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**"Shakespeare and ecocriticism: The unexpected return of the
Elizabethan World Picture" By Gabriel Egan**

Abstract In the early 1970s the Gaia hypothesis of James E. Lovelock and Lynn Margulis proposed that self-regulating processes of homeostasis have locked together the obviously living biosphere and the apparently dead environment so that one might usefully think of the whole Earth as a single organism. Although Lovelock and Margulis came from strictly scientific fields it is easy to see the appeal of their hypothesis for 'alternative' Western cultures of the New Age movement, complementary medicine, and holistic spiritualism, all of which have links with the broader anarchist and animal rights movements and with the emerging theory and practice of ecocriticism. At its best, ecocriticism builds upon post-structuralism's rejection of the imaginary unified human subject previously dominant in literary studies to consider how Nature too is constructed as well as depicted in literary works. At the other extreme, however, ecocriticism shades off into a neo-Romantic spiritualism that merely asserts the healing power of living in the countryside or vicariously enjoying it through literature about rural idylls. This essay considers the materialist basis of the Gaia hypothesis, comparing it to ways of thinking about the world that were available to Shakespeare's audiences and in particular its surprising parallels with the much-reviled Elizabethan World Picture described by E. M. W. Tillyard.

The ways we human beings think about the world around us – our explanations for how the Earth came to be as it is – change over time. Separating us from Shakespeare's time is a radical new way of thinking that emerged in the 17th and 18th centuries: the Enlightenment. Building on Renaissance humanism, the Enlightenment thinkers saw themselves as applying reason (rationality) to matters that had previously been dominated by superstition. Isaac Newton and Johannes Kepler had explained the motion of the planets, and the empirical philosophers Thomas Hobbes and John Locke provided materialist explanations of human society and the human mind that left little need for religion, although in fact many Enlightenment thinkers held their religious faith to be quite unlike superstition. Just one question remained

beyond the reach of science: how did animals and humans come about? This last bastion fell to Charles Darwin in the mid-nineteenth century.

In the late-twentieth century the Enlightenment came in for considerable criticism on a number of fronts. In philosophy (and subsequently in literary studies, which always gets its theories second-hand [\(1\)](#)), the influential post-structuralism of Jacques Derrida eroded faith in the power of human reason to properly formulate, let alone solve, central problems regarding the way we think about and represent the world. As post-structuralism and its corrosive offshoot partner post-modernism rose to prominence in the 1970s and 1980s, real street politics moved away from specifically left-wing concerns, and related actions such as strikes, and increasingly focussed on environmental issues. This process accelerated after the collapse of communist states in 1989–90, and with the removal of fear of international nuclear war many people turned to the next greatest threat: worldwide environmental disaster from pollution of the atmosphere and the food chain.

This latest concern has not yet had much impact on criticism of Renaissance writers such as Shakespeare, although it has become important in relation to others such as the New England Transcendentalists (especially Henry David Thoreau and Ralph Waldo Emerson) who seem concerned to report their experiences of natural environments. The application of ecopolitics in the world of literary criticism is called ecocriticism, and the purpose of this paper is to suggest some insights that ecological thinking can usefully bring to bear upon Renaissance ways of thinking. In this I must declare a theoretical prejudice. Within the broad alliance of anarchists, animal rights activists, anti-globalizationists, ecowarriors, and New Ageists that constitutes the only active resistance to late-industrial capitalism in the Western democracies, there are quite a few superstitious people who would rather the Enlightenment had never happened. Post-modernism's 'incredulity towards metanarratives', as it has been called, [\(2\)](#) gives a spurious intellectual veneer to anti-Rationalism, and for some dissident thinkers Big Theory, like Big Science, appears to be part of the problem rather than part of the solution. As a Marxist with ecocritical sympathies I disagree and suggest that these two critiques of the way the world is now are mutually sustaining, not antithetical.

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You probably will not have noticed, but the sun has been getting hotter. If you were 3.6 billion years old – that is to say, if you were born when life started on Earth – the sun's output of energy would have increased by about 30 per cent over your lifespan, yet the Earth's surface has remained between 10 and 20 degrees Celsius all this time. To understand why requires the Gaia hypothesis first formally presented by James E. Lovelock [\(3\)](#) and subsequently expanded upon by Lovelock and Lynn Margulis. [\(4\)](#) The Greek word (Gaia) or (Ge) means 'Earth', hence our English prefix *geo-* for earth-related nouns, and was suggested to Lovelock by William Golding when he heard Lovelock's ideas in 1967. The essence of the Gaia hypothesis is that the Earth is a single organism comprised of the obviously alive biota (all the lifeforms we recognize) and the parts we have previously treated as inorganic, the

'background' environment such as the rocks, oceans, and atmosphere. It doubtless seems odd to include the inanimate rocks in any organism, but it is worth remembering that most of a tree is in fact dead material accreted over its lifetime and stored away in the trunk: only the outer bark actually 'lives' by the organic processes we recognize. To understand why this is a reasonable scientific (and hence materialist) way to think about the Earth, Lovelock invented a simple model of a Gaia process and called it DaisyWorld. (5)

DaisyWorld is a spherical planet uniformly bathed in light from a sun, and upon DaisyWorld there happen to be seeds for two kinds of plant: white daisies and black daisies. White daisies reflect a lot of light and hence keep themselves and their surroundings cool, but they do not photosynthesize as efficiently as black daisies, which absorb a lot of light and quickly warm themselves and their surroundings. Both kinds of daisy thrive at the same ideal temperature, but initially their sun produces too little energy for either to germinate. As suns across the universe do, theirs heats up and as the surface temperature rises both kinds of plant begin to grow and to populate DaisyWorld. In this initially cold climate, the black daisies do rather better than the white ones because they are better at photosynthesis, and by natural selection DaisyWorld is covered with black daisies. A mostly black DaisyWorld reflects little light and the entire planet warms up rather more quickly than it would have were it barren. As the sun's output continues to rise, the relative advantage of the black daisies diminishes: there is so much light that even white daisies have enough to photosynthesize efficiently and they begin to return. This is just as well because the ever-rising output of the sun is making DaisyWorld rather too hot for daisies, but of course the white, reflective daisies are less affected by this than the black, absorptive daisies are. As the temperature rises still further the black daisies die off and the white daisies come to dominate the planet's surface, and a mostly white DaisyWorld reflects much of the sun's energy, keeping things cool enough for life to go on. Eventually, of course, the sun's energy is so great that not even a white daisy-cooled planet can sustain life and eventually all the daisies die.

The significant thing about this scenario is that in a model where the sun got increasingly hot, the temperature on DaisyWorld remained roughly the same (near the ideal for daisies) while it supported life, because the ratio of black to white daisies shifted precisely as needed to counteract the effect of overheating. The daisies did this without any planning or design, it was merely that the ecosystem in general (comprised of the organic matter, the daisies, and the inorganic matter, the surface of DaisyWorld that they grow on) formed what is called a negative-feedback loop, regulating the planet's surface temperature. At the extremes this regulation did not work: when it was too cold at the beginning and too hot at the end, no daisies survived. But for a significant time between these extremes, the energy from their sun rose steadily yet the surface temperature of DaisyWorld remained stable.

Figure 1 illustrates how this process unfolded. If DaisyWorld were lifeless, as most planets are, its temperature would simply rise with the sun's increasing output (dashed line). But with daisies growing on DaisyWorld, however, something remarkable happens (solid line). There is a roughly level area

between the time (marked by the first dotted vertical line) when DaisyWorld became warm enough to support daisies, and the time (marked by the second dotted line) when the sun's output became just so great that even when entirely covered in white, reflective daisies DaisyWorld became just too hot and no daisies could survive. If the sun's output were only to vary within the boundaries of this plateau, the temperature on DaisyWorld would remain roughly constant. Within that plateau, one might say that DaisyWorld is regulating its own temperature by adjusting the ratio of black to white daisies to keep things just right for life to be supported.

You will accuse me of anthropomorphizing: DaisyWorld is not really 'alive' and so cannot regulate its own temperature in the way that biota do. This was the common view of biologists when Lovelock first proposed his Gaia hypothesis, but in the last twenty years great changes in the philosophy of science have convinced many people that the traditional distinction between 'alive' and 'dead' and between 'individual' and 'others' can be as misleading as the distinction between 'nature' and 'culture'. This can best be exemplified in genetics. There is a parasitic fluke (flatworm) that lives inside a certain species of snail and interferes with the snail's hormonal system to increase the signal controlling how thick a shell the snail will grow. The snail ends up with a thicker shell than it really needs and this wasted energy lowers the infested snail's ability to reproduce. This is of no concern to the fluke, whose 'investment' is in the particular snail it has infested, not its descendants. So long as this particular snail does not get killed (and for this a thick shell helps) the fluke can reproduce. Zoologists have traditionally thought of the limit of the effect of an organism's genotype (collection of genes) to be its phenotype (body), but in this case one can truly say that the fluke carries the gene for 'thick shells' even though the fluke hasn't got a shell and only borrows the one of its host. (6) Certainly, a fluke that does not carry the gene for thickening its host's shell will lose out in the competition for survival with those that do, and so the 'thick shell' gene will be naturally selected. Looked at another way, one might say that since a spider's web is as much an effect of its genes as its hairy legs – the web-making behaviour is innate not learned – the distinction between the traditional phenotype (the hairy body) and the product made by that phenotype (its web) is false. Richard Dawkins, who pointed out this error, suggested that we should take into account *all* the effects of genes and think about *The Extended Phenotype*, (7) as he called his book.

Tillyardism and systems thinking

Like a number of recent scientific developments such as memetics and artificial intelligence, Lovelock's Gaia hypothesis has disturbing implications for modern critical theory, threatening to disrupt the distinctions by which we work, such as nature/culture and lifeform/environment. Shakespearians are particularly well-placed to deal with these disruptions because we work on texts from a relatively unfamiliar culture that, while it probably did not treat as indisputably true the cosmological model described in E. M. W. Tillyard's *The Elizabethan World Picture*, (8) clearly contained many views about the universe that we consider mistaken. A belief in the connection between the affairs of human beings in the sublunary sphere and occurrences among the

higher layers (the sky, planetary spheres, and the fiery realm) was firmly, and it seemed at the time irrevocably, ruptured in the eighteenth-century Enlightenment. We might argue about the extent to which this connection was generally believed in the Renaissance, and can blame Tillyard for promulgating a naive view of ideological cohesiveness that gave too little space to reasoned dissent from the dominant beliefs of the period. But characters in Shakespeare speak meaningfully about comets presaging disaster and the music of the spheres, and unless we think that these lines always elicited derisive laughter from the theatre audiences we have to accept that such things were within the realm of the believable. And they now are not.

Or are they? One of the most noticeable cultural developments in the Western world in the past thirty years has been the rise of an anti-rationalistic, 'alternative' culture that embraces the New Age movement, complementary medicine, and forms of holistic spiritualism, and links these to broader anarchist and animal rights movements. For an apparently rising number of people the Enlightenment itself was an illusory detour into hyper-rationality and the sense of connectedness voiced in Elizabethan drama and poetry offers a form of spirituality that comes packaged with a rich supply of artistic works that are already central to Western culture. To illustrate my view that we should reject such co-option of Shakespeare I will use his characters' apparent understanding of why black people are that colour.

The black daisies of DaisyWorld retain heat energy that strikes them while the white ones reflect it away. Anyone who has changed from black to white clothes or vice versa on a sunny day will have noticed that black materials retain heat energy. The prevailing Renaissance conception of how black people come to be black is clearly expressed by characters in Shakespeare. In *The Merchant of Venice* the prince of Morocco anticipates (correctly, as it turns out) that Portia is racist:

MOROCCO (to Portia) Mislike me not for my complexion,

The shadowed livery of the burnished sun,

To whom I am a neighbour and near bred.

(The Merchant of Venice 2.1.1–3) (9)

His blood, he goes on to insist, is as red as anyone else's, but the important point for my purpose is his idea that his blackness is a coating ('shadowed livery') caused by living in a sunny country. Desdemona's father uses the same idea of a burnt coating that should so revolt his daughter that only Othello's use of magic could have caused her to 'Run from her guardage to the sooty bosom/Of such a thing as thou' (*Othello* 1.2.71–2). Othello shares (or perhaps comes to share) this sense of his blackness as a coating: convinced that Desdemona is unfaithful he says 'My name, that was as fresh/As Dian's visage, is now begrimed and black/As mine own face' (*Othello* 3.3.391–3). In the very act of denying that blackness can wash off, Aaron in *Titus Andronicus* imagines it not as an innate colour but a coating:

Coal-black is better than another hue

In that it scorns to bear another hue;

For all the water in the ocean

Can never turn the swan's black legs to white,

Although she lave them hourly in the flood.

(Titus Andronicus 4.2.98–102)

Washing the Ethiop (or blackamore) white was, of course, proverbial in Shakespeare's time. (10) What conceptions about the world gave rise to the idea that blackness is a coating? For a white actor playing Morocco, Othello, or Aaron, the character's sense of his blackness as a coating is, of course, literally true: excluding the unlikely possibility that a black actor worked in Shakespeare's company (about which we would expect there to be some record), the actor would have 'blackened up' with a coating as preparation for the performance. The part, then, with its references to blackness as a coating, is inherently suited to a white actor in makeup and not a black actor at all, and this adds support to the argument made by the Ghanaian actor Hugh Quarshie that black people should not play Othello, or at least not without major reworking of the play. (11)

An observation of the distribution of skin colours around the world would have indicated to Elizabethans that black people live in hot countries, and many things (including white skin) do darken under strong sunlight, so a reasonable assumption would have been that black people simply had really deep tans. And in a sense they do: the melanin pigment causing brownness is the same in all humans. But in this particular DaisyWorld daisies and ourselves are unlike, for we tan in the sun not in order to absorb more of the sun's energy but as a protection from it. The heat energy of the sun would not do us much harm, but its ultraviolet light promotes errors in the copying of genetic material during cell division and can produce in us clusters of out-of-control skin cells, cancers. In countries where sunshine is strongest, humans whose melanocyte cells are especially active, producing greater amounts of the skin pigment melanin, are less likely to get skin cancers because this brown pigment absorbs ultraviolet light before it penetrates too far into the body. Such people have a competitive advantage over those with less active melanocyte cells and so over time dark skins were naturally selected, although once human populations spread around the world the advantage became less pronounced. Those living in cold northerly climates would in fact be at a relative disadvantage if they made excessive melanin – making it costs energy that was better spent elsewhere in the body – and hence, over evolutionary time, people in these climates turned white.

Importantly, the operations giving rise to colour differences between the races operate by Darwinian selection across a population, not on an individual, but nonetheless it is true to say that the hot sun makes black people black. It is

equally true to say that the sun shining on DaisyWorld made it turn white, and so the empirical observation can be literally true even within an utterly deficient model of how the processes operate. What matters is the level at which one thinks the phenomenon is operating, for no individual turned from white to black because of the sun (tanning is in all people a marginal change) just as no daisy turned from black to white in DaisyWorld. Rather, the effect emerges when one looks to a higher level of population change. There is an instructive analogy here between the scientific view and the thinking of post-structuralists for whom binary oppositions of the kind black/white are false, human distinctions in which the supposedly opposing terms actually have much in common. The word 'black' comes from the Old Teutonic word 'blækan' meaning to scorch and the word 'bleach' has the same origin, because an object placed in a fire turns first black and then, after a while, white. So 'bleaching' (making white) and 'blackening', far from being natural opposites, are cognate. Our binary opposition, like so many false oppositions, has just deconstructed itself.

However, where the post-structuralist view depends ultimately only on linguistics (and hence ancient experience), the apparently opposing scientific explanations (sun > black skin, sun > white DaisyWorld) are both entirely scientific. But they are scientific in a way that Enlightenment thinking, especially its concern with causes and effects, has considerable difficulty coping with. The control systems that make whole populations of people and of daisies change colour are the subject of the science of cybernetics invented by Norbert Wiener (12) and its related disciplines of 'systems theory' that Ludwig von Bertalanffy developed in his work on biology (13) and 'systems dynamics' as Jay Forrester termed it in relation to social organizations. (14) The problem with Enlightenment thinking is not its rationality, however, but its propensity to consider phenomena in isolation rather than in interaction within larger systems. On the other hand, however, one can overstate the reverse too, as Barry Commoner did with his much cited First Law of Ecology that 'everything is connected to everything else'. (15) An analogous false dichotomy has long dogged Marxist and anti-Marxist arguments about whether everything or nothing at all can be explained by analysis of the economic base of a society, that is how production is organized. The answer, of course, lies somewhere between the extremes. Your favourite aunt catching cold might seem unrelated to the activities of big business, until you consider that her straitened financial circumstances are due to the company pension fund being raided by her former employer so that she can no longer afford to keep warm.

The aspect of the Elizabethan World Picture that American New Historicist and British Cultural Materialist critics most vehemently rejected in the 1980s and 1990s was the homogeneity of thought that Tillyard seemed to insist upon. For John Drakakis, Tillyard's work overlooked (or, more actively, suppressed) the reality that Shakespeare's texts, like any others, are 'sites of struggle' rather than monovocal pronouncements. (16) Robin Headlam Wells gave a concrete example: far from simply agreeing with the ideas contained in the Homily Against Disobedience (as Tillyard would have it), the Elizabethans were decidedly ambivalent about responsible tyrannicide and personal

revenge. On the one hand the Pope had absolved Catholics of their allegiance to Elizabeth, and on the other the Bond of Association allowed private citizens to avenge any harm done to her. (17) There are good reasons to accept that Tillyard overstated the singularity of Elizabethan thought, although a careful reading of *The Elizabethan World Picture* shows that his critics have themselves rather overstated the degree to which he claimed that singularity, as I argue in a book currently in press. (18)

But no-one has thought to attack the World Picture itself, with its multiple planes of being (cosmological, earthly, social, and biological) and their alleged correspondences and analogies (the head rules the body as the king rules the state), all tied together by the unifying valences of the Great Chain of Being. Its wrongness has seemed so obvious as not to require stating, but in fact the Gaia hypothesis and work in cybernetics and systems thinking/theory could go some way towards rehabilitating aspects of it. As a single organism, Gaia comprises what we consider to be quite distinct collections of living matter (flora and fauna) and non-living matter (rocks, oceans, and the atmosphere), but on reflection the same is true of each of our bodies. Your hair and the ends of your fingernails, for example, are quite dead (19) but no less a part of you for that. Treated as complex systems of control, the chemical exchanges involving the seabed, exposed rocks, and the troposphere that keep the Earth's atmosphere in its high state of disequilibrium – so essential to life – have quite strict analogies with, and indeed dependence upon, the internal chemical exchanges of plants and animals. The hard distinction between the biota of the Earth and the 'environment' in which these biota live, an 'environment' conceived as a background or mere context, is a misleading legacy of Enlightenment thinking. To that extent, the realms of human and animal existence have valid analogies with the four planes of earth, water, air, and fire in Tillyard's model of alleged Elizabethan thinking. We may dispense with the religious and authoritarian concomitants of the model's hierarchical organization, and marvel at the scientific aptness of a way of thinking that so unites the macrocosmic and microcosmic levels of existence.

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Ecocriticism as it is currently constituted suggests an essentially conservative political ambition: that humankind cease harming the ecosphere. In a much-quoted definition, one of the field's founders, Cheryll Glotfelty, made an analogy with two political schools of criticism and offered examples of what ecocriticism might do:

Simply put, ecocriticism is the study of the relationship between literature and the physical environment. Just as feminist criticism examines language and literature from a gender-conscious perspective, and Marxist criticism brings an awareness of modes of production and economic class to its reading of texts, ecocriticism takes an earth-centered approach to literary studies.

Ecocritics and theorists ask questions like the following: How is nature represented in this sonnet? What role does the physical setting play in the plot

of this novel? Are the values expressed in this play consistent with ecological wisdom? How do our metaphors of the land influence the way we treat it? How can we characterize nature writing as a genre? In addition to race, class, and gender, should place become a new critical category? . . .

Despite the broad scope of inquiry and disparate levels of sophistication, all ecological criticism shares the fundamental premise that human culture is connected to the physical world, affecting it and affected by it. (20)

This is at once a vague statement of principles – who could disagree with the premise that ‘human culture is connected to the physical world’? – and a specific set of enquiries (there were eight more I have elided). Obvious theoretical objections are immediately apparent, for example that ‘place’ should not be a new critical category alongside race, class, and gender because i) it is hopelessly imprecise (was this poem written upstairs or in the basement?), and ii) race-class-gender should not in any case form a critical triplet.

The race-class-gender error has a respectable Shakespearean history, for example in Jonathan Dollimore and Alan Sinfield’s introduction to their anthology *Political Shakespeare*, which proclaimed that their new approach ‘registers its commitment to the transformation of a social order which exploits people on grounds of race, gender, and class’. (21) The problem, of course, is the patently absurd idea that capitalist society exploits on the grounds of class, here likened to the categories of race and gender. Marx would disagree about the category class, which he thought merely a convenient generalization about people’s relations to production, and the most important category simply because capitalism will necessarily cast greater numbers of people into one class, the proletariat, until that class is large enough to overthrow the bourgeoisie.

Nobody wants to be poor, of course, but it is far from clear that everyone wants to be released from the categories of race and gender; if only being a woman did not entail doing more housework and earning less money than men, it would not of itself seem a condition of oppression. Likewise, those in Britain’s first overseas colony have long struggled to be free, but have tended to consider their oppression in terms of the economic wealth extracted from their island rather than in the condition of simply being Irish. By likening race, gender, and class, Dollimore and Sinfield abandoned the Marxist insight that class is a unique category, not an incidental attribute by which one might be oppressed, and without this the political project diminishes to liberal reformism that treats the social order as a given and hopes only for a meritocracy in which being from the wrong race, gender, or class would be no barrier to advancement.

Dollimore and Sinfield’s slip was uncharacteristic of their work and that which their anthology presented, but ecocritical founder Glotfelty’s avoidance of materialism is of a piece with essays in her anthology. These are suffused with a variety of anti-intellectualisms of which Paul Gunn Allen’s is amongst the most invidious: ‘The westerner’s bias against nonordinary states of

consciousness [produced in American Indian ceremonies] is the result of an intellectual climate that has been carefully fostered in the West for centuries, that has reached its culmination in Freudian and Darwinian theories, and that only now is beginning to yield to the masses of data that contradict it.' (22) And even those of us who marvel at the self-regulatory processes of DaisyWorld might well feel that William Rueckert is unlikely to win over the opponents of ecocriticism with such claims as 'Green plants, for example, are among the most creative organisms on earth. They are nature's poets. . . . Poems are green plants among us; if poets are suns, then poems are green plants among us for they clearly arrest energy on its path to entropy . . .' (23) Ecocriticism seems to occupy a critical position something like that held by feminism 30 years ago, when ideas of breath-taking idiocy such as Shulamith Firestone's projects for reproductive liberation via artificial placentas and limited contract households (24) jostled for space alongside (indeed, in Firestone's case, within the same book as) serious political scholarship.

Materialism, the view that the basic substance of the world is matter and that it is known primarily through and as material forms and processes, is not the opposite of spiritualism. Materialism finds its opposite in metaphysical idealism (which asserts the ideality of reality), and in epistemology the contrast is between realism (which holds that in human knowledge objects are grasped and seen as they really are, independent of the human mind) and epistemological idealism (which holds that in the knowledge process the mind can grasp only the psychic or that its objects are conditioned by their perceptibility). Spiritualism is something altogether distinct, but, like essentialism, literary theorists draw upon it to form a simple, mistaken dualism that is homologous to head/heart. By such distorted categorizing one is either headily materialist and realist or one is heartily spiritualist, idealist, and essentialist.

In fact, it is entirely possible to hold opinions that have long been deemed spiritualist (such as the view that the Earth itself, rocks, sea water, and all, is singly alive) while insisting upon materialist explanations. James E. Lovelock often notes that his Gaia hypothesis has been stoutly resisted by scientists (whom one would think amenable to rational argument) and yet it fits well with ancient – and indeed specifically rural and non-scientific – ways of understanding the world. Discerning just what is and what is not causally related is a ticklish business – who would have believed twenty years ago that most stomach ulcers are caused by a bacterium? – but it is always a materialist and rationalist endeavour. It may well turn out to be true that human activity will make the Earth unfit for human habitation, but it is exceedingly unlikely that Gaia itself will die because its regulatory systems are remarkably robust and adaptive. If we are to reject any part of our Enlightenment inheritance it is the anthropocentric conviction, derived from humanism and itself bearing a vestigial religious conviction, that we humans are the *sine qua non* of the universe. This decentering apart, the Enlightenment's promotion of rationality, and not post-modernism's valourization of illogicality, is just what is required to avoid writing ourselves out of Gaia's future.

Notes

1 Shakespearean scholar David Scott Kastan offered a humorous explanation for why English Literature repeatedly seems to borrow theory from other disciplines, and indeed why it adopts each one just as the 'home' discipline is abandoning it: the Strand Bookstore phenomenon. Scholars of literature are, in general, underpaid and tend to frequent second-hand emporia such as the vast Strand Bookstore at the corner of Broadway and 12th Street in New York. There they find used books of scientific and cultural theory that colleagues in other, better-funded, disciplines have sold off as no longer relevant to their work. By this means discarded theories are recycled in literary studies.

2 J. Lyotard, *The Postmodern Condition: A Report on Knowledge*, trans. G. Bennington and B. Massumi, *Theory and History of Literature* 10 (Manchester: Manchester University Press, 1984), xxiv.

3 J. E. Lovelock, 'Gaia as Seen Through the Atmosphere', *Atmospheric Environment* 6 (1972), pp. 579–80.

4 J. E. Lovelock and L. Margulis, 'Atmospheric Homeostasis By and for the Biosphere: The Gaia Hypothesis'. *Tellus* 26 (1974), pp. 2–9; J. E. Lovelock and L. Margulis, 'Biological Modulation of the Earth's Atmosphere', *Icarus* 21 (1974), pp. 471–89.

5 J. E. Lovelock, 'Daisy World: A Cybernetic Proof of the Gaia Hypothesis'. *Coevolution Quarterly* 38 (1983), pp. 66–72.

6 R. Dawkins, *The Selfish Gene*, 2nd edition (Oxford: Oxford University Press, 1989), pp. 240–2.

7 R. Dawkins, *The Extended Phenotype: The Gene as the Unit of Selection* (Oxford: Oxford University Press, 1982).

8 E. M. W. Tillyard, *The Elizabethan World Picture* (London: Chatto and Windus, 1943).

9 W. Shakespeare, *The Complete Works*, ed. S. Wells, G. Taylor, J. Jowett, W. Montgomery. Electronic edition prepared by W. Montgomery and L. Bernard (Oxford: Oxford University Press, 1989). All subsequent quotations of Shakespeare are from this edition.

10 R. W. Dent, *Shakespeare's Proverbial Language: An Index* (Berkeley: University of California Press, 1981), Appendix A, E186.

11 H. Quarshie, 'Second Thoughts About *Othello*'. *International Shakespeare Association Occasional Papers* 7 (Chipping Campden: International Shakespeare Association, 1999).

- 12 N. Wiener, *Cybernetics: or, Control and Communication in the Animal and the Machine* (New York: John Wiley, 1948).
- 13 L. von Bertalanffy, 'The Concepts of Systems in Physics and Biology'. *Bulletin of the British Society for the History of Science* 1 (1949), pp. 44–5; L. von Bertalanffy, *General Systems Theory: Foundations, Development, Applications* (London: Allen Lane, 1968).
- 14 J. F. Forrester, *Industrial Dynamics* (Cambridge MA: Massachusetts Institute of Technology Press, 1961).
- 15 B. Commoner, 'The Closing Circle: Nature, Man, and Technology'. In *Thinking About the Environment*, ed. M. A. Cahn and R. O'Brien (Armonk NY: M. E. Sharpe, 1971), pp. 161–6 (p. 165).
- 16 J. Drakakis, 'Theatre, Ideology, and Institution: Shakespeare and the Roadsweepers'. In *The Shakespeare Myth*, ed. G. Holderness, Cultural Politics (Manchester: Manchester University Press, 1988), pp. 24–41 (p. 26).
- 17 R. H. Wells, *Shakespeare on Masculinity* (Cambridge: Cambridge University Press, 2000), p. 71.
- 18 G. Egan, *Marx and Shakespeare*, Oxford Shakespeare Topics (Oxford: Oxford University Press, forthcoming).
- 19 Cosmetic products that their makers claim can 'revitalize' those parts of your body are, therefore, purporting to work magic.
- 20 C. Glotfelty, 'Introduction: Literary Studies in an Age of Environmental Crisis'. In *The Ecocriticism Reader: Landmarks in Literary Ecology*, ed. C. Glotfelty and H. Fromm (Athens GA: University of Georgia Press, 1996), pp. xv–xxxvii (xviii–xix).
- 21 J. Dollimore and A. Sinfield, 'Foreword: Cultural Materialism'. In *Political Shakespeare: New Essays in Cultural Materialism*, ed. J. Dollimore and A. Sinfield (Manchester: Manchester University Press, 1985), pp. vii–viii (viii).
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