Dickens in the City: Science, Technology, Ecology in the Novels of Charles Dickens

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It was always feasible that Dickens would display an environmental sensibility because of the Victorian inheritance of a romanticism comprised, partially, in Paul de Man's words, of 'a return to a certain form of naturalism after the forced abstraction of the Enlightenment'.[1] He was, though, somewhat removed from the conventionalised romantic love of nature, as Andrew Sanders notes:

> The more placid rhythms of rural life elude him as much as does an ability to observe and record the delicacies of a flower or the contours of a working landscape. Although he readily recognised the Romantic conventions of seeing nature as the inspirer and the regenerator, few of Nature's voices echo directly in his novels. As a writer of fiction, Dickens generally remained distinctly unawed by its phenomena.[2]

His work displayed instead a very different, post-Romantic sensibility. We see this, immediately, in *The Sketches by Boz* (1836) where Dickens applies precise, sensitive description to an urban rather than rural environment:

> The streets of London, to be beheld in the very height of their glory, should be seen on a dark, dull, murky winter's night, when there is just enough damp gently stealing down to make the pavement greasy, without cleansing it of any of its impurities.[3]

The sketches display occasional flashes of an interest in more conventional nature writing, for example of the moon 'shining brightly over the calm sea, which dashed against the feet of the tall gaunt cliffs with just enough noise to lull the old fish to sleep' (*SB*, 405). Yet these give way, almost immediately, to the human dimension which, here, in 'The Tuggs's at Ramsgate', means the story of two Platonic lovers – Cymon Tuggs and Belinda, or 'Mrs Captain Waters' – gazing romantically (in a different sense) at the sea (*SB*, 405).

It was, nevertheless, the combination of these two things – urban environmental description and human interest – that set the template for Dickens's later writing. An example is his description of the Seven Dials district, that

archetypal Victorian symbol of poverty, danger and filth, depicted also in Disraeli's *Sybil* (1845):

> The streets and courts dart in all directions, until they are lost in the unwholesome vapour which hangs over the house-tops, and renders the dirty perspective uncertain and confined; and lounging at every corner, as if they came there to take a few gasps of such fresh air as has found its way so far, but is too much exhausted already, to be enabled to force itself into the narrow alleys around, are groups of people, whose appearance and dwellings would fill any mind but a regular Londoner's with astonishment. (*SB*, 92)

It is, he continues, an environment in which 'no [caged] bird in its proper senses, who was permitted to leave [...] would ever come back again' (*SB*, 94).

This sense, that a degraded physical environment equates to a hazardous human one – a Victorian 'risk society' – is, specifically, ecological and it is that point, the extent to which Dickens foreshadowed contemporary ecological thinking, that I will explore in this article. However, to propose Dickens as an ecological writer is to adopt a somewhat different position from that usually taken in the theoretical field – ecocriticism – that is concerned with the relationship between literary texts and ecological ideas. To clarify my argument, it is worth, briefly, elaborating on its distinction from a conventional ecocriticism characterised by a concern, as Lawrence Buell has noted, with the 'creative and critical recuperation of the natural world'.[4]

Ecocriticism has generally turned towards Romanticism which, in having 'inaugurated a radically new conception of humankind's relationship to the natural world',[5] appears as the most fruitful reference point for nourishing the act of 'recuperation'. This prevailing 'romantic ecology' has also generated specific arguments, most clearly articulated in Jonathan Bate's *The Song of the Earth*, as to how best literature might serve ecological thinking. Bate argues that when we 'commune' with what Wordsworth called 'the beautiful and permanent forms of nature […] we live with a peculiar intensity, and conversely that our lives are diminished when technology and industrialization alienate us from those forms'. From this perspective he envisages, but also confines, the role of literature as that of stimulating an 'imaginative reunification of mind and nature', a deep ecological standpoint that eschews any pragmatic function for literature even though this leaves romantic ecocriticism, as he concedes, stranded within 'a melancholy awareness of

the illusoriness of its own utopian vision'.[6]

Another ecocritic, the American writer Scott Russell Sanders, has complained that in Dickens, and most other British novelists, 'the social realm – the human mortality play – is a far more powerful presence than nature'.[7] Faithful to the 'Romantic ecology' perspective, that complaint nevertheless only makes sense for so long as this is regarded as the only possible form of ecocriticism. Yet ecological theory has conventionally been separated into two quite distinct philosophies, deep and social ecology.[8] While there is not the space here to rehearse, in full, these two competing, and often antagonistic, positions, a brief sketch of the latter does allow us to anticipate the shape, and possibility, of an alternative type of ecocriticism, one that might be pursued through Dickens.

The first respect in which social ecology differs from deep ecology is that rather than merely recuperate an idealised 'nature' it emphasises what the philosopher Murray Bookchin, who has remained the central presence in social ecology, has called a 'deep-seated continuity between nature and society'.[9] It is, therefore, interested in the concepts (not least, scientific concepts) by which human beings construct their understanding of, and practice towards, (nonhuman) nature. Consequently, social ecology also cultivates a pragmatic belief that we can and should intervene in the world. This takes two forms: an essentially 'utopian' vision, as Bookchin describes it, of 'democratic confederal communities' supported, in turn, by new technologies. It constitutes, in other words, an approach that is not 'antitechnological, antirational or antiscientific'.[10] Because the prevailing (deep) ecocriticism is so largely founded upon Romanticism, the (post-Romantic) Victorian period has remained somewhat neglected and for that reason alone it seems logical to explore this in seeking out the possibility of a countervailing (social) ecocriticism. Positioning Dickens as central to a Victorian literary culture that responded ambivalently, as indicated above, to Romanticism, there are two main arguments, to be explored in this article, for regarding him as a prototypical social-ecological thinker.

The first of these arguments is that the intimations of ecology in his writing are substantiated by Dickens's interest in science as a means of understanding both the natural world and the human place within it. In what is still an atypical examination of (what he calls) 'Practical Ecocriticism', Glen Love argues that an

understanding of the life sciences is fundamental to ecological awareness and, writing here as a literary critic, that examining those writers who display such an understanding can lead us towards a better perception of the 'human connection with nature and the rest of organic life'.[11] Dickens is significant in this context because of what has already been uncovered by the existing work on Victorian literature and science – an interest in those scientific ideas, evolutionary theory and energy physics, that converged to form scientific ecology once the German zoologist Ernst Haeckel had first coined the word 'ecology' in 1866.

Secondly, I will argue that Dickens channelled his own (possibly) idiosyncratic take on science into a social critique and social prescriptiveness that parallels the pragmatism of contemporary social ecology. Presenting Dickens, then, as a writer whose sense of how to 'make the world a better place'[12] broadly aligns with Bookchin's own 'utopian' vision, and, more specifically, with the trust that social ecologists have placed in technology, this second point, in particular, will be proposed as one offering a new direction for ecocriticism.

I

Dickens and science

The case for accentuating Dickens's scientific knowledge has been constructed around his library, publications in his journals, and allusions in the novels. Scientific works, in the first place, comprised a notable component of Dickens's library. He owned several major texts including Robert Chambers's pre-Darwinian *Vestiges of the Natural History of Creation* (1844), a second edition of *The Origin of Species* (1859, second edition 1860), Charles Lyell's *Geological Evidence of the Antiquity of Man* (1863), and, K. J. Fielding notes, earlier works such as Buffon's *Natural History* (1797-1808) and Cuvier's *Animal Kingdom* (1827-33).[13] More importantly, Dickens also played a not insignificant role in disseminating new scientific ideas through articles published in *Household Words* and *All the Year Round*. Notable here is an enthusiastic correspondence with Michael Faraday which resulted, Dickens having procured Faraday's lectures notes, in Percival Leigh writing two articles for *Household Words* – 'The Chemistry of a Candle' and 'The Mysteries of a Tea-Kettle' – that 'were designed to introduce basic chemical or physical

principles to a lay audience' (*Letters* VI, 105-6, 110).[14] Likewise, Dickens published, in *All the Year Round*, a review of *The Origin of Species* shortly after its initial publication in 1859 and commissioned and published in 1860 and 1861 articles on 'Species', 'Natural Selection' and the 'Transmutation of Species'.

Such evidence underpins those readings which have found evolutionary ideas and energy physics in the novels. Gillian Beer and George Levine have explored the parallels between Darwin and Dickens finding a shared sense, in Beer's words, of 'profuse interconnection', 'superfluity [...] gradually and retrospectively revealing itself as order', and 'ecological interdependence'.[15] Levine, furthermore, finds descent in *Martin Chuzzlewit* (1843-4), geological time in *Bleak House*, the conservation of matter in *The Haunted Man*, and notes that thermodynamics 'comes quickly to mind as an appropriate metaphor' for *Little Dorrit*.[16] He also draws out the moral and social dimensions of Dickens's interest in science. While insisting that Dickens emphasised fidelity to scientific fact, Levine nevertheless offers an interesting parallel in writing that 'Dickens is the great novelist of entanglement, finding in the mysteries of the urban landscape those very connections of interdependence and genealogy that characterize Darwin's tangled bank'.[17]

Yet, running alongside these have been more sceptical analyses, sharpest in Francis O' Gorman's description of Dickens's reading of the life sciences as 'nugatory'.[18] That analysis gathers around two arguments: that Dickens could not, in chronological terms, have had the modern understanding of science attributed to him; and that what interest he did have was often outmoded or unconventional. Fielding argues that if Dickens was influenced by Darwin, this could not have happened until the 1860s, once *The Origin of Species* had been published (thereby ruling out all but the last two completed novels), and that, notwithstanding the famous reference at the start of *Bleak House*, the notion of the 'death of the sun' only came to public attention after William Thomson's paper 'The Age of the Sun's Heat' had appeared in *Macmillan's Magazine* in 1862. Dickens, then, 'could not have communicated it to his readers even if he understood it better than most of us do'. Finally, in his discussion of the term 'entropy', Fielding suggests that 'Dickens almost certainly never heard the word nor knew the idea', an argument mapped against the emergence of the concept in English language publications in the late 1860s.[19]

The second point, that Dickens' interest in science was peripheral to mainstream contemporary debate, is, possibly, borne out by the twelve volumes of his letters. The very few references to science or scientific figures are mainly to works of natural theology and residual figures such as Chambers and Lyell. To Mrs Richard Watson, Dickens suggests she read two recent books, William Whewell's *Of the Plurality of Worlds, An Essay* (1853) and Sir David Brewster's *More Worlds than One, the Creed of the Philosopher and the Hope of the Christian* (1854). Although they were debating the inhabitation of other planets, both writers were, also, seeking to combine new science – Brewster wrote on light and optics – with Christianity (*Letters* VII, 454-55). Further evidence of this interest in natural theology can be gleaned from Dickens telling W. W. F. de Cerjat that 'Nothing is discovered without God's intention and assistance, and I suppose every new knowledge of His works that is conceded to man to be distinctly a revelation by which men are to guide themselves' (*Letters* X, 253). It is most apparent, however, though with a different twist, in Dickens's one published statement about science, a review of Robert Hunt's book *The Poetry of Science, or Studies of the Physical Phenomena of Nature* (1848) which appeared in the *Examiner*.

Here Dickens concurs with Hunt's view that science, though double-edged, has the potential both to extend our understanding of the world and elicit what would now be called a deep ecological regard for the integrity of nature.

> [Science] can, like Nature herself, restore in some new form whatever she destroys; that, instead of binding us, as some would have it, in stern utilitarian chains, when she has freed us from a harmless superstition, she offers to our contemplation something better and more beautiful, something which, rightly considered, is more elevating to the soul, nobler and more stimulating to the soaring fancy: is a sound, wise, wholesome object.

Science can show us, Dickens continues, 'whole coasts of coral reef constructed by the labours of minute creatures' and, in those rocks, can 'read aloud, the great stone book which is the history of the earth, even when darkness sat upon the face of the deep'.[20]

Fielding's analysis is not easy to refute and, at the same time, Dickens's 'Poetry of Science' is, clearly, idiosyncratic. Taken together, these prompt us to question how far one can realistically pursue any hypothesis founded upon the extent of Dickens's expertise in, or acquaintance with, contemporary science. Yet a

legitimisation for such an analysis can be found if we examine more closely his place in the complex crosscurrents between culture and science, crosscurrents that preoccupied numerous Victorian writers (as the work on Victorian literature and science testifies), just as they now engage contemporary writers and philosophers in the wake of the emergence of ecological ideas.

One might understand Dickens's interest in and application of science with reference, in the first place, to Bruno Latour's much cited distinction between the diffusion and translation models of how scientific ideas pass through society. Latour has argued that in the former scientific ideas are transmitted largely unaltered, whereas in the translation model individuals and agencies alter scientific concepts in accordance with their own ontologies or interests, those concepts thereby becoming transformed as they pass into and through the social world.[21] As Latour's work has repeatedly demonstrated, notably in connecting his ideas about science to 'Actor-Network-Theory', this notion of diffusion versus translation can, in turn, be applied to the technologies that develop out of scientific discoveries (i.e. to the practical uses to which science is put). Arguing, in this connection, that 'belief in the existence of a society separated from technoscience is an outcome of the diffusion model', Latour indicates, conversely, that translation is a necessity if we are to ensure that science, and its technological application, is put to the betterment of society.[22]

There is evidence to suggest that the concept of translation might fruitfully be applied to Victorian literary culture. We see a direct example of this in Michel Serres's essay 'Turner Translates Carnot' in which Serres reads elements of J. M. W. Turner's work as an aesthetic translation of thermodynamics.[23] One might also cite Gerard Manley Hopkins's attempt to integrate new scientific ideas, particularly an interest in energy physics, into his Catholicism.[24] And this could be applied to Dickens. To give an example, Adelene Buckland has argued persuasively that his long-standing (and overly neglected) interest in geology bequeathed to Dickens's work an 'objective, scientific, and accurate observation of the natural world' as well as an anti-utilitarian 'poetry of science' that in effect translated into a critical dimension. This occurred, she suggests, as a result of Dickens's interest in Catastrophism, a general 'narrative', supported by the geological record, 'of earth history as a series of catastrophes'.[25] Through this interest Dickens found a form by which he could symbolise both the consequences of urbanisation and, in reference to

the renewal that comes after destruction (as described in his review of *The Poetry of Science*), the emergence of a broader, reconstructive social vision,[26] a vision not entirely unconnected to technology (in this case, the railway depicted in *Dombey and Son*).

While Buckland offers an illustrative example of Dickens's translation of scientific concepts towards a wider social intent, she nevertheless underestimates, in my view, his knowledge of contemporary scientific thinking around evolutionary theory and energy physics. One might evoke in this respect Greg Myers' notion of the rhetorical scientific 'commonplaces' available to Victorian literary figures. Myers argues that the concepts and language of science and 'social and moral criticism' borrowed from each other, a circular relation of influence that in effect views translation as operating both ways.[27] He illustrates this through Carlyle foreshadowing the conservation of energy in *Sartor Resartus* (1833-4);[28] Beer has made a similar point in suggesting that *The Origin of Species* carries traces of Dickens in its style and organisation.[29] Either way, the evidence gathered, concerning scientific allusions in Dickens's novels, is simply too compelling to ignore. There are, it would appear, references to Darwinism and energy physics in *Our Mutual Friend*, via Eugene Wrayburn. Wrayburn's objection to 'being required to model my proceedings according to the proceedings of the bee' and his speculation that 'the hive may be satirical' may well refer to a passage on the hexagonal structure of beehives in *The Origin of Species*.[30] Indeed, this passage was well-known enough to have been one of only two references made to Darwin by Hopkins.[31] Correspondingly, Wrayburn's earlier reference to a notably capitalised 'Energy' can surely only be seen as a deliberate allusion to contemporary science (see *OMF,* 62-3).

Therefore, Dickens, as is consistent with Latour's paradigm, can be seen as having translated what he knew about these concepts into the language and shape of his own 'poetic science'. That translation offered a conception of science different from but equally legitimate to a more literal understanding, in so doing transcending the problems Latour has identified within the straightforward diffusion of scientific ideas into 'technoscience'. The value of this has been outlined by Robert Hewison in relation to John Ruskin, whose own ambivalence and occasional hostility towards science was not dissimilar to Dickens's. Concerning Ruskin's conception of a

'science of the aspects of things' – defined in the claim, about natural phenomena, that 'it is as much a fact to be noted in their constitution, that they produce such and such an effect upon the eye or heart […] as that they are made up of certain atoms or vibrations of matter'.[32] Hewison argues that Ruskin's paradigm offers a useful alignment between the 'discipline imposed by the [scientific] emphasis on accurate observation as the foundation of all knowledge' and an imaginative dimension, encompassing our 'moral relationship with nature', that can be supplied to science by the arts; an 'even more pressing' need, Hewison points out, in the context of environmental concerns.[33]

An indication of how that might work is offered when Buckland observes that geology afforded Dickens a structure and a metaphor for describing natural processes at work in the midst of industrial urban settings whose histories and landscapes were themselves made multi-layered and fractional by rapid change'.[34] The argument is extended by Jonathan Arac who suggests that Dickens's novels were, indeed, characterised by an under-regarded scientific precision and who claims (in a way that could allude to Latour) that the:

> […] transfer to social theory of language from such scientific writing marks the beginnings of the characteristic nineteenth-century terms of historical perception that describe the relations of part and whole: 'milieu', 'circumstance(s)', 'influence', 'air', 'element', 'atmosphere', 'medium', 'conjuncture', 'mentality', 'background', and 'environment'.[35]

While it remains apparent that Dickens did, in some respects, translate science into an essentially Romantic paradigm, the equation Arac offers, between an acquaintance with contemporary science and a socially reconstructive urge, is equally compelling and is borne out by the novels in ways that signal suggestive new possibilities for ecocriticism.

II

Dickens, imagination and social ecology

Relatively disinterested in any Romantic 'return to naturalism', the 'meaning' Dickens distilled from science was one of 'ecological interdependence', akin to Bookchin's 'deep-seated continuity between nature and society' or, more specifically, what Peter Dickens has described as 'the real or material connections

between people and nature and the social relations involved in the modification of nature and of the body'.[36] This translation of scientific into social thinking, which will be analysed in the remainder of this article, can be understood by means of a paradigm suggested by the social ecologist John Clark.

Clark argues that 'ecological social transformation' requires, among other things, addressing 'the system of socially shared images by which society represents itself to itself'. He proposes an alternative 'social ecology of the imagination' comprised of two dimensions: a 'concrete and experiential investigation' of the existing social and material world; and contributions to 'the creation of an ecological imaginary'.[37] Adopting this 'social ecology of the imagination' as a paradigm for how a social-ecological literary text might work, we can trace in Dickens's writing just how closely his scientific perception of interdependence conformed (even allowing for some qualification) to contemporary social ecology. Accordingly, this section of the article will argue two points: that the novels represented a 'concrete and experiential investigation' of the impacts of Victorian industrialisation on human and nonhuman nature alike; and that Dickens's writing and active involvement, notably in the area of sanitation reform, constituted 'the creation of an ecological imaginary', one constructed around an interest in political change and, in particular, an enthusiasm for the possibilities of new technology.

Dickens's motivation for investigating the Victorian social world was, of course, his love for the modern city. He described Liverpool, for example, as 'beautiful'[38] while, in 1858, bored by the ancient cathedral city of Durham, he happily walked thirteen miles across 'Pit-Country' to heavily industrialised Sunderland making 'a little fanciful photograph' in his mind (*Letters* VIII, 668-69).[39] Most notably, Dickens regarded the city as fundamental to his muse. Writing, ironically, from Switzerland where two generations of Romantic and Victorian writers had sought inspiration, Dickens attributed a struggle with his writing to:

> […] the absence of streets and numbers of figures. I can't express how much I want these. It seems as if they supplied something to my brain, which it cannot bear, when busy, to lose [...] a day in London sets me up again and starts me. But the toil and labour of writing, day after day, without that magic lantern, is IMMENSE !! (*Letters* IV, 612)

What resulted was something consistent with Marshall Berman's argument – elaborated through Baudelaire but with reference to Dickens – that the Victorian city

stimulated a more socially engaged literature, a mode of writing grounded in and ignited by the artist's everyday immersion in the urban environment.[40]

This took the form of Dickens instigating what Laurence Buell has called a tradition of 'toxic discourse'. A concept derived from Beck's risk thesis, toxic discourse refers, in Buell's definition, to an 'expressed anxiety arising from perceived threat of environmental hazard due to chemical modification by human agency'. Yet while toxic discourse is, indeed, the element of Dickens's work that conforms most closely to the first element of Clark's paradigm, I want to suggest that what Dickens anticipated, more specifically, was the current, emergent concept of ecosystem health. Initially a paradigm that applied medical terminology – 'stress', 'syndrome', 'dysfunction' – to describe the risks society has placed on ecosystems, ecosystem health has subsequently expanded to consider the extent to which human health is itself affected by those risks.[41] The subject of several (mainly American) books in the health and social sciences, the one book to discuss literature includes Terrell Dixon's suggestion that a 'literature of toxicity' may well have had 'its origins in works of English fiction as early as the urban novels of Charles Dickens'.[42]

Dickens's analysis of the Victorian physical environment moved towards a recognisably ecological perspective through four stages: straight environmental description; a more complex description informed by the language and concepts of science; a visceral, ecological mode of analysis in which he began to recognise that environmental hazards – most notably, air pollution and sanitation – pervaded the entire (human and nonhuman) environment; and a concern about the impact on human health that mirrored and anticipated the ecosystem health thesis. To illustrate this I will draw on the four novels which, I believe, are most obviously informed by science and closest to the themes of social ecology: *Dombey and Son* (1846-48), *Bleak House* (1852-53), *Little Dorrit* (1855-57) and *Our Mutual Friend* (1864-65).

Generalised environmental description is easy enough to uncover in Dickens. He describes in *Dombey and Son* 'two gaunt trees, with blackened trunks and branches, [which] rattled rather than rustled, their leaves were so smoke-dried' and challenges us 'to think of any simple plant, or flower, or wholesome weed, that, set in this foetid bed, could have its natural growth, or pull its little leaves off to the sun' (*DS*, 74-5, 737). *Bleak House* famously opens with an incremental description of

environmental blight: of 'Fog everywhere'; 'the waterside pollutions of a great (and dirty) city'; gas 'looming [...] in divers places in the streets'; and, of course, 'Smoke lowering down from chimney-pots, making a soft black drizzle, with flakes of soot in it as big as full-grown snow-flakes—gone into mourning, one might imagine, for the death of the sun'.[43] *Little Dorrit* is, likewise, indicative. 'Melancholy streets, in a penitential garb of soot, steeped the souls of the people who were condemned to look at them out of windows, in dire despondency', people for whom there was 'Nothing to see but streets, streets, streets. Nothing to breathe but streets, streets, streets'.[44] This is later juxtaposed to Switzerland, described, when the Dorrits visit, as having 'air [...] charged with the scent of gathered grapes', and where 'the breath of the cows and goats was redolent of leaves and stalks of grapes' (*LD*, 482). If one might, here, detect a hint of irony in the overblown pastoral description – reinforced in that the 'fresh beauty' soon yields to 'barrenness and desolation' (*LD*, 483) – this is because Dickens sought his inspiration not (as we know) in Switzerland but in the city, not in comparing built with natural, or urban with rural, but in evaluating the social world in terms of both its human and nonhuman cost.

He developed this, in the first place, by augmenting these primarily aesthetic descriptions with others that exhibited greater scientific precision. This is most apparent in *Our Mutual Friend* where environmental description is informed by degeneration. Dickens describes, for example, a 'grey dusty withered evening in London':

> The closed warehouses and offices have an air of death about them [...] a sun-dial on a church-wall has the look, in its useless black shade, of having failed in its business enterprise and stopped payment for ever [...] fallen leaves of the few unhappy city trees grind down in corners under wheels of wind [...] (*OMF*, 450-51)

Such scientifically grounded themes of degeneration and decay, informed, in turn, the urgency behind the third mode of analysis he practised – of the extent to which environmental conditions, in the form of urban pollutants, permeated the entire ecosystem.

So, the fog (more accurately, smog) that 'rolls' across the environment at the opening of *Bleak House*, 'flows [also] among green aits and meadows', and 'the gunwhales of barges and small boats', before, lastly, 'creeping' into the tobacco of a boat's skipper or 'the eyes and throats of ancient Greenwich pensioners, wheezing

by the firesides of their wards' (*BH*, 1). Similarly, in *Our Mutual Friend* the air is not only 'smoky' but 'gritty' the emphasis here placed on the human, social dimension: 'the city grit gets into the hair and eyes and skin' (*OMF*, 450-51) while, as a result of the smog, 'Animate London, with smarting eyes and irritated lungs, was blinking, wheezing, and choking [...] the whole metropolis was a heap of vapour charged with muffled sound of wheels, and enfolding a gigantic catarrh' (*OMF*, 479). This development, from descriptions of the insidious intrusion of pollutants into the air and soil and water, to those of its entering the 'hair and eyes and skin' of the human population, culminates with an anticipation of ecosystem health that clarifies the social-ecological dimension in Dickens.

That Dickens had perceived the connection between human health and environment can be inferred from a passage quoted in his review of *The Poetry of Science*:

> A plant exposed to the action of natural or artificial decomposition passes into air, leaving but a few grains of solid matter behind it [...]. Our dependency on the atmosphere is therefore evident. We derive our substance from it – we are, after death, resolved again into it. We are really but fleeting shadows.[45]

This awareness was substantiated by his involvement in the sanitation movement, beginning when Dickens expressed an interest in the Metropolitan Improvement Society, which, at its first general meeting in 1842, had brought together issues of smoke abatement, sanitation and water supply (*Letters* III, 330-31). Eight years later, prior to the launch of *Household Words*, he wrote 'I hope to be able to do the Sanitary cause good service, in my new periodical'. His editors note that 'CD was as good as his word: *HW* spoke out on all these questions' (*Letters* VIII, 18-19). In 1850 and 1851, Dickens spoke to the Metropolitan Sanitary Association, working alongside Sir Edwin Chadwick in the campaign to bring London into the provisions of the 1848 Public Health Act; and, in November 1854, *Household Words* published Henry Morley's 'People's Charter' which advocated properly constructed housing, the abolition of cesspools and 'a constant and unlimited supply of wholesome water' (see *Letters* VII, 436).

Appalled by the sanitary conditions that he observed directly, Dickens expressed this in characteristically sensorial ways:

> I can honestly declare tonight, that all the use I have since made of my eyes – or nose – that all the information I have since been able to acquire

> through any of my senses, has strengthened me in the conviction that searching sanitary Reform must precede all other social remedies. (*Speeches*, 129)

He spoke jokingly on this occasion, but direct experience also gave rise to a sharp, informed critique endowed with anger, compassion and humanity. Having noted, in an earlier speech, that thirteen thousand people had died in London as a result of sanitary problems (*Speeches*, 106), Dickens also found, in a literal rendering of the ecosystem health hypothesis, that 'infancy was made stunted, ugly, and full of pain; maturity made old, and old age imbecile' while 'pauperism [was] made hopeless every day' (*Speeches*, 106). Admiring the patience, sympathy and mutual help given by the poor (*Speeches*, 108) he believed, all the same, that London and its campaigners held a responsibility to 'set an example of humanity and justice' (*Speeches*, 106).

Christopher Hamlin argues that, with urban residents facing 'a common environmental problem', sanitation engendered 'the growth of a "civic gospel"'.[46] Dickens acknowledged that his most positive contribution to this movement was in bringing alive, in his novels, the experience of living under an 'urban health penalty'.[47] Seeking 'to turn Fiction to the good account of showing the preventible [sic] wretchedness and misery in which the mass of people dwell',[48] what Dickens's writing ultimately illustrates is the role imaginative literature can play in inculcating concern about and action around environmental injustice. Having written, in the preface to *Martin Chuzzlewit*, that 'in all my writings, I hope to take every possible opportunity of showing the want of sanitary improvements in the neglected dwellings of the poor', he was, again, 'as good as his word'.

The passage in *Dombey and Son* describing a 'foetid bed' where no plant 'could have its natural growth' supports, for example, a description of 'polluted air, foul with every impurity that is poisonous to health and life' and the depiction of an imaginary 'good clergyman or doctor, who, with his life imperilled at every breath he draws, goes down into [the] dens' of the urban working class and finds a 'world of odious sights' and 'millions of immortal creatures [who] have no other world on earth' (*DS*, 737). Likewise, in *Little Dorrit*, it is not only that there is 'nothing to see but streets, streets, streets' but, more substantially, that there is 'nothing to breathe'. The 'penitential garb of soot' has infested the lungs of the urban population, while

the water, correspondingly, infects their intestines:

> Fifty thousand lairs surrounded him where people lived so unwholesomely that fair water put into their crowded rooms on Saturday night, would be corrupt on Sunday morning […] Miles of close wells and pits of houses, where the inhabitants gasped for air, stretched far away towards every point of the compass. Through the heart of the town a deadly sewer ebbed and flowed, in the place of a fine fresh river. (*LD*, 68)

Ultimately, Dickens feared that the combination of polluted air and dreadful sanitation would bring into being an 'Unnatural humanity', a view articulated in 'The Thunderbolt', the thematically pivotal forty-seventh chapter of *Dombey and Son*, which draws upon the authority of science:

> Those who study the physical sciences, and bring them to bear upon the health of Man, tell us that if the noxious particles that rise from vitiated air were palpable to the sight, we should see them lowering in a dense black cloud above such haunts, and rolling slowly on to corrupt the better portions of a town. But if the moral pestilence that rises with them, and in the eternal laws of outraged Nature, is inseparable from them, could be made discernible too, how terrible the revelation. Then we should see depravity, impiety, drunkenness, theft, murder, and a long train of nameless sins [...] (*DS*, 738)

Dickens alludes here to miasma theory, the widespread Victorian belief that it was poisonous air carrying particles harbouring decaying matter, rather than contaminated water, which spread disease. At this time, and connected to his interest in sanitation, Dickens was particularly interested in this theory and he alluded to it again in a speech to the Metropolitan Sanitary Association, warning of the certainty that 'a vigorous pestilence raging furiously' in the air would carry across London (*Speeches*, 128). In time, miasma theory was disproved, primarily through the physician John Snow's study of the 1854 cholera epidemic. Yet, while Dickens may have been wrong about the scientific particulars, his instincts were right. Intent on examining, in both his writing and social activism, urban environmental conditions – or following, as he puts it in *Little Dorrit*, 'the secrets of the river' – Dickens intuited, even if he did not fully understand, the ecological laws governing both nature and human society. This understanding, in due course, translated into a socially reconstructive dimension that appeared in his work.

There are certain, obvious ways in which we can see this. Dickens held, for example, to a notion of social responsibility derived, in turn, from a sense of

environmental justice that has remained central to social ecology. Indeed, Dickens's writing conforms closely to the contemporary, American literature examined by so-called 'environmental justice ecocriticism', the aim of which has been to discover imaginative works that:

> attempt to redress the disproportionate incidence of environmental contamination in communities of the poor [...] to secure for those affected the right to live unthreatened by the risks posed by environmental degradation and contamination, and to afford equal access to natural resources that sustain life and culture.[49]

Both are apparent in what he tells Ernest Hart, a surgeon and reformer in the area of sanitary and medical reform:

> My knowledge of the general condition of the sick poor in workhouses is not of yesterday, nor are my efforts, in my vocation, to call merciful attention to it. Few anomalies in the land are so horrible to me as the unchecked existence of many shameful sick wards for paupers [...] (*Letters* XI, 164-65)

Dickens was also aware that environmental injustice might engender dire social consequences. We see this in *Bleak House* in a passage cited by Arac to demonstrate Dickens's scientific understanding:

> There is not a drop of Tom's corrupted blood but propagates infection and contagion somewhere. It shall pollute, this very night, the choice stream [...]. There is not an atom of Tom's slime, not a cubic inch of any pestilential gas in which he lives, not one obscenity or degradation about him, not an ignorance, not a wickedness, not a brutality of his committing, but shall work its retribution, through every order of society. (*BH*, 575-76)[50]

This awareness led both to the perception, as he writes in *Dombey and Son*, that we are 'creatures of one common origin [...] tending to one common end' (*DS*, 739) and an insistence on the need to find political solutions, a pragmatic impulse consistent with, and which prefigures, social ecology. In particular, he castigated those who argued against a systematic addressing of environmental hazards, defending political or legislative 'centralisation' as 'by far the best thing to stand by in an emergency' (*Speeches*, 130). While this particular emphasis conflicts, perhaps, with social ecology's usual preference for decentralised governance, his general advocacy of 'rational' political action does not. Furthermore, in Dickens's engagement with environmental issues such as sanitation and in his numerous speeches both to bodies seeking to ameliorate environmental conditions, including the Metropolitan Sanitary

Association and the Hospital for Consumption and Diseases of the Chest, and improving organisations such as various Institutes for mechanics, warehousemen or railway workers, we see intimations of a politics broadly corresponding to Bookchin's democratic confederalism. In Graham Storey's view, Dickens can, then, be regarded, in the 1840s and early 1850s at least, as 'a politically progressive Radical'.[51] Admittedly, Dickens did not maintain this stance; he gradually 'regressed', Storey continues, from more radical positions, becoming increasingly 'authoritarian and exasperated' and cynical about government.[52] Nevertheless, his attitudes did continue to conform to and anticipate, in a much more sustained way, the other central pragmatic tenet of social ecology – a belief in technology's capacity to help engender a more equitable, sustainable society.

Derived out of his acquaintance with science, Dickens was particularly interested in the practical applications of technology, as seen in his enthusiasm for Faraday's physics of invention or in his proposing for *Household Words* an article lamenting the neglect of 'chemists' and other 'men of science' in the award of peerages. These, he argued, should reflect 'the great progress of the country [...] of Railway construction, of Electric Telegraph discovery, of improvements in Machinery, of any sort of contribution to the happiness of mankind' (*Letters* VI, 467-68). Occasionally inclined to salute, as in Birmingham, the 'name and fame' of capitalists and the 'greatness and importance of [...] merchants and manufacturers' (*Speeches*, 60), the apparent endorsement of technology applied to the pursuit of wealth, evoked in Ruskin's description of Dickens as 'the leader of the steam-whistle party *par excellence*', was not, however, the whole story.[53] *Dombey and Son* indicates, of course, a notable ambivalence to industry and technology. Dickens counterbalances the railway, under construction, decimating the 'neighbourhood to its centre' (*DS*, 120), with, as Buckland points out, a vision of regeneration: 'The miserable waste-ground, where the refuse-matter had been heaped of yore, was swallowed up and gone' (*DS*, 289).[54] The point here, as Raymond Williams argued, was not to celebrate 'progress' but to demonstrate that the power of technology is ambiguous, presenting a choice, Williams wrote, as to 'the human shape of the new social and physical environment'.[55] While Dickens was wary of technology he nevertheless believed that it might contribute to a necessary, more equitable reconstruction of society. The most obvious fictional embodiment of this was the

character of Daniel Doyce in *Little Dorrit*.

Doyce stands as testimony to a more utopian view of technology. He represents, in the first place, two things: esteem for practical science and scientists; and the critique of a society insufficiently progressive to utilise such skills. Through Doyce, regarded as no 'ordinary man' (*LD*, 232), Dickens idealises 'engineers, quick in invention and determined in execution' for having the capacity to make anything they 'perceived to be wanted out of the best materials they could find at hand' and for being 'as bold and fertile in the adaptation of such materials to their purpose, as in the conception of their purpose itself' (*LD*, 735). Dickens praises much more than the engineer's technical skills, attributing to Doyce a vision and imagination, 'bold and fertile', that combines 'what was original and daring in conception with what was patient and minute in execution' (*LD*, 232). Doyce also embodies an integrity both personal, 'unobtrusive self-sustainment […] a calm knowledge that what was true must remain true' (*LD*, 234-5), and social, the latter reflected in Doyce's hope that his invention might prove 'useful' and 'serviceable to the nation' (*LD*, 233).

Alongside this idealisation of practical science comes a social critique constructed around the entropic force of the Circumlocution Office. Dickens portrays the incessant bureaucratic frustrating – or even, according to Mr Meagles, virtual criminalisation – of men such as Doyce who have, in fact, perfected 'an invention (involving a very curious secret process) of great importance to his country and his fellow-creatures' with the potential 'to effect a great saving and a great improvement' (*LD*, 160). This situation is juxtaposed to other (unnamed) countries in which engineers or inventors are 'regarded as men who meant to do it, engaging with other men who meant it to be done' (*LD*, 735). Yet the significant thing, in the end, about the advocacy of technology made through Doyce is that these sentiments are counterbalanced by the checks, balances and qualifications that Dickens placed upon it.

Dickens believed, and articulated through Doyce, that technology's true utility would lie apart from the greed, wastefulness and pollution of mainstream Victorian society. Such a view is apparent in what was probably his most significant statement concerning science and technology, an 1869 speech made on his election, for one year, as President of the Birmingham and Midland Institute. Unconcerned

'that the walls of the [...] Institute will ever tremble [...] to the croakings of the timid opponents of intellectual progress', he disputes the imputation 'that this age is a material age, and that a material age is not a religious age'. The point is captured in the rhetorical question 'What is the materiality of the cable or the wire, compared with the immateriality of the spark?' Dickens, in this practical version of 'poetic science', argues that living in a modern age need not diminish the mystery of the forces underlying nature. He also poses a second question, one derived from his awareness of the double-edged power of a technology that might also destroy nature: 'Is not my moral responsibility tremendously increased thereby?' (*Speeches*, 403-05).

This belief that technological application confers moral responsibility is entirely consistent with similar elements in social ecology, articulated by critics such as Janet Biehl, who, while opposed to nuclear technology, support sustainable technologies such as wind power.[56] While decisions of this type remain problematic, Dickens's solution is useful and instructive. In an 1858 speech to the Institutional Association of Lancashire and Cheshire, he introduces an imaginative dimension to technology that would diminish its more blindly utilitarian tendencies:

> […] in the midst of the visible objects of nature, whose workings we can tell off in figures, surrounded by machines that can be made to the thousandth part of an inch, acquiring every day knowledge which can be proved upon a slate or demonstrated by a microscope – do not let us, in the laudable pursuit of the facts that surround us, neglect the fancy and the imagination which equally surround us as part of the great scheme. (*Speeches*, 284)

Emanating from this imaginative dimension was a belief in a morally responsive science which, as we find in the depiction of Doyce, could be placed at the service of an equitable, sustainable society. This becomes apparent from a late conversation between Doyce and Arthur Clennam in which these two sympathetic characters converge closely with John Stuart Mill's (lately influential) concept of an anti-growth 'stationary state'. Possibly alluded to, also, in Eugene Wrayburn's dismissal of bees because 'they make so much more than they can eat' (*OMF*, 139), Doyce tells Clennam:

> If I have a prejudice connected with money and money figures [...] it is against speculating. I don't think I have any other. I dare say I entertain that prejudice, only because I have never given my mind fully to the subject.

> But you shouldn't call it a prejudice [...]. My dear Doyce, it is the soundest sense. [...] I was saying the same thing to Pancks, who looked in here. We both agreed that to travel out of safe investment is one of the most dangerous, as it is one of the most common, of those follies which often deserve the name of vices. (*LD*, 736)

Like us, the Victorians lacked the imagination to realise the vision implicit here: technology can help engender a self-sustainable future rather than simply serve the greed that creates the 'contagion' of *Little Dorrit*. The closest the Victorians came was in what Peter Gould has called the 'early green politics' of the Social Democratic Federation, a leftist political group in which William Morris was a central figure, which collapsed because of an unbridgeable divide between a Romantic faction who argued that production would have to take into account social and environmental consequences and an overly rationalist, industrialist Marxism.[57]

Similarly, we too have yet to close our own parallel divide between 'deep' and social ecology. In *The Song of the Earth*, Jonathan Bate, via Heidegger, regrets that one form of *poiesis* – the bringing-forth of phenomena 'into appearance and concrete imagery' and originally a mode of revelation encompassed by technology – has disappeared from human understanding as a consequence of the rationalism and utilitarianism of post-enlightenment technology. He suggests turning our backs on technology, and argues that a different form of *poiesis*, the artist or poet's 'bringing-forth into presence', is better placed to engender ecological awareness.[58] Dickens, I believe, offers a more realistic vision, an advocacy of technology, which represents his most unequivocal anticipation of social ecology. In this context, we need to understand why Dickens used the same word, 'genius', to describe Wordsworth and Faraday (*Letters* I, 639; *Speeches*, 157) and, in so doing, to revive a vision of technology that transcends the dichotomies bedevilling contemporary ecological theory. For in bridging the gap between reason and science, romance and imagination, Dickens demonstrated that, used responsibly and imaginatively, science has the capacity to re-enchant the world.

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