This essay revolves around a terminological distinction – adopted from Tim Ingold – between ‘transport’ and ‘wayfaring,’1 the thematic reverberations of which I shall pursue through a number of interrelated Victorian concerns, ranging from epistemology and natural history to the sensation novel and the railway. Arguably, all of these concerns may be drawn out of a dynamic field – one that was intensely researched around 1850 – on which chemistry met with physics and physiology. This interdisciplinary meeting ground was seen to be constituted through a continuous conversion of kinetic energy or (as it was then called) ‘living force’ into heat and heat into living force. And what was taken to initiate and perpetuate this process was the persistent pull of gravitation, the mutual attraction, and concomitant repulsion, of material bodies capable of moving through space. “Indeed the phenomena of nature,” as James Prescott Joule summarises this view in a lecture on matter, living force, and heat (1847), “whether mechanical, chemical, or vital consist almost entirely in a continual conversion of attraction through space, living force and heat into one another.”2

On Joule’s account, this “continual conversion” means not only that “the phenomena of nature” are caught up in an endless process of variation and reconfiguration, but also – and just as importantly – “that order is maintained in the universe,” as he proceeds to emphasise: “nothing is deranged, nothing ever lost, but the entire machinery, complicated as it is, works smoothly and harmoniously.”3 So, on the one hand, the world is conceived as forever in transition, kept alive (so to speak) by means of an ongoing exchange of energy variously translating mass into motion and motion back into different arrangements of mass. But on the other hand, it is still regarded as well-balanced and well-proportioned, held in place by an equilibrium of forces which ensures that “nothing is deranged, nothing ever lost,” the whole ma-

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chinery working smoothly and harmoniously. “And though, as in the awful vision of Ezekiel, ‘wheel may be in the middle of wheel,’ and every thing may appear complicated and involved in the apparent confusion and intricacy of an almost endless variety of causes, effects, conversions, and arrangements, yet is the most perfect regularity preserved.”

Yet, while this may provide a reassuring conception of the universe, it is contingent on a cosmological view which clearly privileges the limited structure of a predefined space over the unlimited possibilities of an indefinite extension in time, ruling out the disquieting prospect of unpredictable future motions in favour of the belief in a preordained design. More precisely, Joule’s argument – also known as the first law of thermodynamics – is premised on the supposition that the logic of energy conversion can be fully captured in terms of a functional equation, that is, in mathematical terms. According to this equation, every expense of kinetic force is exactly matched by a corresponding production of heat which may, in due course, be reconverted into the same amount of kinetic force, so that the total measure of energy always remains the same. But this argument can only work on the assumption that the space of conversion, or the space in which the conversion of one form into another takes place, excludes the time that is required to constitute this space in the first place. Indeed, in Joule, the succession of time is implicitly reduced to a stable pattern that already exists, preordaining the way all processes of conversion materialise or unfold. Time, on this account, can therefore not function as a medium of innovation, opening up new pathways and possibilities by creating or unleashing energies that do not yet exist. It can only work as an instrument of conservation, mechanically executing or reaffirming an economy of relations that has been mapped out in advance.

One might therefore say – using Ingold’s distinction – that the exchange of energy is here conceived as a mode of transport rather than wayfaring, which is to say that it is not regarded as an activity of developing along lines, but as an operation of carrying across. This has further implications, for there is a crucial difference between these two modes of movement, as Ingold explains: The object (or subject) of transport remains unaffected by the process of travelling from one location to another, its destination having been determined from the start, whereas the object of wayfaring is worked out in

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6 Ingold, “Against Space” 150.
response to what occurs on a path that only opens up in the process of moving itself. When “in transport,” Ingold writes, “the traveller does not himself move. Rather he is moved, becoming a passenger in his own body, if not in some vessel that can extend or replace the body’s powers of propulsion.”

The time of transport, that is to say, is regulated and controlled by a definite space, preconfigured according to a schema of dots and directions that reduces the totality of possible relations to a limited grid of rational connections. Time in transport, one might say, is time spent in confinement, locked up inside a definite compartment that is sealed off from whatever may take place on the outside. In this imprisoned mode, time is no more than an unavoidable function of space, necessarily to be endured in anticipation of a station that waits at the end. When time is put at the service of destination-bound transport, it must therefore either be killed or forgotten or at least passed as quickly as possible, which may explain (by the way) why the most cherished notion of an ideology of transport is speed. The time of wayfaring, by contrast, cannot be captured inside a spatial grid that is already measured and laid down in a definite form. In the mode of wayfaring, time rather opens up spaces of its own, as it takes shape along a line – not necessarily a straight one – “that advances from the tip,” to quote Ingold again, “in an ongoing process of growth and development, or self-renewal.” Consequently, the space of wayfaring does not exist outside of and apart from the processes and practices through which it is given form and meaning in time. Rather, this space continually impinges on the traveller, motivating her to move out of her vessel in order to engage with the environment sustaining her on her course. The time of wayfaring, in short, leaves room for swerves, turns, roundabout ways and the possibility of surprising encounters emerging from unmapped places that have not been registered in advance, whereas the time of transport is dominated by abstract figures, numbers, plans, schedules and stationary coordinates, constraining all journeys from the start.

I. Epistemology

My purpose in drawing on this distinction is to bring out that the time of thermodynamics, as implied in Joule’s theory, is still conceived as an enclosed time of transport, restricted to the function of carrying energy across from one self-contained point to another. Time, that is to say, is a vehicle of maintaining a pre-programmed system, rather than of engendering incalculable disturbances in the architecture of powers, out if which, in the long run, a new order may arise. This concept of time is not only tied up with an ideal-

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7 Ingold, “Against Space” 150.
8 Ingold, “Against Space” 150.
ist world-view, holding that there are a number of absolute, sense-transcendent structures of the mind – typically represented by the axioms of mathematics and geometry – corresponding to laws of nature which are independent from the often confusing and contradictory information picked up by the senses. The same concept of time also – and concomitantly – functions as the main pillar of what one might call an epistemology of transport, according to which true knowledge is acquired by transferring particular phenomena ‘upwards’ into a stable general framework interpreting, elucidating and classifying these phenomena. True justified knowledge, on this transport-based conception, is the destination of a temporal process which is not regarded as an integral part of this knowledge, but as a subsidiary pathway leading there. Consequently, the time that it takes to work out a true and valid theory is not regarded as a time of wayfaring or line-making, during which the conceptual boundaries of an object are continuously drawn and redrawn in relation to the changing environments in and through which this object takes shape. It is rather regarded as a time of transport, necessarily to be spent in relocating any object from a context of discovery into a context of justification, but leaving the substance of this object unchanged.

In this manner, for example, the Kantian William Whewell – whose work propounds this epistemology of transport in an exemplary way – conceives induction, or the collecting of general truths from particular facts, as a process of translating sensual data into ideal schemata which colligate and explicate these data, thus converting “their apparent confusion into order, their seeming chance into certainty, their perplexing variety into simplicity.” The act of induction, on this account, makes sense of experience by interpreting it in terms of a theorem which is not itself built up from experience, but passed down from the mind. “Thus in each inference made by induction there is introduced some general conception, which is given not by the phenomena, but by the mind.” In other words: “We take a standard, and measure the facts by it; and this standard is constructed by us, not offered by Nature.” Or yet again: “The particular facts are not merely brought together, but there is a new element added to the combination by the very act of thought by which they are combined.” When Johannes Kepler discovered that Mars moves in the shape of an ellipse, for example, “he bound together particular observations of separate places of Mars by the notion or, as I have called it, the conception of an ellipse, which was supplied by his own mind.” It is perhaps no

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coincidence that Whewell’s favourite example is taken from the science of astronomy which was often regarded as a model science because it seemed to epitomise one of the most pervasive myths of all sciences, namely the belief in some kind of distance or gap between the observed matter and the observing mind, gazing on this matter from the outside or at least from a different plane.

Astronomy thus suits Whewell’s transport-model particularly well because the making of justified true belief is, on this model, simply regarded as an act of crossing the gap between ideal forms and material facts, the one being carried over to the side of the other. The journey to known truth, one might say, invariably begins with a distinction between ideas and senses, thoughts and things, theories and facts, and ends, if it is successful, with their identification because, in Whewell’s view, “Inductions, Laws, Theories, which are true, are Facts.” But this means that the time which is required and used, in practice, to translate theories into facts and vice versa, can only feature as a time of passive confinement, spent in transport from one definite location to another, rather than as a time of active exploration, unravelling existing definitions in order to disclose incipient fields which are no longer or not yet clearly defined. Just as Joule, then, Whewell reduces the time of conversion – the time that it takes to convert one thing into something else – to a predefined space that is already marked out in definite terms, restricting and controlling the movement within it, like a travel plan or a roadmap.

For the inductive process of gaining insights and proving theories starts and ends, as Whewell sees it, with distinct items and self-enclosed sites, “facts” and “concepts”; but it excludes – or does not take account of – the time that is needed to constitute and cultivate such items and sites in the first place. An obvious contention against this view of induction, however, is that there are, in reality, no fixed distinctions between mind and matter or things and thoughts, but only a multiplicity of mobile relations, allowing for different ways of interpreting how these categories interact. In fact, each time such established distinctions are used in practice, one might argue, they are drawn afresh. But it is precisely this active time of marking new trails, or marking

13 Ideas (or theories) and facts (or things) are the two fundamental elements of Whewell’s dualistic epistemology. “Ideas are the *Form*, facts the *Material* of our structure” (*Philosophy of the Inductive Sciences* 2:213). They largely correspond to Kant’s two primary sources of the understanding (“zwei Grundquellen des Gemüts”), the senses and the mind, whose duality is simply taken for granted.

14 Whewell, *Philosophy of Discovery* 250.

15 This is one of the main assumptions of so-called practice theoretical approaches, closely associated with the work of Wittgenstein and Heidegger, which are particularly prominent in sociology and philosophy of science, while literary critics have only recently begun to discover their potential. For an overview see Joseph Rouse, “Practice Theory,” *Handbook of Philosophy of Science. Vol. 15: Philosophy of Anthropology and Sociology* (Am-
existing trails anew, along with the modifications, alterations and dissipations these markings tend to engender, which has no room in Whewell’s epistemological thought.

Consequently, the art of science, the skilful practice of navigating through uncharted fields, is explicitly banned from the domain of science, as he conceives it, because the laws and principles of this practice – so Whewell argues – cannot be fully captured in propositional terms, “consciously looked at in a general form.” These principles – as Whewell knew well enough – rather involve a kind of practical knowledge or know how, a “Lebenswissen” which can only be acquired and expressed in the movement from one situation to another, in wayfaring, but which cannot be reduced to a definite location outside of this movement. The grounds of practical wisdom, that is to say, always have to remain partly personal or tacit, escaping the determinate form of impersonal rules. If this were otherwise, if the principles of action could be spelled out as general laws, then human agency would no longer be sufficiently elastic to be tuned to changeable circumstances and tasks. In short, all kinds of practice or, as the Victorians tended to say, ‘art’ have moral or ‘first-person’ components which elude the ‘third-person’ perspective of ‘science.’ Whewell, being aware of this, consequently seeks to disconnect the temporal mode of doing from the spatial mode of knowing. He tries to purify the reasoning of science from the necessarily ‘impure’ influence of art, making as he does a pronounced case for a “rigorous separation of the Practical from the Theoretical.” But in this way he inevitably has to leave his epistemology incapable of accounting for what Andrew Pickering has called “the performative aspects of our being,” including individual skills and styles, which escape all merely representational thought.

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16 Whewell, Philosophy of Discovery 245.
17 See Ottmar Ette, ÜberLebenswissen: Die Aufgabe der Philologie (Berlin: Kadmos, 2004); Ingold, “Against Space” 154.
19 Whewell, Philosophy of the Inductive Sciences 2:277.
Implicitly, Whewell’s philosophy is therefore still based on a conception of scientists as detached spectators, importing inert facts into an existing framework which names, classifies and integrates these facts. What this view of induction as a kind of upward transport cannot accommodate, however, is a conception of scientists as creative experimenters, interfering with the living forces of the world, disturbing the economy of natural relations by their very practice of engaging with an environment, in which they, as human beings, have themselves always been immersed. More generally, indeed, Whewell’s epistemology is still firmly aligned with a theistic view of man as a special creation, extracting facts from or projecting ideas onto nature while somehow hovering above or outside of, rather than living within this nature. What Whewell could not (or did not want to) embrace, in short, is the fact that scientist, like all human beings, are not disembodied minds but living organisms which are enmeshed with their material environment, contributing to the changing constitution of this environment by the sheer activity of moving through and drawing meaning out of it.

If there is one single ideology which was most thoroughly dismantled in the second half of the nineteenth century, however, then it is perhaps this idealist view of man as a special creation, inhabiting a mind that stands apart from the facts of matter, rather than being a part of it. Moreover, the dismantling of this dualistic ontology went along with intensive debates in the philosophy of science – especially between Whewell and his foremost opponent John Stuart Mill – in the course of which the epistemology of transport was increasingly supplanted by, or at least supplemented with, what one might call an epistemology of wayfaring. The method corresponding most closely to this epistemology of wayfaring was an experimental method which, unlike the method of transport, is not so much premised on definite positions in space, as on a mobile capacity to respond to unpredictable variations as they occur in time. The experimenter, as the physiologist Claude Bernard puts it in an influential book on the theory and practice of this method, “guides himself by an assumed or provisional principle which he alters moment by moment because he is searching in almost total darkness.” Bernard therefore compares the experimental procedure with a walk along “a winding road in the dark and over unknown hilly ground,” forcing the wanderer to go forward slowly and cautiously, pausing after each step. “Before taking a second step, he must make sure that he has placed his foot on a spot that is firm, then go forward in the same way verifying experimentally, moment by moment,

the solidity of the ground, and always changing the direction of his advance according to what he encounters.”

In this sense, the experimental method incorporates and makes use of an insight which, in the aftermath of the debate between Whewell and Mill, became increasingly accepted among Victorian philosophers of science, although Whewell’s objectivism still tried to deny it, namely “that the complete attainment of the ideal position of the mere observer is nowhere to be secured even in Physics,” as the logician John Venn puts it in 1889. “No one of us can be spared to occupy the ideal logician’s seat; and if he try [sic] to do so he would find that he was perpetually leaving it, and mixing himself up in some way or other in the course of what should have been to him a wholly external world.” This methodological argument is a consequence of, and feeds back into, a number of developments within science itself – most notably Darwin’s evolutionary theory and the second law of thermodynamics – all of which cast serious doubt on the belief in “a wholly external world,” distinct from lived practice and time. Instead, taken together, all of these theories promoted a relational ontology, according to which human beings – scientists included – can, as a rule, never stand outside of whatever they may want to examine, but only move in relation to it. Taking up one position, on this account, inevitably means gliding out of another and vice versa, but there is no one standpoint in which this relational motion could ever be brought to a halt. “Each one of us has his own position amongst the objects which compose the world,” as Venn says it; “he has his own little sphere of activity which he may change only by taking up some other.” The methodological consequence to be drawn from this belief, on Venn’s account, is that the position of a mere spectator must be regarded as no more than a “fictitious post” because every act of observation is premised on a physical movement which mixes itself up in the “generative currents of the world,” influencing these currents, just as they influence the movement of those who try to understand them. Even the astronomer, being subject to the same laws of gravitation as the stars at which he gazes, cannot help perturbing their course, however slightly, by the sheer “fact of observing them,” as Venn points out. “Every motion to or from his instrument, nay the very calcula-

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26 Venn, Principles 21.
27 Venn, Principles 21.
tions he writes down on paper or the words he utters by his voice, are mo-
tions of matter, and therefore react on the motions of every other material
thing in the universe, including the planets themselves.“29 It is, quite literally,
a matter of fact, on this conception, that the physical practice of drawing
determinable patterns of meaning out of indeterminate things just as much
leaves its traces on these things as they, in turn, leave their traces on the
meaning that is made out of them.

My point here is that the experimental method, as it is sketched and used
by empiricists like Bernard, Mill and G.H. Lewes, may be seen as a practical
enactment of this very conception, for this method is premised on the as-
sumption that all knowledge originates in an act or event of what Mill calls
“varying the circumstances,” a motion making a difference that may either be
brought about accidentally or deliberately.30 The circumstantial variation that
sets an experiment in train, that is to say, may either be found or made, but in
both cases the temporal processes that it instigates cannot be reduced to an
ideal position outside of these processes, controlling the way they unfold.
The art of experimentation, in this sense, not only involves movement, but is,
so to speak, grounded on movement, because the only unalterable principle
of this art is the belief that all knowledge originates in experiences which can
only become imbued with form and meaning if – and because – they are
acted out in time, that is: because they are lived. Indeed, one might say that
one fundamental tenet of experimentalist science, as it emerged in the second
half of the nineteenth century, is the proposition that “time is of the essence”
to use a phrase of Latour’s)31 because according to empiricists like Mill and
Lewes there are, strictly speaking, no synchronic patterns, structures or ideas –
not even the axioms of mathematics and geometry – which can exist with-
out, or outside of, the diachronic practices and processes through which they
are issued forth, modified, abandoned and held in place.32 Whatever was, at

29 Venn, Principles 20.
30 John Stuart Mill, A System of Logic, Ratiocinative and Inductive. Being A Connected View of
the Principles of Evidence and the Methods of Scientific Investigation (1843), 2 vols (London:
Longmans, Green, Reader and Dyer, 1875), 1:440.
31 Bruno Latour, “A Text-Book Case Revisited–Knowledge as a Mode of Existence,” The
Handbook of Science and Technology Studies, ed. Edward J. Hackett, Olga Amsterdamska,
compatibility of Latour’s approach with nineteenth-century concerns see also Steven D.
Brown and Rose Capdevila, “Perpetuum Mobile: Substance, Force and the Sociology of
Translation,” Actor Network Theory and After, eds. John Law and John Hassard (Oxford:
32 This was one of the key sites of controversy between Mill and Whewell. For Whewell
mathematical truths such as 2+2=4 can never be contradicted by experience because
they follow from ideal principles or mental laws which have never had any connection
with the senses in the first place. For Mill, even mathematical propositions have been
any point, proposed to be true, was therefore always open to be modified and revised in response to unforeseen circumstances, thrown up by the irreversible flux of time. “There is no proposition of which it can be asserted that every human mind must eternally and irrevocably believe it,” Mill writes.33 “In matters of evidence, as in all other human things we neither require, nor can attain the absolute. We must hold even our strongest convictions with an opening left in our minds for the reception of facts which contradict them.”34

Rather than seeking to eliminate the vicissitudes of lived time from the method of science, then, Mill’s empiricism left an opening for them, allowing the experimentalist to calculate on the incalculable, to play with time in order to provoke surprising encounters that cannot be foreseen in advance. Experimentalism, in this sense, is a method that works with and through contingency, rather than fighting against it. It seeks not, unlike Whewell, to lift knowledge ‘upwards’ into a safe enclosure of theory, situated outside of the messy practice through which knowledge is generated in time. Experimentalism rather keeps theory ‘down’ in the ‘dirty’ field of practice by constantly trying and re-engaging this theory in order to provoke the emergence of further ideas which may then be fed back into established patterns, potentially modifying or reshuffling these patterns and so on. This does not mean that experimentalists cannot make progress, but it does mean that their progress is not guided by a final end, but only ever by what John Dewey later called “end[s]-in-view,”35 provisional stations which remain open to be reconceived, however slightly.36 From an experimentalist perspective, indeed, “the advancing movement of science forbids the notion of finality,” as G.H. Lewes puts it, whose work represents the stance of Victorian empiricism in exemplary ways.37 “Knowledge unfolds vista after vista, for ever stretching

abstracted from experience, for which reason he held that they are, in principle, modifiable by it.

33 Mill, System 2:98.
36 Linking Victorian empiricism with American pragmatism may seem a long shot, but I do indeed think that one can make a plausible case for the first being a forerunner of the latter. It does not look like a coincidence, after all, that William James dedicated his programmatic 1906 lectures on Pragmatism (New York: Dover Publications, Inc., 1995) “To the Memory of John Stuart Mill from whom I first learned the pragmatic openness of mind and whom my fancy likes to picture as our leader where he alive to-day.”
illimitably distant, the horizon moving as we move.” 38 As this suggests, the field of Victorian empiricism was not a closed territory comparable to a map, but an open-ended space, the boundaries of which kept changing along lines of becoming, drawn and redrawn by those who passed through this space. What must be understood quite clearly, however, is that the strong awareness of contingency and relativity displayed by authors like Mill and Lewes did by no means turn these authors into radical skeptics. They did not believe that man can have no reliable knowledge of the world at all, or that there is no rational way of distinguishing one truth claim from another. All they held was that every kind of true justified (including mathematical) knowledge was, at the time of their writing, still to be seen as provisional, subject to be modified in relation to empirical evidence which has not yet emerged.39

II. Natural History

The distinction between induction as transport and induction as wayfaring, as I have outlined it so far, is of course itself an abstract one that, in the textual practice of drawing patterns of knowledge out of lived experience, frequently tended to become blurred. Philip Henry Gosse’s Evenings at the Microscope, for example, seems, at first sight, to represent a typical example of the spectatorial stance, with the author, a firm believer in divine design, acting as an authoritative “provider of scientific entertainment and instruction to a circle of friends.” 40 Gosse, that is to say, assumes the role of a naturalist turned showman, who, quite literally, magnifies the work of God by introducing his readers to an awe-inspiring world of miniscule proportions below the level of what is normally visible.41 More precisely, the text seeks to set up

39 For an authoritative explication of Lewes’s epistemological thought see Rick Rylance, Victorian Psychology and British Culture 1850-1880 (Oxford: Oxford UP, 2000), 251-330; Mill’s views are well treated in Elijah Millgram, “John Stuart Mill, Determinism, and the Problem of Induction,” Australasian Journal of Philosophy 87:2 (2009): 183-199. As Millgram shows, for Mill, the Humean Problem of Induction – that experience can never provide us with absolutely reliable knowledge – is no problem in the first place because he rejected the very idea of a mathematical or “logical must” on which this problem is premised (191). For a more general approach to the possible role of the empirical in literary studies see Virginia Richter, “‘I cannot endure to read a line of poetry’: The Text and the Empirical in Literary Studies,” JLT 3.2 (2009): 375-388.
an “accurate inventory” of “the minuter organs and forms of animal life,” submitting these forms to the reader’s inspection by casting them in relatively common terms or re-cognising them as relatively common forms. To this end, Gosse typically begins with a panoramic view or “general glance,” before zooming in on ever more specific details, as, for instance, in his description of the aptly named *amoeba diffluens* or “Proteus” which he singles out of a teeming multiplicity of moving microbes, “an array of life, indeed!,” as he cries out in his characteristically passionate and profuse style:

Motion arrests the eye everywhere. ‘The glittering swift and the flabby slow’ are alike here; clear crystal globules revolve giddily on their axes; tiny points leap hither and thither like nimble fleas; long forms are twisting to and fro; busy little creatures are regularly quartering the hunting ground, grubbing with an earnest devotedness among the sediment as they march up the stems; here are beauteous bells, set at the end of tall threads, ever lengthening and shortening; here are maelstroms in miniature, and tempests in far less than a teapot; rival and conflicting currents are whirling round and round, and making a series of concentric circles among the granules.

The microscopic perception and representation of organic motion is here still premised on an arrested eye, a stable vantage point outside of the observed play of living material, allowing the observer to draw relatively familiar descriptions of anthropomorphic “creatures” out of his unfamiliar subject-matter (“busy,” “earnest,” “hunting ground,” “devotedness”) without being himself drawn into the “conflicting currents” whirling these creatures around. Yet, as Gosse puts on a higher power to focus on the activity of the Proteus amoeba, the stability of the inspecting viewpoint is increasingly affected by the mobility of the inspected matter which impels the writing to move along with its object, adapting and correcting its descriptions while trying to keep pace with circumstantial variations that cannot be anticipated or controlled. Thus Gosse tries to identify the “very irregular form” of the amoeba by comparing it with (or translating it into) “the outline of some island in a map,” only to find that the form in question refuses, in fact, to be contained in a single place that could be located on such a map since “it is not at two successive moments of exactly the same shape,” as he points out to the readers of his work:

This individual, which when you first looked at it was not unlike England in outline, is now, though only a few minutes have passed, something totally different; the projecting angle that represented Cornwall is become rounded and more perpendicular; the broken corner that we might have called Kent has formed two little
points up in the position of Lincolnshire; the large bladder, which was in the place of the Eastern counties, is moved up to the Durham coast, and is, moreover, greatly diminished; and other like changes have taken place in other parts. Although, in this instance, the geographical shape of England clearly serves as a blueprint or schema for the representation of the amoeba, Gosse’s writing manifestly struggles to accommodate the represented matter to this schema. For the described object, rather than standing still, keeps altering while it is being described, forcing the describing practice to alter with its material, adapting and redefining its ideal template – the map of England – as it proceeds. The activity of representation finds itself lured, one might say, into a “dance of agency” with an equally active object whose movements keep exceeding and outrunning the boundaries of the schema through which they are supposed to be mapped out. Consequently, Gosse’s description appears just as capricious and amorphous as the animal that it attempts to describe, shifting and twisting in rather unpredictable ways. Parts of Kent are made to drift into Lincolnshire and the Eastern counties are moved up to the Durham coast as the author tries to fit his observations into a preconceived frame. The very form of Gosse’s writing, in other words, is exposed as contingent, as susceptible to become otherwise because it is bound up with a temporal movement that keeps running ahead of the spatial patterns seeking to grasp and fixate this movement. What has begun as a schema-based representation with a single centre has, in this way, been inadvertently turned into a process-based performance evoking a mobile tangle of views, the outcome of which can no longer be reduced to an immovable design apart from practice and time. Gosse’s text, in short, represents – at least in this instance – not so much a definite matter of fact as an emergent structure, resisting to be transported out of the temporal medium, “the current of time” in which it is immersed. What Gosse tries to capture in conceptual terms is an exasperatingly mutable thing, provoking his writing to draw out ever fresh shapes:

Lo! Even while speaking of these alterations, they have been proceeding, so that another and totally diverse outline is now presented. A great excavation takes the place of Dorset: Kent is immensely prolonged; the bladder has quite disappeared, &c.; but it is impossible to follow these changes, which are ever going on without a moment’s intermission, and without the slightest recognisable rule or order. The projections are obliterated or exaggerated; the sinuosities are smoothed, or deepened into gulfs, or protruded into promontories; firths form here, capes there; but

44 Gosse, Evenings 379.
46 Gilles Deleuze, Difference and Repetition (1968; London: continuum, 2004), 67: “Movement, for its part, implies a plurality of centres, a superposition of perspectives, a tangle of points of view, a co-existence of moments which essentially distort representation.”
not by starts, but evenly, and with sufficient rapidity to be appreciable to the eye while under actual observation.\textsuperscript{48}

Isobel Armstrong has rightly argued that Gosse considers the scientist to be a representative of God whose task it is to reveal the traces of the invisible demiurge in the equally “invisible world” disclosed by the microscope. On her account, Gosse’s ‘vision’ is supposed to uncover an ideal design in the multiplicity of details to be found under the microscope. But in order to do this, she writes, he has to exclude “the third term of mediation,” the instrumental practice of making the invisible visible.\textsuperscript{49} He has to conceal the art of translating what is seen into a general pattern that can be read. What I meant to show, however, is that this practice of mediation, the performative aspect of representation inevitably re-enters Gosse’s world whenever, as in the case of the amoeba, the subject-matter of his observations resists or escapes the ideal design that he intends to detect in them. For in these instances the observing act and the observed material drift asunder, compelling the former to respond to the demands of the latter, to move along with – and in relation to – it. In this way, the space of mediation or conversion between matter and meaning, ‘hand’ and ‘head’ or, in this case, perceiving and writing is turned into the site of an experimental dialogue or dance between at least two partners whose movements are yet to be mutually brought in tune. This experimental process of tuning, of “resistance and accommodation”\textsuperscript{50} not only takes time. It also structures the experience of this time as a diachronic process that cannot be reduced to a synchronic state. It rather makes room, so to speak, for ever fresh findings and outlines to emerge from this process.

So my point, to sum up, is that Gosse’s writing, in trying to draw the changeable figure of the amoeba out of the flux of time and into the definite pattern of a map, represents not only what structure the amoeba looks like. It also represents how this structure is generated or made out, as one can see in the pencilled sketches, “successively drawn from one individual,” that Gosse inserts into his printed text.\textsuperscript{51}

\textsuperscript{48} Gosse, \textit{Evenings} 379-380.
\textsuperscript{49} Armstrong, “The Microscope” 36.
\textsuperscript{50} Pickering, \textit{Mangle} 22.
\textsuperscript{51} Gosse, \textit{Evenings} 379.
To be sure, Gosse eventually gives up on his attempt to map the motions of the amoeba in terms of a definite shape, claiming that, in this instance, the change of forms is the essential principle of the animal’s identity, which, to his mind, explains the name Proteus. But even so, Gosse’s struggle to describe the amoeba in accurate terms, inevitably poses the question of whether a scientific method that is premised on fixed positions and definite principles is indeed capable of accurately coming to terms with a movement-based world that is not “in two successive moments of exactly the same shape.” After all, what Gosse’s drawings and descriptions represent is a series of provisional snapshots, exposed signs of fugacity and fleetingness that can only ever pin down what, a few minutes later, may no longer be the case. So one might say that, in representing nature in this way, Gosse has inadvertently nudged his writing towards the very relational or process-based world view from which the experimental method starts. For this method is not premised on the belief in an ideal design that is, as it were, imprinted on the earth to be re-cognised by human observers who gaze down on it. It rather works from the assumption that the design that can be found in nature evolves – and has always evolved – co-extensively with the human experience of this nature, taking shape through spatial practices in time. Therefore, the only way to acquire true justified knowledge of the world is, on this account, to go along with it, correcting and adapting one’s position as one proceeds, rather than trying to master the laws of nature from an ideal outside. “An experimenter must not hold to his idea,” Bernard writes. “But he must submit his idea to nature and be ready to abandon, to alter or to supplant it,
in accordance with what he learns from observing the phenomena which he has induced.”52

It is perhaps no coincidence that this notion of experimentation appealed not only to scientists, but also to writers of fiction because what the writing of novels, especially serialised realist novels, and the performance of experiments have in common, I would argue, is that they are temporally extended ways of provoking and modelling experiences of the world.53 The only, albeit crucial, difference between these two ways of modelling experiences – the writing of fiction and the performance of scientific experiments – is that fictional models, unlike scientific ones, do not necessarily have to refer to a world, or an aspect of a world, that actually exists. Even if realist novelists aim to be true to the world in which their texts appear – which they often do – it is still, in any case, sufficient for them to be true to what might be part of this world, to what could, on the basis of the general knowledge and practical experience of their contemporaries, be reasonably imagined to be the case. This categorial difference aside, however, the practices of writing and experimenting, along with the course of “resistance and accommodation” through which meaningful forms emerge in the study and in the laboratory, may well be and therefore indeed – at least in the nineteenth century – have often been compared. George Eliot’s much cited claim that all her novels were “simply experiments in life”54 and Emile Zola’s attempt to develop and promote a full-fledged theory of an “experimental novel” based on the work of Bernard are just the two best known instances of a variety of endeavours to describe the writing of novels in terms of the making of empirical knowledge.55 Here, also, however, I would resist the temptation to describe this conceptual transfer as a kind of transport by means of which a given idea or,

52 Bernard, Experimental Medicine 23.
in this case, a method travels from one self-contained field (‘science’) into another (‘literature’), with its places of arrival and departure remaining unchanged. My proposal, instead, is to see the Victorian drawing of science into fiction itself as an experiment that enabled writers of novels to explore their own skilful practice, their own art in relation to what seems to be other to, but has, in fact, always evolved along with it: the art of the scientist.

III. Railroads of Sensation

There is perhaps – especially with regard to the theme of mobility – no other genre which lends itself more to be studied as such an experimental engagement of fiction with science than the sensation novel. For the sensation novel is not only a relatively new kind of writing; it is also a genre that self-consciously defined itself as new by absorbing the most recent developments in science and technology to a degree that was not lost on contemporary commentators. Henry James even declared Collins’s novels to be “not so much works of art as works of science,” the proper “mastery” of which required, on the part of the reader, “an index and a notebook.” While this may be an exaggeration, the sensation novel certainly made new demands on its readers. It did so not only in that it addressed itself primarily to the “sympathetic nervous system” of these readers, as D.A. Miller has claimed, but also in that it tended to involve them in a dense meshwork of possible signs, false clues and hidden secrets, mobilising their need to discover the promised meaning at the bottom of this meshwork, to carry on reading and speculating until the whole plot is – or seems to be – disentangled at the end.

On these grounds, Nicholas Daly has suggested a historical link between the Victorian criticism of these novels and contemporary accounts of the railway journey, arguing that, in the nineteenth century, the “traveler, like the reader of sensation fiction, is thought of as having been harnessed into a particular apparatus.” More precisely, Daly identifies the emergence of the railway – for many Victorians one of the most powerful icons of modernity – as the source of the excessive, but otherwise inexplicable nervousness that pervades almost all sensation novels, affecting both many characters like Walter Hartright in the Woman in White and the readers who are compelled to move along with these characters, accompanying them on their unsafe path into the future, with dangers and surprises lurking at every point. The sensation novel, on this account, registers and enacts a specifically modern condition of anxiety, restlessness and nervous tension that many Victorians

56 Henry James, “Miss Braddon,” The Nation (9 November 1865): 593-594.
would immediately associate with railway journeys. Reading sensation fiction was—like travelling in a Victorian railway carriage—a characteristically distressing experience, Daly argues, with regular concussions, unexpected jolts, fears of lateness, and the ever present risk of a major accident preventing the reader-traveller from settling into a more relaxed state, so that, on arrival, she was typically left exhausted, shaken and glad to have arrived. 59 This case for a connection between modernity, nervousness and the railway is convincing on many counts, not least because it provides a good reason for the fact that the railway forms such a continuous, if subtle thematic presence in almost all sensation novels, often dictating the all-important pace and timing of these novels. 60

Yet, having said this, the identification of reading and transport, which is implied in Daly’s argument, also tends to gloss over one of the key differences between these two modes of passing the time. In fact, the activity of reading and writing novels, unlike the activity of travelling to a particular destination, could and cannot be fully reduced to a cause or end outside of this process. The railway traveller, that is to say, travels mainly in order to reach a predefined location which is distinct from the process of moving there whereas the reader of sensation fiction reads mainly for the enjoyment of the process itself. For railway passengers, therefore, the stimulation of the nerves is a side-effect, temporarily to be tolerated for the sake of arriving at a terminus where they can relax. For the reader of sensation novels, by contrast, the stimulation of the nerves is often an end in itself. Indeed, one of the main Victorian criticisms routinely directed against the new wave of sensation novels was that “preaching to the nerves,” as H.L. Mansel puts it in his often quoted attack on these novels, appears to be the only purpose they have. “Excitement, and excitement alone seems to be the great end at which they aim—an end which must be accomplished at any cost by some means or other.” 61 So while Daly is certainly right to emphasise the fact that the nervousness on which much sensation fiction thrives, seems strangely ungrounded, “in excess of any actual narrative motivation,” one may question whether the historical arrival of the railway offers indeed the only explanation for these “nerves-without-a-cause” and the fascination they exerted on many readers at the time. 62

Another way of approaching the issue would be to say that the sensation novel engages with a condition that characterises the empirical subject more generally, namely its profoundly fragile, mobile and unsettled state of exis-

59 Daly, “Railway Novels” 471.
60 Cf. Daly, “Railway Novels” 473-474. See also Nicholas Daly, Sensation and Modernity in the 1860s (Cambridge: Cambridge UP, 2009).
62 Daly, “Railway Novels” 468.
tence. After all, as Peter Garratt has shown, one of the central premises of Victorian empiricism is the belief that all human beings enter the world as mere bundles of nerves and sensations, yet lacking the knowledge on which their thoughts and actions are to be based. Whatever knowledge of self and world people may have, as Lewes was fond of pointing out, is connate, not innate. It is acquired experimentally, in response to circumstantial variations. The spatiotemporal movement from one situation to another, provoked by sensual stimuli, is therefore, on this account, the only way through which this knowledge can be built up. Sensation writing, I would argue, can be read as a way of enacting and exploring this movement towards knowledge, “the processes of finding out and making sense” through which knowledge is generated in space and time, along with the mental and experiential conditions through which these processes are actuated and maintained. This explains why almost all sensation novels – as early reviewers have regularly observed – are, in one way or another, concerned with the unravelling of criminal plots and secrets, often involving amateur detectives like Robert Audley in Lady Audley’s Secret (1862) who travels around – by train – between Essex, London, Southampton, Liverpool, Dorset and Yorkshire, collecting circumstantial evidence to shed light on the sudden disappearance of his friend George Talboys. Indeed, the representation of Robert’s exploratory “movements” is a good example for how sensation novels frequently reproduce – on the level of the represented events – the very practices of reading and writing or, more generally, of taking notice and leaving marks through which patterns of meaning are worked out in time.

In chapter XIII of the first volume, for example, when George has just gone missing and all the locations where he would have been most likely to be found – the Essex pub, Audley Court, the train station, Fig-tree Court, George’s father-in-law and Southampton port – have already been checked, Robert draws up a “record of all that has occurred between our going down

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63 Garratt, Victorian Empiricism.
65 One representative reviewer, for example, dubbed the sensation novel “The Enigma Novel,” Spectator 28 (Dec. 1861): 1428.
66 Cf. Daly, “Railway Novels” 474.
68 Critical interest, by contrast, has overwhelmingly focussed on the theme of madness as well as discourses of mind and brain, not only in this novel, but in sensation fiction generally. See for instance Jill Matus, “Disclosure as Cover-up: The Discourse of Madness in Lady Audley’s Secret,” University of Toronto Quarterly 62.3 (Spring 1993): 334-355; Winnifred Hughes, The Maniac in the Cellar: The Sensation Novel of the 1860s, (Princeton: Princeton UP, 1980).
to Essex and to-night, beginning at the very beginning” (LAS 103). The key part here is that this record, also entitled “JOURNAL OF FACTS CONNECTED WITH THE DISAPPEARANCE OF GEORGE TALBOYS” contains references to “all that has occurred” so far, meaning that it is “INCLUSIVE OF FACTS WHICH HAVE NO APPARENT RELATION TO THAT CIRCUMSTANCE” (LAS 103). For what this shows is that the process of retrospective integration, which is often taken to be synonymous with narrative as such, is premised on a process of forward-looking addition, of accumulating numerous metonymic details, picked up from different places, which are no longer or not yet part of a pattern or plot. In fact, the very “theory of circumstantial evidence” (LAS 123) – quite central to many sensation and detection novels – hinges on the awareness that indeed everything, “all that has occurred,” even the tiniest coincidence, is potentially relevant for the construction of the explanatory structure on which a final forensic judgement may be based, as Robert Audley points out to Lady Audley in a chapter headed “On the Watch:”

Upon what infinitesimal trifles may sometimes hang the whole secret of some wicked mystery, inexplicable heretofore to the wisest upon the earth! A scrap of paper; a shred of some torn garment; the button off a coat; a word dropped incautiously from the over-cautious lips of guilt; the fragment of a letter; the shutting or opening of a door; a shadow on a window-blind; the accuracy of a moment; a thousand circumstances so slight as to be forgotten by the criminal, but links of steel in the wonderful chain forged by the science of the detective officer (LAS 123).

In catalogues of accessories and particulars such as this, Braddon’s text exhibits the plentiful material out of which it is made, indicating that it assembles far more potentially meaningful details than whatever plot that is abstracted from these details may suggest. What I want to argue, therefore, is that many Victorian writers and readers of sensation novels knew well enough that these novels are not primarily made up of plots. Rather, they are made up of a complex texture of “infinitesimal trifles,” of “a thousand circumstances” that each reading has to concatenate into a new “chain” of story-links, repressing some of these trifles, highlighting others.

Therefore, whatever general arrangements, plots or other structures one may detect in the meshwork that each novel represents can never exist outside of and apart from the individual practice of reading and writing through which these patterns are made out. And precisely because of their tendency – through an eminent cultivation of secrecy and an extended deferral of resolutions – to draw readers into a mere reading for the plot, sensation novels are particularly apt to make these readers aware of the sense-making practices, the activities of noting and construing through which the promised meaning is or, rather, is not revealed. For whenever sensation fiction is consumed merely in the page-turning manner, as a medium of transport geared to-
wards a final insight or point, the end of the text will most likely leave people in a state of lingering tension and non-fulfilment which can only be cured by beginning the journey anew – by picking up another novel of a similar kind and so on. Thus, in generating an insatiable appetite for more, sensation novels cannot help foregrounding that the final meaning or point, epitomised by the idea of the plot, is in fact no more than an illusion, an unattainable fiction in Venn’s sense, because all patterns of knowledge are threaded out of a movement of lived experience which, as long as one is alive, cannot be brought to a halt.

All that the reading of these novels can eventually reveal, in other words, is that their meaning resides not in whatever plot may be extracted from them, but in the movement of plotting, the practice of collecting and interpreting circumstances through which this extraction is performed. Sensation fiction, then, by seeming to strap its readers into a particular apparatus, may also make them aware of a counteracting motion which seeks to escape this apparatus. In *Lady Audley’s Secret*, this inverse tendency is, again, reproduced in the actions of Robert Audley who often displays a notable reluctance to know as well as a propensity to break out of the machinery of secret machinations that drives him on to an end. For this end, as he suspects, can only disappoint him, likely as it is to make him find that his friend is dead. “Am I tied to a wheel, and must I go with its every revolution, let it take me where it will?” he asks himself repeatedly. “Am I bound to discover how and where he died?” (*LAS* 159). And: “Why do I go on with this?” (*LAS* 174). The larger question Robert is made to ask himself here is whether there might not be other paths through the matrix of possible clues than the one towards a final insight which, if it is really final, must be equivalent with death; “shall I do a wrong to the memory of George Talboys by turning back or stopping still?” (*LAS* 159) What is at stake, in other words, is the very end or purpose of the detective action that the novel’s main character performs or is made to perform by the writer and reader of the text. If this end is definite knowledge, as Robert’s questions suggest, then all the characters (in the double sense) through which this knowledge is established – along with the reading and writing process that fills these characters with life – must inevitably be, as George Levine would say, “dying to know.” 69 If the end of the novel is to keep the experimental process of sense-making alive, by contrast, then ultimate knowledge must again and again be deferred, concealed and promised anew, causing the knower to linger, take circuitous routes, or revisit places in which she had already been. In this latter case, however, the process of knowing – as well as the activity of reading and writing that performs this process – has far less to do with the mode of end-determined transport than

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with that of open-ended wayfaring which, as long as the wayfarer is alive, will always have somewhere further to go or something else to find out.

What I am arguing, therefore, is that sensation novels like *Lady Audley's Secret* integrate both of these motions. On the one hand, they seem to turn on the discovery of secrets, often rapidly transporting readers towards the last page. But on the other hand, they are also highly alive to the insight that the revelation of a single secret can never be the end or purpose of their existence as texts. Indeed, the meaning of their existence as texts can only be found in the process of interpretation, of reading, writing and discussing through which this meaning is constituted and re-constituted, like the open-ended trail of a wayfarer, again and again. As a mere string of words, that is to say, all texts are finished, ‘dead.’ On these assumptions, the unwillingness, with which characters like Robert Audley move towards what they often perceive to be an inevitable destiny, may also be read as an ironic exhibition of the awareness that, whatever secret may be revealed at the end, the meaning of the novel’s existence will certainly not be found there. “If I could let the matter rest; if – if I could leave England for ever, and purposely fly from the possibility of ever coming across another clue to the secret, I would do it,” Robert tells George’s stepfather Mr. Maldon, “– I would gladly, thankfully do it – but I cannot! A hand which is stronger than my own beckons me on.”

In such instances, the text foregrounds the contingency of its own method. For what Robert claims to be a necessary movement towards a final truth is simultaneously revealed to be the non-necessary act of a “hand” – that of the writer, reader, or, more generally, the interpreter – which could as well make him move otherwise. It is almost as if Robert was protesting against the remorseless way in which he is transported towards a goal that is tantamount to the end of his life as a character in the text: “How pitiless I am, and how relentlessly I am carried on. It is not myself; it is the hand which is beckoning me further and further upon the dark road whose end I dare not dream of.”

My point, then, is that Robert’s resistance against the “hand” which beckons him on may be seen as a symptom of the text’s awareness that a mere reading for the plot will inevitably turn its characters into mere functions of a transport-apparatus, inexorably carrying them towards a pre-destined end. At the same time, I would propose to see such passages as an invitation to read the sensation novel otherwise, against the grain, if you like. In this way, the text’s characters can be freed from the contingent pattern of end-determined plots that the ruthless “hand” of the interpreter so often imposes on them. Instead, the process of reading and (re-)writing these novels can

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be viewed as an experiment, a kind of wayfaring, as it were, that is not controlled by a pre-designed structure or purpose outside of this process, but takes shape along emergent lines, capable of being drawn out in many different ways. One way of justifying this approach is to point out that the sensation novel, like the railway, with which it engages, is – and has always been perceived to be – an inherently ambivalent medium, an observation that Daly’s reading bears out well. On the one hand, its form is clearly influenced by an impersonal rationalisation and standardisation of space and time, as it is epitomised by Bradshaw’s railway schedule.71 But on the other hand, the characters through which the sensational form is constituted, as well as the readers and interpreters who bring these characters to life, are regularly affected by – and, indeed, thrive on – a deeply personal nervousness and restlessness, a nomadic waywardness, resisting to be controlled by definite structures and ideal forms.

Wilkie Collins’s late novel *Heart and Science* (1883) evokes both of these aspects – the personal and the impersonal – in its title, before going on to explore them through the characters Ovid Vere, an overworked physician who represents one of the excessively anxious Victorians, and Dr. Benjulia, a mixture of Byronic hero, Gothic villain and mad scientist, who deems himself to be “travelling on the road to the grandest medical discovery of this century.”72 Contrary to what the novel’s title may suggest, however, Collins’s text does not simply, in a dualist vein, pit the rationality of the scientific ‘head’ against the emotionality of the non-scientific ‘heart.’ Rather, the personal and the impersonal, or the general and the singular, part and whole are described as integral elements of one and the same movement towards knowledge.73 For both Ovid and Benjulia are scientific practitioners, even though their methods could not be more unlike. For Benjulia, a “living skeleton” (*HS* 96), scientific research is no more than a vehicle of transport, a means to an end, for the sake of which he sacrifices the ability to be affected or moved by anything that lies outside of his predetermined course. Instead, he subjects all matters to the same, unswerving, indifferent gaze. “He pur-

72 Wilkie Collins, *Heart and Science: A Story of the Present Time*, ed. Steve Farmer (Peterborough: Broadview, 1996), 190. All references to this edition are given in the text (HS). This novel has received very little critical attention so far. It is usually read as an intervention in the vivisection debate of the time. See Richard French, *Antivivisection and Medical Science in Victorian Society* (Princeton: Princeton UP, 1987).
sued his own ends with a penitent cook, just as he pursued his own ends with a vivisected animal. Nothing moved him out of his appointed course, in the one or in the other” (HS 214). Benulia, to use Levine again, is dying so much to know that he cannot live for anything other than knowledge, even though he is aware that, in this way, he is effectively annihilating his feeling self, along with the moral sensibility that originates in this self. His “grand problem,” as he calls it, possesses his existence, usurps his aesthetic responsiveness, and forces him into a relentless march towards a destination which can eventually, being the only motive for him to live, only deprive him of a reason to continue doing so. “I labour at it all day. I think of it, I dream of it, all night. It will kill me. Strong as I am. It will kill me.” (HS 190) At the end of the novel, Benulia does indeed die, but not because he has found what he was looking for, but because Ovid Vere has, largely by accident, found it before him, thus causing the other man to commit suicide. The tragedy of Benulia, then, is that his belief in the idea of absolute knowledge, “the one god I worship” (HS 190), has made him shed everything else of which his humanity is made up. In this way, he has gained an “impenetrable compo- sure” (HS 245) which dissociates him from his sympathetic nervous system, but which also – and because of this – locks him up inside a machine-like motion that cuts him off from life. So if Benulia represents the inhuman, technocratic side of science, as it is epitomised by the railway as a high-speed means of transport, then his counterpoint, Ovid Vere, represents the human or moral side of science, an uprooted and unfinished nervousness that is yet searching for a final destination or cause.
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