Title	Threading the hidden pathways : the relationship between scientific discovery and the unknowable in middlemarch
Sub Title	『ミドルマーチ』に於けるジョージ・エリオットの科学的思考
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Publisher	慶應義塾大学藝文学会
Publication year	1997
Jtitle	藝文研究 (The geibun-kenkyu : journal of arts and letters). Vol.72, (1997. 6) ,p.197(92)- 213(76)
JaLC DOI	
Abstract	
Notes	
Genre	Journal Article
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AN00072643-00720001-0213

Threading the Hidden Pathways: The Relationship Between Scientific Discovery and the Unknowable in *Middlemarch*

Yohko Nagai

"Science is a bringer of light," wrote George Henry Lewes in the June 1878 issue of the *Fortnightly Review*. According to his interpretation, science is simply, "Knowledge classified, systematised, made orderly, impersonal, and exact, instead of being left unclassified, fragmentary, personal, and inexact."(1) In a more social perspective, T. H. Huxley perceived science as offering a new source of stability and a positive release from constricting tradition. In both cases, science is recognised as being something which will elucidate, demystify, and provide a firm basis for understanding our existence. With the advancement of technology (such as the development of the lens), there is a tendency to insist upon greater precision and exactness — a complete knowledge. Discovery, no doubt, draws our attention to aspects which have not been explored. Yet, at the same time, it has the effect of increasing in scope and "widening the skirts of light,"(2) thus paving the way for further areas of the unknown. In *Middlemarch* (1871-72), Mr. Brooke comments, "I went into science a great deal myself at one time ; but I saw it would not do. It leads to *everything*" (emphasis added, 17). The more light there is, the more darkness is produced in consequence. Is there any limit to knowledge? Is it inevitable that all discovery be "partial"? If to see close is paradoxically to see wide, is there any hope of achieving a total image — "the whole of a subject"(3) How are we to justify the existence of those physical phenomena which are not detect-

ed by our senses? It is my interest to examine these questions in the light of George Eliot's application of science in her novels, particularly *Middlemarch.*

While the telescope enabled scientists to make distant objects appear nearer and larger, the microscope which came to be used "with new enthusiasm of reliance" (149) by the 1800's, served to reveal small details which are there in front of us but are indistinct or invisible to the naked eye. It is these seemingly accessible items unseen or "perception unexpressed,"[4] which rouses George Eliot's imagination. Like Tertius Lydgate who seeks to examine the unapparent relations, "showing new connections and hitherto hidden facts of structure" (148), Eliot is also preoccupied with the multiple unseen world: "to me the Development theory and all other explanations of processes by which things came to be, produce a feeble impression compared with the mystery that lies under the processes."[5]

If the role of scientists is to elucidate what has previously been hidden from our perspective, how do they actually go about making their discoveries? Lydgate's research adopts the form of hypothetical study: "he was enamoured of that arduous invention which is the very eye of research, provisionally framing its object and correcting it to more and more exactness of relation" (165). It is no coincidence that William Whewell's theory on the colligation of facts almost echoes Lydgate:

> The discovery of general truths from special facts is performed ... by the use of a series of Suppositions, or *Hypotheses,* which are looked at in quick succession, and of which the one which really leads to truth is rapidly detected, and when caught sight of, firmly held, verified, and followed to its consequences.[6]

In both cases, the object being tested is provisionally "framed" and is

then followed by a process of modification where the object is adjusted to an equally definite form that relates more exactly to reality. This modification, which is an integral part of "conjectures" or "happy *Guesses,*"[7] is precisely what Rev. Edward Casaubon's method of research lacks :

> Mr. Casaubon's theory of the elements which made the seed of all tradition was not likely to bruise itself unawares against discoveries : it floated among flexible conjectures ... it was a method of interpretation which was not tested by the necessity of forming anything which had sharper collisions than an elaborate notion of Gog and Magog : it was as free from interruption as a plan for threading the stars together. (478-479)

Casaubon's research method, in other words, is self-enclosed and self-confirming.

By basing research on "happy *Guesses,*" the results will tend to vary depending upon circumstances. Thus, the results will inevitably be provisional and tentative. What this implies is that the knowledge which scientists have claimed to have attained through their research may only be "partial" of what lies in reality. In the epigraph of chapter 21 of *Daniel Deronda* (1876), George Eliot indicates that, "Knowledge ... enlarges discovery and makes record of it.... Knowledge is power, but it is a power reined by scruple, having a conscience of what must be and what may be."[8] Knowledge and the unknowable, in other words, are two sides of the same coin. For George Eliot and her contemporaries, like John Tyndall[9], the unknowable and the mystery are by no means things which will act as an inhibiting force. On the contrary, mystery provides the motive or the impetus to struggle — struggle to capture even a little share or a hint of what takes place in our universe.

In the Prelude to *Middlemarch,* George Eliot suggests that the

novel is a study of "the history of man" — "how the mysterious mixture behaves under the varying experiments of Time" (emphasis added, 3). Likewise, Eliot, in one of her letters, identifies her writing as "simply a set of experiments in life — an endeavour to see what our thought and emotion may be capable of — what stores of motive, actual or hinted as possible, give promise of a better after which we may strive."[10] Here, particular attention should be drawn to such words as "mysterious mixture" and "varying experiments." They have rather an exploratory, free-ranging, expansive connotation, for they entail uncertainty as they probe the unknown. By calling *Middlemarch* "A Study of Provincial Life" or "an experiment," Eliot has aptly provided herself the very freedom to explore.

Identifying Bertha Grant as his "oasis of mystery," Latimer in "The Lifted Veil" (1859) particularly emphasises the importance of the unknown :

> So absolute is our soul's need of something hidden and uncertain for the maintenance of that doubt and hope and effort which are the breath of its life, that if the whole future were laid bare to us beyond to-day, the interest of all mankind would be bent on the hours that lie between ; we should pant after the uncertainties of our one morning and our one afternoon ; we should rush fiercely to the Exchange for our last possibility of speculation, of success, of disappointment....[11]

The fact that Latimer has the ability to participate in other people's consciousness and to foresee their incalculable words and actions, suggests that his vision is always predestined. In other words, there is no hope for creative development.[12] Latimer's situation is strikingly similar to that of Casaubon whose whole life is based on preconception. One can do no better than read his verbose letter of proposal to

Dorothea to realise that he perceives life as a great plan in which everything is prearranged to satisfy his personal needs:

> For in the first hour of meeting you, I had an impression of your eminent and perhaps exclusive fitness to supply that need ... and each succeeding opportunity for observation has given the impression an added depth by convincing me more emphatically of that fitness which I had *preconceived*.... It was, I confess, beyond my hope to meet with this rare combination of elements both solid and attractive, adapted to supply aid in graver labours and to cast a charm over vacant hours; and but for the event of my introduction to you (which, let me again say, I trust not to be superficially coincident with *foreshadowing* needs, but *providentially* related thereto as stages towards the completion of a life's plan), I should presumably have gone on to the last without any attempt to lighten my solitariness by a matrimonial union.
>
> (emphasis added, 43-44)

Dorothea, in a sense, becomes the object of Casaubon's dream of totalization — to add her among his collection of "shattered mummies, and fragments of a tradition" (478). It is when he fails to penetrate the "obscurity" beneath surface appearances and recognise the subtle changes, the "minute processes," that occur in Dorothea's mind that difficulties arise, especially in the marital "relation."

In the way Lydgate has sought to "work out the proof of an anatomical conception and make a *link* in the chain of discovery" (emphasis added, 146), George Eliot sees the relevance of examining "relations."[13] To compromise for the variability and the transitoriness of the research results, there is a need to identify a certain kind of "relation" or "an intermediate link" that would bring these results into the scope of our understanding. Acknowledging that there is "individual

variability"[14] among organic beings in nature, Charles Darwin in *The Origin of Species by Means of Natural Selection* (1859) reveals that "the structure of every organic being is related, in the most essential yet often *hidden manner,* to that of all other organic beings, with which it comes into competition for food or residence, or from which it has to escape, or on which it preys."[15] According to such interpretation, scientists, in pursuit of discovery, are constantly faced with the task of "thread[ing] the darkness with strict deduction."[16]

In the way Lydgate examines the "primary tissue" in order "to demonstrate the more intimate relations of living structure" (148), George Eliot also tries first to elucidate the various details of human life and to "unravel" the complex interrelationship of the characters within a society. It is through such process that she is able to create a panoramic view of provincial life. Contrasting herself to Henry Fielding, George Eliot reveals her narrative intention:

> I at least have so much to do in unravelling certain human lots, and seeing how they were woven and interwoven, that all the light I can command must be concentrated on this particular web, and not dispersed over that tempting range of relevancies called the universe. (141)

Using the analogy of science, the characters in *Middlemarch* are placed in "the same embroiled medium, the same troublous fitfully-illuminated life" (290), and it is through their interaction and their relation to their social surroundings that a social fabric is established. Eliot focuses her attention on this social fabric, and in order to "study" the texture or the nature of this "sarsnet, gauze, net, satin and velvet from the raw cocoon" (148), she, like the experimenter, uses a diverse selection of lenses with which she can adjust her magnification or her perspective.

Similar to this technical act of changing the lens of the

microscope,[17] the shift in perspective from general to particular or vice versa is based on the assumption that the intimate relations that are less visible to our naked eyes are exactly recapitulated on a larger scale :

> The suffering, whether of martyr or victim, which belongs to every historical advance of mankind, is represented in this way in every town and by hundreds of obscure hearths : and we need not shrink from this comparison of small things with great ; for does not science tell us that its highest striving is after the ascertainment of a unity which shall bind the smallest things with the greatest? In natural science, I have understood, there is nothing petty to the mind that has a large vision of relations, and to which every single object suggests a vast sum of conditions. It is surely the same with the observation of human life.[18]

In relation to the divine or the Supreme Unity, Ezra Mordecai Cohen in *Daniel Deronda* also acknowledges the interdependency of the part and the whole : "Now, in complete unity a part possesses the whole as the whole possesses every part."[19] This relationship between the part and the whole can be described in terms of one looking into a kaleidoscope. When the tube is rotated, one can either look at the movement of individual pieces of coloured glass or enjoy the larger figure produced by their reflections. Though the patterns in such figure be intricate, one can never escape from the thought that the figure is a product of mere reflections — illusions. When there is such doubt of authenticity, is it not our human nature to want to look back at a more definite object — in this case, the original pieces of colored glass? Lydgate states that "there must be a systole and diastole in all inquiry," and that "a man's mind must be continually expanding and shrinking between the whole human horizon and the horizon of an object-glass" (640). It is with this rhythm

of expansion and contraction that the scientists must penetrate the mysteries of the unknown. The pursuit of discovery can, therefore, be interpreted as an active task that withholds all means of stability. What scientific discovery ultimately entails is an intense feeling of exultation on the part of the experimenter, "bending over the first stirrings of change that correspond to what in the fervour of concentrated prevision his thought has foreshadowed."[20] Only those who have questions can have any access to knowledge, but as questions entail the antitheses of "yes" and "no" — of being this way and that — a stability of thought is never achieved.

If such is the case, does stability then inhibit creative development? Enigma or the ineluctable mystery associated with nature has an effect of encouraging its revelation, and it is this endeavour to know the unknowable which has frequently coloured the image of the scientists in nineteenth-century literature. Ironically, their role as "demystifier" often carries with it the latent quality of being the source of uninvited consequences. As in the case of Victor Frankenstein exerting his energy and time in creating his monster, the most productive moments are when their discoveries still prove incomplete, leaving areas for further improvement. Frankenstein has laboriously worked for two years for the single purpose of "infusing life into an inanimate body." Yet, once he has achieved his goal, "the beauty of the dream vanished, and breathless horror and disgust filled [his] heart."[21] Recognising that a discovery is only "partial," there will always be an urge to search for further clues that may possibly help to make the discovery "whole." It is this notion of "unfulfilment," "partiality," and "instability" which sustains the enticements of scientific discovery :

> The inspirations of the world have come in that way too : even strictly measuring science could hardly have got on without that

forecasting ardour which feels the agitations of discovery beforehand, and has a faith in its preconception that surmounts many failures of experiment.[22]

The reality which George Eliot envisaged is not just confined to the visibly perceptible objects. She particularly takes into account the fact that any objective conception of reality must include an acknowledgement of its own incompleteness. Struggle is essential for any kind of development and to settle for security and to achieve too perfect a control over the environment will only leave room for degeneration. For the Victorians, fulfillment even carried with it a vague prospect of retrogression or disbelief.[23]

George Eliot's preoccupation throughout her novels with hidden lives, hidden structures, and the problem of perception directly corresponds with the Victorian concern with what it means to "see." With the contribution made by John Tyndall, T. H. Huxley, W. K. Clifford, and James Clerk Maxwell, science in the Victorian period even went into examining areas which are beyond the reach of the microscope or the telescope — the atomic and the molecular structure of the universe. George Henry Lewes in *Problems of Life and Mind* (1873-9) states that the world of the "invisible" includes objects which are "beyond all practicable extension of Sense" : "It presents objects to the *mind's eye* such as no bodily eye could discern : molecules, and waves, having their precise measurements and laws, planets and their stages of evolution before man was."[24] With the use of imagination, the world of the "extra-sensible" assumes a greater sense of reality than the visible world. It comes as no surprise that George Eliot who collaborated with George Henry Lewes in his psychological, scientific studies[25] also found herself captivated by this "roar which lies on the other side of silence" (194) — a "roar" which remains inaudible or "unknown to the

world,"[26] however much its existence is inferred from given conditions.

The physicist, James Clerk Maxwell, in his paper on "Molecules" presented to the British Association for the Advancement of Science in 1873, poses a question which was much in debate during the nineteenth century : how to express in words objects which are "imperceptible by our senses, and which cannot be subjected to direct experiment."[27] Language, in other words, presents itself as the crucial problem. Despite its wide popularity, Darwin's *The Origin of Species* had already proven to the public the difficulty of adopting a very human attribute called "writing" to explain the vast natural phenomena of the world. Since every consequence or result in nature is liable to change according to circumstances, the language to express these issues will also project meanings that are tentative, provisional, and approximate. One only needs to examine Darwin's language to capture its speculative, conditional quality :

> That natural selection will always act with extreme slowness, I fully admit. Its action depends on there being places in the polity of nature, which can be better occupied by *some* of the inhabitants of the country undergoing modification of *some* kind. The existence of such places will *often* depend on physical changes, which are *generally* very slow, and on the immigration of better adapted forms having been checked. But the action of natural selection *will probably still oftener* depend on *some* of the inhabitants becoming slowly modified ; the mutual relations of many of the other inhabitants being thus disturbed.[28]

Criticising Darwin's work as being "ill-written and sadly wanting in illustrative facts,"[29] George Eliot was well aware of the limitation of language. It is true that, in practice, our limited abilities enable us only to discern and describe one moment or a "part" of what lies in reality.

In her novels, George Eliot has not, in any way, demystified the "unknowable." Nevertheless, by adopting multiple perspectives or shifting focus (as represented in the changing of the lens of the microscope), she has sought for ways to compromise the need for both exploration and mystery. George Eliot succeeds in reminding us that there is much we cannot know, an infinite possibility to all things. This notion of multiplicity is in keeping with her stance as a writer:

> On the same ground it may be said that the most effective writer is not he who announces a particular discovery, who convinces men of a particular conclusion, who demonstrates that this measure is right and that measure is wrong; but he who rouses in others the activities that must issue in discovery, who awakes men from their indifference to the right and the wrong, who nerves their energies to seek for the truth and live up to it at whatever cost.[30]

In attempt to become this "effective writer," George Eliot, at the same time, is also offering a solution to the problems faced by many of her contemporaries — to "reveal" without reducing the mystery that motivates man's urge for discovery. The fact that she refrained from making a single judgement or arriving at a simple conclusion in *Middlemarch* suggests her gradual withdrawal from the robust belief in fact. Writing, for her, became an intimation of possibility.

The novel about the endeavour to reveal the unknown — the "unhistoric acts" and the hidden "human histories" — is also about the limitation of what can be known or perceived. Science provides the suitable "light" or the schema from which we attempt to comprehend the reality. It paves the way for a testing vision of details and relations. Yet, given the fact that our language is "multivocal" and "potentiates diversity of meaning,"[31] there will always be infinite possible ways of

explaining natural phenomena. This only makes more conspicuous our inability to comprehend them. Science in its attempt to interpret natural phenomena paradoxically opens ways to further mysteries of the unknown. The human desire to reveal the unknown and thus, to claim its ownership is constantly checked by the limits of our perception and linguistic ability. Mr. Brooke has claimed that science leads to everything. This is a prime indication of how little the Victorians felt they had begun to understand the world around them.

Notes

(1) George Henry Lewes, *Versatile Victorian : Selected Writings of George Henry Lewes,* ed. Rosemary Ashton (London : Bristol Classical, 1992) 317-18.

(2) George Eliot, *Middlemarch,* ed. Rosemary Ashton (Harmondsworth : Penguin, 1994) 392. Subsequent references to *Middlemarch* are to this edition and are cited parenthetically in the text.

(3) John Stuart Mill, *On Liberty and Other Essays,* ed. John Gray (Oxford : Oxford UP, 1991) 25.

(4) Robert Browning's "Paracelsus" (1835) in *The Poems, Volume* I, ed. John Pettigrew (Harmondsworth : Penguin, 1981) 134.

(5) George Eliot, "To Mme Eugène Bodichon," 5 December 1859, *The George Eliot Letters,* ed. Gordon S. Height, vol. 3 (New Haven : Yale UP, 1954 ; London : Oxford UP, 1954) 227.

(6) Emphasis original. From *Novum Organon Renovatum, Being the Second Part of the Philosophy of the Inductive Sciences,* 3rd edition (London : 1858). William Whewell, *Theory of Scientific Method,* ed. Robert E. Butts (Indianapolis : Hackett, 1989) 134.

(7) Emphasis original. Whewell 134.

(8) George Eliot, *Daniel Deronda,* ed. Barbara Hardy (Harmondsworth : Penguin, 1967) 268. In "The Spanish Gypsy" (1868), Salomo Sephardo also refers to the limitation of science — astral science or horoscope — in predicting the future : "No horoscope makes slaves. / 'Tis but a mirror, shows one image forth, / And leaves the future dark with endless 'ifs.'" George Eliot, *George Eliot's Works,*

The Warwick Edition, vol. 11 (Edinburgh and London: William Blackwood and Sons, 1906) 214.

(9) John Tyndall expresses an optimistic view towards the limits of human knowledge: "Meanwhile the mystery is not without its uses. It certainly may be made a power in the human soul...." See George Levine's "The Scientific Texture of 'Middlemarch'" in *George Eliot,* ed. Harold Bloom (New York: Chelsea House, 1986) 194.,

(10) George Eliot, "To Dr. Joseph Frank Payne," 25 January 1876, *The George Eliot Letters,* ed. Gordon S. Haight, vol. 6 (New Haven: Yale UP; London: Oxford UP, 1955) 216.

(11) George Eliot, *The Lifted Veil,* afterword by Beryl Gray (London: Virago, 1985) 43.

(12) Gillian Beer, "Myth and the Single Consciousness: *Middlemarch* and *The Lifted Veil,*" *This Particular Web,* ed. Ian Adam (Toronto and Buffalo: University of Toronto, 1975) 92.

(13) Gillian Beer claims that "In *Middlemarch* wholeness can be approached only through relations." See Beer, "Myth and the Single Consciousness" in Adam 112.

(14) While Charles Darwin explores the notion of "Variation" in *The Origin of Species by Means of Natural Selection,* Gillian Beer comments that his theory, itself, also has "an extraordinary hermeneutic potential — the power to yield a great number of significant and various meanings.... It has no place for stasis." See Gillian Beer, *Darwin's Plots : Evolutionary Narrative in Darwin, George Eliot and Nineteenth-Century Fiction* (London: Ark, 1983) 10-11.

(15) Emphasis added. Charles Darwin, *The Origin of Species by Means of Natural Selection,* ed. J. W. Burrow (Harmondsworth: Penguin, 1968) 127.

(16) Eliot, *Daniel Deronda* 202.

(17) The following passage illustrates the effect of the concentrative powers of the microscope: "Even with a microscope directed on a water-drop we find ourselves making interpretations which turn out to be rather coarse; for whereas under a weak lens you may seem to see a creature exhibiting an active voracity into which other smaller creatures actively play as if they were so many animated tax-pennies, a stronger lens reveals to you certain tiniest hairlets which make vortices for these victims while the swallower waits passively

at his receipt of custom." (59-60)

(18) George Eliot, *The Mill on the Floss,* ed. A. S. Byatt (Harmondsworth : Penguin, 1979) 363.

(19) Eliot, *Daniel Deronda* 802.

(20) Eliot, *Daniel Deronda* 550.

(21) Mary Shelley, *Frankenstein or the Modern Prometheus,* ed. Maurice Hindle (Harmondsworth : Penguin, 1992) 56.

(22) Eliot, *Daniel Deronda* 572.

(23) John Ruskin, for example, explores the benefit of "partial knowledge" : "we need not wonder now, that mist and all its phenomena have been made delightful to us, since our happiness as thinking beings must depend on our being content to accept only partial knowledge, even in those matters which chiefly concern us. If we insist upon perfect intelligibility and complete declaration in every moral subject, we shall instantly fall into misery of unbelief." John Ruskin, *Modern Painters,* vol. 4 (London : George Allen, Sunnyside, Orpington, 1897) 72.

(24) Emphasis added. George Henry Lewes, *Problems of Life and Mind,* vol. 1 (London : Trübner, 1883) 261.

(25) George Henry Lewes wrote to John Blackwood (13 July 1872) that "The shadow of old Casaubon hangs over me and I fear my 'Key to all Psychologies' will have to be left to Dorothea!" This foreboding proved true, for it was George Eliot who finally completed the last volume of his *Problems of Life and Mind* and prepared his rough manuscripts for publication after his death. George Eliot, "To John Blackwood," 13 July 1872, *The George Eliot Letters,* ed. Gordon S. Haight, vol. 5 (New Haven : Yale UP ; London : Oxford UP, 1955) 291.

(26) George Eliot in her introduction to *Felix Holt, the Radical* (1866) states that "there is much pain that is quite noiseless ; and vibrations that make human agonies are often a mere whisper in the roar of hurrying existence.... Many an inherited sorrow that has marred a life has been breathed into no human ear." George Eliot, *Felix Holt, the Radical,* ed. Peter Coveney (Harmondsworth : Penguin, 1972) 84.

(27) James Clerk Maxwell, "Molecules," *Nature* 8 (1873) : 441. Collected in Noel G. Coley and Vance M. D. Hall, eds., *Darwin to Einstein : Primary Sources on Science and Belief* (New York : Longman, 1980)

86. For further analysis on the problems involved in the description of science, see chapter 7 of Gillian Beer's *Open Fields : Science in Cultural Encounter* (Oxford : Oxford UP, 1996) 149-72.

(28) Emphasis added. Darwin 152-153.

(29) George Eliot, "To Mme Eugène Bodichon," 5 December 1859, *The George Eliot Letters,* ed. Gordon S. Haight, vol. 3 (New Haven : Yale UP ; London : Oxford UP, 1954) 227.

(30) George Eliot, "Thomas Carlyle," *Selected Critical Writings,* ed. Rosemary Ashton (Oxford : Oxford UP, 1992) 187.

(31) Gillian Beer, *Open Fields : Science in Cultural Encounter* (Oxford : Oxford UP, 1996) 156.

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