

"THE MESSAGE OF A MAGIC TOUCH": MIDDLEMARCH AND THE ETHER

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With her customary scepticism about absolutist explanations of human behaviour, George Eliot wrote that "one might as well hope to dissect one's own body and be merry in doing it, as take molecular physics (in which you must banish from your field of view what is specifically human) to be your dominant guide, your determiner of motives, in what is solely human" (*Letters* 6: 98-99). In a similar vein, she criticises Nicholas Bulstrode, *Middlemarch's* pious evangelist and hypocritical banker, who places faith in a Providence that he trusts will always be on his side. She demolishes these metaphysical pretences—and, by implication, those of any grand cosmology—with this piece of practical wisdom: "Even while we are talking and meditating on the earth's orbit and the solar system, what we feel and adjust our movements to is the stable earth and the changing day" (525; ch. 53). While Eliot, as a progressive nineteenth-century rationalist, welcomes advances in science with open arms and recognises the explanatory power of scientific theory, she is always on her guard when it strays outside its legitimate domains.

So it is with some disregard of these warnings from Eliot about treating science as a final arbiter of knowledge and meaning that I embark on this paper: my aim is to point out how the nineteenth-century cosmology of the ether permeates the language and epistemology of *Middlemarch*. First, I will need to briefly outline my view of the novel which contrasts sharply with recent readings tending to emphasise the novel's uncertainties and ambiguities.¹ The central characters all seek unitary systems of knowledge: Casaubon wants his "key to all mythologies"; Lydgate, his primary tissue; Dorothea seeks to reconcile her desire for social action with the absence of a fertile medium for it. All of these ventures fail, although one feels that Dorothea's is at least partially successful; and in Lydgate's case, although his personal life and problems deflect him from his original idealistic vision, the vision that he espouses remains a valid one. Diana Postlethwaite points out that "there has been a consensus among George Eliot's critics that because *Middlemarch* contains so many doomed searchers for that elusive key, therefore Eliot must believe that the enterprise is inherently futile, that the monist entertains a false view of reality" (252). Postlethwaite, however, sees the temper of Eliot's age and intellectual circle as synthetic and unifying, and says that "*Middlemarch* is George Eliot's own aspiration towards a key to all mythologies, her effort to incarnate a monistic conception of the world" (249). I share this view. The laws of cause and effect, the convergence of human lots, Eliot's quasi-mystical belief in "inexorable consequence" (*Essays* 31) are all asserted as axiomatic first principles. The narrator of *Middlemarch* states that "there is no creature whose inward being is so strong that it is not greatly determined by what lies outside it" (838; Finale). This is a

¹ See, for example, Hillis Miller, Lodge, Brody and Carroll.

positive value, although perhaps one that is made so by default and necessity: we are all part of the web, which can provide an image of community, continuity, order and unity. I want to turn now to a parallel image of order and continuity which corresponds to Eliot's vision of reality.

In a famous passage from the novel, Tertius Lydgate, Eliot's representative of scientific idealism, wants to reveal the "subtle actions inaccessible by any sort of lens, but tracked in that outer darkness through long pathways of necessary sequence by the inward light which is the last refinement of Energy, capable of bathing even the ethereal atoms in its ideally illuminated space" (165; ch. 16). This is the language of a physicist, albeit a physicist with a mystical bent. However, Lydgate does not seem unusual in this respect. Many physicists at the time of *Middlemarch's* publication were not averse to talking in a language that verged on the mystical, and this tendency grew as the century progressed.² Faith and science were not incompatible but rather mutually dependent. The principal elements detailed in Lydgate's reverie—subtle actions that are imperceptible and unavailable to empirical analysis, necessary sequence with its reliance on Newtonian laws of causality, and the revelatory power of light as well as its all-pervasiveness in its form of Energy—are manifest at many levels in Eliot's analysis of Middlemarch society. The narrator of *Middlemarch* constantly tracks the play of minute causes, the multitudinous invisible webs of causal relationships which determine the society she writes about.

Lydgate's reverie is not confined to the cosmologies of physics. He has chosen medicine as a profession precisely because of the breadth and variety of perspectives, both social and scientific, that it affords: "One can have the exclusive scientific life that touches the distance and befriend the old fogies in the parish too" (165; ch. 16). His gazing into the ethereal realm stimulates him to reflect on his simultaneous interest in psychology and society. His imaginative reverie in the realm of the ether connects subtly with the processes of the social world which follow, and are ultimately governed—however obscurely and diffusely—by physical processes. Eliot's narrator watches "the stealthy convergence of human lots" (95; ch. 11) and, like Lydgate, wants to "pierce the obscurity of those minute processes which prepare human misery and joy" with the ultimate aim, and satisfaction, of attaining a "suffusive sense of its [the specific object of inquiry] connections with all the rest of our existence" (165; ch. 16). The metaphor advanced as a hypothesis by which the narrator hopes to trace and illuminate the unseen connections at all levels of Middlemarch society is the totalising and governing principle of the web.

² For an account of the interactions between the "hard" science of the ether and its more mystical manifestations—divisions which can become quite blurred—see Wynne, Myers and Heimann. Wynne examines the work of physicists such as Oliver Lodge who also subscribed to spiritualism; Myers explains how the commonplaces, the ordinary language of thermodynamics, were easily transferred to other discourses; Heimann examines the metaphysical foundations of Stewart and Tait's influential popularization of thermodynamics and ether theory, *The Unseen Universe*. Parenthetically, one might add that modern physics also has many practitioners who are not shy of indulging in metaphysical speculation: Werner Heisenberg's *Physics and Philosophy: The Revolution in Modern Science* (Harper: New York, 1958), has provided a foundation for extra-scientific extrapolations from quantum mechanics and Paul Davies's accounts of modern cosmology have played a similar role.

Lydgate and Dorothea embody Eliot's highest aspirations, Lydgate in the scientific sphere and Dorothea in the moral sphere. They meet only a few times in the course of the novel. It is fitting then that the connection between them is made explicit as a paradigm for the relationship that exists between all human beings. In a flash of inspiration which is appropriate to his role as an imaginative scientist, Lydgate perceives the existence of the thread that connects them. When Dorothea turns to him for advice on the subject of her husband Mr Casaubon, the moment stays in his memory: "For years after Lydgate remembered the impression produced in him by this involuntary appeal—this cry from soul to soul, without other consciousness than their moving with kindred natures in the same embroiled medium, the same troublous fitfully-illuminated life" (290; ch. 30). Lydgate's "troublous fitfully-illuminated life" is the object of the "ideally illuminated space" that he constructs as a scientist. His thought of an "embroiled medium" brings us to another question. What is the nature of the medium in which these two atomised souls move and find connection?

In nineteenth-century physics, in which Eliot with her insatiable intellectual appetite was well-versed (Brody 42-45), an analogous hypothesis to the web was advanced to allow Newtonian physics to accord with discoveries in electro-magnetism made by experimentalists such as Michael Faraday and framed theoretically by scientists such as William Thomson and James Clerk Maxwell. This hypothesis was the ether. Ether theories were many and varied, contentious and speculative, but their common thread was to frame a system that ensured uniformity, consistency and mechanical explanation of all physical phenomena.³

A description of the ether by J.J. Thomson employs a metaphor which is strikingly similar to Eliot's web: "the invisible universe—the ether—is to a large extent the workshop of the material universe, and the phenomena of nature as we see them are fabrics woven in the looms of this unseen universe" (qtd Benson 833). J.H. Poynting said that "as we watch the weaving of the garment of Nature, we resolve it in imagination into threads of ether spangled over with beads of matter" (qtd Benson 832). The similarity does not seem to be entirely co-incidental. Ether theory, in the forms that were proposed at and around the time of Eliot's novel, was a unifying theory that also gave "a suffusive sense" of the connections between everything. A.A. Michelson said that the ether "may be one of the grandest generalisations of modern science—of which we are tempted to say that it ought to be true even if it is not—namely, that all phenomena of the physical universe are only different manifestations of the various modes of motion of one all-pervading ether" (qtd Siegel 259). Michelson's phrase

³ I am referring here specifically to nineteenth-century ether theories. The ether has a very long history, which is outlined in Cantor and Hodge, going back to Aristotle and Plato. Cantor and Hodge take Isaac Newton's gravitational and optical ethers as broadly encompassing subsequent ether theories, albeit allowing for fundamental variations:

ether was a spatially and temporally extended entity exerting but not merely identifiable with certain forces and supposed to fit most of the following descriptions: It may be present in spaces empty of ordinary solids, fluids and gases; it is not perceivable as such ordinary materials are; it transmits actions or effects including or like those of magnetism, electricity, heat, and nervous impulses; it can penetrate and pass through ordinary solid, fluid, and gaseous materials; changes in its distribution or its state can cause observable changes in ordinary bodies. (2)

Such a definition gives an idea of how broadly the ether could be applied as a metaphor.

"ought to be" suggests the desire of Victorian science and culture for unity, for a monistic explanation of reality, which, in large measure, is inherited directly and authoritatively from the Newtonian tradition. In the preface to the *Principia*, Newton calls for a single, all-encompassing explanation of reality: "the whole burden of philosophy seems to consist in this—from the phenomena of motions to investigate the forces of nature, and then from these forces to demonstrate *the other phenomena*" (xvii-xviii; my emphasis). This desire is realised in the resolution and harmonisation of the Prelude's depiction of the plight of those latter day Therasas whose "struggles seemed mere inconsistency and formlessness" (3). Eliot's metaphor of the web gives these struggles form and consistency. The ether hypothesis provided form and consistency in physics.

What precisely are Lydgate's ethereal atoms? For the modern reader, the words conjure up a misty spiritualism. But for Eliot's contemporaries, while they had something of this notion,⁴ it was also a reference to a supremely imaginative hypothesis that could be seen as a type of key to all mythologies, a monistic explanation of the material world. The ether to a Victorian audience was not as ethereal as it is to a twentieth-century one. As George Levine points out, Lydgate's "'ethereal atoms' are no mere poetic device here; they are, of course, the 'extra-sensible' matter of 'ether', that hypothesised matter which was, indeed, 'illuminated'—both literally and figuratively, by the inward light which is human intelligence"(14). The ether was the "unified field theory" of its day. Sir Humphrey Davy, eulogised in the novel by Sir James Brooke as a poet and a scientist, proposed a theory of nature which claimed that "the different species [of matter] are continually changing into each other" (Heimann 79). According to Heimann, Davy's "unified ether theory emphasised the balance of forces, the unity and interconversion of natural phenomena and the self-sufficiency of nature, contending that the activity of nature was maintained by forces of attraction and repulsion" (80). Transposing ether theory to the sphere of society, we can see an analogous belief system at work in Eliot's epigram to Chapter 51:

Party is Nature too, and you shall see
 By force of Logic how they both agree:
 The Many in the One, the One in Many; All is not Some, nor Some
 the same as any:
 Genus holds species, both are great or small;
 One genus highest, one not high at all;
 Each species has its differentia too,
 This is not That, and He was never You,
 Though this and that are Ayes, and you and he
 Are like as one to one, or three to three. (497; ch. 51)

⁴ Dale traces the different approaches of Lewes and Tyndall as to the real or purely hypothetical nature of atoms. He says that Eliot's tolerance of the inductive method, and hence of imagination in science, stems from Tyndall rather than Lewes who was more guarded in ascribing a concrete reality to atoms. He concludes that Eliot's position was more closely aligned to Tyndall's: "In George Eliot's passage . . . it is precisely these 'ethereal atoms,' rejected by Lewes as unreal, that the energy of the imagination reveals" (143).

Eliot's narrator constantly argues that there are separate centres of self but her altruistic morality demands that their separateness not be radical, that connections are established between them. This epigram with its difficult logic and language strives to unify the self and the whole. The young James Clerk Maxwell wrote a poem which touched on the same theme and which captures the same sense of mystical connection:

Reflex Musings: Reflections from Various Surfaces

In the dense entangled street,
Where the web of trade is weaving,
Forms unknown in crowds I meet
Much of each and all believing;
Each his small designs achieving
Hurries on with restless feet,
While, through Fancy's power deceiving,
Self in every form I greet.

Oft in yonder rocky dell
Neath the birches' shadow seated,
I have watched the darksome well,
Where my stooping form, repeated,
Now advanced and now retreated
With the spring's alternate swell,
Till destroyed before completed
As the big drops grew and fell.

By the hollow mountain-side
Questions strange I shout for ever,
While the echoes far and wide
Seem to mock my vain endeavour;
Still I shout, for though they never
Cast my borrowed voice aside,
Words from empty words they sever—
Words of Truth from words of Pride.

Yes, the faces in the crowd,
And the wakened echoes, glancing
From the mountain, rocky-browed,
And the lights in water dancing—
Each my wandering sense entrancing,
Tells me back my thoughts aloud,
All the joys of Truth enhancing
Crushing all that makes me proud. (qtd Jennings 268)

Maxwell's first stanza introduces the familiar metaphor of the web. Moreover, it touches on Eliot's theme of the relation of the self to the greater social entity, in this

case fancying the identification of the one with the other as at first a deception. In the second stanza the self is dissolved by the power of natural forces. The last stanza, however, brings the isolated self back into connection with the natural and social world—the "faces in the street," the mountain and the water, and hence, closer to some solid Truth. Ether theory in Clerk Maxwell's hands was certainly not of exactly the same order as his poetic inclination to order and unity. Clerk Maxwell's unification of electro-magnetic forces was not mere wishful thinking. It provided the theoretical structure that ultimately enabled Einstein to decisively break with Newton. Nevertheless, Eliot's epigram, Clerk Maxwell's poem and the hypothesis of the ether as a unifying element in physics suggest a shared cultural matrix. The ether was the stabilising and uniting element in a physical flux, just as Eliot's web is the stabilising and uniting element in the societal flux of *Middlemarch*.

Donald R. Benson argues that the ether was a heuristic device that was a cultural necessity to resolve the crisis that had been developing in the nineteenth century when Newtonian absolute space was being called into question. According to Benson, the ether that the scientists describe "is a fiction in significant ways":

It is an imaginative construct, derived by metaphor and analogy—often consciously so—from observation and inference. . . . [E]ther provided means for resolving apparent discontinuities in the spatial material order, and even for resolving the fundamental discontinuity between material and non-material orders. This latter possibility led some of the scientists into extra-scientific speculation, thus implying the character of ether as a general cultural fiction. (830)

The ether was, then, an anti-empirical invention. It relied on the same "arduous invention" that Lydgate proposes as the model for science and Eliot endorses.

Critics such as Sally Shuttleworth and Gillian Beer have rightly drawn attention to the biological imagery and language of *Middlemarch*. Beer notes that Eliot's scientific language has become naturalised over the years and that consequently the modern reader does not inevitably discern the "freight of controversy and assertion" that this language, with its Darwinian cargo, carried (149). However, the language of physics also plays an important role in the novel. Underlying the new scientific language is an older, less easily discernible language that did not carry the weight of controversy. This is the language of cause and effect, of "necessary sequence."

Many of the studies that deal with science in *Middlemarch* tend to under-emphasise the numerous references to Newtonian physics, perhaps because having been so thoroughly integrated into the culture and thought of the times, and indeed of our own times, they don't stand out as they otherwise might. Newtonian laws are constantly restated throughout the novel, particularly in the epigraphs, and allusions are often made to contemporary physics. From these sources, Brody extrapolates the idea that Eliot was drawing on the recently conceived Kinetic Theory of Gases as an analogy for society. Dale has detailed Eliot's use of terms such as "force" and "energy" and shown how their usage in the novel relates to theories of thermodynamics and the conservation of energy. Dale shows how Eliot utilises the scientific weight that these terms possessed and how this weight is carried over into the spiritual and emotional realm

(129-63). My aim now is complementary—to trace the language of ether theory in the novel and to point out the extrapolations that Eliot makes from physics into psychology.

Shuttleworth makes the point that "the unity of *Middlemarch* is based primarily, not on relations of direct effect, but on the shared community of language" (147). Language is also a web-like structure that disseminates force and energy. However, language and the ideas that flow from it have effects that are at least as palpable as the relations between things and between physical events. The epigraph to Chapter 64 restates the essential premise of Newtonian philosophy, that "Cause is not cause unless effect be there" (647), and the assertion is that the law of cause and effect applies equally to the psychological and social realm as to the purely physical realm.

An important book that attempted to place psychology within the framework of physics was David Hartley's *Theory of The Human Mind*. Following Locke's Theory of the Association of Ideas, and at the behest of a suggestion of Newton, Hartley formulated a mechanistic psychology which, in Joseph Priestley's words, said that "some mechanical affection of the nerves and brain must necessarily correspond to all our sensations and ideas" (Hartley xiv). Ideas, in other words, are to some degree physical facts, similar for example to sound waves. This effect was attributed to vibrations in what Hartley called the medullary ether.

Hartley's psycho-physical ether, the luminiferous ethers of Clerk Maxwell and Thomson, and Eliot's web all share these properties: they are places of intense and effective activity, pulsing with electrical energy and vibration. The novel teems with imagery and language that cast psychology and social relationships in terms of physics: the narrator is "not sure that certain fibres in Mr Garth's mind had not resumed their old vibration towards the very end which now revealed itself to Fred. For the effective accident is but the touch of fire where there is oil and tow" (561; ch. 56); talking of Rosamond's beguiling influence on Lydgate, she says that there is "Nothing in the world more subtle than the process of gradual change! In the beginning they inhaled it unknowingly; you and I may have sent some of our breath towards infecting them, when we uttered our conforming falsities or drew our silly conclusions: or perhaps it came with the vibrations from a woman's glance" (145; ch. 15); the work of Bichat, Lydgate's mentor, is imaged as "vibrating along many currents of the European mind" (148; ch. 15), suggesting again a palpable physicality to thought or at least an immediacy and effectiveness that replicates physical events.

Eliot's use of the word "currents" here also suggests the pre-eminent metaphor of ether as a fluid, a metaphor which was transferred to electro-magnetic forces. Fluidity is a central motif in the novel; it is embodied in Dorothea Brooke's name, and is the defining metaphor in the Prelude and Finale. Parallel with Eliot's ethereal vibrations is her use of electrical energy as an instance of vibratory energy, as a conveyor of action at a distance. Electricity and magnetism were hypothesised as prime manifestations of the activity of a universal ether (Siegel 239-68). Eliot extends their influence beyond the realm of physics and imagines electricity as a causal influence in psychology: Mr Brooke brings Dorothea some pamphlets from Lowick and it seems "as if an electric stream went through Dorothea, thrilling her from despair into expectation" (37; ch. 4). When Celia suggests to Dorothea that they finally arrange the division of their late mother's jewels, her face has "the shadow of a pouting expression in it, the full presence of the pout being kept back by an habitual awe of Dorothea and principle; two

associated facts which might show a mysterious electricity if you touched them incautiously" (11; ch. 1). The suggestion here is that abstractions like "principle" somehow possess a sort of materiality that we might be able to uncover. In a way, Eliot is promoting a sort of hyper-materialism. Physiological processes are constantly made to stand in for psychological processes. The material world interacts with and possesses an effectual power which often precludes that of conscious will, or in fact replaces and stands in for conscious desire: our misdeeds are "like the subtle muscular movements which are not taken account of in the consciousness, though they bring about the end that we fix our mind on and desire" (687; ch. 67).

A similar, although more emphatic physical reaction of this kind, is experienced by Will Ladislaw. His reaction to the announcement of Dorothea's presence is described thus:

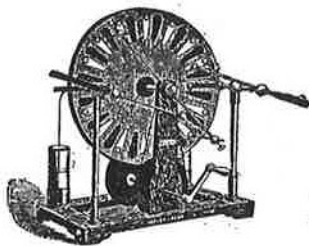
[H]e started up as from an electric shock, and felt a tingling at his finger-ends. Any one observing him would have seen a change in his complexion, in the adjustment of his facial muscles, in the vividness of his glance, which might have made them imagine that every molecule in his body had passed the message of a magic touch. And so it had. (388; ch. 19)

And that is exactly what the molecules in the luminiferous ethers are doing, passing the message of a magic touch, transmitting action at a distance, filling in the gaps that lie between a cause and its effects. These suggestions reinforce the totalising comprehensive nature of the web, how every action and every thought is mediated along its lines of extension, just as the particles of light bounce through the subtle elastic fluids of the ether. Eliot's web, and the ether, are intricate metaphors, imaginative fictions, moral and cosmological ideals, and working models of society and the world and their underlying physical and psychic structures.

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