to higher in the history of organic life. In

40 *Principles*, Vol. I, Chs. 6–8 and Ch. 9 respectively.
the final version of the caricature (copied with only trivial changes from the last sketch), this text reads as follows:

“You will at once perceive,” continued Professor Ichthyosaurus, “that the [human] skull before us belonged to some of the lower order of animals, the teeth are very insignificant, the power of the jaws trifling, and altogether it seems wonderful how the creature could have procured food.”

In other words, in Lyell’s interpretation a human being is no “higher” than a reptile; indeed, its functional anatomy might even make it seem “lower.” This refers to Lyell’s argument, based on a rigid dualism between the physical and the moral realms, that the recent appearance of man was no evidence of organic progress, on the grounds that man’s superiority was exclusively moral, and that physically he was no higher than any other mammal.41

But Lyell’s idiosyncratic interpretation of the fossil record had deeper implications that linked it indissolubly to the rest of his steady-state system. Not only had there been no overall progression in organic life in the past; there would be none in the future either. Lyell tried to guard against being interpreted as postulating a strictly cyclical theory of indefinite repetition on the Greek model, but it is clear that many of his contemporaries did regard his theory as being for all practical purposes one of cyclical repetition.42 Indeed he laid himself open to this interpretation. For example, having told Mantell his “receipt” for producing organisms of diverse climatic habits more or less to order at any latitude, he explicitly applied this to the future as well as the past. Mantell had discovered the fossil terrestrial reptile Iguanodon in Sussex, and Lyell told him that “All these changes are to happen in future again, and iguanodons and their congener must as assuredly live again in the latitude of Cuckfield as they have done so.” Likewise in the published Principles Lyell wrote: “Then might those genera of animals return, of which the memorials are preserved in the ancient rocks of our continents. The huge iguanodon might reappear in the woods, and the ichthyosaur in the sea, while the pterodactyle might flit again through umbrageous groves of tree-ferns.”43 Lyell may not have believed that organisms would ever reappear as precisely identical species after their earlier embodiments had become extinct. But his concept of new species being “created” in ecologically and adaptively appropriate space/time locations, combined with his geological concept of a continual flux at the earth’s surface which was repeatedly producing virtually identical environments, led him inexorably to a view that very similar species must have been produced repeatedly in the past and would continue to be produced indefinitely into the future.

41 Ibid., pp. 162–164.
The future reference of De la Beche's final caricature therefore needs to be taken as a serious comment on this aspect of Lyell's system. The title of the drawing, "Awful Changes," refers to a repeated line in Byron's The Dream (1816): the dreamer moves forward in time from one visionary episode to the next, introducing each successive vision with the words "A change came o'er the spirit of my dream." In such a manner, De la Beche implies ironically, Lyell the visionary dreamer might conceive such a scene as he has drawn, from the far distant future history of the earth.44 The subtitle of the caricature, "Man found only in a fossil state—Reappearance of Ichthyosauri," refers even more clearly to this supposed future state of the earth.

The centrality of Lyell's steady-state theories as a target for De la Beche's criticism will be no surprise to those Lyell scholars who take seriously the many critical published reviews and unpublished comments on the Principles. I have argued earlier in Isis that the whole strategy of the three-volume work was dominated by this steady-state component; and these caricatures give further support to the view that it seemed equally important to Lyell's critics.45 More recently it has been suggested that the steady-state component was extrinsic to Lyell's original research program: that his reason for adopting a theory so far out of line with current geological thinking lay in his fear of the evolutionary implications of progressionist theory for the place of man in nature, and that he adopted a steady-state theory as a defense against these implications only after reading Lamarck in 1827.46 This interpretation is not, however, incompatible with my own; on the contrary, the urgency of Lyell's putative fear of Lamarck's theory may be reflected in the thoroughness with which he developed his geology into a watertight steady-state system that would serve to defend the uniqueness of man. In any case, there is no doubt that the steady-state component of Lyell's uniformitarianism was a conspicuous target for criticism by almost all of his contemporaries, even by those who, like his friend George Poulett Scrope, most fully approved of his emphasis on the adequacy of actual causes within a vastly extended time scale.47

I therefore conclude that De la Beche's caricature of "Awful Changes," which

44De la Beche's irony may extend further, applying the final doom of Byron's "Wanderer" ("To end . . . in misery") to Lyell's overambitious quest for the final secrets of the earth:

"... with the stars
And the quick Spirit of the Universe
He held his dialogues; and they did teach
To him the magic of their mysteries;
To him the book of Night was open'd wide,
And voices from the deep abyss reveal'd
A marvel and a secret—Be it so." (The Dream, viii).

45See nn. 4 and 29.
is superficially so trivial in meaning, has a much more weighty significance in the light of the series of sketches of which it was the final product. It serves to emphasize that Lyell's geology by no means swept the English geological community off its feet (despite the fears expressed in De la Beche's third sketch); that criticism of it was by no means confined to scientific or theological conservatives or motivated by their prejudices; and that the steady-state component of Lyell's uniformitarianism seemed so implausible that the persuasive impact of his use of actualistic reasoning must also have been dulled.

In the light of this example, I suggest that historians of science who encounter caricatures by other scientific figures of the past, whether published at the time or not, would do well to study them carefully for their possible substantive meaning, before dismissing them light-heartedly (or with academic embarrassment) as materials unworthy of serious historical attention.

De la Beche's use of the medium of caricature illuminates not only the substantive content of a scientific argument, but also—perhaps less controversially—its social context. It emphasizes the close parallel between the social worlds of geology and politics at this period: De la Beche's drawings, like Gillray's, reflect the rivalry, polarization, and partisanship of contemporary debate. His sketchbook shows that he himself felt no restrictive boundary between the scientific and the political as fields of caricature, even though the avowedly nonpolitical norms of the Geological Society may have inhibited him from circulating his political drawings as freely as his geological sketches.

Granted, however, the social circumstances of the caricature I have analyzed, the way in which De la Beche conceived his final design still remains a separate question. I suggest that his sequence of preliminary drawings deserves attention for what it reveals about the mode of thinking of a man who in his publications appears as a prototypical sober, rational scientist. If my interpretation of the sketches is even approximately correct, it must be clear that the sequence displays all the dreamlike qualities of genuine free-associative thinking. It shows the characteristic fluid transmutation of images and ideas from one sketch to the next (e.g., spectacles, angel or fairy wings) and the uninhibited use of metaphors, puns, and double meanings (e.g., seeing, coloring, cooking, viewpoints, balance of power, hot air).

But De la Beche was not one person when he drew such scientifically meaningful caricatures and a different person when he went out into the Devonshire countryside to study geology. He was a single human being. If we are to understand more fully the nature of scientific thinking, we shall surely need to take more seriously the mental levels on which such free-associative thinking occurs. But if we are also to avoid writing spurious "psychohistory," it is equally clear that we shall need to tie down such analyses as closely as possible to interpretable evidence. I do not claim that my interpretation of these sketches is likely to be correct in every detail. But I do believe that, like any other suggested reading of documentary material, it is at least testable and improvable by clear criteria based on its coherence with other sources of evidence.