

Higher Pantheism in a Nutshell' (1880), the division between language and nature, self and other, can be dissolved by transcendent vision: 'the shadows that sundered them' can be put to 'flight'. But the speaker in 'A Nympholept', sorely tempted to take comfort in such myths, as Swinburne himself still is, cannot quite bring it off. 'Nought is all' delivers a parting comment on the figures of Apollo and Pan, which, without a basis in 'natural fact', can testify only to the poet's desire to believe in what his reason cannot allow: the 'dream' of a 'god' without 'Gods', of a light beyond the shadow of doubt.

IN J. B. BULLEN, ED., THE
SUN IS GOD (OXFORD:
 CLARENDON (OUP), 1989).

pp. 159-180.

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'The Death of the Sun': Victorian Solar Physics and Solar Myth

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MANY Victorians, including Darwin himself, were disturbed by the apparent contradiction between the 'progressive' implications of evolutionary theory and the emphasis in the physics of Helmholtz and Thomson on the ageing of the sun, which would eventually make the world too cold for life.¹ Physics, mythography, and the ordinary fear of death converged in late nineteenth-century imaginations. Such condensations form most readily at a point of contradiction. In this essay I shall examine some of the attempts made to moralize the conclusions and bring under control the anxieties generated by early solar physics. The contradictions between evolutionary ideas of sustained development and physicists' theories of the dissipation of energy, as well as the more specific debate between them concerning the age of the earth, gave urgent propinquity in Victorian thinking to apparently disassociated ideas. This activity is first particularly notable in the 1870s. John Tyndall, in 'The Scientific Use of the Imagination' (1870), connects 'Natural Evolution' with the sun as the source of all consequent energy:²

For what are the core and essence of this hypothesis? Strip it naked and you stand face to face with the notion that not alone the more ignoble forms of the horse and lion, not alone the exquisite and wonderful

¹ Darwin concludes *The Origin of Species* by emphasizing the stability of cosmic conditions equally with the paradoxical production of ever higher and more various forms from adversity: 'Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is a grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved'. The reference to the creator is not in the first or some later editions. I quote from Charles Darwin, *The Origin of Species* (London, 1872), 429.

² John Tyndall, 'The Scientific Use of the Imagination', in *Uses and Limits of the Imagination in Science* (London, 1870), 47.

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mechanism of the human body, but that the human mind itself—emotion, intellect, will, and all their phenomena—were once latent in a fiery cloud. . . . But the hypothesis would probably go even further than this. Many who hold it would probably assent to the position that at the present moment all our philosophy, all our poetry, all our science, and all our art—Plato, Shakespeare, Newton, and Raphael—are potential in the fires of the sun. We long to learn something of our origin. If the Evolution hypothesis be correct, even this unsatisfied yearning must have come to us across the ages which separate the unconscious primeval mist from the consciousness of to-day.

In 1876 Darwin wrote in the *Autobiography* he prepared for his family of his dismay at the view now held by most physicists, namely that the sun with all the planets will in time grow too cold for life:³

Believing as I do that man in the distant future will be a far more perfect creature than he now is, it is an intolerable thought that he and all other sentient beings are doomed to complete annihilation after such long-continued slow progress. To those who fully admit the immortality of the human soul, the destruction of our world will not appear so dreadful.

But Darwin did not count himself among such religious believers.

In this argument I shall conclude by considering speculatively some of the reasons for the popularity of Darwin's last published work, *The Formation of Vegetable Mould through the Action of Worms, With Observations on their Habits* (1881): 'This is a subject of but small importance; and I know not whether it will interest any readers, but it has interested me,' Darwin wrote shortly before its publication.⁴ Yet between November 1881 and February 1884, 8,500 copies were sold and it went on outselling all his other works. What were the intellectual and emotional needs which contributed to its enthusiastic reception? The processes of interpretation in a culture are the results of multiple needs and anxieties—and so, we may agree at the outset, is the later process of reinterpretation and pattern-seeing in which I am here engaged as well. I shall return to this problem of methodology and insight later in my argument: suffice it to say here that we are not exempt from the instability of interpretation, nor from its blindness to its own sources.⁵ Let us

³ *Autobiographies of Charles Darwin and Thomas Henry Huxley*, ed. G. de Beer (London, 1974), 153–4.

⁴ *Charles Darwin: His Life Told in an Autobiographical Chapter and in a Selected Series of his Published Letters*, ed. Francis Darwin (London, 1892), 52.

⁵ For discussion of related issues, see Paul de Man, *Blindness and Insight: Essays in the Rhetoric of Contemporary Criticism* (New York, 1971).

first look in more detail at the specific controversy between the geologists and the physicists which made physical theory a talking-point in the 1860s and 70s.

During the 1860s the findings of William Thomson, later Lord Kelvin, and of Charles Darwin came directly into conflict, though this was only the most public phase of disagreements between geologists and physicists over the preceding thirty years. The major argument was about the age of the earth and the age of the sun. Darwin and Lyell's theories demanded an immense prolongation of the age of the earth in order for evolutionary process to have taken place according to the mechanism (natural selection) and in the manner (uniformitarianism) that they argued. If Thomson's ageing of the sun according to his physical calculations of the rate of dissipation of energy from the sun's source were correct, there could not have been sufficient time for Darwinian evolutionary processes to have taken place. Thomson believed the sun to be cooling without renewal of its energy. In his article in *Macmillan's Magazine* on 'The Age of the Sun's Heat', which made his ideas available to a wide public, Thomson particularly attacked Darwin's calculations of the time necessary for the geological 'denudation of the Weald'.⁶

We may therefore consider it is rendered highly probable that the sun's specific heat is more than ten times, and less than 10,000 times, that of liquid water. From this it would follow with certainty that this temperature sinks 100 per cent in some time from 700 years to 700,000 years.

What then are we to think of such geological estimates as 300,000,000 years for 'the denudation of the Weald'? Whether it is more probable that the physical conditions of the sun's matter differ 1,000 times more than dynamics compel us to suppose they differ from those of matter in our laboratories; or that a stormy sea, with possible channel tides of extreme violence, should encroach on a chalk cliff 1,000 times more rapidly than Mr. Darwin's estimate of one inch per century? . . . It seems, therefore, on the whole most probable that the sun has not illuminated the earth for 100,000,000 years and almost certain that he has not done so for 500,000,000 years.

The sun was thought to have a store of heat which it gradually gives out. How long can this store last? How long has it already lasted?

⁶ William Thomson, 'On the Age of the Sun's Heat', *Macmillan's Magazine* 5 (Mar. 1862), 388–93, 391–2, 393. For a full discussion of Thomson's career and views, see Joe D. Burchfield, *Lord Kelvin and the Age of the Earth* (London, 1975).

Helmholtz suggested that the source of sun's heat was not combustion (of oxygen and hydrogen) but contraction. In 'Observations on the Sun's Store of Force' (1854) Helmholtz wrote:

If the mass of the sun had been once diffused in cosmical space, and had then been condensed—that is, had fallen together under the influence of celestial gravity—if then the resultant motion had been destroyed by friction and impact, with the production of heat, the new world produced by such condensation must have acquired a store of heat not only of considerable, but even of colossal, magnitude . . .

He is here considering the problem of an age for the sun greater than known resources could account for:

. . . We may, therefore, assume with great probability that the sun will still continue in its condensation, even if it only attained the density of the earth—though it will probably become far denser in the interior owing to the enormous pressure—this would develop fresh quantities of heat, which would be sufficient to maintain for an additional 17,000,000 of years the same intensity of sunshine as that which is now the source of all terrestrial life.

He offers reassurance: combustion 'would be sufficient to keep up the radiation of heat from the sun for 3021 years. That, it is true, is a long time, but even profane history teaches us that the sun has lighted and warmed us for 3000 years, and geology puts it beyond doubt that this period must be extended to millions of years.'⁷

Helmholtz calls on evidence from geology as his *starting-point* in the search for an extended source of the sun's heat. Thomson, on the other hand, prefers swingeingly to cut back the allowance of time demanded by geology and to use this cutback incidentally to undermine evolutionary theory. In his article 'On a Universal Tendency in Nature to the Dissipation of Mechanical Energy' (1852), Thomson concludes that there is 'at present in the material world a universal tendency to the dissipation of mechanical energy', and that 'most probably the sun was sensibly hotter a million years ago than he is now'.⁸ Hence, he argues, geological speculations assuming somewhat greater extremes of heat, more violent storms

⁷ Collected in Hermann Helmholtz, *Popular Scientific Lectures*, trans. E. Atkinson (London, 1872), ii. 312–25, and extracted in A. J. Meadows (ed.), *Early Solar Physics* (Oxford, 1966), 99–102.

⁸ William Thomson, 'On a Universal Tendency in Nature to the Dissipation of Mechanical Energy', *Philosophical Magazine*, 4 (1852), 304–6, 306.

and floods, more luxuriant vegetation, and hardier and coarse-grained plants and animals in remote antiquity are more probable than those of the extreme quietist or 'uniformitarian' school.

Darwin was disturbed by Thomson's attack on his geologically-based time-scale. In the second edition of *The Origin* he responded to the anonymous review in *Saturday Review* which questioned his calculation of denudation of the Weald—that same matter taken up by Thomson in his 1862 *Macmillan's* article.⁹ Darwin wrote repeatedly about his trouble with Thomson's views: 'Thomson's views on the recent age of the world have been for some time one of my sorest troubles'.¹⁰

In *Myths and Marvels of Astronomy* the astronomer Richard Proctor opens his chapter on 'Suns in Flames' thus:¹¹

In November 1876 news arrived of a catastrophe, the effects of which must in all probability have been disastrous, not to a district, or a country, or a continent, or even a world, but to a whole system of worlds. The catastrophe happened many years ago—probably at least a hundred—yet the messenger who brought the news had not been idle on his way, but has sped along at a rate which would suffice to circle the earth eight times in the course of a second. That messenger has had, however, to traverse millions of millions of miles, and only reached our earth November 1876. The news he brought was that a sun like ours was in conflagration.

After an account of the present conflagration and of past observations Proctor ends the chapter on an upbeat, assuring his readers that our sun is likely to persist yet awhile:

. . . we may fairly infer a very high degree of probability in favour of the belief that, for many ages still to come, the sun will continue steadily to discharge his duties as fire, light, and life of the solar system.

But the doubt has been raised and was raised repeatedly in this period.

Max Müller was the most influential of Victorian mythographers;

⁹ The question was first raised by John Phillips in *Life on Earth: Its Origins and Succession* (London, 1860). James Croll, the author of *On Geological Time* (London, 1868) and *Climate and Time* (London, 1875), supported Darwin.

¹⁰ Alfred Russell Wallace: *Letters and Reminiscences*, ed. J. Marchant (London, 1916), i. 242.

¹¹ R. A. Proctor, *Myths and Marvels of Astronomy*, new ed. (London, 1896), 160, 190. Proctor, one of the most productive of scientific journalists and a respected astronomer in his own right, published a number of volumes which took up the ethical and imaginative problems raised by scientific knowledge, for example, *Our Place Among Infinities* (London, 1875).

his work on language and on myth signification dominated interpretation before Frazer and Freud. In *Lectures on the Origin and Growth of Religion* (1878) Müller cites the work of John Tyndall on radiation as a way of claiming a specific territory for his own researches on solar myth. He emphasizes the centrality to scientific enquiry of recent work on the sun:¹²

Not even the most recent scientific discoveries described in Tyndall's genuine eloquence, which teach us how we live, and move, and have our being in the sun, how we burn it, how we breathe it, how we feed on it—give us any idea of what this source of light and life, this silent traveller, this majestic ruler, this departing friend or dying hero, in his daily or yearly course, was to the awakening consciousness of mankind. People wonder why so much of the old mythology, the daily talk, of the Aryans, was solar:—what else could it have been?

Müller here is almost certainly referring to Tyndall's *Six Lectures on Light* (1873), which gives an account of contemporary solar physics. Müller's usual shifty eloquence claims more than it states: the sun is quasi-scientifically equated with godhead by that rolling in of the biblical phrase 'we live, and move, and have our being' to describe our relationship to the sun. Müller's well-known inability to imagine other topics of conversation among early peoples apart from solar myth is neatly mocked by Andrew Lang: 'Savages, like civilised people, are much more interested in making love, making war, making fun, and providing dinner, than in the phenomena of nature.'¹³ But Müller himself had worried long about the obsessional singleness of his topic: 'Is everything the Dawn? Is everything the Sun? This question I had asked myself many times before it was addressed to me by others . . . but I am bound to say that my own researches lead me again and again to the dawn and the sun as the chief burden of the myths of the Aryan race.'¹⁴

Without, I hope, falling into Müllerian monomania, I want to suggest that conversation among articulate Victorians about solar physics and the prospects for life on earth in a cooling solar system worked, as half-formulated anxieties will, to generate much imaginative thought and production and that the power of Müller's work and its enthusiastic reception draws on displaced anxieties:

¹² Max Müller, *Lectures on the Origin and Growth of Religion* (London, 1878), 207–8.

¹³ Andrew Lang, Introduction to *Grimm's Household Tales*, ed. M. Hunt (London, 1884), vol. 1, p. xxiv.

¹⁴ Max Müller, *Lectures on the Science of Language*, second series (London, 1864), 520.

we can see some of the very varied literary responses in works such as *Middlemarch*, *Two on a Tower*, *Tess of the D'Urbervilles*, *After London*, and *The Time Machine*. In Müller's system all linguistic and mythological signification leads back towards the sun and the phenomena of weather, and to the fear of non-recurrence. He claimed that primitive peoples constantly feared that the sun would not rise again. In her *Darwinism in Morals* (1872), Frances Power Cobbe, speaking of the presence of subconscious thought, recounts a terrifying dream which goes deep into the current imagery of her culture: the loss of faith in *recurrence*, the loss of any assurance of 'eternal return', the recognition that oblivion is not only the matter of the past but of the future.¹⁵

I dreamed that I was standing on a certain broad grassy space in the park of my old home. It was totally dark, but I was sure that I was in the midst of an immense crowd. We were all gazing upward into the murky sky and a sense of some fearful calamity was over us, so that no one spoke aloud. Suddenly overhead appeared through a rift in the black heavens, a branch of stars which I recognised as the belt and sword of Orion. Then went forth a cry of despair from all our hearts! We knew, though no one said, that these stars proved it was not a cloud or mist which, as we had somehow believed, was causing the darkness. No; the air was clear; it was high noon, and *the sun had not risen!* That was the tremendous reason why we beheld the skies. The sun would never rise again!

Max Müller's solar mythology was so powerful because it gave expression to covert dreads then current: it cast itself as past enquiry but expressed current fears.¹⁶

To take first a later example of powerful counter-interpretation in which both analyst and analysand have recourse to the discourse of solar myth: in Freud's 'Notes on a Case of Paranoia' (1911) Schreber dreads the end of the world as a result of a permanent cooling of the sun, 'a process of glaciation owing to the withdrawal of the sun'. Schreber's 'delusional privilege' will be the power to look directly at the sun, which in Freud's analysis, overriding the feminine gender of *die Sonne*, signifies the father.

The eagle, then, who makes his young look into the sun and requires of

¹⁵ *Darwinism in Morals and Other Essays* (London, 1872), 343.

¹⁶ Compare my discussion of this passage in a different context in 'Origins and Oblivion in Victorian Narrative', in *Sex, Politics and Science in the Nineteenth-Century Novel: Selected Papers from the English Institute*, ed. R. B. Yeazell (Baltimore and London, 1986), 78–80. The passage represents the genesis of the present essay.

them that they shall not be dazzled by its light, is behaving as though he were himself a descendent of the sun and were submitting his children to a test of their ancestry. And when Schreber boasts that he can look into the sun unscathed and undazzled, he has rediscovered the mythological method of expressing his filial relation to the sun, and has confirmed us once again in our view that the sun is a symbol of the father.

Freud reinterprets what he calls this 'solar myth' into parental myth:

Schreber makes it easy for us to interpret this solar myth of his. He identifies the sun directly with God, sometimes with the lower God (Ahriman), and sometimes with the upper . . .

The sun, therefore, is nothing but another sublimated symbol for the father; and in pointing this out I must disclaim all responsibility for the monotony of the solutions provided by psychoanalysis. In this instance symbolism overrides grammatical gender—at least so far as German goes, for in most other languages the sun is masculine. Its counterpart in this picture of the two parents is 'Mother Earth' as she is generally called.

Schreber's myth-economy is produced out of elements generated from late nineteenth-century anxieties—recast into a personal form.¹⁷

We might take as rough end-dates for the constellating activity I am here examining the publication in 1847 of Helmholtz's essay *Über die Erhaltung der Kraft* and the conclusion to Frazer's *The Golden Bough* (1915). Frazer's first volume appeared in 1890, the twelfth and last in 1915, well after the discovery of radioactivity but with its imaginative space unaffected by the realization of the implications of this new form of energy. In his final paragraphs Frazer looks forward ecstatically to the future sweep of science, only to halt in the realization of cosmic ending, before coming to rest in that comforting fabulatory dissolution of Prospero's great speech:¹⁸

The dreams of magic may one day be the waking realities of science. But a dark shadow lies athwart the far end of this fair prospect. For however vast the increase of knowledge and of power which the future may have in store for man, he can scarcely hope to stay the sweep of those great

¹⁷ Sigmund Freud, 'Notes on a Case of Paranoia', in *The Pelican Freud Library* (Harmondsworth, 1979), ix, 190, 207, and 222. Daniel Schreber's memoir of his illness was published as *Denkwürdigkeiten eines Nervenkranken* (Leipzig, 1903).

¹⁸ James Frazer, *Balder the Beautiful* (1913) in *The Golden Bough* (London, 1907–15), xi, 306–7.

forces which seem to be making silently but relentlessly for the destruction of all this starry universe in which our earth swims as a speck or mote. In the ages to come man may be able to predict, perhaps even to control, the wayward courses of the winds and clouds, but hardly will his puny hands have strength to speed afresh our slackening planet in its orbit or rekindle the dying fire of the sun. Yet the philosopher who trembles at the idea of such distant catastrophes may console himself by reflecting that these gloomy apprehensions, like the earth and the sun themselves, are only part of that unsubstantial world which thought has conjured up out of the void, and that the phantoms which the subtle enchantress has evoked today she may ban tomorrow. They too, like so much that to common eyes seems solid, may melt into air, into thin air.

Everything, it turns out, is mind: and this mentalism is the new escape from death.

Between these points in time lies the work of Thomson, Darwin, and Müller—alongside Frazer lies Freud. It is not my purpose in this essay to argue simply for points of agreement and disagreement among these theorists in several fields. Rather I shall demonstrate how an imaginative idea—the death of the sun or 'Balder Dead' to quote the title of one of Matthew Arnold's poems on the Norse myth—increased in intensity and range of meaning once it was accorded scientific status and was generating scientific controversy.¹⁹

The reception of ideas outside the immediate circle of co-workers is not systematic. This realization may be a nuisance for those of us raised in scholarly habits of mind but its acceptance is a precondition for any worthwhile analysis of the movement of ideas across fields within a historical culture. We must not look for intact ideas being transferred from setting to setting: ideas rarely remain intact when they change context. Instead, we need to study how ideas are reimagined in response to other needs and to the thickness—in Geertz's term—of enquiry and debate elsewhere. We need also to be aware of the inertia of old thoughts to which new ideas can be accommodated. Deepest habits of mind often leave only slight traces on the surface of writing. We need to look as much at movements across from sentence to sentence as at what is

¹⁹ Carlyle gave a synopsis of the Balder legend in *Heroes and Hero-worship* (London, 1841)—the legend from the *Edda* of the death of the sun-god leading to *Ragnarök*, the twilight of the gods, was very like that explored by William Morris in 'Sigurd the Volsung', and by Richard Wagner in *The Ring*. Arnold's poem was published in 1853, and is a Christianizing of the myth in which Balder is identified with Christ. The poem ends with a vision of a new earth 'More fresh, more verdant than the last'.

contained within any single sentence, and to watch how substantive theories become metaphors in another field. Nor should we forget how far our acts of interpretation are powered and bound by shared needs in our own culture.²⁰ To most intelligent Victorian readers physics could become intelligible only in a popular conceptual form. Moreover, the absence of a formal scientific education meant that scientific ideas tended to be received by non-scientific Victorians in the mode of dreads and dreams as well as intellectual conundrums. The result is that ideas of 'force' and 'energy', arguments concerning the age of the earth and the cooling of the sun, passed rapidly into an uncontrolled and mythologized form. In addition, prominent Victorian scientists saw it as part of their function to impart their ideas to untutored readers in an accessible form and so wrote not only for technical but for general cultural journals. Some Victorian scientists, for example, Tyndall, Proctor, and W. K. Clifford specialized in the teasing out of theorems into imaginatively illuminating ideas for those to whom the succinct elegance of mathematical formulation is a hermetic tongue.

The world as argued by geological and evolutionary theory (specifically that of Hutton, Lyell, and Darwin) must have begun very much longer ago than biblical Mosaic accounts had suggested. But the death of the sun, according to Thomsonian physics, was not put farther off; on the contrary, it was rendered historically foreseeable. Instead of the timeless apocalypse of Revelations, physicists were busy computing the number of years left for life on earth—they ranged from twenty-one years more to several million. In his 1862 article in *Macmillan's Magazine* on 'The Age of the Sun's Heat', Thomson puts it thus: 'As for the future, we may say, with equal certainty, that inhabitants of the earth cannot continue

²⁰ Jacques Derrida in 'White Mythology: Metaphor in the Text of Philosophy' in *Margins of Philosophy* (Brighton, 1982), p. 213, argues that 'any expression of an abstract idea can only be an analogy. What is metaphysics? A white mythology which assembles and reflects Western culture: the white man takes his own mythology (that is, Indo-European mythology), his *logos*—that is the mythos of his idiom, for the universal form of that which it is still his inescapable desire to call Reason'. This idea is discussed further by Steve Connor, below, ch. 8. A remarkable example of the simultaneity of mythic and scientific thought in metaphysics is Michel Serres' conclusion to his essay 'The Origin of Language: Biology, Information Theory, and Thermodynamics', where he says: 'Nothing distinguishes me ontologically from a crystal, a plant, an animal, or the order of the world; we are drifting together towards the noise and the black depths of the universe, and our diverse systemic complexions are slowing up the entropic stream toward the solar origin, itself adrift'. (J. V. Harari and D. F. Bell (eds.), *Hermes Literature, Science, Philosophy* (Baltimore and London, 1982), 83.)

to enjoy the light and heat essential to their life, for many million years longer, unless sources now unknown to us are prepared in the great storehouse of creation' (393). The number, 'several million years more', is reassuring, but the curtailing form of the sentence, 'cannot continue to enjoy the light and heat essential to their life', is alarming.

The death of the sun was far off, true enough, but, in the time of the imagination, a million or two of units cannot stave off immediacy. The *event* is more imaginable than its distance. People do not spend all day worrying about the extinction of the universe; they have other matters on hand. That is true even for us, in our more immediate nuclear crisis (which, in its turn, has raised into my consciousness a hitherto not much discussed trouble in Victorian imagination). Such thoughts tweak the memory and disturb the serene continuity of a future beyond the self which, for the Victorians at least, had seemed to be newly vouched for by the continuous descent and proliferation of evolutionary history. Such thoughts may fasten themselves about available myths: cosmic deaths prefigure as well as post-date our own. Proctor, in his article on 'The Past and Future of our Earth', seeks to reassure his readers of the continuity of the future by an appeal to the concepts of absolute time and space.²¹

Thereafter, during ages infinite to our conceptions, the great central orb will be (as now, though in another sense) the life of the solar system. We may even look onwards to still more distant changes, seeing that the solar system is itself moving on an orbit, though the centre round which it travels is so distant that as yet it remains unknown. We see in imagination change after change, cycle after cycle, till

Drawn on paths of never-ending duty,
The worlds—eternity begun—
Rest, absorbed in ever glorious beauty.
On the Heart of the All-Central Sun.

But in reality it is only because our conceptions are finite that we thus look forward to an end even as we seek to trace events back to a beginning. The notion is inconceivable to us that absolutely endless series of changes may take place in the future and have taken place in the past; equally inconceivable is the notion that series on series of material combinations, passing onwards to ever *higher* orders,—from planets to suns, from suns to

²¹ R. A. Proctor, 'The Past and Future of Our Earth', *Contemporary Review*, 25 (1974), 74–99, 91.

sun-systems, from sun-systems to galaxies, from galaxies to systems of galaxies, from these to higher and higher orders, absolutely without end,—may surround us on every hand.

In the argument of this passage, it is notable that Proctor moves into poetic allusion in order to blur the question of the collapse of the universe, which may thus be perceived poetically as the tranquillity of God. Note also how by the interposition of the word 'higher' he implies progress as well as progression:

It has been said that progression necessarily implies a beginning and an end; but this is not so where the progression relates to absolute space or time. No one can indeed doubt that progression in space is of its very nature limitless. But this is equally true, though not less inconceivable, of time. Progression implies only relative beginning and relative ending; but that there should be an absolute beginning or an absolute end is not merely inconceivable, like absolute eternity, but is inconsistent with the necessary conditions of the progression of time as presented to us by our conceptions.

In the same issue of the *Contemporary Review* James Hinton, in an article on 'The Religious Emotions', has resort to a mentalist argument to escape the universality of matter and force as characterizing the universe:²²

To science the world is no more mechanical than it is coloured, or warm: as colour is an idea derived from a mode of our Sensation, so also, fully as much, is force, or mechanical necessity.

Incongruities were manifest, then, between the new physics (with its insistence on increasing disorder in entropy and on the running down of the sun, already in a period of desuetude), and Darwinian theory (with its emphasis on development and upon increasing complexity as a means to sustained diversity of life). Such incongruities could provide a bolt-hole for determined optimists (it is all just a matter of description), but the awkwardness of fit, and even contradiction between them, also meant that they were readily trapped back into human reference and human problem. Huxley, in 'The Physical Basis of Life' (1868), uses the savages' fear of their sun darkening as an analogy for the modern fear of materialism. And later, in *Social Diseases and Worse Remedies* (1891),

²² James Hinton, 'Professor Tyndall and the Religious Emotions', *Contemporary Review*, 25 (1974), 93–9, 91.

he comes to see that the final threat is not the incongruity of evolutionary theory and physics but their congruity:²³

... it is an error to imagine that evolution signifies a constant tendency to increased perfection. That process undoubtedly involves a constant re-modelling of the organism in adaptation to new conditions; but it depends on the nature of those conditions whether the direction of the modifications effected shall be upward or downward. Retrogressive is as practicable as progressive metamorphosis. If what the physical philosophers tell us, that our globe has been in a state of fusion, and like the sun, is gradually cooling down, is true; then the time must come when evolution will mean adaption to an universal winter, and all forms of life will die out, except such low and simple organisms as the Diatom of the arctic and antarctic ice and the Protococcus of the red snow.

Mythography, linguistics, physics, and biology were all public subjects of debate in the 1860s and 1870s rather than being confined only to specialist journals. Thomson, as we have seen, published one of his major essays, 'On the Age of the Sun's Heat', in *Macmillan's Magazine* in March 1862. Huxley published in a wide variety of magazines. The mythographer Müller, the folklorist Lang, the anthropologist Tylor, and Whitney the language theorist, as well as the physical scientist George Darwin, carried on their quite savage debates about linguistics in relation to mythographic and anthropological methodology in *The Nineteenth Century* in the 1870s and weighed the differing claims of linguistic and ethnological methods. Darwin did not make contributions to generalist journals but *The Origin* and *The Descent of Man* were bestsellers. As a result there could be a free and rapid movement of ideas among specialists and in the general public. It is worth noticing, for example, that in the issue of the *Fortnightly Review* in 1873 in which Andrew Lang mounted his first attack on Müller's solar mythology, 'Mythology and Fairy Tales', there was also a review of Helmholtz's *Popular Lectures on Scientific Subjects* with an introduction by John Tyndall. The collection, the reviewer records, includes his essays 'On the Interaction of Natural Forces' and 'Conservation of Force'. These two essays the reviewer concludes: 'treat the subject with special reference to the practical euthanasia of force in mechanical work, and discuss the problem of perpetual motion in its widest

²³ T. H. Huxley, 'The Struggle for Existence in Human Society (1888)' in *Social Diseases and Worse Remedies* (London, 1891), quoted from *Collected Essays* (London, 1906), ix, 199.

bearing, on the future prospects of the mechanism of the universe'.²⁴

At their meeting in 1875 Hardy and Leslie Stephen talked, so Hardy tells us in his *Journal*, of 'theologies decayed and defunct, the origin of things, the constitution of matter, the unreality of time . . . and the staggering fascination of the new theory of vortex rings'.²⁵ George Eliot, in her journal, copies out passages from Clerk Maxwell's address to the British Association in which he advanced his theory of ring vortices. This theory added a third mode of movement to the current argument about time and catastrophism. First, Darwin's theories suggested development, expansion in variation, even progress. Second, Thomson's theories emphasized an ageing and cooling world which was inevitably proceeding towards the period when it would be too cold for life on earth. The sun expended but did not renew its energies. Clerk Maxwell's work on molecules, on the other hand, emphasized *unchangingness*, neither the outward and upward movement associated with evolutionary ideas, nor the downward motion of *Sonnenuntergang*, the final setting of the sun. 'If a whirling ring be once generated . . . it will go on forever . . . and could never be divided or destroyed', wrote Maxwell in 1870 in one of the passages George Eliot copied out. And in his essay on 'Molecules'²⁶ he made it clear that such a process could have nothing to do with evolution:

No theory of evolution can be formed to account for the similarity of molecules, for evolution necessarily implies continuous change, and the molecule is incapable of growth or decay, of generation or destruction.

He concludes that essay with a reassertion of the argument from design:

Natural causes, as we know, are at work, which tend to modify, if they do not at length destroy, all the arrangements and dimensions of the earth and the whole solar system. But though in the course of ages catastrophes have occurred and may yet occur in the heavens, though ancient systems

²⁴ Andrew Lang, 'Mythology and Fairy Tales', *Fortnightly Review*, NS 8 (1893), 618-31. Lang argues for a progressive and evolutionary account of myth with fetishism as a stage in all myth-making, rather than Müller's organization, which Lang sees as a theory of dissipation and degeneration. 'If this be so,' he said, 'the myths of the dawn and the sun, can no longer be considered *primary*.' The review of Helmholtz is printed in *Fortnightly Review*, NS 8 (1873), 664-5.

²⁵ Florence Hardy, *The Early Life of Thomas Hardy* (London, 1928), 139.

²⁶ James Clerk Maxwell, *Scientific Papers*, ed. W. D. Niven (Cambridge, 1890), ii. 377.

may be dissolved and new systems evolved out of their ruins, the molecules out of which these systems are built—the foundation stones of the material universe—remain unbroken and unworn.

They continue this day as they were created, perfect in number and measure and weight, and from the ineffaceable characters impressed on them we may learn that those aspirations after accuracy in measurement, truth in statement, and justice in action, which we reckon among our noblest attributes as men, are ours because they are essential constituents of the image of Him who in the beginning created, not only the heaven and the earth, but the materials of which heaven and earth consist.

The indivisibility of molecules has a mythic function. It becomes a way of sustaining the mind drifting towards dissolution with the cooling sun. The indivisible world is steadfast even when life-giving light dies out.

Nor did physicists read only physics. Maxwell offers a tongue-in-cheek solar mythological reading of *Middlemarch*. He reports to his friend Campbell, professor of Greek at St. Andrews, a meeting of the Philosophical Society, a revealing name for the principal Cambridge scientific society.²⁷

The Cambridge Philosophical Society have been entertained by Mr. Paley on Solar Myths, Odysseus as the Setting Sun, etc. Your Trachiniae is rather in that style, but I think *Middlemarch* is not a mere unconscious myth, as the *Odyssey* was to its author, but an elaborately conscious one, in which all the characters are intended to be astronomical or meteorological.

Rosamond is evidently the Dawn. By her fascinations she draws up into her embrace the rising sun, represented as the Healer from one point of view, and the Opener of Mysteries from another; his name, Lyd Gate, being compounded of two nouns, both of which signify something which opens, as the eye-lids of the morn, and the gates of day. But as the sun-god ascends, the same clouds which emblazon his rising, absorb all his beams, and put a stop to the early promise of enlightenment, so that he, the ascending sun, disappears from the heavens.

Dorothea, on the other hand, the goddess of gifts, represents the other half of the revolution. She is at first attracted by and united to the fading glories of the days that are no more, but after passing, as the title of the last book expressly tells us, 'from sunset to sunrise', we find her in union with the pioneer of the coming age, the editor . . .

There is no need to refer to Nicholas Bulstrode, who evidently represents the Mithraic mystery, or to the kindly family of Garth,

²⁷ Lewis Campbell and William Garnett, *The Life of James Clerk Maxwell, with a selection from his writings* (London, 1884), 295-6.

representing the work of nature under the rays of the sun, or to the various clergymen and doctors, who are all planets. The whole thing is, and is intended to be, a solar myth from beginning to end.

Note how well Maxwell picks up the Müllerian etymological insistence (lyd-gate) and the mixture of explanation and unexplanation 'they are all planets'. The analysis is not entirely facetious—there are evident allusions in *Middlemarch* to solar myth: Casaubon (rather too early) worrying about other men's solar deities, Will's sunny Apollonian locks:²⁸

Poor Mr. Casaubon himself was lost among small closets and winding stairs, and in an agitated dimness about the Cabeiri [fertility gods] or in an exposure of other mythologists' ill-considered parallels, easily lost sight of any purpose which had prompted him to these labours. With his taper stuck before him he forgot the absence of windows, and in bitter manuscript remarks on other men's notions about the solar deities, he had become indifferent to the sunlight.

The final book is called 'Sunset and Sunrise'. The sun does rise again. At sunrise Dorothea sees determinedly demythologized, though generalized, human beings—the emphasis is on the manifold, the complex, the extending, rather than the drawing all back upon a single source. Although *Middlemarch* respects the work of the solar mythologists, it preserves always a sense of the relative. No one explanation can encompass all the phenomena of the world. Just as Lydgate poses a question in physiology not quite in the form required by the waiting answer, so does Casaubon. His seemingly old-fashioned and anachronistic obsessions in myth theory were not 'scientific', but *Middlemarch* brings into doubt also the 'scientistic' claims of solar mythologists with their single explanatory system. Clerk Maxwell, with his usual brilliant immediacy, has picked up the hints concerning solar mythological controversy implicit in the book, and his jest concurs with *Middlemarch*'s own refusal of the overweening explanatory power that Müller and his followers claimed. This example also makes it clear that scientists and writers imbibed each other's materials: solar physics and solar myth were separate enquiries certainly, but beneath the surface they stirred some of the same troubles.

It was not until the turn of the century that new sources of energy for the sun were experimentally established, thereby resolving the

²⁸ *Middlemarch*, cabinet edition (Edinburgh and London, 1878–80), i. 303.

quarrel between geologists and physicists about the age of the earth. Curé and Laborde (*Sur la chaleur dégagée*) discovered that radium salts constantly release heat, thereby unveiling the unknown source of heat which Thomson had somewhat dismissively prophesied. By 1904 Rutherford was convinced that radioactivity overthrew Thomson's results. The imagery of darkness and the dying sun comically, and perhaps unawares, permeates Rutherford's account of the reception of his ideas at the Royal Institution:²⁹

I came into the room, which was half dark, and presently spotted Lord Kelvin in the audience and realized that I was in for trouble at the last part of the speech dealing with the age of the earth, where my views conflicted with his. To my relief, Kelvin fell fast asleep, but as I came to the important point, I saw the old bird sit up, open an eye and cock a baleful glance at me! Then a sudden inspiration came, and I said Lord Kelvin had limited the age of the earth, *provided no new source of heat was discovered*. That prophetic utterance refers to what we are now considering tonight, radium! Behold! The old boy beamed upon me.

Rutherford's speech ends:

The discovery of the radio-active elements, which in their disintegration liberate enormous amounts of energy, thus increases the possible limit of the duration of life on this planet, and allows the time claimed by the geologist and biologist for the process of evolution.

That is to take the story towards its end and to show another *Ragnarök* or *Götterdämmerung*, as the old Thomson, by now Lord Kelvin, beams on the theory which spells the end of his own—however much his prophetic role is flatteringly exaggerated by Rutherford. The discovery of radioactivity relieved anxieties about the imminent death of the sun—but the happy end of that story was to prove the start of another and more terrifying one with which we are all-too familiar. Thermodynamics both distances Huxley's 'universal winter' by replenishing the sun's heat, and brings it near through nuclear fission.

But while the question of the sun's age still hung in the balance and foreshortened time, we can see varying attempts to reassure, as well as various unconscious appropriations of the assumptions of solar physics into solar myth. Perhaps the most pleasing example of a leap in interpretation which covers an unrecognized assumption

²⁹ Quoted from Arthur Eve, *Rutherford* (Cambridge, 1939), 107. Rutherford's paper was entitled 'The Radiation and Emanation of Radium'.

or concern is that of Müller's follower Sir George Cox in *Aryan Mythology*, where he offers a solar analysis of the Wolf and the Seven Little Kids (the analysis is criticized by Lang in the same Introduction to *Grimm's Household Tales* cited earlier). Lang emphasizes the modernity of the clock-case and criticizes Cox for placing so much emphasis upon it:³⁰

If, then, we interpret the tale by regarding the clock-case as its essential feature, surely we mistake a late and civilised accident for the essence of an ancient and barbarous legend. Sir G. W. Cox lays much stress on the affair of the clock-case. 'The wolf', he says, 'is here the Night, or the Darkness, which tries to swallow up the seven days of the week, and actually swallows six. The seventh, the youngest, escapes by hiding herself in the clock-case; in other words, the week is not quite run out, and before it comes to an end, the mother of the goats unrips the wolf's stomach, and places stones in it in place of the little goats who come trooping out, as the days of the week begin again to run their course.'

Lang quips:

Surely a clock-case might seem . . . a good hiding-place, even to a mind not occupied at all with the sun.

Tylor rather surprisingly allows:³¹

We can hardly doubt there is a quaint touch of sun-myth in a tale which took its present shape since the invention of clocks.

What is the unanalysed connection in both Cox and Tylor's minds which makes the link between the feature of the clock and solar myth? There is no manifest association. The answer surely is that, according to then contemporary physics, the sun, like the seven-day clock, is running down. The happy ending of the seventh day recovered is not available in the physical world. The sun, as the new theory of the dissipation of energy had made very clear, cannot be rewound like a clock. The hidden grounds of interpretation here conceal a contemporary anxiety which is displaced and healed by the solar analysis of the Grimm *Märchen*. Lang's sceptical puzzlement as to why the clock should be seen as an essential feature of the story leads on to an explanation that even he could not observe because it was too specific to the culture he shared with Tylor and Cox. Interpretation tells as much about the needs of the

³⁰ Andrew Lang, Introduction to *Grimm's Household Tales*, ed. M. Hunt (London, 1884), vol. i, p. xvii; *The Mythology of the Aryan Nations* (London, 1870), i, 358.

³¹ Edward Tylor, *Primitive Culture* (London, 1871), i, 341.

interpreter and the current culture as about its material—and the concerns of a present-day interpreter brings to the surface hitherto unobserved mythic patterns which have as much to do with our own predicaments as those of the past, but which are not thereby devalued.

In the light of that argument let us look at the Earthworm essay anew. Darwin's last book marked a return in his own mind to his earliest professional self. He thought of himself initially as a geologist and was secretary to the Geological Society of London in the late 1830s. It was in geology also that he made his only major theoretical blunder, in his 1839 paper on the 'parallel roads' of Glen Roy. He tended, perhaps, as the controversy over the denudation of the Weald also shows, to rely in geology overmuch on Lyell's views. He had first thought academically about worms in a geological context. In 1837 he read a paper 'On the Formation of Mould' to the Geological Society of London.³² The report ends: 'The author concluded by remarking that it is probable that every particle of earth in old pasture land has passed through the intestines of worms, and hence, that in some senses, the term 'animal mould' would be more appropriate than vegetable mould.' When, more than forty years later he returned to the theme, Darwin entitled his volume, judiciously: *The Formation of Vegetable Mould, Through the Action of Worms, with Observations on their Habits*. The worm is, in Darwin's argument, not only the lowliest but the most enduring life-form, living out of sight of the sun, endlessly turning the soil of the world and fructifying it. Like Maxwell's account of the molecule, Darwin's account of the worm emphasizes unchangingness. Maxwell writes of the molecules' steadfastness:³³

But though in the course of ages catastrophes have occurred and may yet occur in the heavens, though ancient systems may be dissolved and new systems evolved out of their ruins, the molecules out of which these systems are built—the foundation stones of the material universe—remain unbroken and unworn.

So writes Darwin in the course of his concluding paragraph:³⁴

It is a marvellous reflection that the whole of the superficial mould over any such expanse has passed, and will again pass, every few years through

³² Charles Darwin, 'On the Formation of Menla', *proceedings of the Geological Society of London*, 2 (1837–8), 574–6.

³³ See n. 26.

³⁴ Charles Darwin, *The Formation of Vegetable Mould, Through the Action of Worms, with Observations on their Habits* (London, 1881), 313.

the bodies of worms. The plough is one of the most ancient and most valuable of man's inventions; but long before he existed the land was in fact regularly ploughed, and still continues to be thus ploughed by earthworms.

The lowest common denominators of matter then known (the molecule) and of life (the earthworm) become matter of consolation. Continuity persists through change. Out of reach of the sun, whose energy is running down, the worm survives, blind and damp, perfectly at home within its limited environment, surviving amidst more and more complex forms—and also surviving after them. Worms are the meek of the earth.³⁵

Leslie Stephen picks up the anthropomorphism of Darwin's affectionate, even tender, regard for the worms he studied,³⁶ as does *Punch* in an 1882 cartoon of Darwin as preacher on the text 'Man is but a Worm' [Plate 11]. Stephen compares Swift's *Polite Conversation and Directions to Servants* with Darwin's essay. Swift's essays:

show how closely Swift's sarcastic attention was fixed through life upon the ways of his inferiors. They are a mass of materials for a natural history of social absurdities such as Mr. Darwin was in the habit of bestowing upon the manners and customs of worms. The difference is that Darwin had none but kindly feelings for worms, whereas Swift's inspection of social vermin is always edged with contempt.

Darwin respects worms whereas Swift does not respect people. Does Darwin's respect turn them into humble folk? Is it class-bound, moving the 'higher-lower' organization anthropomorphically to and fro, celebrating and binding labour?

Andrew Lang, in his essay 'Apollo and the Mouse', enquires why it is that Apollo, particularly in his threatening aspect, is associated with the worship of insignificant creatures. He opens by asking 'Why is Apollo, especially the Apollo of the Troad, he who showered the darts of pestilence among the Greeks, so constantly associated with a mouse?'³⁷ He quotes sceptically De Gubernatio's solar suggestion (Zool. Myth II. 68): 'The Pagan sungod crushes under his foot the Mouse of Night', and instead substitutes a

³⁵ A correspondent points out that the association of earthworms with anthrax in the 1880s meant that this was the end of the worm's era of innocence, and was thus threnody unawares.

³⁶ Leslie Stephen, *Swift*, English Men of Letters Series (London, 1882), 200.

³⁷ Andrew Lang, *Custom and Myth* (London, 1885), 103–120.

historical explanation in which totemism is overlaid with Apollonian worship. Another possible mode of explanation is that the conjunction of lowest and highest may have the function of warding off threats to stability by a fictional alliance of most and least powerful—that, I suggest, may be a function of Darwin's worm.

In 1850, turning away from dragon or serpent, Landor had written an 'Ode to the Worm', which appeared in *The Leader* (4 May 1851, reprinted 1853 and 1876). It opens 'First-born of all creation! yet unsung' and hymns the enduringness of the worm. Landor's poem ends 'Last of creation I will call thee now.'³⁸ For the worm survives meteors, feeds on prince and vulture, and is so lowly that it is the last surviving thing. Darwin may have read Landor's poem: it is quite probable, though not essential to this argument. What is striking is that Darwin's dismay at the oncoming death of the world (and his awareness of his own oncoming death too, perhaps) led him back to the primordial creature he had studied at the beginning of his career, in his initiating discipline. He domesticates the worm and through the delicate and detailed attention he pays to all its proceedings he also celebrates it. It becomes the object of *attention* after long disregard: worms select and show purposive intelligence, he claims. They are capable of bringing about the sinking of great stones. They produce tower-like castings of rococo form. They dash into their burrows like rabbits: they select like men and vary their habits as if in acts of choice.

The aesthetic choosiness of worms, and their great consequence for earth, despite their limitations, allows Darwin to comfort his readers with an image of the resourcefulness and unchanging stamina of fundamental life-forms: 'It may be doubted whether there are many other animals which have played so important a part in the history of the world, as have these lowly organized creatures.' Turning away from 'higher complexity' and from the changing future, Darwin gives pleasure and solace together. 'All sentient beings are doomed to complete annihilation after such long-continued slow progress',³⁹ he wrote of the cooling sun. But the obscure worm allows him an image, at once matter-of-fact and newly dignified, for the unchanging Saturnian world hidden away from the controversies of physics, forming (though this, I am sure,

³⁸ W. S. Landor, *Poetical Works*, ed. S. Wheeler (Oxford, 1937), iii. 184–5.

³⁹ Darwin, *Earthworm*, p. 312.

not consciously) a counter to solar myth. The almost blind worm shrinks from the light of the sun. It pulls down Stonehenge piece by piece beneath the ground. It pursues its subterranean pathways, least Apollonian of creatures. Such a reading of Darwin's essay in no way affects its status as scientific observation. It allows us though, I hope, some speculative insight into the reasons for the work's immense and immediate popularity, and into the powers of myth within other forms of knowledge.



11. 'Man is but a Worm' from *Punch's Almanack* for 1882, December, 1881.

7

The Gods in Wessex Exile: Thomas Hardy and Mythology

J. B. BULLEN

'THE deepest want and deficiency of all modern Art lies in the fact that the Artists have no mythology'. The words of Friedrich Schlegel caught Hardy's attention in 1875 and he copied them on two occasions into his literary notebook.¹ By 1875 he had *Desperate Remedies*, *Under the Greenwood Tree*, and *A Pair of Blue Eyes* behind him and had recently finished *Far From the Madding Crowd*. All these novels were set in the Wessex countryside, and Hardy's preoccupation with a 'mythology' for modern fiction grew, in part, out of a strong reluctance to being classed as a rural novelist—a mere provincial concerned with provincial matters. He felt the need to expand the horizons of his writing in such a way that though the settings and the characters might be rustic, the issues with which they were involved would be much broader and more universal than the local settings suggested. For Hardy the answer lay in a complex of allusions and parallels with mythical archetypes.

Consequently Hardy's next novel, *The Return of the Native*, marked a radical change in his writing in the direction of a kind of high seriousness on the Greek model. 'What the Greeks only suspected we know well; what their Æschylus imagined our nursery children feel'² he tells his reader at the opening of the Third Book; but even from the first page of the novel it is clear that the little stage of Egdon Heath is to be the battleground of forces which transcend the local and particular. Egdon is portrayed as a hyperborean Hades populated by the ghostly presences of Thor and Woden;³ the novel opens on the fifth of November with dancing and the lighting of bonfires on the heath, which says Hardy are 'rather the lineal descendants from jumbled Druidical rites and

¹ *The Literary Notebooks of Thomas Hardy*, ed. Lennart A. Björk (London, 1985), entry 118 and 'Memoranda', 16 June 1875; Björk, vol. i, pp. xxxvi–xxxvii.

² *The Return of the Native*, in *The Works of Thomas Hardy in Prose and Verse (Wessex Edition)* (London, 1912–14), 197.

³ *Ibid.*, p. 17.