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Convolutions:

Writing the Mind and the

Neurology of the Literary Brain

by

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Re(con)volution: An Introduction

In Germany, the term *Konvolut* has a common philological application: it refers to a larger or smaller assemblage – literally, a bundle – of manuscripts or printed materials that belong together. The noun ‘convolute’ in English means ‘something of a convoluted form.’ [...] ‘Convolute’ is strange, at least on first acquaintance, but [...] it remains the most precise and most evocative term for designating the elaborately intertwined collections of ‘notes and materials’ [...].

(Translators’ Foreword, in Benjamin 1999: xiv)

He tried to convoke the college [...].

(Borges 2000a: 74)

What is a Convolution?

This question may appear to be the opening to this thesis, but it is also its end, in terms of temporality as well as teleology: the question will inevitably require repetition even after its consideration, and thus its answer is not the final goal, which is actually to come back to the question, eventually. When speaking about convolutions it is entirely natural, then, to start at the end. This may seem illogical or counterproductive, but is not too far off the mark if one considers the sometimes overlooked truth, as elucidated usefully by philosopher and novelist Dan Lloyd, that ‘scholarly books usually begin by announcing their conclusions, and follow with the support’ (Lloyd 2004: xvi). Thus, the opening question was in some way only illusorily the start, and will be answered now, with the support to follow leading back to the question itself.

This is because a convolution is a loop, or a fold, as the folds of the brain (neuroanatomically speaking, the trench-like sulci and ridge-like gyri which also constitute the larger looping lobes of the cerebral cortex) are sometimes termed the cerebral convolutions – this will be one of the main senses in which the convolution is considered in this thesis. But it is a loop in another sense, in the way stories or narratives are often referred to as convolutions (or convoluted) if their plots and themes are complex and refuse any straightforward reading – most commonly when they are non-linear, either because their temporality is skewed or some other element of the supposedly transparent structure of a story is subverted (perhaps speech is not signalled by quotation marks, or characters’ names change without apparent reason; there are countless examples, no doubt). This literary version of the convolution is the other main sense referred to here. Nevertheless, a convolution is also a function, also known as a zip, in computer science, specifically in the field of formal languages (Cf. Borowski and Borwein 2002: 119). Additionally, in the branch of mathematics known as functional analysis, a convolution is an operation on two functions which produces a third function, the inverse operation of which is known as a ‘deconvolution’ (Cf. Laplante 2001: 106–107; also, Cf. *OED*: ‘deconvolution’). Undoubtedly these further meanings of ‘convolution’ (and perhaps others) are related to the neurological and the literary definitions I have proposed, but for reasons which will become clearer later on, I want to wander away from these definitions from mathematics and computer science in this thesis – to purposely wander away is indeed part of what I am trying to propose about the very nature of convolutions.

Having thus started with a nod to the end, an actual beginning behoves an appearance now, and so a return to the first sense of convolution mentioned: that of the cerebral convolutions. Of the four senses recorded by the *Oxford English Dictionary* for the noun ‘convolution’, the one referring to the brain has as its earliest example of usage a quotation from

pioneering anatomist Helkiah Crooke, who according to the *Oxford Dictionary of National Biography* ‘burst into public awareness in 1615 with the publication of *Microcosmographia: a Description of the Body of Man*. It was the first English language anatomy written by a physician, rather than a surgeon’ (ODNB: 394), and though it provoked the ire of the medical establishment of the day, such as it was, as well as causing some consternation on the part of religious institutions too, *Microcosmographia* was a huge success. It was so popular that it was reprinted the next year and again in 1618, and so despite the first use of the word ‘convolution’ coming considerably earlier (in a different, pre-cerebral context – more on this later), it seems safe to say that the instance taken from Crooke’s anatomy by the *OED* – a simple, direct mention in sense 3 of ‘The convolutions of the Brain’ – would have been a coinage that many read and took on board. By the late nineteenth century, at least, the term seems almost unshakable in neurological discourse.

A good example of this term’s standardized use at that time is Charles Richet’s *Physiology and Histology of the Cerebral Convolutions*, which was translated from Richet’s native French and published in English in 1879. As the title suggests, Richet’s purpose is to draw together in summary what knowledge had been gleaned thus far about convolutions, both animal and human, and expound on it a little further. His dedicatory page unsurprisingly mentions two further French eminences in the neurological world, Paul Broca and Jean-Martin Charcot, and there is no doubt that future Nobel Prize winner Richet is here rubbing shoulders with fellow bastions of the establishment, two figures he deems to ‘have so greatly honoured French science by their magnificent works upon cerebral convolutions’ (Richet 1879: iii). In his praise for them, Richet silently draws a parallel as well, thus praising himself for also taking up the discussion of convolutions. More surprising and less mainstream, perhaps, is Richet’s opening assertion; that what appears to be his relatively straightforward task in writing the book is in fact almost impossible. This he puts down to the ever-changing nature of the field, and corollary to this, that in order ‘to fairly understand this department in medical science, and to be able to explain it intelligently, exacts a familiarity with a greater number of sciences than does almost any other subject’ (Richet 1879: vii). He goes on to list this broad but necessary skillset of sciences and concludes that indeed ‘the list might be indefinitely multiplied, and in all these sciences, each one of which is a life-long study, who can hope to be so perfected as not to be justly exposed to criticism?’ (Richet 1879: ix). The important thing to bear in mind here is Richet’s suggestion of the inherent multiplicity involved in the study of convolutions – the field is itself already convoluted, requiring a paradoxical movement out of the field for a fuller definition.

This expostulation on disciplinary itinerancy, bordering on outright scepticism, is mirrored in Richet’s actual description of a cerebral convolution: ‘each convolution forms an oblong mass, with blunt and rounded angles so confounded at each end with other convolutions

that the precise point of commencement and ending can only be schematically designated' (Richet 1879: 4). As with brains, so too with brain study, each part 'so confounded' with each other part that it is not certain that they are even separate enough to describe where they start and end (and so, that I started my own introductory chapter on convolutions at the end now seems less strange and better justified, perhaps even just the orthodox way of approaching the topic). The form of studying cerebral convolutions follows its contents; or in other words, despite (even because) they are virtually indistinguishable, the end of one field that studies convolutions is simply the beginning of another – just as with cerebral convolutions themselves. Thus, in a speculative closing chapter to Richet's book which appears to pre-empt the neuropsychology of the twentieth century, his admirably doubt-ridden fastidiousness reaches its self-negating zenith. Entitled 'Intellectual Functions of the Convolutions', Richet's very first statement is to baldly admit 'I do not believe that at the present time this question can be properly treated' – but of course, the rest of the chapter very much does try to 'establish a relation between intellectual phenomena and [the human brain's] numerous and rich convolutions' (Richet 1879: 130), which essentially reads like an attempt to locate the material basis of the (immaterial) mind in the lobes of cortex in the brain. Despite repeatedly remarking all of the problematics entailed by the isolation of discrete convolutions, the establishment of this 'relation', by hook or by crook, is seemingly the ultimate end-goal for Richet and his peers.

Yet it is precisely this plethora of problematics that has persisted into the present day, and no amount of, in Richet's words, 'schematically designating' parts of the brain (which is tantamount to simplifying and reducing them) can account for this. This has led to the befuddlement rather than the clarification of the situation. As technology and visual aids have progressed more quickly and beyond the capacity to understand what is being seen, it is an overabundance of descriptive terms rather than their dearth which has become the issue. Critics Gilles Deleuze and Félix Guattari point to this in their attempt to prune and reseed the garden of neurological terminology:

Thought is not arborescent, and the brain is not a rooted or ramified matter. What are wrongly called 'dendrites' do not assure the connection of neurons in a continuous fabric. The discontinuity between cells, the role of the axons, the functioning of the synapses, the existence of synaptic microfissures, the leap each message makes across these fissures, make the brain a multiplicity immersed in its plane of consistency or neuroglia, a whole uncertain, probabilistic system ('the uncertain nervous system'). Many people have a tree growing in their heads, but the brain itself is much more a grass than a tree. 'The axon and the dendrite twist around each other like bindweed around brambles, with synapses at each of the thorns.'

(Deleuze and Guattari 1987: 15)

Could the argument about the significance of the convolutions, not just in the brain but in neurology itself, really come down to a distinction between trees and grass? At any rate, what remains clear is the attention to neurology's textual nature that is required, and the convoluted, metaphorical liberties at its centre that Deleuze and Guattari observe (and in which they are themselves, perhaps, also complicit). Coupled with Richet's statements on the potentially infinite domains of expertise required to properly assess it, neurology is perennially left unfulfilled, ever awaiting commentary and analysis outside of its usual remit and boundaries. Yet this has, of course, not diminished the progress of neuroscience into the modern day.¹ The schematic view of convolutions, which will always ultimately leave something unseen and thus unremarked, lies at the heart of neuroscience's identity, providing its driving force rather than being a cause for concern.

It is not immediately obvious why this reductive, schematic tendency is important, but it is certainly a question of identity, and in more ways than one. Principal among these ways are two: how some domain or item can be identical to any other; and how stable the boundaries between domains or items might be, how well defined their identities are. In the first instance, what is most relevant here is the philosophical debate over what is known by names such as 'type physicalism', or the 'mind/brain identity theory', or simply 'identity theory' for short – the names themselves may not be identical, but ironically designate equivalent theories, in essence. This is because they all, again, would reflect Richet's stated desire to 'establish a relation between intellectual phenomena and [the human brain's] numerous and rich convolutions' – to establish once and for all a concrete relation between mind and brain. Proponents of the identity theory, of course, tend to the view that mind and brain are more than just related, and are actually identical. But the controversy surrounding the theory's central tenets means there are plenty of detractors, too, who nevertheless seek to find alternative ways of expressing the relation of mind and brain. In summing up this debate, philosopher C V Borst reveals that regardless of position, there is a pre-existing, ingrained, idiomatic way of attending to such matters, because

it is certainly now common knowledge that the brain, even although a physical organ, bears some intimate relation to the mind; and this knowledge is manifestly embodied in common idiom.

When referring to admittedly mental happenings or conditions we speak of racking one's brains, picking another's brains, having it on the brain, having a good brain or, contrariwise, being all brawn and no brain; and so on.

(Borst 1970: 13–14)

¹ Which can itself easily be considered a part of the continuous progress of neurology, and as such, unless being deliberately and expressly treated in its technical, clinical (or historical) sense, 'neurology' is largely used here as a precursory but essentially analogous term to 'neuroscience'.

The brain itself has become a metaphor for mind. It is not yet possible to see the stuff that is called ‘mind’, but there are several ways in which the stuff of ‘brain’ can be seen – make the terms identical, and all of a sudden, mind can be seen. However, there is perhaps more seeing being done than understanding, as often ‘seeing’ is also idiomatically taken to mean ‘understanding’ when this is not necessarily the case.

Again, the importance in this distinction between seeing and understanding is as crucial as that between brain and mind, because in the former, the distinction itself can go unobserved – that is to say, the relative importance of seeing is itself not always seen. Demarcating boundaries, especially when dealing in the abstract or the linguistic, as here, begins to be severely complicated.² Laura Otis expresses this complex idea succinctly in her book *Membranes* (2000), accentuating the manner in which vision and language can become perplexingly entangled, and how this plays out in disciplinary wrangles. Originally trained as a biochemist and neuroscientist, but later turning to comparative literature and the cultural history of science, Otis is uniquely positioned as a witness to these wrangles, and it is indeed separate yet similar forms of witnessing which inform her account. Right at the start of *Membranes*, she eloquently describes two experiences early in her career, one in a neuroscience lab and the other in a lecture on literary theory, in both of which she learnt ostensibly the same thing – first through the example of vision, and second through the example of language:

I was a biochemist, a mere visitor to the lab, but I learned an important lesson that night. The eye, and the regions of the brain that interpret visual information, respond only to changes, to borders between light and dark. [...] To create meaning from what it sees, indeed, for there to be vision at all, the eye needs borders, differences that distinguish one object from another.

Fresh from the lab, I learned the same lesson in [an] introductory course on literary theory. [...] When defining something, we typically compare it to something similar and then, like the eye, focus on the way it differs from the concepts most closely related to it. [...] Like our visual system, we create meaning only through the differences we perceive and the boundaries we believe are present.

(Otis 2000: 1–2)

Though in both instances this amounts to the ‘same’ and ‘important lesson’, this focus on defining things negatively – on seeing and understanding concepts and objects by their differences from (and boundaries with) other concepts and objects, rather than in and of

² The demarcation of boundaries in science is also a hotly contested topic. For the classic account of this debate about ‘boundary-work’ and its significance, Cf. Gieryn 1983.

themselves intrinsically – itself produced an ironic and furthermore somewhat unsettling difference in Otis’s appreciation of the same basic idea:

What had struck me in the lab as natural and quite reasonable devastated me in the classroom. Perhaps I had hoped that nature and culture worked differently, or that the humanities offered a different perspective from that of the natural sciences. How could there be truth, I wondered, and how could there be meaning, if we defined our ideas only negatively? What were our thought and vision worth if we perceived the world only in terms of boundaries, arbitrarily drawn?

(Otis 2000: 2)

Otis’s frank account encapsulates the knotty relationships at play in discussions of identity and boundaries, be these visual, neurological, conceptual, linguistic or disciplinary. This is because the same ‘natural’ and ‘reasonable’ idea had become utterly befuddling and even alienating to her when transferred across invisible lines of context, with previously unquestionable truth-value paradoxically confirmed only by negation and contrast.³

However, rather than give up in despair at the seeming intractability of the situation, it is worth pointing out that somehow eyes still see, objects are still described, meaning is still transmitted and knowledge of one sort or another is still produced, all regardless of the supposedly irreconcilable differences in identity thrown up by boundaries. Otis reaffirms just such a positive outlook and furthermore translates it into an expansive philosophical remit for research:

It has been more than ten years since that class and that night in the lab,⁴ and in that time I have come to regard the division between the humanities and the natural sciences as another boundary arbitrarily drawn. Scholars on both sides of the line want to answer the same questions, and we express ourselves through metaphors provided by a common culture. If we exaggerate our differences and take pride in our technical dialects, it is because our identities, as we perceive them, rely on these differences. To communicate effectively with one another, to live with one another, we need to rethink these identities, focusing not on the semipermeable membranes that separate us but on our permeability and on our mutual connections.

(Otis 2000: 2)

³ I touch upon the issue of confirmation by negation, in the context of W H Auden’s poetry, in the first chapter of this thesis, Convolution 1: Quest.

⁴ Plus another sixteen years since *Membranes* was published, meaning 26 years altogether in which the situation has had time to develop.

Part of rethinking these identities, Otis contends, is to think disciplines together, and this might easily be interpreted, as I do in this thesis, as the need for humanities subjects such as literary studies to become part of that extra-neurological skillset that Charles Richet advocates as integral to a proper consideration of neurology.

Otis has not been alone in calling for just such a breakdown of boundaries, and certainly the last decade and a half or so since the publication of *Membranes* has seen an immense groundswell of research into interdisciplinary subjects involving some nexus of humanities and sciences focused on the brain and mind.⁵ However, as literary scholar Paul B Armstrong argues, this ‘so-called cognitive revolution in literary studies’, as the name implies, has relied much more on ‘cognitive science, which explores how the “mind” knows the world, rather than neurobiology, which focuses on the structure and functioning of the brain [...]’ He says this is ‘no doubt understandable, since it is easier to move literary phenomena from psychological theories about mental processes than it is to bridge the gap between neurological mechanisms and lived experience’ (Armstrong 2014: 18). Whilst not wanting to dismiss cognitive science in its entirety, and also keeping in mind that (as will be mentioned below) neuro-critics Suparna Choudhury and Jan Slaby astutely point out that most invocations of the term ‘neuroscience’ actually leave out a large part of the overall field and refer more specifically to ‘cognitive neuroscience’, Armstrong’s commentary makes two important contributions here, and upon which this thesis will build: first, that literary studies need to take into account what might be termed ‘hard-core’ neuroscience as much as cognitive science (that is, to include biology along with psychology); and second (and most important), to avoid altogether the notorious ‘hard problem’ of how consciousness arises from inanimate matter.

Though literary scholars and scientists of all manner are generally agreed that mind-body dualism is an intellectual cul-de-sac, neither do any of the alternatives seem to offer a better solution; I do not want to advocate dualism any more than anyone else, but neither do I think that the endless toing and froing of the debate over what should most appropriately replace it aids fruitful discussion of anything. It seems to me that new research ought to synthesize anything and everything relevant which has already been studied, and wait (albeit impatiently) for better theories, better technologies and better interdisciplinary collaborations to emerge from this.⁶

⁵ For overviews from a variety of perspectives: Cf. Ortega and Vidal 2013; Armstrong 2014; Lynch 2009; Rose and Abi-Rached 2013.

⁶ Having said this, however, I am cognizant and furthermore sympathetic to the view espoused by interdisciplinarian neuroscience researchers Felicity Callard and Des Fitzgerald, who are well positioned (or rather, well scattered) for their fairly scathing critique of reciprocal interdisciplinarity: ‘All too often, “reciprocity” emerges as the (imagined) organizing logic of interdisciplinary collaboration – with collaborators invited to forms of mutuality, fair exchange, and so on. [But] what is missing from this analysis [...] is any account of power [...], in particular, some of the different financial, epistemic, and cultural resources that belong to different disciplines’ (Callard and Fitzgerald 2015: 96).

Perhaps then, and only then, will a return to the debate make any sense. In the meantime, not accepting any reductions to ‘mind’ nor to ‘brain’ alone seems the best way forward – an acceptance that they are not the same thing but not at all appreciable separately. This is summed up really well by Armstrong, who does not do away entirely with ‘the cognitive turn’, but nevertheless still posits that ‘productive dialogue between literary studies and neuroscience may be facilitated if the mind-brain dispute can be bypassed and a way to correlate aesthetic experiences and neurological mechanisms that does not rely on assumptions about the mind can be found’ (Armstrong 2014: 19).

In this spirit, I turn now from the ‘mind-brain dispute’, to some observations on how and why literature can and does interact with neuroscience – but instead of in a directly relational sense, it does this according to the logic of convolutions, and should be investigated as such. This is because ‘convolutions’ are one of the central ‘metaphors provided by a common culture’, as Otis puts it, that in turn provide further metaphors in which neuroscience and literature (as well as many other disciplines) trade across the abovementioned invisible lines. To begin with, then, it ought to be mentioned that neuroscience is both a rapidly expanding but hotly contested sphere. Thus, in their recent call for a ‘critical neuroscience’, Choudhury and Slaby take philosopher Edmund Husserl’s concept of the ‘lifeworld’, a ‘pretheoretic reality in which we all live and from which we draw our prescientific understanding,’ and say that in fact ‘today’s neuroscience is in part threatening to be a colonizing force with regard to certain domains of today’s lifeworld’ (Choudhury and Slaby 2012: 3, note 5). They claim that neuroscience now contributes to the very constitution of the lifeworld, taking up an undeserved pre-eminence in humanity’s understanding of itself – that the totalizing reach of the neurosciences have enacted a form of revolution in conceptualizing and characterizing what it even is to be human.

This, according to them, constitutes an epistemological and ontological revolution, the principles of which must be questioned, as in fact should the revolutionary rhetoric employed. To what degree is literature, a field which can also traditionally lay claim to a similar pre-existing authority on human self-comprehension, one of the domains being colonized by neuroscience? Thus, the primary aim of what follows in this thesis is to offer a preliminary exploration of the intersections of literature with neuroscience, alongside the complex relationship they have both maintained with study of the mind. This will be chiefly examined through this idea of the ‘convolution’ – as mentioned, a mainly nineteenth-century term for a loop or fold in the lobes of the brain, but also a structural notion distinctly related to literature via the ‘convoluted plot’ – as a possible alternative to the widely heralded neuroscientific ‘revolution’ that Choudhury and Slaby are so keen to interrogate.

However, proposing such an alternative is not simply a case of assessing how literary scholarship (or by extension, other humanities and arts) have dealt with the so-called revolution

inaugurated by neuroscience, nor vice versa – it is as much about taking a further step back and assessing whether there is even a revolution to speak of, of questioning if the correct questions are being asked instead of being assumed. For example, as recently as 2010, psychologist Eugene Taylor writes: ‘Humanistic psychologists are encouraged to turn their attention to the humanistic implications of the neuroscience revolution in order to answer aspects of the relationship between the brain and the mind that the reductionistic neuroscientists still cannot fathom’ (Taylor 2010: 411). Whilst Taylor’s anti-reductionistic sentiment here is certainly laudable and necessary, he too readily takes for granted the revolutionary nature of neuroscience. This is tantamount to accepting this hyperbolic idea – ‘the neuroscience revolution’ – before a single bit of critique has been ventured, undermining any eventual attempt as a reaction rather than an intervention.⁷ Therefore, this is what gives an analysis of neuroscience as a convolution, as opposed to as a revolution, an advantage straight out of the gate: it questions and contextualizes such hyperbole, appraising the humanistic roots of neuroscience, rather than taking the supposed revolution as a given and focusing on its ‘implications’ alone.⁸ Convolutionary analysis does not merely look forward at the post-neuro-revolutionary world, but looks at how and why such a rhetorically loaded notion even exists, including its very own role (the role of convolutionary analysis) in this historical yet ongoing narrative. As such, the goal, as sociologist of scientific knowledge Malcolm Ashmore puts it, is ‘to treat reflexivity less as a problem and more as an opportunity; an opportunity, even, for celebration (Ashmore 2015: 94). This serves to illustrate the spirit of convolution, as well as the perpetually ‘convolving’ relationship between scientific and literary writing, because the neuroscientific analysis of literature only reveals the equal need for a literary analysis of neuroscience. A basis for such an analysis will be given in the next section, beginning with a reformulation of the research question at hand.

⁷ For an extended commentary on the so-called ‘neurorevolution’, Cf. Lynch 2009.

⁸ At first glance, this may seem to be the opposite of historian and philosopher of science Thomas Kuhn’s assertion that revolutions in science rewrite history, thus rendering themselves invisible, because according to commentators such as Choudhury and Slaby, the ‘neuroscience revolution’ is so keen to make itself visible, audible and generally attention-worthy. However, this is not so for two main reasons: first, it is fair to say that after four editions of his landmark (revolutionary?) book *The Structure of Scientific Revolutions*, Kuhn’s thinking is now actually part of the way scientific revolutions occur (strongly corroborated by accounts such as John D Greenwood’s of ‘The Cognitive Revolution’; Cf. 2009: 523); second, the point here is not to deny neuroscience’s contemporary standing, but to remark the gradual twists and turns in its coming to prominence – a narrative compressed to the point of virtual invisibility by the bombastic suddenness of ‘revolution’.

This is compatible with Kuhn’s view, because it is the *process* of revolution which is cleansed and rendered invisible, rather than its influence in the post-revolutionary present day. Kuhn gives the example of John Dalton’s development of chemical atomism: ‘What all of Dalton’s accounts omit are the revolutionary effects of applying to chemistry a set of questions and concepts previously restricted to physics and meteorology. That is what Dalton did, and the result was a reorientation to the field’ (Kuhn 2012: 138). The effect of the ‘reorientation’ is real enough, even if once complete, it effaces its own historical occurrence and presents itself as a bare ‘orientation’, without the prefix ‘re-’. Convolution, as I will show in this thesis, is a creative way of reaffirming the extant, but effaced historical narrative of revolutions, and thus of reinserting the ‘re-’ before ‘orientation’.

Neuroscience's Historical Rise and Currency

So, instead of asking again what a convolution is, one might instead simply ask: what is neuroscience? Though a singular noun, the *OED*'s entry for 'neuroscience' reveals an intrinsic plurality: 'Each of the sciences (as neuroanatomy, neurophysiology, etc.) concerned with the structure or function of the nervous system; such sciences collectively.' Not only is the 'brain' not mentioned, but the earliest usage the *OED* gives of 'neuroscience' which is not in plural form is from a 1970 article called 'Promising Trends in Neuroscience', wherein author Francis Schmitt writes that 'during the past few years neuroscience, comprising the sciences of brain and behaviour, has been differentiating, integrating, regrouping'. Although here the brain is finally mentioned, most notable again is the singular neuroscience's hidden plurality and instability: it is not a science but a collection of sciences; it refers not only to physiology, but also to behaviour; its delimitation already involves 'differentiating, integrating [and] regrouping'; and finally, neuroscience is the study not of the brain, but of the whole nervous system.

Why then do experienced neuroscientists even now write concrete and narrow statements, such as the very title of Dick Swaab's 2014 book *We Are Our Brains*,⁹ when they should be more than aware of all of the above? Should they not write something like 'we are our nervous systems', or 'we are our brains plus our behaviours plus anything else that crops up via a process of differentiating, integrating and regrouping'? Historians of science Fernando Vidal and Francisco Ortega have linked this reduction of the human subject to a 'cerebral subject' with the recent development of personhood into something more like 'brainhood' (Cf. Vidal and Ortega 2011). From the title onwards, their edited volume *Neurocultures* (2011) emphasizes the plurality of the sciences of the brain and nervous system, but also of new fields and public interest emerging from these sciences. They write that 'the belief that human beings are essentially their brain [...] has become extremely powerful in contemporary culture. [Some] scientists have, at least by their public pronouncements, contributed to reduce to the brain the range of determinants of human existence' (Vidal and Ortega 2011: 7). The perhaps expected philosophical response provoked by the neuroscientific reduction of selfhood to brainhood actually has, since Patricia Churchland's 1986 book *Neurophilosophy* (and its resolutely reductive defence of totally

⁹ This title is itself only a further reduced variation on Nobel prize-winner Francis Crick's 'Astonishing Hypothesis', which gives one of his most famous books its title and claims that "'You," your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules' (Crick 1995: 3).

neurobiological explanations of mental states), only exacerbated the idea of brainhood.¹⁰

However, as self-styled anti-neurophilosopher Raymond Tallis observes,

those who believe that personhood boils down to brainhood are entitled to point to several serious questions that opponents like me leave unanswered. Why, if the brain is not the basis of consciousness, is it so intimately bound up with our awareness and our behaviour? And what are we to make of the genuine advances of neuroscience? [...] The critique of neural accounts of consciousness is only the first step.

(Tallis 2013: 45)

As Tallis rightly points out, tackling cerebral subjection on philosophical grounds, though necessary, only prompts equally necessary questions which need to bypass the reactionary dismissal of neuroscience's genuine benefits to society.

As yet, neither philosophy nor neuroscience offers a satisfactory account of human consciousness. In his essay 'Consciousness and the Novel', literary author and theorist David Lodge points out that

until fairly recently, consciousness was not much studied by the natural sciences. It was considered to be the province of philosophy. Psychology, inasmuch as it aspired to be an empirical science, regarded consciousness as 'a black box.' All that could be observed and measured was input and output, not what went on inside.

(Lodge 2002: 6)

In this rather diplomatic gloss on the behaviourism that dominated early twentieth century psychology, Lodge highlights the historical role of philosophy in the study of consciousness, but goes on to say how the natural sciences have since come to incorporate this study. Sketching out this trajectory leads to Lodge's main question: 'What has all this to do with literature [...]?' Amongst his answers, he most saliently states 'literature is a record of human consciousness, the richest and most comprehensive we have. Lyric poetry is arguably man's most successful effort to describe qualia. The novel is arguably man's most successful effort to describe the experience of individual human beings moving through space and time' (Lodge 2002: 10). This is an important point which Lodge claims is being steadily taken on board by luminaries in and around the cognitive/neuro sciences, such as Noam Chomsky, Gerald Edelman, Antonio Damasio and

¹⁰ A distinction can also be drawn here, nevertheless, as per philosopher Carl F Craver's suggestion: 'There are neurophilosophers, and there are philosophers of neuroscience. Neurophilosophers use findings from neuroscience to address traditional philosophical puzzles about the mind. Philosophers of neuroscience study neuroscience to address philosophical puzzles about the nature of science' (Craver 2007: vii).

Daniel Dennett. It is this kind of steady (if still new and slightly hesitant) adoption of literary studies by the sciences of mind and brain that mean theses such as this one do not appear completely out of the blue, and give me the impression that discussion of literature alongside neuroscience is not something being called for solely by literary critics or other humanists.

Literature's Historical Currency and Decline

However, just as neuroscience's star is on the rise, literature's is seemingly on the wane. In *On Literature* (2002), theorist J Hillis Miller sums up the situation as follows:

The end of literature is at hand. Literature's time is almost up. It is about time. It is about, that is, the different epochs of different media. Literature, in spite of its approaching end, is nevertheless perennial and universal. It will survive all historical and technological changes. Literature is a feature of any human culture at any time and place. These two contradictory premises must govern all serious reflection 'on literature' these days.

(Miller 2002:1)

When Miller says playfully that 'it is about time', he means literature has a history which is tied to the print culture in which it became prevalent, this culture itself in flux as he is writing in 2002 and even more so now as I write today in 2016. Miller argues that literature arose out of a universal literacy attached to the establishment of nation states, reflected in notions of national literatures and the development of modern research universities. This accounts for the current double status of literature today, usurped by new media technologies whilst simultaneously codified into Western views on education, social formation and the freedom of speech represented by literary expression. So perhaps it is the university-led, authoritative stance of literary studies and theory that is on the wane rather than literature itself? Poet and political activist Joshua Clover espouses just such a view, saying that

For a while now, many of us poets have been telling ourselves lies about the political force of poetry. Many of these we know by heart. Speaking truth to power. Finding the form which might both reveal and persuade. Preserving the space of critique. [...] Laying bare the truth of the ineluctably immiserating mechanism in which we live. We have been aided in this set of justifications by that peculiar historical development known as capital-T Theory, and particularly by ideas based around the primacy of discourse and 'the materiality of the signifier' – ideas which allow activities at the level of language to claim the same material force as a thrown brick. Both constitute the world.

But it's such bullshit, isn't it? I don't mean to dismiss the theoretical developments of the last forty years, the so-called 'linguistic turn.' I often find myself defending such matters against various attacks – one must oppose anti-intellectualism, tooth and nail. One must be open to new thoughts. It just so happens that my own understanding of our present situation finds these particular thoughts wanting.

(Clover 2012)

If Miller contextualizes literature's political coalescence in the university during the last hundred and fifty years or so, then Clover's more recent forty-year historical sketch of the so-called 'linguistic turn' condemns the current political inefficacy of poetry, indicating that university orthodoxy has no bottom-up potential, only traditional, top-down, hegemonic dominion over the poet, the individual, the subject.

When Clover decries 'capital-T Theory', 'the primacy of discourse and 'the materiality of the signifier', he essentially means what can (with obvious reservations) be umbrella-termed 'poststructuralism'. Nor is he the first to decry this. Indeed, two interesting views on poststructuralism's virtues versus its limitations are offered by Raymond Tallis and David Lodge. Tallis marks his distaste for poststructuralism, postmodernism and deconstruction in book-long polemics such as *Not Saussure: A Critique of Post-Saussurean Literary Theory* (1988) and *Theorrhoea and After* (1999). Although Tallis's arguments against nihilistic, anti-humanistic lexical oblivion are relatively convincing, his scathing indictments of theorists Jacques Derrida and Jacques Lacan, though often amusing and perceptive, end up doing what Clover specifically warns against: Tallis totally '[dismisses] the theoretical developments of the last forty years, the so-called "linguistic turn."' In so steadfastly combatting the abyssal relativism he sees in the thought of these figures, Tallis disregards plenty of positive or useful aspects of theory, poststructuralist or otherwise – and this is the same wholesale dismissal which Tallis admonishes in critics of scientific thought.¹¹ Furthermore, as philosopher Christopher Norris has argued, science and deconstruction, for example, are not necessarily as incompatible or antithetical as they might at first appear (Cf. Norris 1997; 1998). Nor do the notorious and oft-attacked claims to scientific status of structuralism and its intellectual descendants preclude a set of philosophical discourses, such as those grouped under a term like 'deconstruction', from having been in constant, fruitful and most importantly co-generative dialogue with science all along. Indeed, intellectual historian Christopher Johnson writes lucidly on this topic, remarking for example that whilst on the one hand Derrida stringently criticized structuralism's 'linguistic reductionism' as well as what he claimed was a more general 'discourse of the human sciences [...] insufficiently cognizant of its roots in a certain history of philosophy,' on the other hand 'Derrida's critique of Lévi-Strauss and the scientific claims of structuralism is not, however, equivalent to a rejection of science itself [...]. There is clear evidence in Derrida's work of a consistent interest in and

¹¹ As David Fuller and Patricia Waugh write of Tallis and this oft-repeated stance of his: 'Tallis's own argument is sometimes forced to proceed (as he acknowledges) using the rhetorical manoeuvres which he deplores in his opponents: hyperbole, *reductio ad absurdum*, selective quotation, and some measure of generalization from a small number of examples. If literary critics need the methods of science (this seems to suggest), then sometimes science needs the methods of literary criticism – especially when it seeks polemical defence and legitimization' (Fuller and Waugh 1999: 10).

attention to contemporary science, from his earliest to his more recent texts' (C Johnson 1998: 478; also, Cf. C Johnson 1993).

David Lodge takes a different tack to Tallis's total dismissal of modern literary theory. First, Lodge glosses on C P Snow's unceasingly debated 1959 lecture 'The Two Cultures and the Scientific Revolution' (and F R Leavis's strong rebuttal), before paraphrasing a more recent critic, Patricia Waugh, noting that 'such debates are most intense when one form of knowledge lays claim to the exclusive title to all knowledge. The contest is unnecessary. Literature constitutes a kind of knowledge about consciousness which is *complementary* to scientific knowledge' (Lodge 2002: 16; original emphasis). Lodge later extends this complementarity between knowledge forms to an ironic equivalence between creators and guardians of each: 'There is [...] a certain affinity between the poststructuralist literary theory that maintains that the human subject is entirely constructed by the discourses in which it is situated, and the cognitive science view that regards human self-consciousness as an epiphenomenon of brain activity' (2002: 89). As Ortega and Vidal note, in his 2001 novel *Thinks...* Lodge dramatizes just such dilemmas facing 'writers who are visiting in prestigious research centres devoted to the cognitive neurosciences, [thus dealing] with the clash between the scientific and humanist worldviews' (Ortega and Vidal 2013: 337). Ortega and Vidal comment that as the novelist protagonist of *Thinks...* struggles with the neuroscientific approach to selfhood, she turns and finds no greater solace in the entrenched poststructuralist anti-subjectivity dominating humanities scholarship; thus, 'if this novel [...] stages the conflict of the two cultures as a way of aesthetically conveying opposing worldviews, it also proposes ways of transcending those antagonistic visions' (Ortega and Vidal 2013: 349). The logic in this seems to be not to come down on any side of the debate, the opposing arguments actually sharing the same flaw, and instead focus on recovering the lost 'self' of the whole equation.

In the Ortega and Vidal article just mentioned, entitled 'Brains in Literature/Literature in the Brain', they survey what they term the 'neural turn' in literary scholarship – that is to say, literary study that takes on board cognitive and neurological approaches. This nascent but swiftly blossoming field is really a continuation of the 'linguistic turn', stemming from various offshoots of cognitive/neuro science themselves based on insights from linguistics – only more or less doing so whilst also rejecting other types of literary criticism derived from the 'linguistic turn' for being impressionistic and unscientific. Alongside this neural turn in literary study (abbreviated as 'neuro lit crit'), Ortega and Vidal identify the brain or the study thereof as a growing motif in literature itself ('neuro lit'). Whilst their analysis certainly fits the picture of a universal increase in the brain's general cultural currency, they also point out that 'neuro lit' and 'neuro lit crit' have not followed the same trajectory nor come to the same epistemological conclusions, and so Ortega and Vidal essentially take a position 'underlining the difference

between incorporating “brains in literature” and placing “literature in the brain” (2013: 327). However, this need not solely apply to writers of the newly christened neuro lit (or neuronovels, neuronarrative, and so forth);¹² the insights of literary authors and critics need not be cast aside simply because they do not fit the current brain-paradigm, or because they are or are not poststructuralist – science and literature have had a long history of speaking to each other in mutually inclusive and productive ways, one that goes back way beyond linguistics and neurology, and nobody would ever dream of rejecting this history in quite the same way.

In addition to this, a brief note here on my use in this thesis of ‘popular’ texts, in the sense of traditionally non-scientific or non-academic texts. It seems to me that if one is going to draw out the scientific aspects of literary texts or the literary aspects of scientific texts, one is already disrespecting what, as has been remarked above, are essentially arbitrarily drawn boundaries. The capaciousness of the potential topics of convolutions means that such distinctions between what concretely constitutes true science or literature, or similarly, what is low and what is high art, need to be temporarily set aside (if not altogether). Indeed, these are the very stakes in play: that such demarcation of intellectual and textual boundaries is ideological, and that at any rate, as sociologist Thomas F Gieryn puts it, ‘boundaries are drawn and redrawn in flexible, historically changing and sometimes ambiguous ways’ (Gieryn 1983: 781). In this attitude, I am also inspired by the self-professed rationale behind historian Robert M Young’s work into mind and brain: ‘My exploration of the strange origins and fates of theories in the nineteenth century has emboldened me to find good ideas wherever they turn up, without trying to be overly systematic. It seems to me that the understanding of human nature has suffered mightily from “system”’ (Young 1990: ix). Avoiding such systematized intellectual entrenchment, I think that as great a pool of sources as possible can only be beneficial to my study, including anything that has in some way communicated the nexus of literary and neuroscientific thought – ‘popular’ or otherwise.

¹² Other than Ortega and Vidal’s article, for a useful overview of this supposed new genre, Cf. Roth 2009.

Again, What (and Why and How) is a Convolution?

To return to convolutions and recap, then, the point is not to regard any intellectual revolution in either literature or neuroscience as conclusive, or as a revolution at all – as Choudhury and Slaby write, although ‘talk of a “neurorevolution” has been in the air for a while,’ they and their colleagues nevertheless ‘share a certain ennui about this revolutionary rhetoric’ (Choudhury and Slaby 2012: 5–6). Instead of revolution, and as an antidote to just such neuro-revolutionary ennui (or its literary corollaries in the schisms of the neural and linguistic turns), I want to emphasize the idea of the convolution as a useful and invigorating way of reconceptualizing the interactions of literature and neuroscience – without at all bypassing the social institutions and practices in which both fields are irrevocably embedded. So to repeat the opening question of this thesis, one can ask once again: what is a ‘convolution’? According to the *OED*, the word originates in 1545, and this example illustrates the early symbolic power of the idea: ‘It hath many conuolucyons, as wormes lyeng together haue.’ This image, of worms lying together in a tangle, is a vivid anatomical simile from a proto-text on obstetrics used to define something perhaps more prosaic: ‘A fold, twist, turn, winding, sinuosity (of anything rolled or coiled up, or of a coiled form).’ Compare this to the next specifically anatomical sense from the *OED*: ‘*Anat.* Each of the sinuous folds or windings of the surface of the cerebral hemispheres in humans and the higher animals.’ Although this definition refers to brain structure, it implies a complex organization difficult to discern amongst the ‘sinuous folds or windings’ similar to the earlier worms. So a convolution is a loop, or a fold, as in the cerebral convolutions. But as mentioned previously, it is also a loop or fold in that stories and narratives can be considered convolutions or convoluted if they in some way refuse a straightforward or linear reading. Although the *OED* has not yet recognized what for me is this very common meaning, *Merriam-Webster* defines ‘convolution’ both as ‘a twist or curve’ and as ‘something that is very complicated and difficult to understand’, a parallel highlighting quite neatly what I am trying to say about convolutions both literal and figurative.

Writing of the history of illustrations of the brain and its functions, medical historians Edwin Clarke and Kenneth Dewhurst observe that

as little was known about [the cerebral cortex] there seemed no need to depict the convolutions of the brain with any accuracy. [...] Erasistratus of Alexandria [had] stated in the third century BC that the appearances of the gyri were comparable to coils of small intestine [while a] later observer, with a more culinary bent compared the cerebral convolutions to a plate of macaroni. Thus it was thought that there was no precise anatomical pattern or determinable functional organization, a misconception that survived until the first few decades of the nineteenth century.

(Clarke and Dewhurst 1972: 60)

Already one sees here in the word ‘convolutions’ – through ‘worms’, ‘coils of intestine’ and ‘macaroni’ – a nexus of anatomy, structural complexity and elucidating metaphor stretching back to classical antiquity. However, as Clarke and Dewhurst point out,

it is paradoxical that the most obvious part of the brain and one of the most important from the functional point of view should have been mostly ignored until the beginning of the nineteenth century. This is its external surface, the cerebral gyri with their surrounding sulci and their covering mantle of cortex. Before the seventeenth century, attention was directed exclusively to the inside of the brain, in particular to the ventricles, the cerebral cortex being regarded as functionless.

(1972: 60)

This reticence regarding what is first encountered in the brain upon dissection or surgery is not to be sniffed at. What is visible and so easily metaphorically rendered long resisted further commentary – worms atop worms stayed merely that, a messy pile of purposeless meat comprising the surface of what is now considered that most wondrous of organs: the brain.

Metaphors like this are evidently the bread and butter of literary writing, but it is perhaps less obvious how pervasive they are, not only in the way science is conducted, written about and even simply thought of, as I argue in this thesis – metaphor has been seen in recent times to largely govern our entire conceptualization of everyday life and its tasks. If this is the case, it is worth expanding a little on metaphor here, in order to stress its importance, though in differing and shifting ways, to these three broadly defined but interlacing ambits: the literary, the scientific and the everyday (this latter mostly experienced in a linguistic way, but I think still metaphorically inflected in pre- or extra-linguistic circumstances). First, the literary; it seems entirely obvious, to the point of mundaneness, how preeminent metaphorical language is in literature. Indeed, literary and metaphorical expressions, long or short, are often treated as near synonyms, and one kind of expression needs to in some way speak to the other in order to be truly considered completely itself – that is to say, ‘no literature without metaphor’ (Hickey and Reiss 2000: 101), no metaphorical expression without recourse to the literary.

This, in brief, sums up the common sense view. However, literature as it is now understood is the product of a historical elaboration, which as J Hillis Miller argues, is not even 400 years old (Cf. Miller 2002: 1–2). Even if the longer view is taken (as well as, perhaps, a less strict definition of the word itself), literature in a basic sense still relies at least upon the invention of writing. Thus it would be fair to say that metaphor predates literature (in speech at least, and as long as it is viable to assume that pre-literate society used in its verbal exchanges what would now intelligibly be called metaphor). This essentially negates the common sense view of the

relationship between literature and metaphor, as elaborated above. Though I am aware the assumptions are now mounting up like the worms mentioned earlier, a further assumption might be that pre-theoretic experience, what Husserl called the lifeworld, even predates metaphor. Literature and metaphor and the lifeworld are all related, but not in the ways that seem so intuitive in the first instance.

In any case, even if one decides that all of the above is not only purely speculative but entirely false, then Miller contends literature is still somehow cordoned off completely from everything else, including its own individual exemplars. He writes: 'Each [literary] work is closed in on itself, separated from the "real world" and from any unified supernal world which all works might be presumed to put to work' (Miller 2002: 34). Two things are interesting here; first, Miller's deployment of the word 'supernal', as in elevated or even celestial, is used by him to refer to a belief in Platonic forms in Husserl's protégé Martin Heidegger, Miller ultimately dismissing this belief. Nevertheless, by contrast with the implied implausibility of the 'real world' when rendered in quotations marks like so, this smacks of Husserl's lifeworld as a realm of experience existing prior to any systematic exploration or explanation of the so-called 'real world'. Secondly, in the process of substantiating this line of argument, Miller borrows from Derrida (this latter already borrowing from Heidegger) and invokes the image of a curled up hedgehog 'as a catachresis [...] for what is idiomatic about each literary work. One form this takes is the approach toward coincidence of its meaning and the materiality of its letters' (Miller 2002: 34). That is to say, the hedgehog in its ball supposedly represents a poem (and by extension any literary work) curled up hermetically to protect itself with quills from anything outside. The *OED* defines the noun 'catachresis' as: 'Improper use of words; application of a term to a thing which it does not properly denote; abuse or perversion of a trope or metaphor.' So in this respect the hedgehog is a purposeful, demonstrative 'perversion of a trope', a wilful metaphorical imposture on the part of Miller (and Derrida), intended to denote the specificity and impenetrable uniqueness of a text. Miller goes on to admit that

no doubt I am here, by making a conceptual analysis, committing again the error against which I warn. It cannot be denied that literary theory contributes to that death of literature [announced earlier in Miller's book]. Literary theory arose in its contemporary form just at the time literature's social role was weakening. If literature's power and role could be taken for granted as still in full force, it would not be necessary to theorize about it [...].

The efflorescence of literary theory signals the death of literature. That Routledge editors should have invited me to write a book 'on literature' is a symptom of this. They would not have thought of making such a request if literature were not widely perceived these days as problematic [or] in mortal danger [or] something that can no longer simply be taken for granted.

(Miller 2002: 35)

Thus the hedgehog is a self-consciously self-defeating metaphor, deployed in the service of proclaiming the death of the literature that by the same token protects or portions itself off in this self-contained way. Essentially, metaphor may underpin but also outlive literature (and literary theory) – these expressions already incorrectly reifying metaphor, theory, literature and their contents into living things capable of dying.

Metaphor Inaction versus Metaphor in Action

Curled up in a ball, on the defensive, so to speak, the hedgehog of literature currently denies visibility of its inner self, in an attempt, perhaps, to protect its soft underbelly. Thus, with reference to what could be called this issue of its true visibility, Miller pithily goes on to say something which as much highlights the supposed wane of literature as it reaffirms the cultural pre-eminence of science: ‘This [problematization of visibility] takes place by an implacable law that says you can see clearly something that is deeply embedded in your culture only when it is in the act of receding into the historical distance’ (Miller 2002: 36). The reason science achieves such current dominion on the cultural and academic scene is precisely because not enough people can see this dominion, perhaps because there is not enough of this so-called ‘historical distance’, but also perhaps because, despite commentators’ often-made critiques and analyses of its twists, leaps and pretences, science itself is largely unwilling to acknowledge the presence of catachresis in its makeup (unlike literary study, which as per Heidegger/Derrida/Miller’s hedgehog above, is happy to repeatedly explore it). Despite the best efforts of people who buck this trend, such as in biologist Evelyn Fox Keller’s *Refiguring Life: Metaphors of Twentieth-Century Biology* (1995) – plus repeatedly elsewhere in her extensive oeuvre – or sociologists and historians Maasen, Mendelsohn and Weingart in their edited collection *Biology as Society, Society as Biology: Metaphors* (1995), the overwhelming significance of how science is metaphorically conceptualized remains undervalued. The two examples given here are both from the life sciences. However, I contend that the same basic principle is true further and wider, or as evolutionary biologist Richard Lewontin puts it, ‘we must never lose sight of the immensely powerful role played by metaphors in our understanding of the natural world’ (Krimsky and Gruber 2013: ix), implying not only a field larger than his own, but that against his admonition, the role of metaphor in science is frequently understated or even overlooked.¹³

The recognition of metaphor, not only within and across intellectual pursuits, but also across time, has at least been noted by journalist and popular science author Steven Johnson, such as in his book *Emergence: The Connected Lives of Ants, Brains, Cities and Software* (2002), which deals with the applications or manifestations in various fields of ‘complexity theory’:

Certain shapes and patterns hover over different moments in time, haunting and inspiring the individuals living through those periods. The epic clash and subsequent resolution of the dialectic

¹³ This is not so in the field of literature and science, wherein metaphor has been widely recognized as a true force not only in scientific niches, but in the wider dissemination of science. For a classic study of metaphor in literature and science, Cf. Beer 2009.

animated the first half of the nineteenth century; the Darwinian and social reform movements scattered web imagery through the second half of the century. The first few decades of the twentieth century found their ultimate expression in the exuberant anarchy of the explosion, while later decades lost themselves in the faceless regimen of the grid. You can see the last ten years or so as a return to these Victorian webs, though I suspect the image that has been burned into our retinas over the past decade is more prosaic: windows piled atop one another on a screen, or perhaps a mouse clicking on an icon.

(S Johnson 2002: 22)

Positing a pattern through time which in itself involves ‘a return’, what Johnson colourfully describes here is the intriguing reoccurrence or even necessity of guiding images propelling entire paradigms towards discovery. Taking his tack from the very phenomenon he is attempting to outline, the literary quality of Johnson’s writing here makes it seem that the merely vague ‘shapes and patterns’ he originally proposes are much more clear, forceful and entrenched, the mention of ‘images [...] burned into our retinas’ itself a strong metaphor suggesting metaphoric language as not just something produced by the gaze of science, but, going beyond its eye and on past the socket and into its brain, fundamental to the workings of its collective mind.

Psychology professor Shimon Edelman advocates something similar in *Computing the Mind: How the Mind Really Works* (2008). In a section subtitled ‘On the nature of the quest’ (of interest because the notion of ‘quest’ is itself an archetypal metaphor used extensively in the sciences of mind/brain, as I will argue in the next chapter), Edelman writes the following:

The explanatory achievement of cognitive science may be compared to that of another discipline whose subject matter has been in humanity’s plain sight since immemorial times, yet remained a mystery until a few decades ago: astrophysics. Two hundred years ago, with the subatomic structure of matter still unknown, physics lacked the very CONCEPTS in terms of which the nuclear reactions that occur over the life cycle of a star are described. Over the course of the twentieth century, the principles of stellar nucleosynthesis came to be understood to a sufficient degree so as to make it, in broad outline, into high-school textbooks.

The predicament of the nineteenth century psychologists (and neurologists) was similar to that of their physicist contemporaries: they were lacking the fundamental explanatory concept [...] without which the study of minds (and of brains) could never even ask the right questions.

(S Edelman 2008: 497–498; original emphasis)

In Edelman’s opinion, being as he is a die-hard materialist whose chief claim is that cognition *is* computation (S Edelman 2008: 70), or put more reductively, that ‘a mind is an instance of computation’ (2008: 499; emphasized in the original in bold script), this supposedly missing ‘fundamental explanatory concept’ was found with the advent of the computer age and its

attendant terminology. Rather than what might be presumed to be a materialist's overarching belief in history hinging on some concrete physical discovery or other, Edelman is at pains to point out the importance of 'CONCEPTS' to explanations, with the incoming metaphoric digital vocabulary providing for him a new conceptual (and thus fundamental) framework for accounts of the mind/brain based on calculation and computation.

Therefore, both Edelman and Johnson speak to the importance of metaphorical concepts in the shaping of what is even possible, let alone achievable within scientific investigation. Furthermore, it is of note that Edelman joins Johnson in making a case for the historical importance of these conceptual metaphors, without which an entire era of research is left bereft of a full explanatory capacity; thus, a historical view of scientific achievement turns on the development or coming to prominence of conceptual metaphors (and perhaps interestingly in both cases mentioned here, at similar points in time). However, it is useful to mention also that Raymond Tallis (who alongside his extensive philosophical writing has worked as a gerontologist and a clinical neuroscientist) is quick to dispute the validity of complexity as per Johnson and computation as per Edelman (though without naming either of these writers specifically), as metaphorical ways of explaining the mind, the brain, or consciousness. Tallis's argument hinges on the notion that neurophilosophical and scientific (as opposed to scientistic) discussions of mind and brain tend to mystify issues by utilizing inappropriate language, in a widespread but dissimulating gesture of the kind of catachresis Miller mentions above. More specifically, in order to diminish or even dismiss the many difficult problems associated with describing consciousness and its contents, these erroneous discussions rely upon the products of neural activity (as a condition necessary but not sufficient for consciousness and its resulting behaviours) as a way of explaining that very same neural activity.

In other words, this is a form of begging the question, which Tallis describes in his book *Why the Mind is Not a Computer* (2004) as 'premature conceptual closure'; he elucidates further by saying that

under the influence of the language of neuromythology, we are misled into believing we know, and make coherent sense of, more than we in fact do. [We] cheat in our attempts to link, say, human beings as citizens with the activity of their brains by importing, or reading back, the most sophisticated activities of citizens – 'calculations', 'information processing', etc. – into our descriptions of neuronal activity.

(Tallis 2004: 30)

In this same book, described in its subtitle as 'a pocket lexicon', he goes on to list alphabetically a number of terms such as the aforementioned 'computation' and 'complexity' on which

Edelman and Johnson respectively base their work.¹⁴ Tallis then systematically refutes the value of these terms as conceptual metaphors. However, Tallis's need to explode these so-called 'neuromythological' terms only belies their significance, as he readily admits himself; Tallis credits the conception of his book as occurring during the writing of a separate

critique of contemporary materialistic accounts of human consciousness [when he realized] that certain terms were used repeatedly and that the use, or more precisely the misuse, of these terms lay at the heart not only of the errors in neurobiological and computational theories of the mind but also of their apparent explanatory force.

(Tallis 2004: 33)

He is here admonishing the truth-value of such metaphors whilst simultaneously admitting their explanatory conceptual power. This is important because while Tallis clearly rejects the terms indexed in his book, he is nevertheless much more comfortable using metaphors or terms borrowed from literature in his own writing; on just one page in the concluding remarks of his book's introduction, Tallis appeals for a different kind of explanatory capability built on three instances of 'story', and one each of 'saga' and 'great adventure' (Tallis 2004: 31).

Whilst this is not to denigrate his argument up till that point, in the strictest sense if a theory of mind or consciousness cannot claim complete identity with a brain or a machine, its history is equally neither a 'saga' nor a 'great adventure', nor is any of its resultant descriptions of experience reducible to simple scientific 'stories'. However, despite all this, what shines through here is that there is a change in tone in Tallis's conclusion, as he moves from a relatively balanced yet wilful dismantling of neuromythology and into a more impassioned plea for a new brand of 'critical neuro-epistemology' (2004: 31), a plea in which he appears to prefer a more traditional mythological language. It is fair to say that Tallis probably thinks of these terms which carry (on the face of it) more literary associations as notions with less 'premature conceptual closure' – perhaps not far off of a convolution, a loop that seems to be closing but veers away again at the last moment towards some unknown goal.

On balance, Tallis's argument is more than anything highly wary of overly reductive theories and what sway these theories may hold over contemporary neuroscience; in this his argument is well thought through and certainly justified. However, it also only underscores the power (not to mention pervasiveness) of conceptual metaphors to an argument, this latter being

¹⁴ Admittedly, Johnson only partially relates his position to the mind/brain, but he nevertheless repeatedly makes reference to many other people whose prime focus has become this neuropsychological relation with complexity, highly lauding them and interconnecting their work outside of their own respective fields. Johnson also uses this as a jumping off point for his next, much more cerebro-centric (but reductive) book – Cf. S Johnson 2005.

Tallis's own or anyone else's. Furthermore, in concurrence with my earlier contention, Tallis's ultimately insightful analyses here, though stemming from someone with a long neuroscientific background and thus more than well-qualified enough to comment on such matters, remain thoroughly outside of the mainstream. Tallis himself notes the very same in his more recent onslaught against what he sees as fallacious uses of neuroscience and evolutionary theory, based as they are, just as are recourses to complexity and computers, on catachrestic uses of language:

The utter failure of my efforts to halt the inexorable advance of Neuromania and Darwinitis may be judged by the fact that, since [the earliest of these published efforts] twenty years ago, evolutionary psychology, various modes of neuro-determinism (based on the notion that 'You are your brain') and a dozen new disciplines basing themselves on those two offshoots of evolutionary theory and neuroscience have achieved an extraordinary influence on discussions of human nature.

(Tallis 2011: 7)

When faced with the immovable wall of the status quo, it seems likely that the multiple and varied frustrations of Tallis, Keller, Lewontin, Edelman, Johnson and others speak to the way certain metaphors (in this case those pertaining to science, but undoubtedly those far further afield too) are so deeply ingrained as to be almost invisible.

Bizarrely, however, although Tallis's self-admission to failure – and admirable refusal to surrender nevertheless – is par for the course as far as the disavowal of scientific metaphoric strength is concerned, some branches of science, interestingly enough offshoots of linguistics and cognitive science, place metaphor at their centre. In fact, they do this in order to attempt to explain the pervasiveness of metaphor, which seems to be routinely passed over for inspection, as actually at the foundation of the way people think, let alone the way people speak or write. Thus one gets the extremely influential and path breaking position of George Lakoff and Mark Johnson in their book *Metaphors We Live By*. Originally published in 1980, in this book Lakoff and Johnson contend that

metaphor is for most people a device of the poetic imagination and the rhetorical flourish – a matter of extraordinary rather than ordinary language. Moreover, metaphor is typically viewed as characteristic of language alone, a matter of words rather than thought or action. For this reason, most people think they can get along perfectly well without metaphor. We have found, on the contrary, that metaphor is pervasive in everyday life, not just in language but in thought and action. Our ordinary conceptual system, in terms of which we both think and act, is fundamentally metaphorical in nature [...].

But our conceptual system is not something we are normally aware of. In most of the little things we do every day, we simply think and act more or less automatically along certain

lines. Just what these lines are is by no means obvious. One way to find out is by looking at language. Since communication is based on the same conceptual system that we use in thinking and acting, language is an important source of evidence for what that system is like.

(Lakoff and Johnson 2003: 3)

This is difficult ground to tread as it not only flies in the face of common sense views of both metaphor and conceptualization, but it also seems to be somehow extra- or pre-psychological – people write and speak the way they do based on ways they think and act which are themselves based on what is ordinarily conceived of as the more florid end of the ways they write and speak. Furthermore, in looking at language for their evidence for this, Lakoff and Johnson add another pre-determining layer of problematic circularity – the truth about the way people act and think can be seen in the way people use language, language itself determined by the way people think and act.

Nevertheless, their systematic approach to metaphor analysis, resulting in what they term ‘conceptual metaphor theory’, is more intelligible and persuasive than it might at first seem, and they observe in their extensive afterword to the 2003 reedition of *Metaphors We Live By* that,

by bringing metaphorical thought into the limelight, this book revealed the need to rethink some of the most fundamental ideas in the study of mind: meaning, truth, the nature of thought, and the role of the body in the shaping of mind. As a result it had far-reaching implications in field after field – not just linguistics, cognitive science, and philosophy but also literary studies, politics, law, clinical psychology, religion, and even mathematics and the philosophy of science.

(Lakoff and Johnson 2003: 243)

It is precisely this last, the effect on or of philosophy of science, which is of interest here and which perhaps can be contested on the basis that conceptual metaphor theory, firstly, makes assumptions about the nature of evidence necessary to its linguistically-based, empirical study of metaphorical language; and secondly, pretending for a moment that this first problem is not true, science itself (as it very often is wont to do in general, and as was shown earlier in this particular case) has by and large disregarded any analysis of metaphor that the philosophy of science might have conducted.

Nonetheless, this is not to say that conceptual metaphor theory is not useful; on the contrary, these problems only show up further the convolving, almost-but-not-quite-circular nature of the interaction between scientific and literary thought. Lakoff and Johnson’s afterword goes on to mention in slightly more detail the effect conceptual metaphor has had on literary studies (amongst the other fields mentioned above), and they do indeed assert that overall their theory ‘calls into question business as usual and requires new collaborative cross-disciplinary

methods of inquiry' (2003: 274). Additionally, given their attempted upheaval of thought and their consequent noting of some degree of success, Lakoff and Johnson simultaneously admit to repeated frustrations in the face of the status quo, just as Tallis does, whilst also observing the slightly problematic (and thus necessarily self-reflexive) nature of conducting a project to change thought and action in the world, when the project itself is based on already extant thoughts and actions:

Every scientific theory is constructed by scientists – human beings who necessarily use the tools of the human mind. One of those tools is conceptual metaphor. When the scientific subject matter is metaphor itself, it should be no surprise that such an enterprise has to make use of metaphor, as it is embodied in the mind, to construct a scientific understanding of what metaphor is.

(Lakoff and Johnson 2003: 252)

Indeed, as Christopher Norris points out, there is already a highly physical metaphoric basis to

the very term 'metaphor' [which] derives from the Greek verb *metapherein* ('to carry across'), thus suggesting the transfer of sense by analogy from one term to another and constituting an instance of catachresis, [namely] a metaphorical expression for which there exists no literal equivalent. Moreover, *literal* is likewise catachrestic [...].

(Norris 1998: 428)

Rather than see in this some spiralling linguistic *mise-en-abîme*, Norris says it is at the heart of Jacques Derrida's reading of that arch-theorist of metaphor: Aristotle. This, according to Norris, affords Derrida a greater anti-relativist or anti-realist position (and thus one thoroughly amenable to a world of science written in an ontologically responsible way) than that with which most commentators would normally credit Derrida. In light of all this, Lakoff and Johnson's 2003 stance on their seminal 1980 work is admirable; the self-criticality and reflexivity mentioned above is reminiscent of that advocated by Choudhury and Slaby in their call for a 'critical neuroscience', and in the most recent afterword of *Metaphors We Live By*, Lakoff and Johnson profess a path somewhere between literalist, objectivist views and the converse poststructuralist tack, accepting neither outright.

Indeed, as useful as Lakoff and Johnson's approach has been, its reflexivity is what I am most interested in, and is something that they merely touch upon, rather than deeply explore within the methods they use themselves. In order to keep honest a philosophical, scientific project wanting to change science and philosophy but adhering from the outset to a dominant empiricist viewpoint stemming from science and philosophy, a little analysis in the literary mode could not

hurt as a reciprocal gesture to conceptual metaphor and its lengthy reach. If the literary mode is indeed not special as Lakoff and Johnson claim, but simply the most normal way of thinking, then perhaps drawing on the diverse expertise of the historical study of the literary mode (as I propose to do) could be beneficial, as an interpretative tool that does not simply assume the empirical, quantitative default, and recognizes the perils but fundamental necessity of appraisals of catachrestic language. As mentioned, Lakoff and Johnson discuss their own use of metaphor in building their theory but also how other fields resist such discussions. This is because the ‘carrying over’ of things/ideas already ‘carried over’ from somewhere else is a difficult and at bottom collaborative process, requiring real widespread co-operation instead of mere lip service to interdisciplinarity. Using the fruits of literary analysis as tools to analyse scientific writing could correspondingly bear as nourishing fruit as scientific analysis of literature has done over the years – a yield available to both scientific and literary writing alike.

The Convolutions to Come

A case in point is the ‘convolution’ of my thesis title, which serves as an overarching metaphor for the lobes of the brain and their constituent sulci and gyri, the convoluted texts of literary and scientific writers alike, and how all of these interweave with my own writing on their history, content and evolution. If, as Lakoff and Johnson say, getting the very concept of conceptual metaphor off the ground has been a major sticking point for intellectuals and researchers in other fields, then the more obvious, prosaic, etymological and historical coexistence I am pointing to in ‘convolution’ might seem to be more readily accepted. Sadly, even this appears not to be the case; Maasen, Mendelsohn and Weingart argue that while the adoption of metaphors across disciplines in science and from science to other spheres (and vice versa) is known to be commonplace to the point of being almost inevitable, the conscious acceptance of this linguistic cross-pollination is far less widespread. Most often it is in fact met with stubborn resistance, possibly because ‘the transfer of meaning is no longer illustrative or even decorous but can imply the redefinition of the subject matter. By becoming integrated, in the case of interdisciplinary transfer, in the body of theories, methods, and basic definitions of subject matter, the transfer may involve their transformation’ (Maasen et al. 1995: 2). They go on to say that ‘as long as the perceived difference in meaning is slight, or serves the purpose to create additional insights, metaphors are judged to be good. As soon as the use of metaphors implies change of meaning, even change of the disciplinary identity, they are judged to be bad’ (Ibid.).

However, considering the undoubted ubiquity of metaphors in all fields, judgement (and even fear) of their interdisciplinary validity obfuscates serious analysis of what functions they have served. Therefore, much like Maasen’s solo paper in the same volume quoted above, my intention in the chapters to follow is to avoid the futility of the debate regarding the pros and cons of metaphor uptake and instead address the following questions: how far-reaching and influential are specific metaphors such as ‘convolution’? Are there other examples of similarly ‘convolving’ terms and what are their histories? To what degree are these related metaphors two-way-streets in the transferal between brain science and literature? What impact does this have on writing within, across and about these spheres? And given its attempts at interdisciplinary integration, both in terms of content and methodology, to what extent does this include my own writing? Thus, in the spirit of a wandering or folding ‘convolution’, inspired in large part by the Derridean concept of *destinerrance* (and ironically backed by trenchant anti-Derridean Raymond Tallis in his recent elaborations on the ‘metaphysical flâneur’ – Cf. Tallis 2013), the scope of this thesis is not limited to one person, work, school of thought, historical period or place.

I have found the continuing groundswell of neurologically-inflected studies of literature and culture to reaffirm my stance. A case in point is the publication in 2012 of *Borges and Memory* by Argentinian neuroscientist Rodrigo Quian Quiroga. Prior to the start of my research, I identified Jorge Luis Borges as a writer who typifies my ideas on ‘convolutions’, where his fiction and the sciences of the mind and brain snake in and out of each other almost imperceptibly. Just such a psychological, neuroscientific view of Borges has been greatly substantiated by comparatist Patricia Novillo-Corvalán, and furthermore extended to include textual interactions with his contemporaries James Joyce and Samuel Beckett (Cf. Novillo-Corvalán 2011a; 2011b). Quian Quiroga’s book, which Novillo-Corvalán also mentions, corroborates this view from the standpoint of neuroscience, not just covering how Borges potentially had a distinctly cutting-edge grasp of brain function and memory, but how Borges’s stories also had a strongly discernible effect on Quian Quiroga’s own scientific work. As mentioned earlier, and sparked by Quian Quiroga’s book, the first convolution I identified reflects a long-standing scientific trope to do with ‘quixotic quests’, originating in one of Borges’s own great passions, Miguel de Cervantes’s *Don Quixote*. Indeed, Maasen et al. themselves speak of people who ‘fight a Don Quixotian cause’ in the discussion of metaphors in science – this itself a metaphor which could be taken positively or negatively depending upon context, because the ‘flow of metaphors among science, politics, literature, and everyday discourses is continuous, recursive, and selective,’ but the metaphor takes on a ‘life of [its] own’ once the original context has been transcended (Maasen et al. 1995: 8).

This typifies what for me is a justification of ‘convolutions’ not just as an object of study, but equally as an original and fruitful methodology. The work of an Argentinian neuroscientist (Quian Quiroga) took me away from a fellow Argentine’s (Borges’s) literary writings and onto a more broadly Hispanic trope’s effect on science. Following the trope in this way culminated in research on so-called father of modern neuroscience Santiago Ramón y Cajal, and his views on literature, science and his native Spanish society – including the notion of the ‘quixotic quest’ mentioned earlier.¹⁵ When Cajal’s perspective on Spain, science and quixotism at the start of the twentieth century revealed inconsistencies – specifically the manner in which quixotic, scientific individuals relate to their society – a change of angle was needed. Thus, I followed the quixotic quest as it led away to another time and place, and into the quest-themed writings of poet W H Auden and neurologist Oliver Sacks. As is evident from this, ‘quixotism’ and ‘quests’ are both terms representative of how literature and brain science mutually inform each other, but equally they encapsulate how disparate fields are written about (including by me) in a common idiom

¹⁵ For penetrating discussions of Cajal with regard to nationalism and literature (specifically Borges), Cf. Otis 2000 and Novillo-Corvalán 2015b respectively; for a picture of how his views play out in his own writing of fiction, Cf. Cajal 2001.

resulting from the common ‘convolutions’ of shared cultural assumptions and practices. As it has been my intention to perform what it is I am demonstrating – that is to say, my writing should ‘convolve’, embodying the process of convolution it seeks to describe – I have brought all of the above together in the first chapter under the title Convolution 1: Quest.

In Convolution 2: Detective, side-stepping from quest heroism to genre fiction heroism, my premise is to examine the notion that neuroscience is detective work and that therefore neuroscientists are literary detectives. The chapter departs from the point at which philosopher Dan Lloyd considers cognitive neuroscience’s view of human and neuron as ‘detector’, and goes on to the current cultural standing of neuroscience and its practitioners as the true bearers of insight into human nature, where this arguably used to be the domain of the detective figure. It then moves to a discussion of neuro-themed television mysteries to demonstrate this uncanny neuroscientific insight. However, by uncritically assuming detective fiction’s comforting resolution of a self-defined problem, neuroscience does not question the ethical and epistemological implications of its borrowings. The chapter wraps up by surveying how this plays out in the works of Oliver Sacks, before returning to Lloyd. On the way, I consider detective fiction’s inbuilt tendency to interrogate and thus police itself, and suggest neuroscience therefore needs to take on board all of the literary genre’s lessons, not just the glamorous ones.

The third chapter, Convolution 3: Labyrinth, adds an extra layer of convolution and claims that if the brain is a labyrinth as neuroscience deems it to be, then so too is brain science itself. This shifts the argument from relatively straightforward epistemological detective-like activity, to a metaphorical blurring of epistemological and ontological endeavours, an accretion into activity-as-material-object that is the labyrinth. From maps in the mind to mice in mazes, neuroscience (as well as its history) is a complicated labyrinth which challenges stable notions of interiority and exteriority, and oscillates between the reductive simplification of cartography and its own incorporation of maze-like associations. My suggestion as the chapter unfolds is that, where the concept of mapping fails to deal with the complexities of labyrinthine thinking in neuroscience, literature’s long-term experience of the figure can be educational and illustrative, such as in the works of Borges. The chapter closes with a synthesis of the literary and the neuroscientific, via a reading of the work of Douglas Hofstadter.

Convolution 4: Ballistics begins with the melodramatic assertion that every neuron is a gun. This is to say that a neuron does not simply interact with its neighbour in a friendly manner, but instead fires at it. When phrased like this, it seems preposterous, but the idea of neurons firing is otherwise so normal and idiomatic as to seem entirely natural and unquestionable. The thread of the chapter runs from the notion of the speed of thought, through uncritically standardized problems from the notion’s history (typified by the apocrypha surrounding Phineas Gage), and on to the evanescent agency propelling ballistically-charged cerebral functions. The metaphorical,

temporal implications of thinking about neurons alongside guns and missiles remains underexplored. By contrast, the chapter argues, metaphorical ballistic ramifications have been much better examined by literary study than science, and in this vein I focus on B S Johnson, Toby Litt and Jacques Derrida. The common ancestry of neurons and weapons in the scientific jargon of neurophysiology silently relates notions of military and biological defence, and the disavowal of this convolution requires rectification by instruction from the literary example, so that weapons do not fall into the wrong hands – that is, if they have not already.

Completing the description of the shape of a convolution, which returns to where it began (but not quite), the concluding chapter of this thesis serves as a form of second introduction, and is therefore titled Convolution: A Reintroduction. It proceeds by firmly asserting the importance of intellectual interrogation as a prerequisite for convolutionary practice, be this in literature, neuroscience, or any other field. It continues by briefly reiterating the contents of all the chapters, before setting out again upon a final case study of the problematic disavowal of convolution in the history of neuroscience, illustrating the very silence of ‘case studies’. From this silence emerges the suggestion for a wandering path out of this problem, once again taking in Borges, Sacks, Lloyd and Hofstadter, and definitively stating the case for a reading of literature which can actually ‘make’ neuroscience happen. Finally, a series of four ‘convolutions’ encapsulate in miniature all the issues raised by the thesis, before proposing an ultimate, novel conclusion for its reflexive and itinerant cogitations.

Each chapter in this thesis revolves (or convolves) around each central, titular term, while the texts used to do so traverse the entire list of terms by including or connecting to more than one (for example, Borges’s short stories are considered in all the chapters without being the sole focus of any). As mentioned, the intention is for the finished work to resemble as well as describe an intelligibly ‘convolving’, intertwining structure. In doing so, this thesis seeks to provide a new and coherent conceptual framework for further research into the joint field of literature and neuroscience which favours neither discipline over the other, recognizing what should be their more widely evident discursive equivalence and relevance. By redressing this fairly recently emerged imbalance, I intend to contribute as much a piece of ‘critical neuroscience’, to reiterate once again Choudhury and Slaby’s significant coinage, as a work of creative and important literary scholarship. In conclusion, then, I would like to suggest that in order to contest the supposed impingement of the so-called ‘neuro-revolution’ upon everything from culture to the very lifeworld itself, it might be most useful to dispense with a simplistic corresponding counter-revolution, and instead, in a highly collaborative, critical way, attempt to wander through and identify the convolutions that already weave throughout the history of literature, neuroscience and the many other fields they touch.

Convolution 1: Quest

While little hands make vain pretence
Our wanderings to guide.
(Carroll 1982: 13)

Everything tends toward the flourish, toward the curve,
toward intricate convolution. What the reader does not
perhaps gather at first sight, however, is that this manner of
laying and arranging things also incorporates a setting apart
– one that leads us back to the knight.
(Behne 1927: 45; cited in Benjamin 1999: 215)

Science is a quest and the brain is its ultimate goal, or so much of the rhetoric of neuroscience would have one believe. This elevates the status of brain science and its practitioners to noble, even epic proportions, worthy of any literary, questing knight. However, when the knight in question is the deluded Don Quixote, the self-ascribed rationality of neuroscience is brought into doubt. This chapter follows the trope of the quixotic quest, beginning with just such a paradoxical self-determination in the writing of neuroscientist Rodrigo Quian Quiroga, and backwards through him to his illustrious forebear Santiago Ramón y Cajal, at the dawn of neuroscience's burgeoning epistemological grip upon the imagination of the world. With reason's reputation thus revealed as potentially neurotic, I move to the poetic, theoretical and autobiographical writings of W H Auden and Oliver Sacks, and their attempts to instead salvage the individual (and ironically rational) possibilities of neurosis, by recasting the true fate of the quixotic quest in an entirely different light. As this demonstrates, 'quixotism' and 'quests' are both terms representative of how literature and brain science mutually inform each other, written as they are in a common idiom resulting from the 'convolutions' of a shared cultural milieu and its practices.

Rodrigo Quian Quiroga: The Quest of Rationalistic Quixotism

This chapter takes as its primary cues some comments from a book recently published by a neuroscientist. However, this is not a book predominantly about his findings; these he has outlined previously elsewhere, and the more recent book is actually about an important literary writer. So what is the connection? According to the scientist in question, Rodrigo Quian Quiroga, the common root of his own research on memory and of the writings of Jorge Luis Borges can be found in the history of neuroscience, all of which Quian Quiroga covers in *Borges and Memory* (2012). The book itself has its own history; it was originally published as *Borges y la Memoria* in 2011 in the author's native Spanish. Given this, Quian Quiroga writes in his Acknowledgements that

Borges, who was raised bilingual, joked that the Spanish version of *Don Quixote* was a bad translation from the English original. It may actually be the case that the English translation of [*Borges and Memory*] surpasses the original. This shouldn't be attributed to my modest bilingual abilities, though, but to the terrific work and dedication of [translator] Juan Pablo Fernández.

(Quian Quiroga 2012: 204)

Thus, this chapter will be about negotiation between one cultural ambit and another, be it linguistic or disciplinary, in translation or historical, neuroscience or literature. In doing so, and in the spirit of Quian Quiroga's remarks here and elsewhere about *Don Quixote*, I want to trace some of the intertwinings of Cervantes's questing knight with science, especially as regards that pertaining to the mind/brain. The chapter will be an attempt to investigate what historian of science Max Stadler has described as 'a cerebral romanticism inscribing the neurosciences, wittingly or not, into an age-old, anthropological quest of ultimate significance, the final capstone on the long-winded path to human nature exposed' (2012: 137).

The wealth of commentary generated by Miguel de Cervantes Saavedra's *Don Quixote* since its two-part publication over 400 years ago is immense. Notwithstanding this reiteratively paradigmatic text's overbearing centrality in the canon of the Hispanic world, it is worth considering its nigh-on instantaneous universal reach; Manuel Durán and Fay R Rogg note that as its first part was 'translated almost immediately after its publication in 1605, [*Don Quixote*] influenced writers from its inception' (Durán and Rogg 2006: 4). This means that what is widely considered the first novel proper was from the beginning subject to simultaneous intra- and inter-lingual scrutiny. Indeed, translation was an issue inscribed into its textual fabric, as the very framing device for the narrative is supposed to be the transcribed version of a tale verbally translated for the narrator from an Arabic original. With this structure of translations in mind,

Durán and Rogg pose and ponder a pair of questions: ‘Why do Don Quixote and Sancho captivate us? How does the work penetrate and play on the modern mind? And so, like Don Quixote, we begin our quest. We choose as a point of reference Edith Grossman’s translation of *Don Quixote* because the contemporary vocabulary makes for much easier reading’ (2006: 5).

So what does this have to do with cognitive/neuro science? A first clue comes in Durán and Rogg’s appeal to the almost delusional quest-like quality of attempting yet another critical reading of *Don Quixote*; Grossman, the translator of the edition they choose for this reading, similarly emphasizes that ‘endeavouring to translate artful writing, particularly an indispensable work like *Don Quixote*, grows out of infinite optimism as the translator valiantly, perhaps quixotically, attempts to enter the mind of the first writer through the gateway of the text’ (Grossman 2005: xviii). This preoccupation, as Durán and Rogg observe, is something that continues to ‘penetrate and play on the modern mind’; similarly, but in the opposite direction, to ‘quixotically’ ‘enter the mind’ of the novel’s writer, as Grossman implies, is the natural, even ideal way of heroically embarking upon another treatment of this heroic text. The common idiom here means delusional questing becomes the mutually reinforcing norm: the Don and his squire (and their author) burrow into one’s skull so that one may then burrow into theirs, making it seem that a reciprocal, metaphorical kind of ad hoc exploratory neurosurgery is very much the order of the day.

Quixotic quests are embedded into the English-language cultural lexicon. The everyday meaning of the noun ‘quest’, as in a search or pursuit, always feels as if it is about to stumble into something grander, more significant or aspirational than the prosaic act of looking for a lost item of clothing, or trying to find the right balance of herbs in a sauce. This more epically charged aspect of a quest is reflected in the *OED*’s sixth definition of it: ‘In chivalric or Arthurian romance: an expedition or search undertaken by a knight or group of knights to obtain some thing or achieve some exploit. Now also: a similar search or journey in any fictional narrative.’ This definition dates back to the late fifteenth century, but interestingly, the *OED* also claims that instances of ‘Quixote’, roughly equivalent both in noun and adjective form to our present day use of the word ‘quixotic’, were first in evidence in 1644, this earliest example credited to English poet John Cleveland. Whilst the contemporary word ‘quixotic’ itself can range in meaning from idealistic and whimsical all the way to foolhardy, capricious and downright delusional, Cleveland’s usage suggests the latter end of this scale: ‘The Quixotes of this Age fight with the Wind-mills of their owne Heads.’ Note the specific mention that the location of the delusional action is the ‘head’. It would appear that the illusory and cranium-bound quixotic quest has been on our linguistic horizon for a long time – almost as long as *Don Quixote* and its ingenious gentleman of a protagonist.

With this latter thought in mind, I turn to another, related discussion on the origin of terms. Literary scholar J A V Chapple, writing in 1986 on the entrance of the now ubiquitous word ‘scientist’ to the general vocabulary, contradicts the *OED*’s then entry by saying that William Whewell did not coin the term in his influential *Philosophy of the Inductive Sciences* (1840), but in a much earlier piece written for the *Quarterly Review* (and this has since been verified and updated by the venerable dictionary). In this earlier piece from 1834, Whewell describes the argument regarding the proper title for a person engaged in science that transpired at the previous year’s meeting of the British Association for the Advancement of Science: ‘some ingenious gentleman proposed that by analogy with *artist*, they might form *scientist*, and added that there could be no scruple in making free with this termination when we have such words as *sciolist*, *economist*, and *atheist*’ (Cited in Chapple 1986: 1; original emphasis). However satirical, the logic here proved sound enough and indeed the word ‘scientist’ stuck, becoming far less controversial than at that meeting. More interestingly, according to Chapple, Whewell’s third person accreditation referred actually to himself, probably the fictionally secret proponent of the new term. Not only was Whewell narrativizing himself (albeit in a gesture of mock modesty), but he specifically calls himself an ‘ingenious gentleman’. This appellation aligns him directly with Cervantes’s most famous creation. By Whewell’s time, Don Quixote of La Mancha’s full title of *El Ingenioso Hidalgo* had been translated into English many ways. These ranged from ‘Valorous and Wittie Knight Errant’ (in Thomas Shelton’s pioneering translation of 1612 – Cf. Colahan 2009: 61) to ‘the most Renowned Don’ (as per John Phillips’s 1687 version – Cf. Hayes 2009: 73, note 6), but by far the most common version, and thus arguably a cognate phrase for the Don’s name itself, was (and still is) ‘ingenious gentleman’. There is therefore a strong suggestion that by the 1830s the linguistic and cultural tropes of *Don Quixote*’s translations had become so embedded in the brains of pace-setting proto-scientists such as Whewell that they had become guiding metaphors for how the new specializations of science emerging in the nineteenth century went about organizing and referring to themselves.

Historian of science Charlotte Sleigh, like Chapple, writes convincingly about the interaction of Whewell with the literary writers of his day. Other than their explicit historical dialogues, Sleigh highlights the distinction in Whewell’s writings between deductive and inductive reasoning, where deduction is akin to pure logic or mathematical thinking, while ‘induction consisted in gathering evidence, generalising it, and then making an explanatory leap to postulate a general conclusion’ (Sleigh 2011: 83). This so-called ‘explanatory leap’, following the creative reassembly of some prior knowledge in light of the evidence gathered, was a piece of imaginative reasoning central to Whewell’s philosophy. As Sleigh argues,

Whewell’s influential model of scientific method [...] was based on idealism, according to which a person had to have the correct idea in mind before she or he could weigh up the claims of

scientific observation. When it came to the novel, this implied that readers were [...] liable to be misled by books if they were not the right sort of person.

(2011: 20)

My own ‘explanatory leap’ might be anachronistic at best considering Sleigh’s mention of ‘the novel’, but it is hard not to extrapolate Whewell’s idea to the right sort of person too, espying in it Don Quixote’s mind-altering bookishness – as his housekeeper says early in Part 1 of *Don Quixote*, ‘Those books should go straight to Satan and Barrabas, for they have ruined the finest mind in all of La Mancha’ (Cervantes 2005: 44).

Counterpoising Whewell’s position with the superficially similar one of Edgar Allan Poe, Sleigh writes that ‘for Whewell, the organising ideas that made sense of experience had to come from a respected person, but Poe’s narrators are far from respectable; they are drunken, mad and murderous’ (Sleigh 2011: 98). Though more famous for his fictions, Poe was himself an astute (but often playful) commentator on scientific matters, and his reliably unreliable narratives stretch to these ostensibly non-fiction writings. As Sleigh explains: ‘Critics even disagree on the fundamental question of whether Poe’s essay “Eureka” about the nature of the universe is serious or spoof’ (2011: 99). This may be because this piece, first published in 1848 and subtitled ‘A Prose Poem’ (Poe 2006: 791–871), flits between cosmology, religion and Poe’s repertoire of literary devices and motifs. Its main title is a transliterated reference to the Ancient Greek for ‘I have found it’, an expression most commonly attributed to Archimedes of Syracuse. Whilst Archimedes’ cry of ‘Eureka!’ legendarily accompanied the spilling of some bath water, Poe’s essay ‘Eureka’ spills over into his lengthiest work of non-fiction and one which has only fuelled further historic, scientific and literary uncertainty (Cf. Sova 2001: 82) – his loquacious take on ‘I have found it’ indicates not the end of a search, but something more like a beginning.

Since at least the times of Whewell and Poe, then, it is not certainty that follows searching, but uncertainty – questions lead to quests lead to more questions, and so on. In *Borges and Memory*, Quian Quiroga dispels the notion of a ‘Eureka!’ moment motivating scientists, positing instead something like the cyclical questions and quests just described: ‘What is it, then, that makes scientists wander about in a universe of ideas and experimentation?’, he asks (Quian Quiroga 2012: 2). Note that in this question he ties the world of ideas to the world of experimentation through the act of wandering. This mirrors Don Quixote’s response to Sancho Panza’s query regarding the true value of knight errantry given its largely unobserved nature, and if it would not simply be better to go and work directly for some more explicitly appreciative patron. The Don replies: ‘before one reaches that point, it is necessary to wander the world as a kind of test, seeking adventures, so that by concluding some of them, the knight acquires a reputation and fame, and when he goes to the court of some great monarch he is known by his deeds’ (Cervantes 2005: 158). The Don then spews forth, just when it seems his point is more

than made, a protracted list, very much in the quixotic mould, of fortuitous and fanciful consequences of this ‘wandering’ as a ‘test’.¹⁶

Quian Quiroga answers his own question regarding a scientist’s motivations with another ambitious list, summarized as follows: ‘the search for knowledge or, in more mundane terms, simple curiosity. Nagging questions; the pressing need to figure something out and the inability to do anything else until the answer is found’ (Quian Quiroga 2012: 2). These ‘pressing’ and ‘nagging’ questions seem to border on the compulsive, meaning the search he mentions does not sound like a choice, but a mental and physical imperative. Already this ‘simple curiosity’ starts to read like something to which he is driven, requiring more complex interrogation than is being allowed for here. Quian Quiroga continues by saying that ‘one can then ask whether scientists, embarked upon their personal quests – their quixotic endeavours – spend their time just thinking’ (2012: 3). Although he subsequently claims the reality is a lot more repetitively mechanical and only theoretically so lofty, his adjectival invocation of *Don Quixote* is striking for two reasons: first, it specifically pitches science as a romantic or epic quest; but second, by admitting that the quixotic quest underpins and even validates the monotonous reiterations of the empirical experiment, he equates science’s putative rationality with the delusional contents of the Don’s head – the quest *itself* is enough to justify and explain one’s vivid mental life in the face of a humdrum existence. Quian Quiroga elaborates:

in my quest to understand different aspects of how the brain works [...] it is rare, very rare, to come by a ‘Eureka.’ Problems are usually left open, answers usually lead to more questions, and the final solution is almost always elusive. But perhaps our obstinate perseverance may be nothing more than the knowledge that [...] the pleasure is not in finding the answer but in searching for it.
(2012: 3)

This pleasure, then, would be that of repetitive questioning and measuring, with its ultimate aim intentionally illusory; this feels like a paradoxical rationalization, a wilful equation of scientific method with the delusional quixotic quest. Unsurprisingly, this raises a further question – to what degree do scientists such as Quian Quiroga suffer from what philosopher of science Nicholas Maxwell somewhat problematically terms ‘rationalistic neurosis’?

Maxwell believes science has increased the knowledge of humanity, and thus its technical potency, but due to the effects of this so-called ‘rationalistic neurosis’, not its wisdom. This has apparently led to ‘the crisis behind all the other current global crises: science without

¹⁶ Of which, incidentally, Jacques Derrida’s concept of *destinerrance* would perhaps be a neat encapsulation. In an attempt to emulate the spirit of said concept, complicated enough as it is on its own without convoluting the rest of the argument in this section, I shall for the time being wander away from *destinerrance*, if only to arrive at it again later.

wisdom. In these circumstances, to continue to pursue knowledge and technological know-how *dissociated* from a more fundamental quest for wisdom can only deepen the crisis. As a matter of urgency, we need to free science and academia of their neuroses [...]’ (Maxwell 2004: xiii; original emphasis). This may seem a touch overblown, but it bears out Maxwell’s choice of the word ‘quest’ here, as in something bigger or more significant underlying the quotidian aspect of science, and he uses it again in the first paragraph of a chapter arguing for a return to the pre-science and more humanities-friendly practice of ‘natural philosophy’ (only a more rational version) (2004: 47). Maxwell’s aims are bafflingly convoluted, yet claim conceptual centrality; his entire argument is to do with the very truth of aims. His point of departure in explaining ‘rationalistic neurosis’ is, aptly, the Oedipus complex, with its desires to love or kill a particular parent reformulated in terms of abstract aims. Thus, he re-represents the complex as a basic aim A in conjunction with another more problematic (and thus repressed) aim B resulting in the professing of an unwittingly false aim C: ‘Neurosis, as I have sketchily characterized it above, is a condition that almost *any* aim-pursuing entity is likely to fall into, in so far as it is sufficiently sophisticated to represent, and hence misrepresent, the aims that it is pursuing’ (Maxwell 2004: 2; original emphasis). Maxwell argues that science, and by extension academia, is rationalistically neurotic because it misrepresents its own aims.

Quian Quiroga’s aforementioned comments, which posit an illusory aim so as to continue asking questions, would at first glance appear to be neurotic in this way. However, with the illusory aim and its quixotic nature having been so readily admitted, his position is actually much closer to Maxwell’s assertion that at bottom, science’s real, problematic and thus disavowed aim is ‘improving knowledge of *explanatory* truth, the truth being presupposed to be explanatory, or comprehensible’ (Maxwell 2004: 115; original emphasis). The issue here is this crucial metaphysical presupposition, which according to Maxwell is denied by science in favour of a standard empirical model that presupposes no truth without evidence. But Quian Quiroga makes no such denial, and instead openly admits the quandary: that the mere possibility of truth is an assumption. His quixotic quest is ironically more like a secular version of the ‘explanatory leap’ that Sleigh credits to William Whewell. If Maxwell’s assertion that the first step in combatting rationalistic neurosis is to freely confess to suffering it, Quian Quiroga is well on the road to recovery. Besides this, additionally problematic is that Maxwell’s argument circularly rests on a Freudian model itself somewhat awkwardly diagnosed with the same problem as the rest of science (Maxwell 2004: 112). Similarly, his justifiably idealistic appeal to the scientific ‘quest’ becomes subverted in his commentary on the fallout from the so-called Science Wars: ‘In a world dominated by the products of scientific progress it is quixotic in the extreme to deny that such progress has taken place’ (Maxwell 2004: 127). This is not Quian Quiroga’s questing for its

own sake, but a self-denial, insisting that one's quixotic ends justify one's means, whilst simultaneously decrying this delusion in others.

Quian Quiroga is not a lone voice in the night unwittingly invoking *Don Quixote* in both scientific thought and deed – the briefest survey shows the contrary. Cognitive psychologists Stephen Goldinger and Tamiko Azuma title their 2003 paper 'Puzzle-solving science: the quixotic quest for units in speech perception', whilst quantitative psychologist Patrick Curran expresses his continuous uncertainty in his 2009 article 'The Seemingly Quixotic Pursuit of a Cumulative Psychological Science'. Curran writes that *Don Quixote* juxtaposes

the eager pursuit of unrealistic ideals with practical grounding in the reality of day-to-day life. The main character succeeded in capturing the very nature of idealistic pursuit to the point that over time his name developed into an adjective that describes something as foolishly impractical. So, is it fair to describe the pursuit of a cumulative psychological science as quixotic? On some days, I believe that it is, whereas on others I do not.

(Curran 2009: 77)

Nevertheless, he still calls it a 'vitaly important quest' (2009: 79). Big names in neuroscience Semir Zeki and Christof Koch both have relatively recent books with the word 'quest' in the title, and some might say their work on the neural correlates of creativity and consciousness respectively is controversially quixotic (Cf. Zeki 2009; Koch 2004). Changing disciplinary tack but not conclusion, sociologist and political scientist Wolf Lepenies boldly argues that 'poets anticipated the discoveries of science. Cervantes had, in his admirable *Don Quixote*, sketched out the true nature of insanity long before any biologist had done so; with profound insight he had described how our emotions influence our perceptions' (Lepenies 1988: 39–40). Interestingly, this tallies with what is to Maxwell a rare instance of sanity in the mire of rationalistic neurosis (though he ends up claiming it for himself anyway). He concedes that

some things have moved in the direction of wisdom-inquiry. [...] There is greater recognition of the [...] fundamental role of emotion in cognition, [which] as far as neuroscience is concerned, has been stressed especially by Damasio [...]. Nearly two decades earlier, I stressed that emotion is essential to rationality, to rational inquiry, and to science.

(Maxwell 2004: 117–118; also, 118, note 1)

In any case, if emotions quixotically influence perceptions, and scientific commentators choose to align themselves with the figure of the Don, then the quest of science from its outset seems to require a quixotic, affective and wilfully imaginative (read: fantastical) paradigm.

It is not, nevertheless, my intention to say Quian Quiroga is a reclusive genius who is currently ignored but who will be historically vindicated by the quixotic tradition. His book *Borges and Memory* is not about *Don Quixote*, nor even about the truth-value of science, per se. It is about Quian Quiroga's interest in a Borges short story, its uncanny congruence with his working life as a neuroscientist, and their potentially common roots. In describing his far from solitary day job, he is quick to give immense credit to the forebears and teams with whom he has worked. However, in a book on an ostensibly literary topic, Quian Quiroga is also unabashedly willing to dwell in the supposedly quixotic edges of science, something which, as has been shown, is perhaps not as irrational (nor as uncommon) as it originally seemed.¹⁷ Like Don Quixote, Borges had a personal library which was the source of his imaginary adventures; and like the priest and the barber, characters who seek to cure Don Quixote by examining his library and rather haphazardly assessing his reading material, Quian Quiroga spends a whole chapter of his relatively short book describing in adulatory terms his visit to Borges's preserved library. Bizarrely, the quest of science here becomes more of a traditionally philological endeavour, Quian Quiroga attempting a diagnosis of the potential philosophical, literary or theoretical influences contained in Borges's library, which, if *Borges and Memory's* common-root thesis were correct, would unbeknownst to him be Quian Quiroga's own influences – and having influences in this way would not be objective, nor detached, and would thus be most unscientific indeed.

But this is specifically Quian Quiroga's position: someone obsessed with the mind/brain, and not just from the angle of his fascinating (empirical) work on memory and concept abstraction at the neuronal level. He purposely enacts a quixotic quest because rather than obscure the truth, this temporary refuge from the quotidian tasks of laboratory neuroscience actually affords him a better view of his practice. A useful parallel can be taken from *Don Quixote*: towards the start of Part 2, the Don accidentally defeats the Knight of the Mirrors and his squire. Soon after, it is revealed these two are merely another pair of amateur physicians secretly aiming to cure Don Quixote's mental problem by taking part in it. They are his fellow villagers, the bachelor Sansón Carrasco and his friend Tomé Cecial, the latter of whom says:

“It's easy enough to think up and begin an enterprise, but most of the time it's hard to end it. Don Quixote's crazy, we're sane, and he walks away healthy and laughing, while your grace is bruised

¹⁷ Indeed, one could make the argument that Quian Quiroga is simply trading off of traditional notions of Romantic Science in order to elevate his work above the neuroscientific norm, or to justify any reductionist or materialist accusations against him. For a selection of essays on Romantic Science in various specific contexts, Cf. Heringman 2003. For a more general overview of the relationship between Romanticism and the sciences, Cf. Knight 1998. For the German context, focusing on Goethe's influence, Cf. Richards 2002. Finally, for a discussion of Romanticism specifically in the light of brain/mind science (and what the author calls 'neural Romanticism'), Cf. Richardson 2001.

and sad. So tell me now, who's crazier: the man who's crazy because he can't help it or the man who chooses to be crazy?"

To which Sansón responded:

"The difference between those two madmen is that the one who can't help it will always be mad, and the one who chooses can stop whenever he wants to."

(Cervantes 2005: 549)

Actively participating in a delusion might gain one some bruises in the short term. But it is ultimately far more desirable than simply allowing fiction to set one's 'dorsolateral prefrontal cortex [...] both for non-action and action [and thus] become uncertain about [one's] own status in reality as well as that of the story' (Holland 2012: 85), as literary scholar Norman Holland extrapolates from the neuroscientific theories of Llinás, Passingham and others. What Sansón Carrasco does not realize is he is as much 'a man who *does act* in response to fictions' (Holland 2012: 86; original emphasis), which is how Holland describes Don Quixote, but could equally represent Borges or Quián Quiroga. In the quest for science, as in any interrogation of truth, it is better to choose to be rationalistically quixotic than to passively lapse into neurosis.

Santiago Ramón y Cajal: The Quest of Nationalistic Quixotism

Belief in the potential virtues available via the kind of rationalistic quixotism described so far is not necessarily unique to the here and now of Rodrigo Quián Quiroga. He is preceded by some hundred years by Santiago Ramón y Cajal, another eminent Hispanic brain researcher (this time Spanish, not Argentinian), who seemed to concur with this type of thinking. Cajal (as his name is often shortened, contrary to the norms of the Spanish naming tradition) is widely though perhaps anachronistically held to be the father of modern neuroscience.¹⁸ Along with the Italian physician Camillo Golgi, Cajal shared the 1906 Nobel Prize in Physiology or Medicine. Golgi had developed a staining technique which allowed a finer grain of detail in brain tissue to become visible, whilst Cajal utilized and elaborated upon this hitherto overlooked technique to observe via microscope, and then get down on paper, the plethora of intricate drawings of neurons with which his name would later become so famously synonymous. His numerous publications and prizes in a long and distinguished career attest to Cajal's widespread prestige as a pioneering neuroanatomist and histologist. Aggregated to his predominantly scientific career (in which of course was nested a highly productive artistic one, all his neuronal draughtsmanship considered), Cajal's intuitive versatility led him also to write a wealth of non-scientific texts, including autobiography and social commentary. Yet unbeknownst to most at the time and perhaps even many still, Cajal also wrote short stories, largely concerned with reflecting upon the world of scientific practice (Cf. Cajal 2001; Otis 2000; Novillo-Corvalán 2015b). Importantly, his literary concerns also intermingled with his social and scientific ones when on 9 May 1905, arguably at the peak of his powers and just a year before his receipt of the Nobel Prize, Cajal addressed a meeting celebrating the third centenary of the publication of *Don Quixote* at the San Carlos medical college in Madrid (Cf. Cajal 1905). His lecture was titled 'Psicología de don Quijote y el quijotismo', which translates as 'The Psychology of Don Quixote and Quixotism'.

Despite several efforts to publicize this important essay, it remains under-recognized, in particular in the Anglophone world. Appropriately enough given its topic, it is freely available on the website of the Instituto Cervantes, the Spanish government's international vehicle for the promotion of Spanish culture, and it was also relatively recently republished in eminent and long-running Spanish science journal *Arbor* (Cf. Cajal 2004). However, while the *Dictionary of the Literature of the Iberian Peninsula* goes so far as to name the essay in a list of Cajal's works

¹⁸ For example, Cf. DeFelipe 2002, wherein neuroscientist Javier DeFelipe amplifies the hyperbole further and announces that 'the appearance of Santiago Ramón y Cajal in the world of neuroscience provoked a radical change in the course of its history' (2002: 481).

which ‘transcend simple reminiscences, providing reflections on Spanish matters as well as a scientist’s intellectual testimony’ (Bleiberg et al. 1993: 1351), its first publication in English was only as an afterthought in 1968, as one of the selections in *The World of Ramón y Cajal: With Selections from his Nonscientific Writings* (Cf. Horne Craigie and Gibson 1968).¹⁹ This translation is somewhat clunky and does not preserve some of the important biological ideas Cajal imports into his treatise, and though a more recent translation is interesting, it changes ‘quixotism’ to ‘quixotic ideal’, losing something of the original’s fluency and scope in the process (Cf. Triarhou 2015). Therefore translations here from Cajal’s original lecture (as posted on the Instituto Cervantes website) are my own.

The relative paucity of English translations is in itself all the more interesting considering Cajal’s introductory paragraph to the lecture, where prior to any discussion of the so-called quixotic psychology of the title, he alludes to a deficiency in the English canon (and presumably in Shakespeare):

The magnificent moral figure of the Manchegan gentleman is universally admired. Turned into a knight errant due to the influence of nonsensical books of chivalry, Don Alonso Quijano the Good represents, as has been said a thousand times, the most perfect symbol of honour and altruism. Never did the Anglo-Saxon genius, so given to imagining energetic and original characters, create a more exquisite personification of indomitable individualism and sublime self-sacrifice.

(Cajal 1905)

In this opening to Cajal’s rousing and sturdy defence of quixotism as the true basis of the Spanish (or even Hispanic) cultural character, he extols the virtues of a potential English-language counterpart whilst bizarrely deriding it for its lack of existence, all in the same breath. However, Cajal goes yet further, proposing the wilful espousal of quixotism as an exertion of Spanish identity, and furthermore, its idealistic moral character. His comments came at a time when Spain found itself in crisis, fresh from what was by any measure a frankly woeful nineteenth century for the country. This period in Spain’s history was bookended by the Napoleonic Wars, Bonaparte rule and the initial murmurings of Spanish American independence at its start; the period’s end was marked by the loss of colonies and resultant collapse in Spain’s global standing, following the disastrous Spanish-American war and the proclamation of Cuban independence in 1898. Indeed, Cajal is sometimes spoken of as a peripheral member of the so-called *noventayochistas*,

¹⁹ Horne Craigie and Gibson admit that the ‘first objective of this book is to present to readers a personalized account of the origins of the great Spanish scientist and author’ while the non-scientific works they include are only secondary, a way to add colour – though they do intriguingly claim said works ‘represent a commentary on life as lived anywhere at any time’ (Horne Craigie and Gibson 1968: vii).

or ‘Generation of 98’, an influential group of Spanish public intellectuals who sought to shake up the political and cultural fallout of imperial Spain’s dramatic downturn.

In his book *Médicos Escritores en España, 1885-1955* (2010),²⁰ cultural historian Alfredo J Sosa-Velasco draws convincing parallels and contrasts between the ideas of Cajal and those of one of the Generation of 98’s more central figures, the novelist and philosopher Miguel de Unamuno. According to Sosa-Velasco,

while Unamuno reclaims *Don Quixote* as a philosophical/religious treatise in which a new ideal is proposed for the regeneration of Spain, turning [the Don] into an icon of Spanish nationalism, Cajal reclaims the psychology of the character in order to explain what it is to be Spanish. For Cajal, it is sufficient to see that come the hour of his death, the sublime madman, transformed back into Alonso Quijano the Good, brusquely recovers his senses and proclaims his resignation in the face of the iniquities of the world. Don Quixote represents one’s will obstinately oriented towards the light and happiness of the collective.

(Sosa-Velasco 2010: 45)

Much has been made, equally within the Spanish-speaking world as well as further afield, about the equilibrium in Cervantes’s great work afforded by the wild idealism of the Don and the grounding, pragmatic influence of his squire Sancho Panza. Far less has been written about the balancing act within the humbled and impotent figure of the Don himself, metamorphosed back into his alter ego Alonso Quijano at the novel’s end, as suggested by Cajal. The distinction Cajal makes is between the isolation and resignation of the wretched Alonso on his deathbed, almost stricken by his return to reason, and the optimism and unbridled enthusiasm of Don Quixote at the height of his powers, however deluded. Cajal’s reading of this certainly seems visionary in itself, especially given his galvanizing nationalistic purpose: the point is that Alonso’s reintegration into ‘sanity’, into a socially agreed reality, actually (and paradoxically) leaves him alone like the dejected version of contemporary Spain. This is salient because as well as Cajal, many *noventayochistas* saw Spain’s future lying in greater ties with the rest of Europe, rather than isolationism. Compared to the re-sanitized, almost quarantined Alonso, the Don’s higher

²⁰ A note here on this Spanish-language book’s disarmingly tricky title (quotations from which are all my own translations): the first two words in the title together translate as ‘doctors who write’ or ‘writer-doctors’, the specification of which implies that the book’s topic is not simply medical men who wrote during that period in Spain (as the rest of the main title suggests, of course), but authors (in the broadest sense) as well as doctors, who participated in the literary culture of their age and context in some significant way. Sosa-Velasco justifies this in his introduction thus: ‘I propose an analysis of the literary products written by doctors as a dialogic space (in Bakhtinian terms) within which they define themselves as intellectuals and critique their society on the basis of metaphors related to medicine, illness and treatment, taken from medical discourse itself’ (2010: 2).

Patricia Novillo-Corvalán has also usefully taken up Sosa-Velasco’s stance, referring to Cajal as a ‘physician-writer’ rather than solely a ‘research scientist’ as per previous scholars, because she ‘seeks to foreground Cajal’s multiple roles as doctor, scientific researcher, and short-story writer’ (Novillo-Corvalán 2015b: 41, note 22).

aspirations are fundamentally social and unselfish, or as Sosa-Velasco emphatically puts it, ‘obstinately oriented towards the light and happiness of the collective’.

In support of this position, Cajal goes back to his own specialities in the biological and brain sciences, in tandem with his reading of *Don Quixote*, to illustrate that the pain of the individual body is ultimately the pain of the larger body politic, and vice versa; or put another way, that without its cells, an organism cannot function properly, and vice versa. In a passage lamenting the suffering that Cervantes went through in his life, and how its avoidance might have made him so much more productive and less tragic in his writings, Cajal concludes that Cervantes’s painful experiences (in prison, in war) actually helped him to accurately reflect his national character in *Don Quixote* – this is why the Don cannot just be an amateur do-gooder who is at bottom a sane, undamaged and well-adjusted person. Cajal continues:

Oh what a great awakener of souls and instigator of energies is pain! Comparable to a swarm of marine fireflies, whose phosphorescence becomes activated upon impact with the propeller of the ship, the sluggish brain cells only switch on their light under the whip of painful emotions.

Perhaps in order to reach the fever pitch of sublime inspiration, the exceptional brain of Cervantes likewise needed the sharp spur of pain and the devastating spectacle of misery!

(Cajal 1905)

Unpacking the metaphoric convolutions in this astounding paragraph is not easy, but proves ultimately illuminating, as it draws together many of Cajal’s strands of thought in an appositely poetic and interlinking manner.

The idea of illumination in the passage coincides with Sosa-Velasco’s interpretation of Cajal’s quixotism as aimed at some beacon of light. This might be read equally as a veiled reference to Enlightenment values of progress, or, considering that this light is reached only by recourse to pain and penance, a messianic hangover of Catholic proportions. This, as Sosa-Velasco points out, would align Cajal once again with Unamuno, the latter of whom writes in a somewhat far-fetched way of Cervantes’s novel as ‘the national Bible of the patriotic religion of Spain’ and the Don himself as the ‘Spanish Christ’ (Cited in Sosa-Velasco 2010: 46–47). Nevertheless, most interesting and rich in Cajal’s analogy of the fireflies is their swarm-like nature, precisely because this gives him recourse to the terminology and symbology of the field in which he would soon after be recognized by the Nobel committee: that of the brain. Cajal compares the illumination of the flies to neurons firing across the synapses he so famously postulated (in direct contradiction of his prize-sharing colleague Golgi). Creativity in this metaphor thus derives from the crashing and continuous rotation of the ship’s propeller, meaning there is no visible swarm without the vicissitudes of life and frequent pain for the individual; but this is also correspondingly instructive if one remembers that Cajal saw Don Quixote as idealistic

in a collective sense. The swarm of fireflies is a hive mind, a set of brain cells which are nothing without each other's lights, willing to share each other's pain in a communal effort.

Cajal reaffirms this notion later in 'The Psychology of Don Quixote and Quixotism', in another nod to the descriptive power of biology and cells. Having rejected disparaging contemporary views of Don Quixote's delusions (and by correspondence the delusions of Spain) in favour of a quixotism that is ever-ready to sacrifice and even die for high ideals, Cajal stresses that figures embodying these more positive attributes of the Don certainly do exist in Spain. He writes that 'in all their acts and tendencies they find an end, not inside of themselves, in the lower regions of the avaricious soul, but in the spirit of the collective person, of whom they recognize themselves as humble and generous cells' (Cajal 1905). Their madness might consume them and make them strange and impractical at times, but the self-effacing loyalty of Spain's Quixotes is unquestionable – because together they make up the larger Don Quixote that is Spain itself. This leads Cajal to an astonishing claim, having earlier (and in concordance with the greater part of Cervantine commentary) sung the praises of the character Sancho Panza: 'Although it might hurt to our core to admit it, it is a strength to recognize and declare that in Spain, outside of its most glorious periods, if there was ever an over-abundance of Sanchos, there was often a shortage of Quixotes' (Cajal 1905). Visionary traits, delusional or otherwise, are necessary to the well-being of the country.

Cajal's oeuvre, inclusive of 'The Psychology of Don Quixote and Quixotism', can easily be taken as patriarchal and imperialistic, nostalgic for a supposedly glorious but bloody age of conquistadors and hell-bent colonialists. As Laura Otis writes, early in his medical career 'Cajal joined the quest [...] against microbes that caused infectious diseases' and 'he continued to refer to infection and suggestion for the rest of his life, [...] often employing them to describe the dissemination of unwanted ideas' (Otis 2000: 66). Ultimately, Otis opines, 'Cajal wanted to revive the decrepit Spanish colonial empire, and [...] he saw scientific investigation as its foundation' (2000: 88). Similarly, Sosa-Velasco points out that bubbling under Cajal's medically informed discourse of progress and modernization lies a series of metaphors relating to infection and disease. These indicate a fear of, for example, intra-national pluralism, something with which Spain still wrestles to this day. Indeed, many of the 'Generation of 98' shared a similar struggle to reconcile issues of nationalism (both as a whole and internally), modernization and cultural identity. According to Sosa-Velasco, this meant most leading lights advocated an economic, political and moral asceticism characterized by retirement from the international arena, but that 'for his part, Cajal preaches that the nation should let itself be carried by that intellectual family of scientists, who are the only ones capable of leading it to progress, taking advantage of the country's resources and modelling its politics' (Sosa-Velasco 2010: 47). Far from shirking modern values, this espousal of the political leadership of scientists is Cajal's present-based but

forward-looking embrace of the supposedly progressive ideology of the scientific.

Nevertheless, the key to this is still quixotism, a tilt if not at the past, then at least to its spirit – even if scientifically this is a self-proclaimed madness, knowing full well that windmills are not enemies but making to attack them anyway. In an intriguing twist on Don Quixote’s bookish delusions, Cajal claims that as far back as Cervantes’s time Spain’s proto-scientists were just as ‘enamoured of old books’, obsessed with theory but finding sufficient intrigue in the achievements of those Quixotes abroad to leave their own ingenious thoughts precisely there in the realm of theory, untranslated into praxis or concrete discovery. Cajal blames this on an entrenched, self-propagating utilitarianism and realism in Spanish literary, philosophical and scientific traditions. This meant that in Spain,

thinkers and scientists mainly limited themselves to modestly utilizing the mathematical theories and biological and physical discoveries of foreigners, [but] always made a great show of disdaining the objects of pure research, of speculative truths stripped of useful application; without looking to see, as is the habit of many current intellectuals, that that science designated as *practical* is indissolubly united to that which is abstract or idealist, like the stream to its source.

(Cajal 1905; original emphasis)

So if science is to provide the basis for political and cultural life, it must itself take its cues from a pervasive policy and culture of imaginative thinking, of wide-spread idealism, of putting the moral collective will into practice, in short, of quixotism.

However wild this may seem, it does not much differ from William Whewell’s ‘imaginative leap’ before it, or Quian Quiroga’s questing for its own sake. While Cajal’s ambitions for Spain tied the political and scientific to quixotism, Quian Quiroga, as mentioned, more specifically echoes Don Quixote’s idea of ‘wandering as a test’ in his vision for the scientific. Science ironically depends on this departure from its own core (or quotidian) workings – thus questing *is* testing, and vice versa. The fact that Cajal came upon this same sort of notion but with a broader, more holistic view of society is no surprise if one takes into account his own biography.²¹ One such rendering of the events of his life certainly seems to corroborate this reading, starting from its very title: *Don Quixote of the Microscope* (1954). This entertaining and

²¹ A biography, one might say, of knight destinerrantry, to borrow and adapt Derrida’s term *destinerrance*, which was itself mentioned and put on hold earlier. A preliminary way to approach this concept might be to consider its similarity to some of the notions of others already discussed, such as when Derrida writes that ‘what I have called “destinerrance” [– a wandering that is its own end, etc . . .] [. . .] is connected with a structure in which randomness and incalculability are essential’ (Derrida 1984: 29; the parenthetical definition of *destinerrance* is from the original).

This certainly reads somewhat like the versions of quixotism espoused (directly or otherwise) by Cajal and Quian Quiroga. It would additionally be intricately interwoven, as I have also been suggesting throughout this chapter of the quixotic quest, with translation, as evidenced by John P Leavey Jr’s chapter ‘Destinerrance: The Apotropocalyptics of Translation’ (Cf. Sallis 1988: 33–43).

informal book, written by medical biographer Harley Williams, narrates Cajal's life as if he were himself a literary character, a hero in a fantasy. Aptly, it illustrates how Cajal's father forbade him from following his dream of becoming an artist, resulting in his wandering away from this dream and instead, almost by accident, into a stellar scientific career. Additionally, Williams points out that in another bewildering about-face, this career issued from the recognition Cajal gained for his artistry – that is to say, for his detailed drawings of brain cells. Williams's text itself is debatably a quixotic interpretation of Cajal's quixotic trajectory.

In a lengthy 'Author's Acknowledgements' section at the start of his book, Williams includes an expression of gratitude to 'Professor Wilder Penfield [...], the most distinguished living pupil of Ramón y Cajal, [the former of whom] furnished [Williams] with first-hand impressions of the master' (Williams 1954: 9). Penfield himself became an internationally renowned neurosurgeon specializing in the fields of memory, epilepsy and cerebral anatomy – so much so that Quian Quiroga also dedicates several pages of *Borges and Memory* to some of the pioneering but still-used methods that Penfield developed as far back as the mid-twentieth century (indeed, around the time that Williams was himself writing and acknowledging Penfield). After his acknowledgements, but prior to the narrative proper, Williams inserts a pair of epigraphs from two of Santiago Ramón y Cajal's contemporaries, one by *noventayochista* luminary Azorín and another by one of the group's sympathizers (like Cajal), philosopher José Ortega y Gasset. In his works, this latter wrote equally as impassioned as Cajal or Unamuno on *Don Quixote*, and furthermore, Ortega y Gasset retains Cajal's interest in the complex quixotic relationships between discourses of nation, history and science. Williams's epigraphic quotation from Ortega y Gasset reflects this:

Everything in Spain has been done by the people, and what they did not do has been left undone. But a nation cannot consist solely of the common people: it needs an eminent minority. It is like a live body which consists not only of muscle but also of nerve ganglia and a cerebral centre. The absence of the 'best people' or at least their scarcity, runs through our whole history and has kept us from ever being like other nations, a completely normal people.

(Cited in Williams 1954: 12)

This extract sounds remarkably like Cajal's argument in 'The Psychology of Don Quixote and Quixotism' with its appeal to the biological, even neurological make-up of the nation. Although Ortega y Gasset does not directly mention Don Quixote here, it is telling that these purported 'best people' are necessary for the 'normal' functioning of people overall: drawing further comparison with Cajal's delineation of quixotism and the relationship of cells to organisms, it appears Ortega y Gasset is endorsing a type of noble yet delusional character carrying the weight

of society and history on his or her shoulders. This also implies that widespread normality rests upon a minor amount of central (and moreover cerebral) abnormality.

The quotation Williams chooses is from one of Ortega y Gasset's most famous works, *Invertebrate Spain* (1921), the title of which makes an implicit connection between nation, biology and political will (or at least some sort of mental state or character trait related to a biological metaphor). But as far back as 1914, Ortega y Gasset was already making similar claims in his first major work, which has the English title of *Meditations on Quixote*. This collection of essays and insights does not always deal directly with Cervantes's novel, using it instead as an occasional springboard to a wide variety of topics, and as such is significant here for several reasons. To begin with, its Spanish title is *Meditaciones del Quijote*, which seems normal enough, except when one considers that its English translation effaces a double meaning: the Spanish could mean 'meditations of the Quixote' as much as the actual English translation, a subtle yet no doubt intriguing difference which suggests, if not an equivalence between the Don and Ortega y Gasset himself, then at least an affinity between an aspirational philosopher-cum-political-agitator and a fictional madman. More salient is a characteristic interwoven three-pronged attack on: Comtist positivism; on nineteenth-century literary realism; and on biological determinism, in Ortega y Gasset's chapter in the *Meditations* called 'Flaubert, Cervantes, Darwin'. He starts by emphasizing the criminally ignored centrality of *Don Quixote* to the Spanish state's future by using a highly physical and agricultural idiom:

The sterility of what passes for patriotism in Spanish thought is made clear by the fact that the truly great Spanish accomplishments have not been studied sufficiently. [...] There is need of a book showing in detail that every novel bears *Quixote* within it like an inner filigree, in the same way as every epic poem contains the *Iliad* within it like the fruit its core.

(Ortega y Gasset 2000: 162)

There is clearly another appeal here to the physical interior directly impacting the exterior, or in congruence with a nucleic model reminiscent once again of Cajal's metaphorical cellular stance – *Don Quixote* is the seed carrier of Spain's literary contribution to the world: the novel.

How a seed grows depends upon many things: how it is cultivated and cared for; the fertility of the soil into which it is placed; sunlight, water, other environmental factors; perhaps as important, the purpose it has been assigned and the perceived value of its growth, for food, for decoration, for eventual replanting. If, as Ortega and Gasset claims, the modern novel always carries *Don Quixote* within it, how has this now widespread storytelling medium been cultivated, repurposed, crossbred? As I have been trying to show, quixotism is a complex but important, even fruitful instance of cross-pollination from literary to scientific thinking. But if Cajal's pretensions to a scientific quixotic ideal serve to nourish the spirits of a nation, the individual

seeds that *Don Quixote* supposedly carries – the characters, the individuated readers, present and future authors, or Cajal’s scientific knights-to-be – are somewhat lost in the aspirations for a mass of people, rather than for the specific people themselves. Science or nation – these are lofty notions indeed, but possibly even loftier is the quixotic quest for the self. The conundrum is that in positing an overall quixotic goal for an organism such as a nation, Cajal ironically overlooks the psychological disposition of the cells comprising it, that is to say, whether the individual people that make up a society are all also supposed to be Quixotes themselves and purposively take on a visionary madness of their own.

The reason for this irony is because of Cajal’s vaunting of the neuron doctrine and the particular saliency of the historical moment in which it began to gain traction. As interdisciplinary critics Laura Salisbury and Andrew Shail write, ‘neurology [provided] the period of historical modernity with new conceptions of how the self might be structured and organized. [A major instance] of this [was] the neuron doctrine [although] conclusive proof of the existence of distinct nerve cells was not discovered until the end of the 1880s [...]’ (Salisbury and Shail 2010: 25). This ‘conclusive proof’, of course, came with Cajal, and is indeed cited as one of the main reasons he won the Nobel Prize (Cf. López-Muñoz et al. 2006). However, this means that Cajal’s own neurological and quixotic outlooks were at odds with each other, positing opposing conceptions of a personal consciousness and a national one. This quandary, of how societal parts relate to wholes after neurology, is described by Salisbury and Shail:

The modern neurological subject needed to be regarded as fundamentally attached to a world by which it could both be nourished and harried.

Advances in the understanding of neurological functioning [...] contributed to the idea that nervous disorder was common, distributed throughout the body and the populace as a whole. [By] locating consciousness in every nerve cell, nineteenth-century neurology had remodelled the nerves as reflections of mental states.

(2010: 24)

Cajal’s quixotism applied to the entire body politic as a unified, continuous totality, whilst his now ubiquitously accepted view of neurons was that they were each separate, individual cells. Where the modern novel, pioneered yet epitomized by *Don Quixote*, was to bond the people in nationalism, modern neurology dispersed the hitherto consistent totality of the nervous system into its minute constituent parts (likely leading to ‘nervous disorder’, as Salisbury and Shail put it), providing a mixed metaphorical message for the agents within a modern, neurologized political state.

So neurons are individual cells which nevertheless make up the nervous system, while the nervous systems of individual people are in turn the discrete entities which nevertheless make

up nervous societies. But if a modernity based on nervousness could be guided at the societal level by quixotism, then perhaps, in fact, so too could the individual person. However, this is not something Cajal really explores; if anything, his encouragement to the personal quests of singular Quixotes in Spain at the very end of ‘The Psychology of Don Quixote and Quixotism’ is not one of unfettered individuality, but of utter self-sacrifice in the service of the nation. It is akin, he claims, to the vital but unnamed, unrecognized layers upon layers of coral submerged under the visible and beautiful part of a reef – literally a bodily sacrifice for the sake of the edifice as a whole. Such a sad, dispiriting quixotism of self-immolation seems quite at odds with the celebratory collective fate of a nation based on rationalistic, scientific quixotism; it is essentially pathological, personal neurosis versus mad, nationalistic joy, and one wonders who would be left in this version of a quixotic state of martyrs to actually celebrate its success anyway. Indeed, it is like the functioning of a nervous system based upon the sacrifice of all its nerve cells: a logical fallacy. Although Otis insists that ‘for Cajal, the fundamental characteristic of every cell and every human being was its individuality’ (Otis 2000: 71), this evidently does not stretch to the quixotic project, at least if any vestige of said individuality is to be preserved. To find a more positive (but no less complex) quixotic appreciation of the singular, individual self, one has to look elsewhere, as will be described below.

W H Auden: The Quest of Individualistic Quixotism

W H Auden posits a type of self-formation in his sonnet cycle ‘The Quest’. Much of Auden’s considerable output was geared towards delineating what he saw as this personal quest – not just for himself, but personal to each and every human – something that spurred one on as an individual and in interactions with others. However, this quest was predicated not on an easily determinable basic goal and then systematically sought after. Instead, some kind of ailment, trauma, problem, or even the very invisibility of any clear goal had to be the justification underwriting the quest and nourishing the quester. Auden’s literary executor Edward Mendelson puts it thus: ‘The hero of a sonnet in the sequence “The Quest,” written in the summer of 1940, eludes deadly peril because “The angel of a broken leg had taught him | The right precautions to avoid a fall”’ (Mendelson 1999: 99). Mendelson goes on to quote Auden expanding on the paradoxical, supposedly beneficial or necessary aspect of hardship represented by ‘the angel of a broken leg’. Mendelson’s quotation is from Auden’s 1941 review of Franz Kafka (thus written near to the time ‘The Quest’), wherein Auden says the following of the formational, productive quality of problems:

The true significance of a neurosis is teleological, [...] the so-called traumatic experience is not an accident, but the opportunity for which the child has been patiently waiting – had it not occurred, it would have found another, equally trivial – in order to find a necessity and direction for its existence, in order that its life may become a serious matter. Of course it would be better if it could do without it, but unconsciously it knows that it is not, by itself, strong enough to learn to stand alone: a neurosis is a guardian angel; to become ill is to take vows.

(Mendelson 1999: 99; also, Cf. W H Auden 2002: 112–113)

This is more than using adversity to one’s advantage, as and when the occasion arises; it involves ‘patiently waiting’ from an early age, actively expecting useful problems.

There is evidently a strong element of determinism in this idea of ‘teleological’ obstacles which are no mere ‘accident’, as physical or mental burden is actually a ‘necessity’ which endows life with value and makes it a ‘serious matter’. Yet the idea goes further than a simple gloss on the well-known Nietzschean aphorism ‘What does not kill me makes me stronger’ (Nietzsche 1968: 23). The implication is that the seriousness of one’s life, known presciently even from childhood to be so important as to necessitate the ‘guardian angel’ ‘of a broken leg’ or ‘neurosis’, is belied by a double triviality: that it can be ‘found’ in something ‘trivial’ in the first place, and secondly, that this something is just one of many opportunities for malady or trauma. Looking for this angel is a calling, a destined thing, a matter of paramount importance which

nevertheless finds expression in the everyday and therefore must be actively sought if it is not to be simply, repeatedly overlooked.

This is why there is consistency in the idea of the quest which informs Auden's entire body of work, just as he claims the quest itself can inform a fruitful life, even if this makes it seem like one is willingly looking for aggravations and neuroses as a form of existential validation. Conversely, the opposite view is held to be problematic by Auden: always seeking a guardian angel or an absolute truth in unfettered rationality and positivity results only in isolation, hesitation and failure. Ironically, however, this then presents one with the very 'opportunity' mentioned above to embrace a reversal of fates, and use the fresh problem as a stepping stone – if only one is able to recognize the opportunity as such amidst what appear to be unfavourable conditions. This is where the prescience mentioned enters, with the knowledge that a difficult life beckons, but even so this quest must be energetically, unwaveringly and perhaps irrationally pursued – certainly this version of a quest is as quixotic as any. Auden sees this, at the time he is writing, as able to give meaning to the seeming meaninglessness of a 1940 already plunged into worldwide war.

It is why Auden is so influenced by Kafka, whom he considers the greatest depicter of modern humanity of his day: 'Kafka is important to us because the predicament of his hero is the predicament of the contemporary man. An industrial civilization makes *everyone* an exceptional reflective [...]: the reflective man, the wanderer, can never find it easy to have faith, but [...] if he loses it he is lost' (W H Auden 2002: 113; original emphasis). To be an 'exceptional reflective', in Auden's terms, is to have realized that the quest looks inwards, not out at a horribly corrupted society and its hypocritical mores, and by embracing this interiority becomes worthy as a seeker. This quotation, along with Mendelson's above which concludes that 'to become ill is to take vows', are both taken from the review of Kafka titled 'The Wandering Jew' (Cf. W H Auden 2002: 110–113). Although in this review Auden covers the timeless yet updated quest trope he identifies in Kafka's works, he finishes the piece with a consideration of the impossible yet invaluable faith of the 'reflective'. This faith takes the form of a stubbornness at the root of the so-called 'vows' to illness, a commitment in the face of mounting malaise and societal scorn which Auden commends in Kafka's characters. But the abundance of religious terminology – 'angels, vows, faith' – also reveals another purpose to Auden's deployment of Kafka with relation to questing. The act of wandering in spite of hardship (indeed, because of or in search of it) is for Auden an important aspect of Jewish history and culture, which for him is most fittingly represented in the modern age by Kafka. By contradictorily underscoring 'everyone' as an 'exceptional reflective', all now undergoing the same internal wandering and questing, Auden seeks to both comment on the inevitable flattening out of anti-Semitism, as well as to link the idea of the quest with religion in general.

So what does this have to do with brain science? Firstly, Auden's quest is certainly redolent of the quixotic wandering as a test that has so far been traced from Rodrigo Quian Quiroga back to Santiago Ramón y Cajal. Additional to this is Auden's complex relationship to science itself. Admittedly, his views fall within the framework of an ever-evolving but pervasive Christianity that always remained central to his work and life. But as Mendelson points out, '[Wystan Hugh Auden] grew up in a household in which the scientific inquiries of his father maintained an uneasy truce with the ritualized religion of his mother' (Mendelson 1999: xvi). As a result, Auden gave scientific issues extensive thought as well as coverage in his poetry. His father, George Augustus Auden, was a trained medical doctor, but also had a plethora of interests which convolved his life into and out of medicine:

Dr Auden gave up his quite lucrative practice in York when he was appointed School Medical Officer for the city of Birmingham, and Professor of Public Health at the University there. [In addition, he] was a voracious reader and also a published writer and translator of archaeological and psychological articles. Wystan's love of the printed word and of literature clearly derived from his father.

(Osborne 1995: 2–3)

But Dr Auden's effect upon his son goes further than words and literature, because 'in other respects [the doctor] was a factually-minded man, and [...] his attitude to knowledge greatly influenced Wystan' (H Carpenter 1983: 8).

Even though biographies of the poet Auden are unequivocal about his far greater closeness to his mother, the course of his intellectual working career was most certainly fired in the crucible of his father's wide-ranging curiosity, and what was furthermore the doctor's epistemologically egalitarian bent:

[Dr Auden] knew a lot about the history of medicine from classical times onwards, and besides being fluent in Latin and Greek [...] he was sufficiently accomplished in modern languages to be able to translate works on archaeology and antiquities from German and Danish into English. Moreover he ignored the conventional distinctions between the humanities and the sciences.

(H Carpenter 1983: 8)²²

Indeed, dispensing with just such 'conventional distinctions' is perhaps what equates the philosophical, literary doctor with his medical, psychological poet of a son, and the latter's

²² Cf. G A Auden 1926 for an example of Dr Auden's attempts at interdisciplinary writing.

consequent identification of an inherent quest-like quality to life stems from this multifarious, interlacing approach to knowledge. In some sense, it is Dr Auden's library, his 'heterogeneous collection of books on many subjects' (H Carpenter 1983: 8) which comprised a rather unorthodox literary education for the young Wystan, and the disciplinary erudition of the elder Auden leads readily to that of the younger:

George Auden's work as a doctor had made him consider not just the practice and history of medicine but also its philosophy. He liked to quote an aphorism that a doctor should 'care more for the individual patient than for the special features of his disease,' and he would tell Wystan: 'Healing is not a science, but the intuitive art of wooing Nature.' Wystan was impressed, and for the rest of his life remained interested in the philosophy of medicine. Perhaps, too, his vision of himself as a surgeon or healer, which haunts much of his early poetry, reflects his father's influence.

Certainly it was during his childhood that he first became aware of psychology. His father was very interested in this new and controversial subject, and bought books by pioneer psychologists as soon as they were published.

(H Carpenter 1983: 9)

Several strands are of note here. First of all, there is something evocative of Don Quixote in the young Wystan's clear and self-confessed passion for his father's varied library. This later played out with the young Auden firmly ensconcing himself in an imaginary world based on geology and mining textbooks from said library. Biographies note that seeing the landscape around him as real, tangible and bound by certain laws did not, apparently, stop Wystan from perceiving it as somehow quasi-magical, empty of interfering people and subject to his own god-like power to interchange elements of what was there.²³ Secondly, as epidemiologist G Davey Smith writes:

The interest that G A Auden and his son shared most was psychology. G A Auden wrote extensively about psychological problems of childhood, adolescence, and young adulthood, including a still-cited report of a case of auto-erotic asphyxiation. [He also] became honorary psychologist to the children's hospital in Birmingham as well as medical advisor to the Birmingham Institution for the Mentally Handicapped, and wrote on topics such as (what would

²³ In this bookish, solipsistic narcissism shared by Auden and Don Quixote, one might interpret something of the paranoid, as described by Sigmund Freud. Indeed, literary scholar John Farrell explicitly ties Freudian thinking to the Don, and writes that 'the attempt to describe paranoid psychology began with [...] Quixote's quest for glory [...] being thwarted by a swarm of malicious enchanters who persecute him at every step' (Farrell 1996: 10). If there are no such 'malicious enchanters' in Auden's unpeopled imaginations, it is because he was younger and in an earlier stage of Freud's version of paranoia than the Don, whereby the young Wystan regressed to 'narcissistic omnipotence and self-containment' (Farrell 1996: 11) – which tallies well with the descriptions of Auden's biographers.

now be called) dyslexia, ‘the biological factors in mental deficiency’ and juvenile criminality. W. H. Auden was also fascinated with psychology, and particularly with psychosomatic disease.

(Davey Smith 2002: 1137–1138)

Psychology was evidently the locus where all of the father and son’s interests met and mixed. Wystan’s avowed diagnostic knack for spotting psychosomatic illnesses, including in his own family, attests to the fact that for him the psychological and the physical were intimately linked, dovetailing with the abovementioned childhood fantasy amalgam of hard-edged, engineering-based materialism, and a quixotic, idealized landscape. For Auden, what was in the head and what was in the world were no less real than each other.

This no doubt accounts for Auden’s belief that neurosis and responsibility – the individual adversity of the quest and the societal, artistic propagation of its codes and myths – go hand in hand. For him, psychology was not simply personal, but also political. As literary scholar Rod Mengham puts it:

Auden became used to thinking about psychological models in relation to the customs and rituals of an entire society, rather than exclusively with reference to the personal history of the individual. [...] He was notoriously fond of stressing the importance of neurosis in the formation of artistic personality, but perhaps the most significant emphasis he places in his statements on the uses of psychoanalysis is on the need to politicise it.

(Mengham 2004: 165–166)

However, it is important to stress that for Auden the political *began* with the personal, the societal with the individual, and this was why the psychoanalysis of Sigmund Freud held sway over Auden in some way – because it elevated a personal crisis to a form of life-affirming, self-fashioning event. The quest was not simply a tale of overcoming adversity, but the active search for neurosis in one’s past which would define the self. Thus, in 1952 Auden writes of Freud that he

perceived that psychological events are not natural events but historical and that, therefore, psychology as distinct from neurology, must be based on the pre-suppositions and methodology, not of the biologist but of the historian.²⁴ [Freud’s] therapeutic technique of making the patient

²⁴ However, an actual historian, Katja Guenther, writes that ‘Freud, at least initially, did not consider himself to be working on the mind as such; instead, he figured his psychological practice as a way of intervening on the nervous system. [His] psychoanalysis does not seem qualitatively different from the range of therapies [then] being developed in neurology’ (Guenther 2015: 188). What Auden reveals here is an ill disposition towards an institutional (read: impersonal) version of science that he does not identify with Freud, which by his own criteria would be incorrect, according to Guenther. Nevertheless, what Auden is driving at is individual personality versus undifferentiated biological status, and his view of science changed later anyway, as will be shown.

relive his past and discover the truth for himself with a minimum of prompting and interference from the analyst (meanwhile, one might add, doing penance by paying till it hurts), [implied] that every patient is a unique historical person and not a typical case.

(W H Auden 2008: 343)

Out of the morass of history emerges individual personality, ‘not a typical case’ but the aforementioned ‘exceptional reflective’ of Kafka’s modernity, as Auden saw it. In some way, then, ‘the reflective man, the wanderer’ (W H Auden 2002: 113), is found as much in the psychoanalysis of Freud as in the literature of Kafka, a pair of Wandering Jews with important insights for the notion of selfhood.

The ability to reflect on oneself is the key aspect of the above, and as such it is possible to compare it with what Ian Watt writes of another, different wanderer:

Quixote is obviously thoughtful and reflective, [and] is in fact very self-conscious on the question of madness. For instance, to show his desperation at how Dulcinea has spurned him, he goes mad as a penance. [...] This sophisticated awareness of the problem of madness is soon given a further complication when Quixote says that if Dulcinea is not overcome by the tribute of his madness, ‘I shall become mad in earnest. Being so, I shall suffer no more.’ Freud would no doubt have agreed with this view of the therapeutic function of neuroses and psychoses.

(Watt 1996: 70)

As has been shown, this latter would also have been Auden’s view, and as pure a delineation of his quest trope as possible – that to be ‘mad in earnest’ can ease one’s suffering, and should therefore be one’s goal. This is because recalibrating madness or neurosis as having a ‘therapeutic function’ makes this goal clear and attainable to anyone capable of being self-reflective. Thus Auden writes that ‘in his three big novels Kafka employs the oldest of literary devices, that of The Quest [...]. Perhaps the simplest way of defining the Kafka hero is to say he is the [...] negator of the negator. His goal is once more, as in the earlier Quests, clearly defined and universally recognized’ (W H Auden 2002: 110–111). Between the time of ‘the oldest of literary devices’ and Kafka in the twentieth century, Auden interprets his idea of the quest to have undergone many a change, including most importantly, the introduction of ironic doubt. The post-Reformation quest, according to Auden, has but a purposeless purpose, a grotesque inversion of its lofty aims, and a moral ambiguity whereby quest heroes and their nemeses become virtually indistinguishable. But with Kafka the negation of the goal is itself negated, only relocated now in the somehow non-solipsistic self; the hero becomes both quixotically selfless as per Cajal whilst also reflectively exceptional as Auden demands. Insofar as this goal should be ‘universally recognized’, one senses here in this return of a Freudian purpose based on ego that,

though not Jewish per se, Auden and Don Quixote (or Cervantes) are as much Wandering Jews as Kafka and Freud.

The point here is not the particular religious faith of an individual, but Auden's advocacy of the 'unique historical person and not a typical case'. Auden's individualistic quixotism fuses the rehabilitation of the quest hero, as per Kafka, with the salvation of the individual from the clutches of mere biology, as per Freud. In this light, it is worth refocusing on those aphoristic sayings which, according to biographer Humphrey Carpenter, are coined or quoted by Auden's father: 'care more for the individual patient than for the special features of his disease,' and 'Healing is not a science, but the intuitive art of wooing Nature.' The first is attributed by Auden himself, in his book *A Certain World*, to Sir William Osler, and he proceeds to explain what he has understood by it thus: 'a doctor, like anyone else who has to deal with human beings, each of them unique, cannot be a scientist; he is either, like the surgeon, a craftsman, or, like the physician and the psychologist, an artist' (W H Auden 1971: 256). The second aphorism, though in the same place passingly attributed to 'Papa', actually derives from the poet himself, in 'The Art of Healing', an elegy for his own fallen physician Dr David Protetch. This poem, first published in 1969 in *The New Yorker*, and *A Certain World*, first published in 1970, together represent something of a nostalgic view of his father's humanistic medical influence, the latter having died in 1957. Almost certainly by the time Auden junior wrote them, he was under the intellectual sway of another medical man, just as the poet was indeed transmitting his own waves of influence in return. This man was the then little-known but soon-to-be famous neurologist and author Oliver Sacks, who, being too shy to approach the heavyweight literary figure of Auden when both had been in Oxford at the same time in the late 1950s, had finally met the poet at a party in 1967 in their second mutual home city, New York.

Sacks is not the longest serving nor the most conspicuous of Auden's wide circle of famous friends, but it is evident that the two became decidedly close for a time. This started with Sacks's literary fascination with Auden's celebrity, and developed into a reciprocal appreciation predicated on the poet's equally deep interest in medical topics, going back, as shown, to George Auden's library and vocation. But whether or not one can say for sure that Auden's late recourse to the wisdom of his father indicates a sentimentality overlaid on the fresh, invigorating insights of new friend Sacks, there is no doubting what an impact Auden had upon the younger, protégé-like doctor. Sacks goes so far as to say the following: 'I feel, in many ways, that Wystan understood me better than I understood myself. [He] became a living mirror for me [...]' (Sacks 1975: 191). This incredible depth of feeling went beyond the limit of a personal interaction and on into the realms of professional life and writing style:

I owe to Auden the realization of certain possibilities whose very existence might otherwise have remained dormant or latent, and hidden from me. Certainly I owe to him much of the unfolding of

thoughts which constitute the originality (and eccentricity) of *Awakenings*. Indeed, I feel that had I not known him, [...] the book would never have been completed, or would have assumed a different (and much more ordinary) form.

(Sacks 1975: 191)

This is significant because Sacks's *Awakenings*, first published in June 1973, a few short months before Auden's death in September of the same year, was Sacks's first major success and the platform upon which the rest of his lengthy and distinguished authorial career was to rest.

Such was the success of *Awakenings* that it has since run to several reeditions, and in 1976, the first edition after the poet's death bore a dedication to him (a solitary dedication until editions after the death of Sacks's overarching intellectual hero A R Luria in 1977). Luria may have been Sacks's impetus to write from within the scientific world, but the specifically stylistic contribution of Auden (in contrast to any vague, theoretical and indirectly related conversation they might have had) is vividly recalled by Sacks in his recent autobiography: '[Auden] was also critically important to me during the writing of *Awakenings*, especially when he said to me, "You're going to have to go beyond the clinical.... Be metaphorical, be mystical, be whatever you need"' (Sacks 2015: 197). The entire basis of Sacks's distinctive authorial ethos and manner, which he would come to characterize as *Clinical Tales* and which would in turn reflect back on the burgeoning practice of this effervescent, mentally acrobatic and increasingly renowned physician, can be encapsulated in Auden's pithy advice.

Tracing influence in this way is not necessarily an indication of the degree to which one person's thought can exist as a seed, waiting to blossom, in the thought of another. But as shown above, Sacks is unequivocal in his estimation of Auden's impact, and further synergies between the two opened up into a dialogue of public support. For instance, the poem 'Talking to Myself', which Auden wrote for and dedicated to Sacks (W H Auden 2009: 309–311), is matched by the smattering of quotations from Auden's poetic works that Sacks uses to punctuate certain points throughout his own oeuvre. Similarly, a concise quotation from Auden adorns the cover of some editions of Sacks's *Awakenings*, reading simply 'A masterpiece', while the source of said quotation is an equally concise but adulatory piece of personal correspondence from Auden to Sacks, about which the latter comments: 'I wept when I received Auden's letter. Here was a great writer, not given to facile or flattering words, judging my book "a masterpiece"' (Sacks 2015: 200). For certain these instances mount up, and show the mutual appreciation of a pair of well-regarded writers, but going beyond this, Sacks affirms of their dialogues that,

for all the variety of topics we covered, it seems to me that our conversations would always return to medicine, whatever geodesics it looped through in strange other worlds. Auden [...] carried within himself, as part of his patrimony, a deep love and understanding of doctors and medicine

[and] in this, no doubt, he was the son of his father, as he was a sort of son/father to me and other physicians. It is no mere coincidence that in his last book of poems, Auden dedicates no less than four of them to physicians he has known, who have been significant to him, as he was to them.

(Sacks 1975: 191)

Though it is not too clear what Sacks means by both ‘son/father’ at the same time, it is striking how much of an important effect he considers Auden to have had upon medical professionals other than himself.

More importantly still, Sacks once again brings up the ever-lingering presence of George Auden, and appreciable in this there is a convolving thread running between father, son and Sacks’s own ‘son/father’ self. Sacks again notes elsewhere that Auden’s father was a doctor, but more specifically that he ‘was a physician in Birmingham who served as medical officer during the great epidemic of encephalitis lethargica’ (Sacks 2015: 197). The epidemic he is referring to ‘was a complex and mysterious disease that appeared around the same time as the great influenza pandemic of 1918’ and lasted more or less until 1925 (Reid et al. 2001: 663). Dr Auden’s many interests included this particular kind of encephalitis (a general term for an acute swelling of the brain), which is also sometimes known as von Economo’s disease after the neurologist who first described it. George Auden, in fact, wrote on how the disease might affect the behaviour and even the future lives of children who had been afflicted, including an insightful article published in *The Lancet* before the supposed peak of the epidemic’s reach in 1923 (Reid et al. 2001: 663; also, Cf. G A Auden 1922). Although Sacks’s memoir only passingly mentions his knowledge of Dr Auden’s investigations into encephalitis lethargica, it is significant for more than one reason: firstly, because of Sacks’s own personal investment into research on the disease beginning some 40 years later, which culminated in the ground-breaking and name-making *Awakenings*; but secondly, because of the similar close attention paid to an individual’s case history, evidenced in both Dr Auden’s writing on the topic and Sacks’s later attempts to do the same (and which largely came to characterize his overall style).

This is not to say that one led to the other directly; Sacks was already deeply involved with his *Awakenings* patients before he even met the younger Auden, and nothing suggests he was necessarily aware of the elder Auden’s writings until then. It is merely to trace a lineage of individualized medical outlook – that is to say, an attitude towards patients as individual people rather than mere sets of medical data – from George Auden, through W H Auden, and on to Sacks. This is evident from the manner in which case studies are handled by Dr Auden. Although it is not unusual for medical articles to include such case histories – quite the contrary – Dr Auden’s ordinarily formal, ostensibly objective tone in summarizing his examinations of post-encephalitic children is punctuated by somewhat more personal, picturesque comments which demonstrate the importance of the patient/doctor relationship. He writes of one girl that she was

‘restless and inattentive, mischievously prying into my cupboards and moving the things on my desk,’ whilst of another case, this time a boy, he says: ‘Manners good and correct. Thoughtfully returned his chair to its proper place on leaving my room’ (G A Auden 1922: 902). Given that the major thrust of Dr Auden’s article is not just medical prognosis, but the potential sociological, legal ramifications of behavioural changes resulting from the so-called ‘sleepy-sickness’ that is encephalitis lethargica, the authorial ‘I’ (via the possessive ‘my’) in these instances is telling. Whilst they might only be small gestures, unassumingly drawn from Dr Auden’s examination room, they vividly humanize children whom he foresees in the article as being let down by the ill-equipped medico-legal system that deals with their increasingly erratic behaviour. It is certainly in keeping with the thoughtful, personal approach to clinical practice that W H Auden attributes to his father, encapsulated in the repetition of Osler’s aphorism as mentioned above, ‘care more for the individual patient than for the special features of his disease’.

No small wonder then that Sacks prefaces his book *An Anthropologist on Mars: Seven Paradoxical Tales* (1995) with two revealing similarities. First, the book is dedicated directly ‘To the seven whose stories are related here’ (Sacks 1995: v) – by this stage in Sacks’s career, he was confident and committed enough to the individual cast adrift in a neurological sea to no longer require the blessing, implicit in a dedication, of a great writer such as W H Auden. Second, he also quotes from Osler the following epigraph: ‘Ask not what disease the person has, but rather what person the disease has’ (Sacks 1995: xi). There is evidently a parallel in the attitudes towards their vocations of Dr Auden and Dr Sacks, echoed in their respective choice of quotations from Osler. For each, Osler’s words seem to guide their practice and infiltrated the way they wrote about their observations and experiences. This latter is more pronounced in Sacks, who ruminated at length on the strategies, goals and implications of his own writing style (for example, Cf. Sacks 1986), but the more measured, less introspective manner of Dr Auden still bears an affinity down the years with Sacks. Where their theoretical clinical philosophies and practical research proclivities actually overlap is in encephalitis lethargica, the coincidence of which is not at all lost on Sacks when he writes:

Among the many eminent physicians who were deeply concerned with the changes in character which might be wrought by the sleepy-sickness was Dr G A Auden (father of W H). Such changes, Dr Auden stressed, could not always be regarded as purely deleterious or destructive in nature. Less zealous to ‘pathologize’ than many of his colleagues, Dr Auden noted that some of those affected, especially children, might be ‘awakened’ into a genuine (if morbid) brilliance, into unexpected and unprecedented heights and depths. This notion of a disease with a ‘Dionysiac’ potential was often discussed in the Auden household, and formed an enduring theme in W H Auden’s thought.

(Sacks 2011a: 17–18, note 22)

This ‘enduring theme’ is of course the formative nature of neurosis and disease – the basis for Auden’s poetic notion of a lifelong quest to distinguish oneself by overcoming (and even first seeking) adversity.

In Sacks’s formulation, fashioned after the ‘less pathologizing’ Dr Auden, this might be more of a positively weighted interpretation of symptoms and effects than an outright vaunting of disease as usefully developmental. Nevertheless, the idea of a ‘Dionysiac disease’ is not one that he rules out, nor even one he feels would be unappealing. The fact that Sacks could countenance such a notion was specifically something that W H Auden liked about and respected of him:

Auden [...] enjoyed his company largely because Sacks was a member of a small group he particularly admired – medical experts who could discuss the philosophy of their science.

[Likewise] Sacks greatly admired Auden, and – unlike many of Auden’s friends – felt he was still spontaneous, still capable of reacting to the world around him.

(H Carpenter 1983: 437)

It appears W H Auden and Sacks wholeheartedly took on board George Auden’s thinking; but additionally, just as Sacks could tease out the positive in an objectively intractable situation such as post-encephalitic parkinsonism (as in *Awakenings*), he was able to see something productive and inspirational in the elderly W H Auden, which others were unable (or unwilling) to see. One could thus say that the way Dr Auden linked the significance of individual medical cases to a larger sociological picture is reflected in his son’s linking of the crucial individual quest to a larger political picture, and this is yet again reflected in Sacks’s identification of a larger, more important goal – the humanistic reclamation of the individual medical self which governed the rest of his writing career – by attending to the specific cases of his *Awakenings* patients. Encephalitis lethargica can be considered Sacks’s formational neurosis, his very own ‘guardian angel of a broken leg’ – although he did not suffer the disease himself, his experience of it helped him to position himself in a quixotic narrative, seeing windmills where the supposedly banal and even brutal realism of the medical establishment did not permit things to be seen. In doing so, Sacks took up an intellectual challenge as a debilitating neurosis constitutive of his own character (or at least, his characterization of himself in the story of his life).

This is evidenced when Sacks explains the genesis of *Awakenings*, whereupon he makes no effort to mask the bitterness and tension caused by his perceived rejection by certain quarters of the medical press. In a short piece from late 1983 on this topic in the *British Medical Journal*, which (in a slightly ironic twist) he says he was asked to contribute by the (unnamed) editor, Sacks evocatively describes how his breakthrough book came about. Sacks had tested the waters by submitting several articles on experimentally treating his post-encephalitic patients with the

new drug L-dopa. These articles were presented ‘in an orthodox or conventional format – papers full of statistics and figures and tables and graphs’ (Sacks 1983: 1969). But despite this, according to Sacks they only

elicited vehemently censorious, even violent, rejections, as if there were something intolerable in what I had written. I was very taken aback at this and could not help contrasting what I was now encountering with the days when I had been a neurological resident and had found instant publication for the papers I wrote. Now, for some reason, strong objection was aroused. I was struck by the irony, the paradox, of all this: when I had nothing much to say I could be published without difficulty; now I had something to say I was denied publication.

‘What is happening?’ I kept asking myself. Have I wandered off, become an aberration? Or has neurology itself fallen on evil days?

(Sacks 1983: 1969)

Quite aside from the somewhat surprising reaction of Sacks’s medical colleagues, if his perhaps overblown depiction of an ‘evil’ and ‘violent’ neurological ambit is to be believed, is Sacks’s highly narrativized anxiety that his ‘aberrational’ ‘wandering off’ comes at the cost of silencing what he is so desperate ‘to say’. This is contrasted with the unpredictable horror of the neurological community’s alternating reprobations and murky but essentially mollifying silence – the former when something seemingly threatens the status quo, the latter ‘paradoxically’ coming when run of the mill and thus ‘un-say-worthy’ neurology contributes little of value.

Sacks’s rhetoric tacitly associates him with something as yet unknown but pertaining to some higher purpose – that of an epistemological upheaval, a reappraisal of clinical truth-value:

I felt, sadly, that I could no longer hope to publish or be published in medical journals, unless I betrayed my own clinical experience. Further, as clinical observation extended itself, and gave rise to considerations beyond the strictly clinical – human, scientific, existential, philosophical – it became clearer that I would have to break out of a purely medical format, and find another one that, while remaining faithful to the clinical, could go beyond it and point to something larger and deeper.

(Sacks 1983: 1969)

The implication is that going ‘beyond the strictly clinical’ and the ‘purely medical’ was something that was not allowed, and that some would find hard to swallow, but was crucial to the grandiose ‘larger and deeper’ goal. Where Sacks had been nervous before, he was by this point forthright, finding confidence instead of anxiety in his habitual acts of ‘aberration’, and seeing more clearly how best to ‘wander off’ stylistically:

I have always had to interfuse narration with meditation, embedding each, so to speak, in the other. Thus what was done in miniature [previously], this interfusion of case history and essay, was done at length and at leisure in *Awakenings*; and could never have been done within the format of any conventional article or book. Perhaps this is why, in 1973, *Awakenings*, while intriguing many non-medical readers, met the same cold reception from the profession as my articles had done earlier. There was not a single medical notice or review, only a disapproving or uncomprehending silence.

(Sacks 1983: 1969)

Where previous reprobations had failed to deter the knight errant Sacks from his sallies, a different kind of silence was now employed.

This apparently unsettled the relatively young author Sacks still was at the time, seeking as he was not just recognition from the public but also from his colleagues in medicine. Though he proceeded to write plenty, gain a huge following, and command widespread respect and admiration, still the distress of this early experience stayed with him until the final years of his life, when he attempted to theorize in his memoirs why he was met with such disdain by his colleagues – but why he went ahead anyway:

I had cast doubt on predictability itself. I had cast contingency as an essential, unavoidable phenomenon that emerged with the continuing administration of L-dopa.

I knew that I had been given the rarest of opportunities; I knew that I had something important to say, but I saw no way of saying it, of being faithful to my experiences, without forfeiting medical ‘publishability’ or acceptance among my colleagues. I felt this most keenly when a long paper I had written about the postencephalitics and their responses to L-dopa was rejected by *Brain*, the oldest and most respected journal of neurology.

(Sacks 2015: 178)

It is apparent from Sacks’s tone in the section from which this quotation is taken that he still ‘felt this most keenly’, despite his many years of commercial and critical success. It stands as testament to the importance of this narrative of rejection, engendered by his experience with encephalitis lethargica, to Sacks’s very self-identity, an important foundational neurosis he just could not let go – and this is the case whether the details of his story were over-dramatized or not. It is this ever-traumatic hardship story which led to his personal involvement and firm embeddedness in both his patients’ care and his own writing, and so this ‘rarest of opportunities’ was indeed to form the core aspect of Sacks’s neurological quest. To borrow Auden’s words about Kafka, Sacks places himself as the ‘negator’ to the medical establishment’s initial negation, cementing the doubled role of the obstacle/goal in his life story. Furthermore, if what Sacks writes about Auden’s crucial importance to the creation of *Awakenings* is to be believed, then

Sacks – whose memoir is entitled *On the Move: A Life*, thus clearly signalling his itinerant predilection – is another questing, Wandering Jew.

Sacks is under no illusion about his debt to fellow wanderer Freud. Writing of the resilience of the self in the face of neurological adversity, Sacks comments that

‘striving to preserve identity’, however strange the means or effects of such striving, was recognised in psychiatry long ago – and, like so much else, is especially associated with the work of Freud. Thus the delusions of paranoia were seen by him, not as primary, but as attempts (however misguided) at restitution, at reconstructing a world reduced to complete chaos.

(Sacks 2011b: 7)

But in the face of Sacks’s own adversity, the supposed malevolence of the medical establishment and his inability to gain any traction in those spheres via his popular writings, Sacks himself comes off as a touch deluded and paranoid. This by no means diminishes the interest of his work; on the contrary, it is merely a narrative strategy, learned from other quixotics like Freud, employed in the service of self-fashioning, of carving one’s own niche, of ‘striving to preserve neurological identity’ – which, as mentioned, applies not just to patients but also the doctors who participate in the institutional concretization of said identity. Just as literary historian John Farrell points out that Freud’s seminal characterization of paranoia, a foundation block of psychoanalysis, is actually best epitomized by Freud’s own quixotic paranoia (Cf. Farrell 1996), so too Sacks’s narrative of neurological identity implicates himself and becomes an instance, for better or worse, of self-fashioning. As Auden’s stance suggests, the irony is that a threat to identity, even if only a perceived threat, is useful, and can in fact come to be a major player in the make-up of that very identity. This gains in salience when reconsidering Sacks’s observation that Auden was his ‘living mirror’, while Auden’s poem for Sacks is titled ‘Talking to Myself’ (1971). Therein Auden ambiguously fuses the first and second person perspective, and claims that ‘You have preserved Your poise, strange rustic object | whom I [...] must bow to as Me’ (W H Auden 2009: 309). If as is likely the poem is not just dedicated but also addressed to Sacks, then the wilful absorption of each other’s characters is not a breakdown of self-identity, but a boon to it, something worthy of the deference implied by a ‘bow’.

In a coded but nevertheless biographical rumination on an intimate relationship, and aware of himself as a poet whose elderly body was slowly failing, Auden suggests what he has practically learned from Sacks. He writes of Sacks that he was ‘my tutor also, | but for whose neural instructions I could never | acknowledge what is or imagine what is not’ (W H Auden 2009: 309). Again, the ‘neural instructions’ could equally stand for Auden’s own brain encased in the body he calls his ‘mortal manor [and] carnal territory’ (Ibid.), as it could for his knowledgeable and philosophical neurologist friend Sacks. But in either case, Auden displays an

epistemological doubt regarding the world and himself, about what he can or cannot ‘acknowledge’ or ‘imagine’, and this doubt finds a useful contrast in another poem which he published more than 30 years previously: ‘The Quest’ (1940). In ‘Talking to Myself’, Auden’s grasp of what is or what could be relies upon his ‘tutor’ Sacks, who is of course someone else, but also impossibly, somehow identical to him as well. By comparison, in the section of ‘The Quest’ subtitled ‘The Way’, Auden writes: ‘how reliable can any truth be that is got | By observing oneself and just inserting a Not?’ (W H Auden 2009: 116). From the earlier to the later poem, the reliability of truth remains the ultimate goal. Yet something changed during that time, finally permitting Auden that insertion of ‘a Not’ into his own self-description, and by extension, into his understanding of the world.

So what was it that changed? One is tempted to give the credit to Sacks alone – who had inserted a ‘Not’ into his self-narrative in order to challenge traditional neurology’s ‘Not’ to him in the first place – but given the relatively short time they knew each other, and Auden’s huge capacity for making friends (amongst whom Auden’s biographers, despite the evidence of all of the above, deem Sacks as fairly peripheral), further explanation is needed. Closer to the truth is that in Auden’s lifelong quest, one’s trajectory through the world ran parallel to, and ultimately became absorbed by, the self. Another two short passages, one from each of the two poems just mentioned, suffice to show that Sacks heralded for Auden the arrival of an unpredictability that he had predicted all along – especially coming as Sacks did from what Auden saw as the normally entrenched realm of science and medicine. Many have seen the whole sonnet sequence ‘The Quest’ to represent a spiritual or existential journey (Cf. H Carpenter 1983: 296; Davenport-Hines 2004: 20), and while the poem suggests that certain kinds of people are not up to, or worthy of such a quest, this is because they follow the countless, incorrect examples of others instead of each examining his or her own identity. In the sonnet ‘The Way’ from ‘The Quest’, the title designates both a path for a person’s journey, but also the rigidity of method. In essence, following rules will only make one a follower, and forever indebted to an unceasingly rewritten rule-book. Despite the poem’s ostensive Christian overtones, if this applies to religion, it does so just as much to science and education, as evinced at its beginning:

Fresh addenda are published every day
To the encyclopedia of the Way.

Linguistic notes and scientific explanations,
And texts for schools with modernised spelling and illustrations.

Now everyone knows the hero must choose the old horse,
Abstain from liquor and sexual intercourse

And look out for a stranded fish to be kind to:
Now everyone thinks he could find, had he a mind to,

The way [...].

Forgetting his information comes mostly from married men
Who liked fishing and a flutter on the horses now and then.

(W H Auden 2009: 115–116)

The options available are redolent of chivalric knighthood, but as they are something the hero ‘*must* choose’, they become obligatory instead. The reflected images of horse, fish and implied marital union, idealized and heroic on the one hand but domesticated, mundane and inconsequential on the other, indicate the hypocrisy and futility of setting out on someone else’s quest – there is no single ‘Way’ but a veritable multiplicity of ‘ways’. Answers from outside of oneself, whether prescriptive (the only ‘Way’) or proscriptive (inserting a ‘Not’ to merely mimic the ‘Way’, but in reverse), are flawed, clichéd, and neither the deterministic obviousness of ‘linguistic notes’ nor ‘scientific explanations’ will do.

However, by the time of ‘Talking to Myself’, Auden has somewhat changed tack. He writes:

Unpredictably, decades ago, You arrived
among that unending cascade of creatures spewed
from Nature’s maw. A random event, says Science.
Random my bottom! A true miracle, say I,
for who is not certain that he was meant to be?

(W H Auden 2009: 310)

Whether consciously or not, the vaunting of unpredictability that was levelled at Sacks as a slur by the medical community around the time of this poem’s publication is here reclaimed by Auden as a virtue. This is Sacks’s entire *raison d’être*, born ‘decades ago’ to usher in this unpredictability. In this way, Auden also rehabilitates the ‘random’ as at bottom predictable and perfectly, appropriately, ‘miraculously’ adapted to whatever one ‘was meant to be’. More than anything, this convoluted combination of unique quest-like predetermination amidst the chaos and contingency of ‘Nature’s cascade’ shows that Sacks in some way rehabilitated establishment ‘Science’ for Auden, making it simultaneously a practice of unpredictable rule-bending and a miracle of law-abiding certainty.

The manner in which one fits into this unlikely sounding schema is precisely what so preoccupied both Auden and Sacks, providing them each with both the start point and the end goal of their respective quests. For Sacks the ‘matter of identity’, as chapters titled as such in memoir as well as collection of *Clinical Tales* attest (Cf. Sacks 2011b: 114–122; 2015: 241–270), was something that drove him throughout his career. As Sacks writes, ‘the patient’s essential being is very relevant in the higher reaches of neurology,’ but one senses that the ‘essential being’ of the doctor must also be relevant in this context. This is why when Sacks insists that ‘*the study* of disease and identity cannot be disjoined’ (Sacks 2011b: x; my emphasis), it is him, or the specific neurological doctor/researcher in question, that is implied to be doing the studying, and of course this studious person also has an identity defined, to some extent, by doing so. When he goes on to propose ‘a new discipline, which we may call the “neurology of identity”’ (Ibid.), there is an echo of himself in the neo-disciplinary ‘we’ he shares with his patients (and presumably readers). Meanwhile for Auden, collapsing subjectivity into the objective world, which may be considered as reconciling the self with society (or a first person poetics with a third person science), was the simultaneous basis for a singular, personal quest alongside the idea of a generically reiterated Quest writ large: ‘The theme of the Quest occurs in fairy tales, legends [...], boys’ adventure stories and detective novels. These poems [comprising ‘The Quest’] are reflections upon certain features common to them all. The ‘He’ and the ‘They’ referred to should be regarded as both objective and subjective’ (Cited in Fuller 1970: 143). As John Fuller points out, the variation between singular and plural registers, the ‘He’ and the ‘They’ which marks ‘The Quest’, is something that ‘represent[s] the world of the self and the not-self’ respectively (Fuller 1970: 144).

In conclusion, if science is a quest and the brain is its ultimate goal, then more than one type of knight has set out in pursuit of such lofty ideals. Nevertheless, this chapter has shown how, at bottom, each type is quixotic. In the case of Rodrigo Quiroga, quixotism can be a rational choice, a seemingly strange but finally, joyously enlightening attempt to avoid inaccurate accusations of neurosis. For Santiago Ramón y Cajal, individual neurosis is neither here nor there, as quixotism is a political necessity, a matter of urgency for the collective good. When it comes to W H Auden, he deemed the wilful, quixotic search for neurosis at once a personal and a political affair, influencing Oliver Sacks by making him realize that his position in neurological circles could be narratively framed as just such a quest. But as Auden also points out, the quest theme also infiltrates other kinds of stories, whether these are ostensibly ‘objective’ like brain science or ‘subjective’ like detective fiction. In this vein, neurophenomenologist Dan Lloyd remarks, ‘Brains and stories do seem to have a powerful metaphorical connection. Both unfold worlds’ (Lloyd 2004: 332). If this is true, then when the story *is* the brain, interpretation of that story convolves, waiting to be unpicked by itself. This kind of logic impels Lloyd to further

comment in and of his simultaneous neuro-philosophical treatise and detective novel *Radiant Cool* (2004): ““The brain is a story.” One theme of this book has been that every moment of every brain is a story unto itself. Reading this non-textual story requires special methods’ (Lloyd 2004: 331–332). Whether there truly is a pattern or a story in the brain that lies dormant beyond its surface until it is found, either by a questing knight, or a detective on the case, or a neuroscientist, will be investigated in the next chapter – as will what ‘special methods’ it is that are required if the story is indeed ‘non-textual’.

Convolution 2: Detective

I wanted to talk to you about a friend of mine. He's in bad
shape. He's a writer. Plenty of dough, but bad nerves.
Needs help.

(Chandler 2000: 467)

The detective's work becomes transformed from detection
to psychology: the purely psychological task of making
people talk more than they intend to talk – and, of course,
to find the right people to do the talking.

(McCabe 1986: 161)

Neuroscience is detective work. Neuroscientists are literary detectives. Or at least they partially base themselves on these detectives, whether consciously or not. Neuroscientists search for clues, follow the evidence and uncover things about ‘human nature’ that are most often hidden from view. Appended to this is a moral imperative, one that understands both neuroscience and detective work as a desire to find truth and justice, things supposedly in the interest of all of society, but that can just as easily find both neuroscientists and detectives working outside the boundaries of normal human understanding (or law) as within them. Additionally, neuroscientific detective work does as much of the ‘artful concealing’ that it purports to be undoing or revealing. Thus, this chapter will show that neuroscience convolves in a necessarily literary way, and ought to examine what the ramifications of this are. The chapter departs from the work of philosopher Dan Lloyd, and his amalgam of detective fiction and neuroscience, to show their basic common elements as well as their hidden problematics. It then moves to a discussion of the neuro-themed mystery television series *Perception*, in order to demonstrate that neuroscience surreptitiously learns a useful discursive trick from detective fiction: namely, the claim to have better access to truth than previous discourses and practices (including detective fiction itself). However, by furtively taking on detective fiction’s comforting resolution of a problem that it had set up in the first place, neuroscience does not question the ethical and epistemological implications of its borrowings. The final section of the chapter surveys how this plays out in the works of Oliver Sacks, before returning to Lloyd via a consideration of detective fiction’s more recent attempts to police its own assumptions – something which neuroscience could also well stand to borrow from the literary genre.

Dan Lloyd: The Brain is a Detective Story

It is no coincidence that Dan Lloyd's 2004 book *Radiant Cool* is subtitled *A Novel Theory of Consciousness*. Lloyd's modus operandi in the book means the choice of the word 'novel' is apt in a number of ways. Firstly, as a philosopher relating phenomenology to cutting-edge cognitive neuroscience, the overarching 'theory' that gives the book its title and themes is by its nature an attempt at something novel, or new. Secondly, rather than simply outline his case in the standard academic way, Lloyd stages a convoluted hoax in which his theory is first elucidated by an alternative author, Miranda Sharpe, an invention allowing Lloyd to explore ideas in a fictional setting. This conceit is never revealed, and Sharpe's first person memoir of a university-set mystery is only implicitly shown to be fiction in Lloyd's second half of the book, the detailed scientific and philosophical commentary on Sharpe's pseudo-literary first half. Finally, this first half is Lloyd's novel pursuit of novelistic writing, a mock-up of a detective story which self-consciously battles to detect consciousness (of) itself. In summary, it is novel: as in a new theory; as in a novelty for scientific writing; and this is because it is in itself a novel, as in the literary form. It is as if Lloyd needs the fictional first half and its authorial alter-ego in order to more properly explore the 'non-fictional' findings of the second half, which would ordinarily fall under the remit of Lloyd's day job.

In this quotidian role of theoretician, investigator and teacher of consciousness, Lloyd is undoubtedly oriented towards the literary, as evidenced both by his institutional and personal web pages. The former lists 'Philosophy in Literature', sandwiched between 'Minds and Brains, from philosophy to cognitive neuroscience' and 'Continental phenomenological philosophy', under the areas of speciality in the 'Teaching' tab. Meanwhile, the 'Research' tab reveals two interests, simply 'Consciousness' and 'Alternative vehicles for presenting complex ideas, including fiction (Jorge Luis Borges, for example) and advanced data visualization' (Lloyd 2016a). Lloyd's personal web page elaborates further: 'Understanding consciousness is my core research interest. This implicates phenomenology – the philosophical effort to characterize the essential structures of experience – and cognitive neuroscience – the empirical quest to understand the function of the brain and nervous system' (Lloyd 2016b). The word 'quest', used here to characterize cognitive neuroscience, inextricably links scientific endeavour with the literary, chivalric, perhaps quixotic motifs explored in the previous chapter. But in a more detailed breakdown of his research interests, Lloyd ties his main concerns more explicitly to literature: 'Consciousness and narrative: Stories are distinctly temporal structures, and their universality among human cultures suggests a close link to basic brain function' (2016b). Having established that Lloyd's interest in literary fiction stretches beyond curiosity or object of research and on into the pages of *Radiant*

Cool, what drives him to present his thought specifically via the mystery story medium? The ‘empirical quest’ which underpins Lloyd’s work would perhaps more naturally suggest fantastical writing, building on that tradition of chivalric epics dating back to at least the Middle Ages. Nevertheless, Lloyd chooses a far more modern form, the detective fiction genre, and thus implicit in his interrogations of cognitive/neuro science and phenomenology lie further questions on the history of narrative forms, their relationship to brain/mind sciences, and the very idea of the ‘detective’.

In the following passage from *Radiant Cool*, Lloyd quotes from and expands on *Computational Explorations in Cognitive Neuroscience* (2000) by Randall O’Reilly and Yuko Munakata:

‘The central idea we use to explain what the neuron is doing is that of a *detector*. As a simplification, we can think of a neuron as detecting the existence of some set of conditions, and responding with a signal that communicates the extent to which those conditions have been met.’ Their central idea is indeed the central idea of half a century of cognitive science, and it is preeminent among the conceptual tools in the cognitive science toolbox. Furthermore, the detector idea is not just the idea of the neuron, but has been scaled up to define the business of every kind of component in the mind and brain (and even scaled down, in computational models of parts of neurons).

(Lloyd 2004: 229–230; original emphasis)

Lloyd eventually rejects this notion of a ‘detector’, but not before commenting on the resilience of the basic premise in the face of the addition of several layers of complexity (in Lloyd’s example, by the development of neural nets). These layers bury the neuron further and further away from the surface (read: sensory) detector with which it shares some mutually causal link, or feedback loop. Despite this, he later dismissively summarizes the detector model as follows: ‘In short, cognitive science sees us all as *detectorheads*’ (Lloyd 2004: 231; original emphasis). Two things are of note here: firstly, in O’Reilly and Munakata’s formulation, there is a ‘central idea’ to be got at. This seems instantly self-defeating if a neuron, or collection thereof, or particle thereof, is to be considered a detector; indeed, there will always be something for which this detector will be detecting, placing the detector not at the centre of anything but at the surface – no matter the layers of complexity in between. Secondly, the term ‘detector’ itself seems remarkably similar to the term ‘detective’ – especially given that the bulk of Lloyd’s book is presented as a neuroscientific, phenomenologically-informed detective story, a piece of updated (and to some perhaps over-written) genre fiction.

The *OED*’s earliest definition of ‘detective’ as an adjective dates back to 1843, and in 1850 appears the now common self-standing noun, defined as follows: ‘One whose occupation it

is to discover matters artfully concealed.’ But the word ‘detector’ is much older, an obsolete meaning dating back to 1541, and this word which is now more associated with technological equipment, from its appearance in act 3, scene 5, line 13 in the first publication of Shakespeare’s *King Lear* in 1608, overlapped in meaning with the word ‘detective’. This is shown by the *OED*’s second definition of ‘detector’: ‘One who finds out that which is artfully concealed, or which tends to elude observation.’ A different kind of ‘definition’ of ‘detective’ suggests that it is in fact the characteristics of fictional detectives that are themselves ‘artfully concealed’, as crime writer Val McDermid proposes of Raymond Chandler’s most famous literary creation, detective Philip Marlowe. McDermid writes that in the reality of non-fiction

such a man would not just be a private detective but could become the archetype of what a gumshoe could be. This rumpled, battered, slightly tarnished knight with his surface defence of cynicism against his desire to fight for the underdog is the irresistible template for hundreds of subsequent novels, films and TV series.

(Chandler 2005: v)

For McDermid as for many other writers, Marlowe is more than a detective, but an ‘archetype’ and an ‘irresistible template’, the definitive detective – the definition thereof. Cynicism may not be the ‘surface defence’ of every single fictional detective, but this anecdotally rings true for many characters in the hard-boiled detective sub-genre, and the main point is the concealment of motivation, a reluctance to part with the details driving the detective to his or her work. The true nature of the detective, what defines them as such both to themselves and to their readers, is an ‘artful concealing’ of these same characteristics, either by the character or author (or both).

With regards to why this concealment is necessary, it is of note that McDermid terms Marlowe a ‘knight’, however much she pre-emptively qualifies this. Playing one’s hand too early in the questing hero stakes is dangerous, redolent of overly zealous chivalric forebears and possibly even downright mad. As McDermid writes of Chandler’s novel *The Little Sister* (1949), in which Marlowe is the protagonist, ‘we see right from the start his quixotic nature. Faced with the naïve eponymous little sister, to his lasting regret he takes the case of tracking down her missing brother’ (Chandler 2005: v). Marlowe’s uncharacteristic lack of concealment in the presence of the not-so-naïve titular femme fatale only leads to ‘lasting regret’. Furthermore, Marlowe is again portrayed in chivalric, more specifically ‘quixotic’ terms. Here McDermid is of course alluding to another archetype, Don Quixote, the self-styled knight who, for Chandler and McDermid and no doubt countless others, is himself an irresistible template of an unhesitating, valiant hero – but also of a deluded, tragically doomed fool. Also of note is what the dangerously devious, disingenuous and ‘eponymous little sister’ in Chandler’s novel shares with her ‘missing brother’ (who turns out to have been murdered for blackmail), and another, elder sister of theirs

(who becomes central to the plot but is also cast in many ways as morally dubious) – this whole catastrophically flawed family has the surname Quest.

So if Lloyd opts to explore the scientific and philosophical study of consciousness via literary means, the detective fiction genre makes sense as it not only has as much linguistic provenance as the chivalric quest, but even contains a quixotic element – of the simultaneously definitive yet marginal, of the hero who both epitomizes valour and agency whilst reaffirming the foolhardiness, irrationality and ultimate fatalism of the heroic endeavour. Lloyd is wise enough not to play this hand too soon, however, and begins his book with his own act of artful concealment, claiming the story is not in fact his – which certainly follows the Cervantine tradition of playful insistence that *Don Quixote* was not his responsibility, but that he had merely transcribed into Spanish a second-hand oral translation from Arabic. Lloyd even conceals his own concealment by designating himself a friend and colleague of would-be detective Sharpe, not an author but merely a minor co-participant in events, offering his exposé of a truth obscured by the press sensationalism ostensibly following Sharpe's narrative. In *Radiant Cool's* 'Prologue', Lloyd writes that Sharpe's

real story [...] was slighted. This book tells its untold core. As a player in the pyrotechnic denouement of Sharpe's adventure, I was aware of the intellectual dimension of her sleuthing, and I felt that the world could use a full report of her discoveries. [...] This story, in her own words, became the first part of this book [...], the real-life whodunit [...] interwoven with a re-alignment in the twenty-first-century view of the mind. This re-alignment occurred in Sharpe's thinking through the very encounters that embroiled her in a murderous drama. This, then, is the story that all the other stories have missed.

(Lloyd 2004: xvi; original emphasis)

Veiled in the final line here of Lloyd's supposed unveiling is a nod to other theories of consciousness, theories ignorant of the '*real*' and further 'real-life' 'story that all the other stories have missed'.

Lloyd attempts to back up these persistent claims to veracity by hinting at his own extra-authorial involvement 'in the pyrotechnic denouement of Sharpe's adventure,' which though it was a 'murderous drama' was also a 're-alignment in the twenty-first-century view of the mind'. The spurious claims to truth of Sharpe's story come attached to a true phenomenological discovery, and Lloyd casts himself as a bit-part player, merely inspired by the unexpected reshuffle in thought caused by dramatic events. This ingenious mechanism of nesting narratives and scientific theories allows Lloyd, unironically but explicitly, to make literary 'the process of *discovering* a new theory – of anything, but especially of consciousness [...]. Like a detective solving a crime, discovery begins in the groping murk of half-thought doubts, and gestates in

chance conversations, nagging metaphors, and backhand revelations’ (Lloyd 2004: xvi; original emphasis). Strongly reminiscent of neuroscientist Rodrigo Quian Quiroga’s debunking of a ‘Eureka!’ moment in favour of a set of mundane but ‘nagging questions’ (Quian Quiroga 2012: 2), Lloyd’s stated awareness of the value of ‘metaphors’, nagging or otherwise, leads him to build his character Sharpe entirely around one: the metaphorical device of himself as a detective of consciousness. His allusion to ‘backhand revelations’ is itself only a coded, backhanded way of saying that this character, or the whole fictional half of his book, is a cypher designed to artfully conceal the metaphor.

The phrase ‘artfully concealed’, from the *OED*’s definitions of ‘detective’ and ‘detector’, has been repeatedly cited or reformulated here for a reason. This is because it suggests hiding things with great skill, in less heavy-handed fashion than crudely covering something over – indeed, something like sleight of hand. A detective, then, can be seen as the enemy of skilful, purposeful narrative misdirection (such as Lloyd’s), or any other kind of sophistry, such as magic, which purports to create highly believable illusions. Where Lloyd uses literary techniques to achieve his sleight of hand, other neuroscience researchers have turned to professional illusionists to study the wilful subversion of perception, and how this in turn can help investigate perception’s proper operation. *Scientific American* editor-in-chief Mariette DiChristina blogs the following:

Why are scientists working with sleight-of-hand artists? Their tricks, honed through the decades, have revealed that people respond to certain situations in specific ways. Like detectives looking for new leads to solve a mystery, scientists can mine magicians’ knowledge for ideas to test in the lab. And for the magicians, understanding principles about the brain – that is, why a trick works the way it does – can suggest new ways to advance their art as they develop new tricks or improve existing ones.

(DiChristina 2012)

To DiChristina’s mind, ‘tricks’ designed to conceal or misdirect have instead ‘revealed’ something about human behaviour, and in this way, neuroscientists and magicians alike participate in a fruitful collaboration which increases both groups’ capacities for concealment and revelation.

Implicit, however, in her association of neuroscientists with ‘detectives’ is that, if not illegal, then something at least underhand is afoot, so much so that even collusion with proponents of the underhand activity is deemed acceptable when necessary. DiChristina’s blog, and a variety of links contained therein, focus on the work of neuroscientific husband and wife Stephen Macknik and Susana Martinez-Conde, whose recent co-authored book *Sleights of Mind* (2011) centres on their collaborations with magicians such as Apollo Robbins, the so-called

‘Gentleman Thief’ of magic (Macknik and Martinez-Conde 2011: 5–6 and passim). It seems neuroscientific detective work means actively encouraging the enemy. Describing a demonstration by Robbins at the ‘Neuromagic 2012’ conference organized by Martinez-Conde and Macknik, DiChristina writes that

narrative, which engages processing power in the brain by creating an interesting plot that the listener then follows, was effectively employed by attendee magicians [and] demonstrated how they make heavy use of a storyline to misdirect, with delightful effect.

As he makes jokes with audience members, Robbins’ questions are also intended to create internal dialogue that eats up some of the brain’s bandwidth. He said he tries to engage what he calls the brain’s ‘two security guards.’ The idea is to get the two talking to each other about what to watch out for, making thievery easier to conduct while the metaphorical guards are distracted.

(DiChristina 2012)

What ‘Gentleman Thief’ Robbins does is teach the neuroscientific detectives how narrative can be used to enhance their knowledge of his profession, and vice versa; story-telling becomes a tool both for and against cognitive sleuthing.

Talking about or researching cognitive faculties requires those very same cognitive faculties, and this type of circular problem can cast doubt upon the truth of findings. This circularity can be regarded as a safety feature of sorts, the ‘security guards’ Robbins mentions, which will not allow an object of investigation to be its own subject, or investigator.²⁵ In some sense, any description of an object requires a subject to make it, and when this is the object itself, a further subject is sought. This might be why neuroscientists, magicians and literary writers all turn to narrative, and especially metaphor. Thus it is understandable that Martinez-Conde and Macknik seize upon Robbins’s descriptions of the brain’s ‘metaphorical guards’, not only to make their work more widely intelligible but to elucidate it to themselves. Robbins’s self-identification as a petty-thieving but essentially trustworthy vagabond who nonchalantly straddles the legal/illegal border is also a fictionalization, reaffirmed by the neuroscientists who write about him in order to promote themselves as the establishment characters that counterpoise Robbins’s playful shadiness. In *Radiant Cool* Lloyd goes a step further – the fictional premise serves not only to elucidate his ideas to himself and others, but additionally casts him as part of

²⁵ However, this reflexive difficulty has been wholeheartedly faced square on by neurophenomenology. For instance, Antoine Lutz and Evan Thompson write: ‘The adoption of a properly phenomenological attitude is an important methodological prerequisite for exploring original constitutive structures and categories of experience, such as egocentric space, temporality and the subject-object duality’ (Lutz and Thompson 2003: 38). For a vibrant espousal of reflexivity in general, Cf. Ashmore 1989.

the just, crime-solving team that picks apart the unjust, mysterious quandary that he himself has so artfully concealed.

Thus Lloyd's gambit of neuroscientific detective work: his high-wire line-walking significantly blurs the boundaries between what is legitimate (or legal) and what is not, but it also involves a significant risk – falling down on either side, rather than carefully choosing a position from the relative safety of a seat on the fence, would be a long fall indeed. A tightrope act can be seen as a reverse magic trick, concealing a supposedly straightforward straight-line walk behind a death-defying stunt and immense feat of balance. Detective work, or detective writing, as Lloyd shows, involves very much the same type of balancing, a high-stakes gamble that Chandler's protagonist Marlowe finds himself similarly pondering in *The Little Sister*:

All I know is that something isn't what it seems and the old tired but always reliable hunch tells me that if the hand is played the way it is dealt the wrong person is going to lose the pot. Is that my business? Well, what is my business? Do I know? Did I ever know? Let's not go into that. You're not human to-night, Marlowe. Maybe I never was nor ever will be. Maybe I'm an ectoplasm with a private license. Maybe we all get like this in the cold half-lit world where always the wrong thing happens and never the right.

(Chandler 2005: 94)

The evocative self-doubt Marlowe betrays in this passage brings together several strands that have been hinted at so far in this chapter. Marlowe is a private investigator and as such his 'business' is to fulfil whatever assignment with which his clients provide him. However, by questioning the precise nature of his business, Marlowe shines a moral light upon it – working in his field has not corrected the injustice that his 'always reliable hunch' senses, but instead has made him 'not human', ensuring rather than preventing that 'always the wrong thing happens and never the right'. Despite the world being only 'half-lit' for Marlowe, he is not fooled by card tricks. Knowing instinctively that 'something isn't what it seems' about the way 'the hand is played', Marlowe suggests it is not a fair gamble if the deck is manipulated by someone with a talent for illusions. Although neither Marlowe nor Chandler are neuroscientists, the professed uncanny ability to read human behaviour and character accurately, even when great skill and effort are being employed to conceal these, is useful as a parallel between literary and scientific enquiry into the mind/brain. The difference is, where Lloyd revels in setting up the puzzle he then explains, Chandler problematizes the ethical dimensions of playing such tricks, regardless of which end of them one is on and on which side of the high-wire this causes one to fall.

Perception: The Detective is a Brain Story

The upshot is that Dan Lloyd celebrates the blurring of boundaries, be they literary or scientific, legal or neurological, formal or content-based, true crime or metaphorical theories of consciousness, real events or illusory conceits, whereas Raymond Chandler can be seen to be condemning just such blurring.²⁶ Therefore, three interlocking ideas can now be proposed for exploration: first, that neuroscience has a basis in detective fiction; second, that this consists of a common ritualistic association, as will be shown; and third, that neuroscience now purports to improve on and replace society's epistemologically and morally outmoded or failed rituals – including that of detective fiction. However, neuroscientific reason's identification of societal faults is itself based on techniques borrowed from the literature upon which it claims to improve. Thus neuroscience convolves in a literary manner, specifically that of the detective genre, because it creates and sets itself the task that it innocently claims to have discovered, and that needs to be solved.

Preliminary evidence of detective fiction's influence on science is provided by eminent neuroscientist V S Ramachandran's book *The Tell-Tale Brain* (2012), whose title puns on detective fiction pioneer Edgar Allan Poe's short story 'The Tell-Tale Heart'. Ramachandran clearly suggests where his scientific, methodological predisposition originates: "“You know my methods, Watson,” says Sherlock Holmes before explaining how he has found the vital clue. And so before we journey any further into the mysteries of the human brain, I feel that I should outline the methods behind my approach' (Ramachandran 2012: xv). If these predetermined methods are good enough for literature's most celebrated, most perceptive detective, they also must surely suit the brain's 'mysteries'. Also writing of Holmes, James and John Kissane claim that in probably his most famous adventure,

the detective-hero has a genuine adversary, but it is another intellect as human, and almost as scientific, as his own. The effect which *The Hound of the Baskervilles* so solidly achieves – an effect perhaps fundamental to the detective story genre – is therefore a ritualistic one. It possesses the characteristic quality of the predictable result whose achieving brings a special satisfaction.

(Kissane and Kissane 1963: 360)

²⁶ Sociologist Thomas F Gieryn argues that in science, “boundary-work” is a sociological parallel to the familiar literary device of the “foil.” Just as readers come to know Holmes better through contrasts to his foil Watson, so does the public better learn about “science” through contrasts to “non-science” (Gieryn 1983: 792). However, I would contend that actually, Lloyd takes on the roles of Holmes and Watson at the same time – as well as that of Conan Doyle.

Kissane and Kissane directly equate Holmes and the entire detective genre with both ritual and science, normalizing the spuriously supernatural canine of that particular novel's title to the domain of the familiarly, knowably 'human'. The 'predictable result' mentioned is redolent of scientific experiment and its tenets of logical hypothesis and demonstrability, but it goes further here. It produces a 'special satisfaction' – fact-hunting is actually pleasurable, and furthermore, 'fundamental', an exercise in obviousness, reason and repetition which is invaluablely necessary to human life. However, Kissane and Kissane also point out that 'if the effect of ritual is reassuring, there must of course be some need for reassurance. [...] Certain details of the novel give a suggestion that civilization itself has at best a precarious hold upon its hard-won position' (1963: 360–1). Holmes may be reasonable, but the rest of the world is decidedly less so. Although Kissane and Kissane make the case that medical man Sir Arthur Conan Doyle used this tension 'to dramatize a struggle of scientific reason against superstition and irrationality' (Kissane and Kissane 1963: 355), there is a sense this dramatization sates the need for reassurance rather than doing away with it. In Doyle's oeuvre, reason becomes the ritual, not its opposite, and the scientific mind uses detective fiction's neatly self-enclosed format to show rationality's superiority had always already been the case.

Indeed, it is all a question of 'case', or 'thinking in cases' as historian of science John Forrester has put it.²⁷ The *OED*, in the sixth sense listed for the noun 'case', defines it as 'the actual state of affairs; the way things stand', before the seventh sense ties it to all things legal and mentions 'an incident or set of circumstances under investigation by the police or a detective'. Whilst detective work, whether fictional or in 'real life', presents itself as a mystery, the unquestioned assumption is that there is a clear, undisputable truth behind this which structures the 'case' itself and allows it to even exist at all. It is interesting, then, that the *OED*'s eighth sense for the noun 'case' relates it to the realm of medicine, as in 'the condition or state of a person receiving or requiring medical treatment; clinical condition. Also: the account of the symptoms and other details of an illness given by a person.' In this latter, the conflation of the 'account' of symptoms and details with the actual 'condition/state/illness' itself once again illustrates how a 'case' both hides and reveals. There is a ready parallel between the 'incident or set of circumstances' in the legal sense and the 'symptoms and other details' in the medical; both require investigation, both have a truth at their core which is equivalent to the story of this investigation, both have a 'case' history and yet still have a 'case' to answer.

²⁷ 'Thinking in cases' has the added bonus of incorporating the reflexivity of considering one's own 'case' into the bargain; Forrester writes that his position on the matter 'necessarily involves some intellectual autobiography', which he later relates to Freud's consideration of himself as the obvious first choice for the delineation of the psychoanalytic case study (Forrester 1996: 1; 10).

Also, Cf. Berlant 2007, which introduces a special issue of the journal *Critical Inquiry* entitled 'On the Case', and precedes a number of what are referred to as 'metacases' (Berlant 2007: 665) (and in which issue Forrester is once again included).

The narrativized nexus of the medical and legal ‘case’ has also been recently remarked by neuroscientists Peter Kempster and Andrew Lees, who write: ‘Neurologists publish case histories that generally take the form of solved mysteries. Like conventional detective stories, they are reassuring, affirming the belief that even obscure neurological maladies can be diagnosed’ (Kempster and Lees 2013: 372). Again, the ‘reassuring’ aspect of ritual is highlighted, with ‘conventional’ procedure leading to pre-established outcome. ‘Mysteries’ paradoxically ‘solved’ in advance, the potentially identity-skewing, function-threatening bizarreness of neurological conditions are reduced to commonplace biological truths. Like Kissane and Kissane, Kempster and Lees also ‘investigate the power of the neurologist’s *alter ego*, Sherlock Holmes [...]’, identifying him directly with Oliver Sacks (Kempster and Lees 2013 374). The investigation of ‘cases’ is thus evidently assigned as much to neurologists as detectives. The detective yarn and neuroscience, both taking recognizable shape in the mid-to-late nineteenth century and then swiftly expanding throughout the twentieth, are now ubiquitous; but where the former is designated a fanciful conceit of the culture industry, the latter now promises to ‘reassuringly’ reveal as already ‘solved’ even the greatest ‘mysteries’ of the brain, this part of the human anatomy which is rapidly coming to define selfhood itself.

This tipping of the scales in neuroscience’s favour can be observed in recent US television series *Perception* (2012–2015). Protagonist Dr Daniel Pierce is an eccentric but virtuosic American professor who lends his neuropsychiatric skills to the Federal Bureau of Investigation to help solve various complex crimes. Pierce is therefore simultaneously a neuroscientist and a detective, conveniently combining a mercurial, brilliant Sherlock Holmes character with the specialized medical expertise of a Dr Watson. The show’s premise is complicated further by the fact that Pierce, as if his plate were not full enough already, is also a regularly hallucinating schizophrenic – but rather than hampering his abilities as a teacher, researcher or investigator, actually these ‘revealing visions help him uncover what lies beneath conscious emotion’.²⁸ The idea driving the narrative is that Pierce’s delusions somehow allow as much, if not even more access to what is ‘real’ as anyone else’s orthodox, non-hallucinatory experiences. At once neuroscientific diagnostician and patient, Pierce dissolves the boundaries between the subject and object of investigation, simply compartmentalizing Apollo Robbins’s metaphorical ‘security guards’. Thus the ideal detective, Pierce has multiple levels of insight into the human mind – the uncannily astute, the academically trained and the inherently empathetic – even when the mind in question apparently goes wrong.

²⁸ As noted on the back cover of the first season’s DVD boxset; Cf. *Perception* 2012. Transcriptions of dialogue from the series are all my own.

Which, as the series progresses, comes to happen quite often. Each episode showcases some interesting neurological condition: prosopagnosia (or ‘face blindness’), autism, Capgras delusion (where sufferers claim close friends or relatives have been replaced by impostors), epilepsy, and so on. The show’s dramatic success turns on how conditions like these demand a reassessment of objective reality, and by extension the legal system stemming therefrom. Legal authority, it is implied, is nothing without neuroscientific discourse to back it up, neuroscience being the highest form of knowledge around. This series-defining idea, that what is ‘real’ is up for debate and currently neuroscience is winning this debate, is foregrounded in the opening moments of *Perception*’s first episode. Dr Pierce is leading a discussion in a lecture hall full of students, and asks:

“What is reality?” [show of hands – Pierce points one out] “Hippy guy.”

“The observable universe?”

“Suppose that answer might fly in the Physics department but this is neuroscience.

Who’s got the brains to give me an answer relating to the brain?” [Pierce points to another raised hand] “Ironic t-shirt.” [laughter]

“Reality is exactly what we see and hear instead of what we fantasize about or dream, or, you know, maybe hallucinate.”

“Ah, hallucination. There’s an answer I would have expected from hippy guy.” [laughter]

“Sex, drugs and rock and roll, right?” [laughter] “OK, now here’s something that’s really going to alter your consciousness: reality is a figment of your imagination. Who here hasn’t woken up breathless from a nightmare and thought ‘Oh thank god it’s just a dream’? That’s because the neurochemical impulses fired when we’re dreaming, or fantasizing, or hallucinating are indistinguishable from the ones banging around inside our skulls when we actually experience those events. So. If what we perceive is often wrong, how can we ever know what’s real – and what isn’t?”

(*Perception* 2012: Season 1, Episode 1)

With this final note on the unreliability of human perception, the lecture hall appropriately fades into the series title, focusing on the ‘c’ of ‘perception’ in a play on ‘to see’. In this opening, Pierce establishes the contemporary authority of neuroscience – the ‘Physics department’ might have been fashionable and influential in the previous century, but in the twenty-first, ‘reality’ is decidedly the brain expert’s domain, the one who truly has ‘brains’. Pierce’s humorous but knowing assertion that ‘reality is a figment of your imagination’ is a cryptic forewarning, as soon after he is revealed to suffer the hallucinations he seemingly equates with ‘reality’ in his neuroscientifically-inflected critique of perception. Like all good detective fiction, it is a clue allowing the viewer to participate in the ritual of investigation, but across as well as within episodes – to uncover the broader neuropsychiatric mystery of the schizophrenic neuroscientist-

cum-detective at its centre, and broader still, the ultimate vaunting of neuroscience as detective work itself.

Despite *Perception*'s convoluted premise, Dr Pierce maintains some semblance of an ordinary life by sticking to a strict routine, implemented by his confidant/assistant Max Lewicki. This is supposed to balance his work, diet, home-life and so on, and thus minimizes the occurrence of his intrusive hallucinations. However, fate takes another neurological twist when Pierce's estranged father is diagnosed with Alzheimer's disease and the two are forced to live together, threatening to upset Pierce's precious work/life balance and his sanity. Desperate to get away, he jumps at any chance to help close friend and FBI agent Kate Moretti; though the increased stress presumably puts him at risk of decompensation and further mental episodes, for Pierce working with the FBI serves as a more potent form of Lewicki's stabilizing routine. It functions as a therapeutic ritual of reason where Pierce symbolically restores internal order by solving external puzzles, whilst also apparently deploying his schizophrenia in a focused and useful manner – in a type of doubled mimesis where delusion aids reason aids delusion, Pierce's hallucinations adapt themselves to the details of each neurologically-themed case, actually helping him investigate before benignly dissipating. The therapeutic capacity of this ritual to Pierce's triple role as detective, neuroscientist and patient is made evident in Season 3, Episode 5. Moretti has approached Pierce with an apt case, the bizarre death of neuroscientist Landon Jennings, just as Pierce is anxious to leave his house and his increasingly challenging father. When Moretti notices his home-life seems amiss, Pierce steers the conversation away from her inquiries:

“Anything you want to talk about?”

“Yes, I want to talk about the case! You brought it to me because the victim's a neuroscientist?”

“I brought it to you for the same reason the [...] police brought it to the FBI – it doesn't seem possible. Whoever killed Jennings got in and out of a secure safe room and then vanished into thin air.”

“A locked door mystery. Thank you. I feel better already.”

(*Perception* 2015: Season 3, Episode 5)²⁹

Enthusiasm for the case eases Pierce's mind regarding his own problems. The greater the case's difficulty, the greater this enthusiasm, and the more his own 'case' has been treated. Therefore the ostensibly impossible scenario Moretti presents him is of utmost satisfaction and therapeutic

²⁹ The second and third seasons of *Perception* are not available yet on DVD, but can be accessed online; Cf. *Perception* 2015.

value. Pierce represents neuroscience's value to detective work; but he also implies detective work's value to neuroscience – and even to clinical neurology, making a patient actually 'feel better' – by tipping his hat to the history of detective fiction, and explicitly acknowledging this 'locked door mystery'.

Covering approximately the mid-nineteenth to the mid-twentieth century, detective fiction's central figures go from Poe's ratiocinating Dupin, through the ubiquitous Sherlock Holmes, to various sanitized parlour-room sleuths (as in Agatha Christie), and the hardboiled backlash typified by Chandler's iconic creation Marlowe. It is at about this point that screen detectives really became prevalent, as film noir and related genres arguably hit their peak, and the writing of detective fiction began to pertain as much to celluloid as print. The textual detectives of the historical trajectory above either gave way to or themselves joined the burgeoning ranks of screen sleuths. Then, more than half a century of variations later (including police procedurals, true crime exposés, and so on), Dr Daniel Pierce the fictional detective comes with more baggage than just his schizophrenic delusions. If the detective figure has been considered a preternaturally intuitive expert on human behaviour, literary scholar Ronald R Thomas nevertheless writes that 'conventions of the form generally require the detective to explain what seems to be his uncanny act of second sight as the simple application of a technique, or even a technology, to the variables of the present occasion' (Thomas 1999: 3). When making accurate snap judgements on opaque characters and events, or on truth and justice, the methods and fruits of science, that is, 'technique' or 'technology', count above the law of the land. The law's discursively-appended machinery, such as the medical judgement of the psychological community, occupies a grey area, as often suspected as trusted. Neuroscience has usurped and improved upon this position of the traditional psychological sciences, and in *Perception*, how this relates to detective work is depicted as a simultaneously technological and epistemological issue.

In Season 1, Episode 3, the plot hinges on a severe case of post-head-trauma anterograde amnesia. Lacey, survivor of a 1986 spate of murder-kidnappings, unwittingly suffered a head injury which rendered her unable to produce new memories. Utterly confused and 'stuck' in 1986, after her escape Lacey was tragically misdiagnosed as dangerously delusional and kept continuously sedated and institutionalized ever since. Having originally sought her testimony to help solve a resurgence of the serial killings, Pierce decides to redress this additional injustice. Taking Lacey for a brain scan, he comments to Moretti:

"Right there, significant accumulation of hemosiderin, old haemorrhaged blood."

"Meaning what?"

"Lacey suffered a traumatic brain injury at the time of her abduction [...]."

"How come nobody noticed this back in 1986?"

“They didn’t have this technology so they just drugged her, assuming it was a psychiatric problem, and they kept drugging her.”

“OK, now how does this [scan] help us?”

“It gives us a diagnosis... and a plan.”

(*Perception* 2012: Season 1, Episode 3)

A bygone authority is doubly critiqued here. Modern neuroscience’s technologically superior knowledge allows Pierce and Moretti to re-diagnose a grave medico-psychological error, but also gives them a new ‘plan’ for approaching crimes unsolved by a previous generation’s legal establishment – to interrogate their star witness, they do not treat Lacey as mentally unstable, but as a 17-year-old, trapped in that age as she is by her memory. The inadequacies of the former epistemological regime are framed as bordering on criminal, almost worse than the serial murders themselves; technological, neuroscientific advances are thus aligned with an urgently necessary recalibration of justice.

Palpable here is a blossoming cultural confidence in the authority of neuroscience to identify truth where legal and medical discourses have failed. However, the relationship between fictional detectives and neuroscience is not as simple as it seems. This is appreciable in the examples cited from *Perception* so far: on the one hand, modern imaging technologies coupled with Pierce’s neuroscientific expertise are used to supplant outmoded investigative techniques (as much as to solve cases), and thus claim privileged access to ‘reality’; on the other, Pierce brings into question the very possibility of that reality, this questioning itself complicated by his own neuroscientifically analysable set of delusional behaviours. The writers of this detective fiction at once place their trust in the workings of brain science just as they undermine this trust. Providing dramatic tension and scope for characterization, this type of central self-contradiction is in itself nothing new. For example, Sherlock Holmes’s notorious penchant for cocaine seems contrary to his otherwise impeccable rationality; Dr Watson has no qualms telling him his ‘brain may [...] be roused and excited, but it is a pathological and morbid process, which involves increased tissue-change and may at last leave a permanent weakness’ (Conan Doyle 2009: 75). But as much as the detective genre is manipulated and turned on its head in order to find its limits, so too neuroscience is fictionalized or dramatized in an attempt to comprehend its consequences. This is taken to extremes by another television series, called *Dexter*, which was originally based on (but then diverged from) Jeff Lindsay’s first novel in a six-book series, *Darkly Dreaming Dexter* (2004). The show premiered in 2006 and after eight successful series drew to a close as recently as 2013, making it of interest as a comparison with its contemporary series *Perception*.³⁰

³⁰ For all references to the content of the series *Dexter* in the main text here, Cf. *Dexter* 2014.

Ronald R Thomas writes that

invariably, the mangled corpse the literary detective scrutinizes reveals a code that his trained eye is uniquely capable of reading; or, alternatively, the body of the suspect betrays its own guilt in some visible signs that are legible only to the eyes of the detective. [...] The literary detective's power, that is, is consistently represented as a new kind of reading [...].

(1999: 3)

This constantly updated 'new kind of reading' requires no less than fantastic vision, either through a great set of eyes or even, as quoted earlier from Thomas, an 'uncanny act of second sight'. If this outstanding visual capacity is traditionally the characteristic of the literary detective, then the latest updates confer the uncanny knack to phenomenologist Sharpe and neuroscientist Pierce; but beyond visual associations, the words 'sharp' and 'pierce' achieve a kind of deeper sight, on into insight (as in literally 'seeing into'), through *Dexter* protagonist Dexter Morgan. Just like the others, his name is a pun: the Latin *dexter* means 'right' or simply 'dextrous', and combines with Morgan's near homophone 'morgue', to signify something like 'straight to death' or 'skilful at killing'. Thus Dexter is relevant to this discussion in a number of other, sometimes grotesque ways. Not only is he a forensic pathologist specializing in blood spatter and working for the police in Miami – meaning that he is coherent with Thomas's description of someone versed in the 'application of a technique, or even a technology, to the variables of the present occasion', or in other words, the crime scene – he is also himself a serial killer who uses his knowledge of crime scenes to cover up his own crimes.

In a bizarre subversion of the ordinary detective/criminal, Dexter utilizes his police resources and training, along with his heightened investigatory instincts, to stay ahead of the police department he works for. He then exacts a type of homicidal vigilante justice upon dangerous criminals he perceives to have slipped through the cracks of the normal judiciary system (even though this is often because of his own involvement). Dexter is presented, just as Pierce, as someone with a serious mental illness (in Dexter's case, the stereotypical catch-all condition of psychopathy, though he frequently experiences hallucinations which are never fully explained); but in spite of or even because of this illness, he has an incredible insight into human behaviour. Indeed, Dexter uses 'sharp' insight to 'pierce' into the true character of those he pursues – but then he simply uses sharp implements to pierce his victims' bodies, as he dismembers them in a variety of gory ways. These are parallel skills to him, perceptive behavioural detective work and forensically informed dead body disposal. As the series progresses, Dexter is revealed to be the way he is because he suffered a severe early childhood trauma, watching his mother get chopped up with a chainsaw, setting him on a fatalistic path and instilling in him an obsession with blood. The police officer who finds him during this horrific

event, Harry Morgan, adopts him out of pity. But recognizing in Dexter the urge to kill, and deciding that curbing this urge is impossible, Harry trains Dexter to strategically direct his bloodlust towards victims whose absence from the world would actually be 'beneficial' to society. Effectively, Harry trains Dexter only to kill other killers, and to do so in a legally, forensically invisible way – to hide his blood-obsession behind his job, the ultimate in artful concealment.

However implausible it seems, this premise, that is to say Harry's bequeathal to Dexter of the so-called 'Code' by which Dexter is to carry out his activities, remains relatively intact until the eighth and final season of *Dexter*. Towards the beginning of this season, it is brought to light that Harry had not been working alone to establish his elaborate programme of alternative childhood development; Dr Evelyn Vogel, a neuropsychiatrist with a particular interest in psychopaths, had been guiding Harry in his training of Dexter all along. Vogel's entrance into proceedings coincides with the emergence of a new serial killer in Miami, who carefully removes a piece of a victim's brain before depositing the rest of the body in a public place; the killer is promptly dubbed the 'Brain Surgeon' by investigators and local media. Vogel approaches Dexter at a moment of weakness, revealing her clandestine role in his upbringing, and once Dexter manages to wrap his mind around this life-altering news, Vogel expresses fear that the Brain Surgeon's ultimate goal may involve her, as she has secretly been receiving his victims' missing brain portions. Eventually, it is revealed that the Brain Surgeon is indeed targeting Dr Vogel, because he is her son, who was institutionalized by her as a teenager, but long thought dead. Although his original name was Daniel, he had kept himself hidden by assuming the alias Oliver Saxon. After this, the plot hurtles on to a chaotic and bloody conclusion, with Dexter outliving almost everyone else around him. In any case, what is of note here is not the fanciful and melodramatic denouement of the whole series, but that the final season centres on: a neuropsychiatrist; parts of brains removed because they might be the causes of aberrant, violent behaviour; scenes once again involving MRI scans as sources of evidential authority; and most importantly, that the neuropsychiatrist's son, the one identifying and removing the pathological brain portions, is named Oliver Saxon. This name is, of course, but a syllable away from the name of renowned physician, neurologist and author Oliver Sacks. A person of interest in the previous chapter's investigations as well as this one, I would now like to shift focus off of Saxon and on to Sacks.

Oliver Sacks: The Story is a Brain Detective

During his lengthy and endlessly productive career, Sacks combined his clinical duties with a growing body of written work. While not at all divorced from his everyday experiences as a practising doctor, as discussed in the previous chapter, his writing is mainly not the typical scholarly, journal article fare one might expect from a medical man. Instead, across books such as *Awakenings* (1973), *The Man Who Mistook His Wife for a Hat* (1985) and *An Anthropologist on Mars* (1995), Sacks has straddled the supposed divide between his authorial and medical roles and developed the self-styled Clinical Tale. Though at first this generic neologism might appear self-contradictorily problematic, it has nevertheless proved successful enough a blend to prompt *New York Times* editor and literary critic Anatole Broyard into dubbing Sacks ‘a kind of poet laureate of contemporary medicine’ (Broyard 1990: 2). Indeed, this oft-reformulated yet chimerical description of Sacks (for example: Cf. Anthony 2010; Evans 2012) – ‘the poet laureate of medicine’ – sums up the perhaps paradoxical nature of his writing, where Clinical Tales are offered up in the name of ‘poetic medicine’. Not only is ongoing use of Broyard’s enigmatic hyperbole rarely accredited to him personally,³¹ but the 2011 edition of Sacks’s *The Man Who Mistook His Wife for a Hat* no longer includes the author’s preferred phrase ‘Clinical Tales’ as a subtitle, while the phrase itself only makes one brief appearance in the preface (Sacks 2011b: x). The reasons for this omission are unclear, especially considering Sacks’s eight-page justification for just such a subtitle, and even an entire genre, in the 1986 issue of journal *Literature and Medicine*:

I have subtitled a recent book ‘Clinical Tales,’ a term which might seem wilful oxymoron to some; to me it seemed entirely natural, indeed, unavoidable, for the sort of narratives I presented. But what is *meant* by the term? And what relation has it to ‘case history,’ on the one hand – and to ‘literature,’ on the other?

Such tales are ‘clinical’ insofar as they have a factual, clinical basis, and lend themselves to a clinical or medical analysis. And they are ‘tales’ insofar as they have a subject – and a theme – neither of which is possessed by a description or case history.

(Sacks 1986: 16; original emphasis)

³¹ As of 16 August 2016, both Sacks’s personal web site and the web site of the University of Warwick, where Sacks was a visiting professor, both use the phrase ‘the poet laureate of medicine’ to describe him, but neither mentions Broyard, instead anonymously citing *The New York Times* (Cf. Sacks 2016a; 2016b).

Clinical Tales cannot be reduced to mere case histories, but neither are they simply allegorical writing.³² Sacks continues by dramatically asserting that his ‘unavoidable’ and ‘entirely natural’ recourse to Clinical Tales actually involved being ‘*forced* to’ take up this ‘elemental form’ (Ibid.; original emphasis). Perceptible here is a clear alignment for Sacks of the given, the normal, with the destined, the inevitable, meaning that he sees Clinical Tales as normative, a form of natural generic law. The rest of the article is a considered yet ardent rationale for the seamlessness between ‘case history’ and ‘literature’, betraying Sacks’s belief that this will be the main component, or angle, of the criticism levelled at him for the coinage of Clinical Tales, or for his style in general. Though he is quick to admit his lack of bona fide literary credentials, Sacks is at pains to stress the centrality of personal narratives, not just to patients, but to doctors, to writers, and to anyone else in between, such as himself or his cherished hero, the Russian pioneer of neuropsychology A R Luria.³³

Sacks’s espousal of Clinical Tales informs his much-noted personal style just as it provides the urgency impelling him to elaborate a genre based on his own medical experiences (including at times as a patient, mirroring Dr Pierce’s complicated multiple role in *Perception*; for example, Cf. Sacks 2010b; 2012). Speaking as much about himself as his patients, Sacks insists on the importance of subjectivity to what he calls ‘one’s “world” (the integration of one’s nervous system, one’s mind, one’s *self*)’ (Sacks 1986: 18; original emphasis). As any such existential realm, or so-called ‘world’, will eventually require some kind of mapping, Sacks continues by comparing patients’ accounts of their movements within their own ‘worlds’ to the genre of travel or exploration narratives. This leads him to once again admit his wide-ranging debt to Luria – both in terms of clinical outlook and literary style:

Luria was always fond of comparing scientific investigations to detective stories (he had a great passion for these!), and the explorations of patients to both: ‘Mystery Tales,’ he would say of all three. For one cannot, as a reflective human being, be precipitated into illness without finding one’s new condition or situation a *problem*.

(Sacks 1986: 19; original emphasis)

³² Indeed, Sacks’s desire to affirm the Clinical Tale as something approaching a literary genre fits into a far older schema. As historian of literature and science Sally Shuttleworth writes: ‘literary texts were routinely invoked by nineteenth-century psychological texts as forms of case studies [...]. In the development of psychiatric case lore, fact and fiction blend together as decisively as in the more explicit borrowings from literary texts’ (Shuttleworth 2010: 10; 22).

³³ Luria claimed that his goal was to reconcile ‘explanatory, physiological psychology and a descriptive, phenomenological psychology of the higher psychological functions’. But he was also reflexive enough to ‘point out that [his] work did not take place in a vacuum. Rather, it was carried out in a larger social and scientific context which shaped the attitude of all scientists, including myself’ (Luria 2010: 175).

Taking Luria's lead, Sacks fashions himself as a detective, a solver of problems and interpreter of mysteries; but these problems and mysteries extend beyond simple medical analyses of patients and on into the realm of self-consciousness, where the true revelation to be sought might be one's very self.

Quoting philosopher Friedrich Nietzsche on how the problems (in the purposefully ambiguous sense of both questions and difficulties) involved with being a patient are always trumped by a boundless curiosity, Sacks acknowledges that such a philosophical engagement with their own particular situations might not be to all patients' tastes or capacities. Regardless, he points out that

all patients are *thrown* into a [...] 'philosophical emergency.' For any alteration in one's world, especially a deep and singular alteration, must present itself to the patient as a problem or challenge [...]. Equally, every such patient is thrown into a 'tale,' a real-life narrative or drama, whether he knows it, or likes it, or not. He is thrown into the problematic, and thrown into the dramatic [...]. And the problematic and the dramatic are fused together, so he finds himself playing the central (and sole) role in a philosophical or symbolic drama.

(Sacks 1986: 20; original emphasis)

At the very least it is Sacks's tone here that is 'dramatic' once more: the compelling nature of the 'emergency' he speaks of lends his prose an inevitability which reflects the plight of patients in the mirror of his chosen writing format, creating an equivalence at the philosophical, theoretical level. If Sacks has been 'forced' into writing *Clinical Tales* as mentioned, this is because, in an inversion of his own quandary on how to present his materials, those he writes about have just as much been 'thrown' into a fusion of the profound personal change that they have experienced (potentially both physically and mentally), and the story of that very change itself. In proposing this fusion Sacks implies a parallel between his case studies and the real people on whom they are based, as he considers this method of viewing patients a fruitful way of bringing closer together first and third person accounts of existence. To appreciate properly the experiential, theoretical and private fusion, one must combine the analytic and investigative tools of detective, writer and clinical neurologist in a practical, written fusion, open to objective scrutiny.

To recap, when a 'philosophical emergency' causes a profound 'alteration in one's world', this 'tale', this 'real-life narrative or drama', poses a 'problem or a challenge' whose resolution requires analysing the tale itself (that is, the change to a patient and its resultant philosophical ramifications). In essence, Sacks advocates a type of neurological detective work, illuminating the murky features of the human condition by investigating its more interesting instances, neurologically speaking. But it is his artistry in writing up (and of course firstly selecting) these instances that chiefly makes them so interesting. What Sacks's books really

reveal is mostly about himself, his predilections as a reader and a writer who just happens to also be a neurologist, and his repeatedly avowed intention (à la Luria) to rehabilitate two relatively unfashionable things: firstly, the notion of a Romantic Science which paints a more accurate and more accommodating likeness of human nature;³⁴ and secondly, to salvage the central concept of ‘self’ which has been squashed by science in its onward march through cultural life. The way that Sacks’s ‘self’-recuperating scientific detective work is conducted is modelled on the literary genre that bears its name – a genre which, just like the subjects of Sacks’s projects, requires at base a problem to be solved in order to be effective, instructive or at the least intriguing. A detective needs something to investigate. Otherwise, one cannot truly be called a detective in any sense of the word.

Of course, one could simply decide to investigate anything and call it detective work – so long as the object of investigation can be shown to be problematic enough, again in both the sense of difficulty and curiousness, to be deemed worthy of investigation. One of the best ways to narrativize even the most quotidian of mini-mysteries is to marry it with the literary aspects of detective fiction: a missing sock becomes a mysterious and long-lost item which has puzzled great minds for ages, a secret ingredient is the future of all cooking and its obfuscation a crime of proportions to match any other. The purpose of these undoubtedly unlikely and trivial examples is simply to demonstrate that accessing this literary quality allows investigation of the everyday to become a matter of potential intrigue, a ritual bestowing symbolically-charged status upon even the least important minutiae of life. It is this access to the literary in his neurological writings that has specifically allowed for Sacks’s success. Fellow neuroscientists Peter Kempster and Andrew Lees make the case yet more plainly:

Oliver Sacks is the most widely read neurologist physician-writer, and his books belong with a broader heritage of medical literature. [During the nineteenth century] medical writers [discerned] that the narrative methods used by novelists could help to organise and connect information in clinical accounts. One source of Sacks’ success has been his ability to draw on these latent literary properties by writing books that consist of anonymised neurological case histories. In many of them, Sacks gives himself the role of detective – observing, gently questioning and sometimes searching out clues in the streets or in the homes of his patients.

(Kempster and Lees 2013: 374)

³⁴ In his autobiography, Luria distinguishes between what he sees as a necessary but reductionist side to science and medicine, the ‘classical’ side, and its obverse, ‘romantic’ side. He goes on to write: ‘The object of observation is [...] to ascertain a network of important relations. When done properly, observation accomplishes the classical aim of explaining facts, while not losing sight of the romantic aim of preserving the manifold richness of the subject. [...] In a good deal of [my] work my approach has been as much that of the classical scholar as the romantic one’ (Luria 2010: 178). Also, for more information on Romantic Science beyond Luria, see note 17 in Convolution 1: Quest, earlier in this thesis.

In this portrayal, Kempster and Lees have Sacks going beyond the medical exam, the clinical case history or even the novelist's narrativization of events – his detective work, spurred on by a deep appreciation of the literary genre confirmed through correspondence with Sacks himself (Ibid.), extends past the consulting room or written page and spills out onto the 'streets' and into the 'homes' of those under investigation.

As his star has risen, cases have in fact been brought to Sacks from outside his own pool of patients, permitting his philosophical concerns to also spill out from the rehabilitation of the medical self onto broader theoretical, cultural and scientific issues – but still under the aegis of a well-orchestrated detective's investigation. A good example is Sacks's 2010 article for the evocatively titled 'A Neurologist's Notebook', his long-standing occasional column for *The New Yorker* magazine. This article is called 'A Man of Letters' and is subtitled 'Why was the morning paper suddenly in a foreign language?' (Sacks 2010a: 22). From the outset this subtitle poses a question, or problem, concisely mystifying the quotidian aspect of the morning paper to the level of intrigue. The defamiliarization of something so ordinary makes investigation seem utterly necessary and inevitable, and so the ritual of reason supersedes and interjects into the ritual of the everyday mundane. The article is about the eponymous 'man of letters', writer Howard Engel, and his post-stroke development of a reading disorder called alexia (essentially translatable from its etymological roots as 'without words'). Again, the problem is not simply summarized in the article's title, but set up by it, announcing the loss of selfhood in advance: first one is told the article concerns a person who deals with words, and next that words can fail one at any moment. From here the bulk of the article covers the history of alexia and related afflictions, the complicated relationship between evolution and brain plasticity, and the philosophical issues raised by alexia. However, all this is tackled in light of the basic premise: a man of letters who is missing his letters. How one person's loss of identity relates to the larger picture is precisely the challenge that Sacks the author-detective sets himself by framing the story this way, and though discernible throughout, this is most clearly appreciable in three places which simultaneously obscure the subtext of how neurological detective work is intimately tied to notions of literariness and writing themselves.

The first instance is in the article's opening lines, which read like a postmodern, self-referential piece of detective fiction:

In January of 2002, I received a strange letter from Howard Engel, the Canadian writer who created the Benny Cooperman series of detective novels. One morning a few months before, he had got up feeling fine. He dressed and made breakfast and then went to the front porch to get his newspaper. But the paper on his doorstep seemed to have undergone a transformation.

(Sacks 2010a: 22)

As discussed above, suspense is provided by the juxtaposition of run-of-the-mill, everyday rituals, with the pre-provided knowledge that something ‘strange’ is about to intrude. In the midst of this comes explicit mention of detective novels and their fabricated nature. This creates a connection between detective writer Engel and article author Sacks, this latter presenting his (ostensibly unfabricated) material in Engel’s own generic idiom. The newspaper then intercedes here, and permeates throughout, as a powerful, symbolic way of negotiating all of these implicit relationships, even forming the visual basis for the article’s graphics. Whilst in Engel’s world the intellectual stability and ritualized literacy represented by the paper has ‘undergone a transformation’ of Kafkaesque proportions, Sacks reconciles the strange and the ordinary through his own investigation, reinstating the missing authority of the written word and explaining away the mysterious newspaper. Ironically perhaps, given his incumbent alexia, Engel first writes to Sacks after reading about a case similar to his own elsewhere in Sacks’s oeuvre. For Engel, this cements Sacks’s medical detective pedigree, reinforcing Sacks’s general authority as expert interpreter of Engel’s own situation, regardless of its Clinical Tale specificity.

Instead, a wider discussion of neuroscience and psychology develops, with the goal of summing up the clues gathered and illuminating alexia’s philosophical implications on a larger scientific scale. This conclusion is staged by Sacks in two parts towards the article’s end. Having gone through the rest of Engel’s case – the months of diagnosis, tentative treatment, and eventual reintegration into something resembling the pre-stroke course of his life – Sacks neatly brings the postmodern self-consciousness of the piece’s opening full circle. Though unable to read, Engel’s particular alexia allowed him to write and thus resume his life as a ‘man of letters’. After the initial anguish had mostly subsided, Engel’s writer’s brain simply took charge once again, and he reintroduced

his alter ego, the detective Benny Cooperman, but it would be a Cooperman transformed: the great detective, waking in a hospital bed, finds himself not only alexic but amnesiac as well. His powers of inference, however, are intact, and enable him to stitch together disparate clues, to figure out how he landed in the hospital and what happened in the mysterious few days he can no longer remember.

(Sacks 2010a: 28)

Engel directly uses his own extraordinary experience to refashion his protagonist and continue his writing career, and in aligning himself with his detective character, it seems only fitting Cooperman’s object of investigation should be himself, dramatically mirroring what Engel went through to ‘rediscover’ his literacy. It is a matter of art imitating life imitating art, and Sacks attaches himself to this convoluted structure as the neurologist detective who deciphers the case’s

problems, which of course he had pointed out were underlying questions all along: ‘Howard Engel is still alexic, but he has found a way to remain a man of letters. “The problems never went away,” he writes, “but I became cleverer at solving them.” That he was able to do so is a testament to the adaptability of the human brain’ (Sacks 2010a: 28).

So too did Oliver Sacks become cleverer at solving problems, the newfound awareness of which made them appear to have been perennial. Sacks never dispensed entirely with specifically personal involvement in his medical ‘cases’; upon his 2007 appointment to a more interdisciplinary role at New York’s Columbia University (where his title was simply that of resident ‘Artist’), he made it clear that ‘his clinical work would remain a focus, not least because it inspires so much of his writing’ (Rich 2007). But it is evident that writing came to greatly inspire his clinical work, expanding the scope of the ritual of reason. By incorporating stories such as Howard Engel’s into his repertoire, one where Sacks’s secondary investigation merely followed the primary detective work of Engel and his team of doctors, Sacks claims authority over a greater swathe of human knowledge and expertise than before. Having rescued the individual self in his earlier work, later writings move to a wider concern for humanity – a movement from the peculiarities and mysteries of one person’s brain at a time, to the much more general ‘adaptability of the human brain’ writ large. The implication is that neurological detective work, through the growth in popularity of the initially tentative and niche format of the Clinical Tale, now stakes a claim over a larger terrain than just some occasional neuro-quirk on the landscape. Despite deriving its methods and force from genre fiction, the authority of the neurological detective has come to outstrip that of his or her largely under-acknowledged literary forebear. This is particularly interesting because Sacks is arguably much more famous or influential as an author than as a doctor or a scientist, something which, in fact, he can use to retrospectively narrate and therefore bolster his clinical, scientific reputation – in this case, as in others that Charlotte Sleigh highlights, ‘it was through self-fashioning *as a writer* that the scientist was made [...] emerging from the cocoon of the scientific outsider (Sleigh 2015: 31; original emphasis).

Andrew Anthony sums up Sacks’s scientific-via-literary acumen when he writes that

Sacks has long been praised and criticised for the manner in which he combines hard science and literary observation. For many, he is the pioneer of a particular form of personalised essay that has helped rejuvenate scientific writing [...].

For others, like the late psychiatrist Arthur Shapiro, Sacks’s blurring of the boundaries between art and science is problematic and potentially misleading. Not alone among medical experts, Shapiro argued that Sacks is ‘a much better writer than he is a clinician’.

What both fans and doubters focus upon is Sacks’s tendency to place himself in the

action [...].

For Sacks, whose abiding subject is the duality of the mind and the brain, the intrusion is another means of exposing the interplay between subjective perception and objective reality. Or, as he once put it: 'I regard everything I write as being at the intersection of the first and third person, biography and autobiography, as it were.'

(Anthony 2010)

If Anthony can be forgiven for naïvely trespassing on the ever-contentious ground of mind/body dualism, his description of Sacks's 'intrusion' of 'subjective perception' upon 'objective reality' is highly illuminating. Whether or not Sacks is literarily laudable or scientifically dubious, whether or not he is an essayistic pioneer or a medical impostor, whether or not he is writing about specific people or the human condition in general – whatever the case, by his own admission, he is always also writing about himself, an 'autobiography' dispersed across all his written work, and so like other detective authors, he is writing about his own writing (or 'thinking in cases' includes thinking about his own case, as quoted from Forrester earlier).

The best example of this reflexive detective writing is Paul Auster's *The New York Trilogy*. This ostensible novel was, as its name suggests, originally published as three separate sections between 1985 and 1986, before first being brought together as a trilogy in 1987. Despite being distinct entities, the sections have many common concerns, including intertextuality itself, which runs throughout the trilogy as both a binding and a dismantling force. In setting up this commentary on the essence of writing and reading, Auster (like Sacks) is talking about himself too; he goes so far as to name a character after himself, confounding what, up till the fictional Auster's entrance, had been the natural identification of protagonist Quinn with the author. Alison Russell puts it this way:

The three novels comprising the trilogy – 'City of Glass,' 'Ghosts,' and 'The Locked Room' – are essentially retellings of the same story. All three employ and deconstruct the conventional elements of the detective story, resulting in a recursive linguistic investigation of the nature, function, and meaning of language. The trilogy also parodies and subverts the Romance, 'realistic' fiction, and autobiography, thereby exploding the narrative traditions associated with these genres.

(Russell 1990: 71)

The list of genres mentioned – detective fiction, Romance, 'realistic' fiction and autobiography – are the key components of Sacks's oeuvre and its persistent call for a return to Luria's so-called Romantic Science. By exploding them all in one place, Auster does not so much contradict Sacks's blend as actually justify it, collapsing their generic boundaries. However, therein lies a conundrum: the authorial authority to destroy such walls is itself destroyed in the process (in a

move sociologist Malcolm Ashmore describes as a ‘tu quoque’ – Cf. Ashmore 1989: 85–86). The self that Sacks is so eager to recuperate is wilfully left to float away by Auster. Ironically, the implication is that in the detective fiction stakes, neuroscience trumps literature. More or less uniformly successful, the neurologist detective of Sacks’s writings achieves the closure his pieces demand, traversing the beginning and the middle of a story on the way to the reassuring, ‘predictable result’ that is so ‘fundamental to the detective story genre’, as Kissane and Kissane put it (1963: 360). Thus the irony – the neurological detective is more strictly speaking literary than the never-ending, never-closing loops of Auster’s literary detective, futilely searching for himself or his author.

This is demonstrated in ‘Ghosts’, the second story of Auster’s trilogy. A detective simply known as Blue is disguised as a tramp. He is supposed to be merely observing Black, but cannot resist investigating him too; and so Blue has positioned himself on a street corner so that Black will encounter him falsely begging for change. When the ruse works, Blue repeats it the next day to engineer a more extensive conversation, into which Black quite willingly throws himself, remarking that Blue is the spit of long dead American poet par excellence Walt Whitman. Blue responds: ‘Every man has his double somewhere. I don’t see why mine can’t be a dead man’ (Auster 2011: 174). Note Whitman’s doubled ‘Ws’ here, which are redoubled in ‘City of Glass’, in Quinn’s pseudonym William Wilson – and according to literary scholar Michael Cook, doubled once more if one considers that Auster’s interest in doubled identity, exemplified by the writer’s detective doppelgänger (or vice versa), is a trope which goes back to Poe’s short story ‘William Wilson’ (Cf. Poe 2006: 314–329; Cook 2011: 138). Having established Blue’s double, Black goes on to speak of ‘curious stories’ surrounding Whitman, arguably equivalent to Sacks’s *Clinical Tales*. He begins with ‘the one about Whitman’s brain, for example. All his life Whitman believed in the science of phrenology – you know, reading the bumps on the skull. [...] Whitman was interested in brains and skulls – thought they could tell you everything about a man’s character’ (Auster 2011: 175). According to Black, this deep interest in the brain led Whitman to bequeath his own brain to science, because

people thought he was a genius, you see, and they wanted to take a look at his brain to find out if there was anything special about it. [But] just as they’re about to work on it, one of the assistants drops it on the floor. [...] It splattered all over the place, and that was that. The brain of America’s greatest poet got swept up and thrown out with the garbage.

(Auster 2011: 175–6)

This grisly but comical anecdote elicits a great deal of laughter from the pair, and Black concludes in a similar vein of black humour: ‘It’s sad to think of poor Walt lying in his grave, though [...]. All alone and without any brains’ (Auster 2011: 176). Several convolving strands

are manifested here as an implicit threat to Blue, which goes unnoticed at the time but surfaces from his subconscious later: literary endeavour, detective work and neurological fatalism are all juxtaposed, as Blue the investigator (who is the dead Whitman's doppelganger) will end up losing his mind, 'alone and without any brains', should he continue to pry into the mind (or the writing process) of the writer Black.

Yet more explicit is another of Black's 'curious stories' about Whitman when visited in New York by friends and fellow writers Henry David Thoreau and Bronson Alcott from Massachusetts. According to Black, everything proceeded normally, until the visitors 'noticed a full chamber pot right in the middle of the floor. Walt was of course an expansive fellow and paid no attention, but the two New Englanders found it hard to keep talking with a bucket of excrement in front of them' (Auster 2011: 177). Black then elucidates:

That chamber pot, you see, somehow reminds me of the brains on the floor. And when you stop to think about it, there's a certain similarity of form. The bumps and convolutions, I mean. There's a definite connection. Brains and guts, the insides of a man. We always talk about trying to get inside a writer to understand his work better. But when you get right down to it, there's not much to find in there – at least not much that's different from what you'd find in anyone else.

(Auster 2011: 177)

'Not much that's different' in Whitman in particular, who Black suggests would have been as happy to display his digestive system's contents as his brains, with all his personal, poetic and philosophical interiority laid bare on the floor, as open to scrutiny as his writing or even his face. Again, the implicit threat (or at least warning) is that investigation into the writer's mind leads to nothing but abyssal failure, and so a budding detective – whether literary, neuroscientific or the standard legal/policial variety – might just as well be searching for clues in brains as sifting through excrement; and for that matter, anybody's excrement, let alone a so-called genius writer. Cerebral 'bumps and convolutions' provide no solution to the mysteries of brain, writing or detective work, and instead are as prosaic as those other metaphorical 'convolutions', the intestines. Auster thus makes a larger point about the writing and reading of detective fiction, with literary convolutions offering no hidden meaning, no artfully concealed depths beyond the generic structural elements themselves, mirrored in his own impenetrable or even empty psyche as the unreliable author of this particular undetectable anti-fiction.

If one accepts Black's view of the writer's mind as an impregnable human commonplace devoid of any special meaning, a deceptive counterpoint is found in Scott Bakker's *Neuropath* (2009). The unpaginated 'Author's Note' which precedes Bakker's narrative purports: 'The following story is based on actual trends in neuroscience, psychology, and cognitive science. Despite all the controversies (and there are many), one fact has managed to rise above the fray:

we are not what we think we are' (Bakker 2009). Two things are noteworthy here: firstly, the recourse to 'actual' neuroscience and related disciplines is meant to lend the novel an authoritative and cohesive air, as in Sacks, which as Auster's trilogy convincingly demonstrates is no longer otherwise available to detective/crime fiction; but secondly, that same confidence in stable ideas drawn from real scientific 'trends' is immediately supplanted by the foreword's self-negating conclusion, so evocative of the equally paradoxical Iago in William Shakespeare's *Othello*, that 'we are not what we think we are'. While Auster concocts an entire detective trilogy out of red herrings regarding his authorial position, even cheekily placing 'himself' into the narrative, Bakker instead uses science to utterly undermine his own authorial position in advance, without a single moment of narrative having taken place. If Bakker's take on neuroscience, psychology and cognitive science is correct, then he himself is not what he thinks he is – that is to say, the author of a violent, sexual thriller based on a highly mechanistic view of the mind/brain. In a way, though, *Neuropath* is actually science fiction, or as Bakker puts it, 'future facts' (Bakker 2009: 377) – a speculative look at what might happen were the brain totally manipulable by a brilliant but deranged killer. In this respect, the novel's pessimistic warning regarding contemporary brain-centred rhetoric, and its authority-giving status, is commendable. Additionally, Bakker's postscriptal elucidations of his scientific and philosophical sources is helpful, like a shorter version of *Radiant Cool*'s second half. However, if his conclusions regarding the brain are to be taken seriously irrespective of the narrative content of *Neuropath*, then even the foreword on its own serves to negate Bakker's own role as author.

Just as Auster is fictionalized and doubled in *The New York Trilogy*, so too is Dan Lloyd in *Radiant Cool*. Lloyd further pluralizes his own roles as would-be literary author and scientific philosopher: in 'real life' he is an academic, but he is one fictionally too, playing himself in the story, so to speak. Lloyd thus writes science and fiction simultaneously, in the unusual sense of separately but together, at the same time in the same volume – like science fiction, only rendered as 'science-and-fiction' (or 'fiction-and-science'). Furthermore, he participates initially as a character, only properly reassuming the narratorial reins late on. As mentioned, this echoes *Neuropath*'s two parts: a tense, dramatic plot in the detective, mystery tradition and a rational, sober exposition in the philosophical, scientific tradition. *Radiant Cool*'s first part, 'The Thrill of Phenomenology', takes up the bulk of the book, and begins with all the hallmarks of a classic hard-boiled detective story: 'He was a fool and a moron, but I never wanted to see him dead' (Lloyd 2004: 3). Of course, these are purportedly Miranda Sharpe's words, but Lloyd pre-empts the confusion, complexity and suspense to come in his Preface, which begins in equally as gripping a manner: 'In the first days of April of last year a young philosopher, Miranda Sharpe, was tempered in the furnace of extraordinary events' (Lloyd 2004: xv). In some way, Sharpe is Lloyd's agent on the inside of the text, so to speak, allowing exploration of ideas without having

to lay full claim to them. Ironically, this lends credibility to the story rather than undermining it, because here is an established academic vouching for it in his Preface, never intimating its spuriousness until the story is over. However, if Lloyd outsources his consciousness to Sharpe, this is because consciousness is precisely the main topic of *Radiant Cool*. By first externalizing his thought via Sharpe, he can then look at it objectively in the book's second part, 'The Real Firefly: Reflections on a Science of Consciousness'. The result is a melding of first and third person views foregrounding Lloyd's discussion of the many-nuanced project of neurophenomenology.

This melding of grammatical persons recalls David Lodge's words on the huge potential value of insights drawn from literary fiction to the most pressing imperatives driving modern science. Lodge notes that 'according to [neuroscientist] V S Ramachandran, the "need to reconcile the first person and third person accounts of the universe... is the single most important problem in science."' It is certainly crucial to the study of consciousness' (Lodge 2002: 28). Lodge then evaluates the relative merits of different approaches to said study, taking as an example the narrative focus on interiority in the novelistic technique of Henry James:

There is no empirical reality against which we can check the truth of Henry James's account of [a character's] consciousness. It cannot be regarded as scientific knowledge. However, it is also true that we read novels like *The Wings of the Dove* because they give us a convincing sense of what the consciousness of people other than ourselves is like.

(Lodge 2002: 30)

The reason that this description of what another's consciousness 'is like' is 'convincing', in Lodge's view, is because of the 'essentially *narrative* nature of human consciousness, recognized by a number of scientific writers on the subject. But it is a narrative full of lacunae. We are conscious of existing in time, moving from a past that we recall very patchily, and into a future that is unknown and unknowable' (2002: 31; original emphasis). Lodge's point is that literary fiction fills in these 'lacunae' by offering something objective, a text, that makes the otherwise impenetrable first person subjectivity of consciousness in some small measure available to third person scrutiny, thus approaching scientific analysability. Literature gives a firm foothold in time to the ever-fleeting conscious moment of now-ness, which Henry's brother, psychological pioneer William James, called the 'specious present'; it is an attempt to firmly record that otherwise evanescent 'past that we recall very patchily', as mentioned by Lodge, an attempt which usefully can also be returned to and consulted as necessary in the 'unknown and unknowable future'.

Lloyd concurs with this view, since he not only invents a fiction to explore the science of consciousness, but in the process also examines a fictionalized version of himself and his own

consciousness. But once again: why detective fiction in particular? One answer lies in what Lodge says of Henry James's authorial success; he argues that James fulfils the readerly need to get 'a convincing sense of what the consciousness of people other than ourselves is like'. According to Lloyd, it is this impulse to know 'what it is like' that has historically been core to the study of consciousness: 'The what-it-is-like formulation swiftly became the standard invocation of the miasmal mystery of consciousness, and has almost become a definition of the term. The grammar of the question demands a search for a singular something that it is like to be a bat, or a rhinoceros, or a human – it's like *this*' (Lloyd 2004: 228; original emphasis). Lloyd's use of the words 'mystery' and 'search' here mean that counterintuitively, consciousness is not at all self-evident or well-known. It requires patient investigation. Much better known is the reassuring figure of the detective, put on the case to seek out the mystery's solution.

However, two provisos qualify this. First, as Lloyd points out, trying to answer 'what-it-is-like' questions with a neat, self-enclosed 'like *this*' makes the vast complexity of consciousness into a singular monolith. Capturing the essence of 'this-ness' with authoritative finality is therefore an unrealistic, mammoth task for Lloyd, and he instead advocates compartmentalizing the science of consciousness in order to systematically analyse elements of its structure. And as a corollary, Lloyd seems concerned that taking down the consciousness monolith by oneself puts too much pressure on the capacities of a would-be detective-cum-scientist working alone. He does not avow this outright but it is implicit in the decision to distribute his thought almost equally across fiction and science-writing in *Radiant Cool*. In addition, after the fiction is over and Lloyd discusses the 'detectorhead' notion he sees as central to cognitive science, he concludes the following:

Where there are brains, there are detectors, and cognitive science is hard at work to describe them. [...] But the question here is whether detection turns out to be a useful concept in the pursuit of consciousness. I think not, [and] hope to embark on consciousness science, a *new* science, as it could look after we set aside detection.

(Lloyd 2004: 239; original emphasis)

'Detection' can mean more than one thing here. Lloyd's fundamental claim is that descriptions of cognition do not necessarily translate well into descriptions of consciousness, and so the detectorheads concept, starting with sensory 'detection' and passing upward to brain processes, needs to be 'set aside'. But less innocently than first appears (given that he says consciousness is under 'pursuit', as if it were being tracked down by the police), by using detection against itself and then rejecting it, Lloyd taps into that tradition of detective fiction which brings itself into question.

This tradition arguably goes back to the genre's inception and codification in Poe, but a more recent example has already been mentioned – Auster's *The New York Trilogy*. As much as detective stories offer a seductive explanatory ideal, the ultimate problematic of detection as a guiding force for cognitive/neuro science is highlighted in literary self-questioning. This is embodied in works such as Lloyd's and Auster's, wherein naming and identification make detective work look like it approaches solubility briefly, before actually shooting away chaotically. Indeed, David Lodge writes that 'in a novel names are never neutral. They always signify, if it is only ordinariness' (Lodge 2011: 37), or as literary scholar John Sutherland puts it, with a somewhat more psychological bent, 'names have values embodied in them. They carry baggage' (Sutherland 2000: 619). Lloyd is evidently aware of the power of naming, displaying this in a multifaceted way. As has been discussed, the perceptiveness of Miranda Sharpe is tied to her surname, but when she does need help, she turns to 'Dr Clare Lucid, shrink to the stars and occasionally to pathetic graduate students' (Lloyd 2004: 26); the doctor is so insightful that Lloyd names her twice for her clarity and lucidity. He goes yet further with the central figure of mystery in the story, Sharpe's vanished graduate school advisor, Professor Max Grue – 'grue' being a reference to philosopher Nelson Goodman's proposition of a "new riddle of induction." The "grue-bleen" paradox, as it is better known, challenges our thinking about categories [and so] "Grue" can be defined in English as follows: If something is green before midnight, December 31, 1999, and blue thereafter, then it is grue' (Poundstone 1991: 45–46).

Popular science author William Poundstone relates that by 'challenging our thinking about categories', Goodman's intention is to problematize the principles of logical or scientific induction, the net result being that 'by suitable choice of terms and zero hour, *anything* confirms that it will be *anything* else at *any* later time' (Poundstone 1991: 46; original emphasis). 'Grue' means that naming something does not guarantee its consistent identification on the mere basis that it had always been a certain way before, and Lloyd's playful naming strategy for a pivotal but absent character draws on this notion. Lloyd later extends this sceptical stance on nomenclature when more seriously discussing detection, naming and the brain: 'Cutting the cords of detection overthrows just about everything. All of the components, from neurons on up, have long been identified through their function in a detectorheaded, information-processing system. [...] Now I'm suggesting that all those identifications are irrelevant, the nice labels merely confetti' (Lloyd 2004: 246). To demonstrate the scramble for the comfort of understandable (but essentially arbitrary) names engendered by disavowing detection-metaphors, Lloyd points out that

the names still in use for many parts of the brain originated [with Renaissance anatomists], and the computational neuro-anatomist Christopher Cherniak has translated them [from Latin]. With Cherniak's help, we can see the brain through the anatomists' eyes: [...] 'seahorses, snails, shells,

worms; almonds, olives, lentils; breasts, buttocks, teeth, [...] spiderwebs, nets, [...] chandeliers, cushions, [...] fires, mosses, glue.'

(Lloyd 2004: 246)

The list is much longer than this, but the sample from Cherniak shows the widespread necessity for the explanatory sanctuary of known items in the face of early modern ignorance about the brain. Nevertheless, the point is that parts of the brain may be named so, but they are not in actuality snails nor chandeliers nor moss.

And neither are brains detectors nor neuroscientists detectives, however theoretically useful such ideas may be. This is because neuroscience finally rests on a desire to describe something real and present which it thus necessarily presupposes,³⁵ while detective fiction just as often shows that underneath such a presupposition there is nothingness. Just as Lloyd and Auster lose their 'real' selves in the arbitrariness of naming fictional characters after themselves, neuroscience as pure detection risks debunking a myth of self that neurological narrative line-walkers such as Oliver Sacks have fought so hard to restore in the medico-scientific context. Moreover, taking metaphors of detection too far could conceivably be dangerous; to think of detection as equivalent throughout the body implies a devaluation of the senses and perhaps of any part that is not the brain – after all, why not cut to the chase of the final link in the detectorhead chain? Thus one gets the warning signs of just such a conclusion from fictional works, in examples like the 'adapted [...] stereotactic neuroradiosurgical device' 'called Marionette' (Bakker 2009: 352) which the titular *Neuropath* in Bakker's story uses to manipulate his victims into nastily maiming and killing themselves; or the less severe but nevertheless remarkably similar 'transient lesioning machine' in *Radiant Cool*, luckily a 'pure fiction' which Lloyd employs to contrast with the 'genuine and authoritative [neurological] discussions [of] A R Luria, and Oliver Sacks' (Lloyd 2004: 334).

'Marionette' and the 'transient lesioning machine' are newly invented coinages redolent of science fiction; the bizarre novelty of bypassing non-cerebral bodily functions has always implicated the problem of naming, and rears its head in 'The Immortals' by H Bustos Domecq. Here, the part-comical, part-menacing Dr Narbondo tells the author-narrator about his business plan to mechanically extend the life of his client-patients:

None of your philosophical niceties here; the body can be vulcanized and from time to time recaulked, and so the mind keeps going. Surgery brings immortality to mankind. Life's essential

³⁵ As Lloyd puts it in the very book he is describing, 'Throughout *Radiant Cool*, fictional and real characters share a common quest for a scientific theory of consciousness, an account that will embed consciousness in nature as it is known through science' (2004: 329).

aim has been attained – the mind lives on without fear of cessation. Each of our immortals is comforted by the certainty, backed by our firm’s guarantee, of being a witness *in aeternum*. The brain, refreshed day and night by a system of electrical charges, is the last organic bulwark in which ball bearings and cells collaborate. The rest is Formica, steel, plastics.

(Borges and Bioy Casares 1982: 138)

The issue of naming here is in the author himself, who is placed into the narrative à la Auster and Lloyd, but who had no original ‘reality’ as a person: H Bustos Domecq is a fictional detective writer, invented as a cipher by Jorge Luis Borges and Adolfo Bioy Casares to revel in the limits of the genre they both loved so much.

Further anxieties abound at the nexus of naming, detection and their joint failure. Bustos Domecq’s purpose in ‘The Immortals’ is to draw parallels between Narbondo and the intriguingly named amateur surgeon Guillermo Blake, the latter of whom ‘concludes that the five senses obstruct or deform the apprehension of reality and that, could we free ourselves of them, we would see the world as it is’ (Borges and Bioy Casares 1982: 134). This leads Blake to experiment on his own son and ‘anesthetize him for life, [...] to emancipate him from the senses [to] make the chosen one unaware of his own body [and cut him off] from all human contact’ (Ibid.). This horrific experiment is uncannily similar to another in *The New York Trilogy*, where Auster describes the cruel experimental upbringing of Peter Stillman, also at the hands of his father: ‘An entire childhood spent in darkness, isolated from the world, with no human contact except an occasional beating’ (Auster 2011: 27).³⁶ Stillman is severely marked by this treatment and finds it difficult to maintain a coherent line of thought. He repeatedly remarks to protagonist Quinn (who is masquerading as the fictional detective ‘Paul Auster’ himself) that Stillman’s name is not his own, perhaps because he shares it with his father and associates it with torment, but also with an unintelligible plurality: ‘Strange, is it not? That two people can have the same name? [...] We are both Peter Stillman. [...] So perhaps I am not Peter Stillman after all’ (Auster 2011: 18).

³⁶ Not quite in the same league, but of a perhaps disturbingly similar ilk are experiments done by founding behaviourist psychologist John B Watson: ‘In the fall of 1916, inspired by the thirteenth-century experiments of the Holy Roman Emperor Frederick II, Watson started experimenting with babies. According to legend, on the instructions of the emperor, several babies were nursed on an island, where they were exposed to no language and no culture, to see how they would turn out. The babies not only failed to speak Greek or Hebrew, as had been hoped, but they all died. Social scientists typically rued the impossibility of conducting any such human experiments themselves, but Watson went ahead. [...] The tests were done in a breathtakingly straightforward manner, considering the tender ages of his research subjects: Present a burning candle to a curious infant and see what happens, and how many times it happens. Introduce different animals and ascertain whether the infant fears them naturally or only after repeated traumatic experiences. Make a hissing noise; observe results’ (Lemov 2005: 40–41). These tests inspired by legend are amongst several disquieting practices of twentieth century psychology, brazen enough to act despite ethical quandaries because ‘the point of behaviourism was not to lose oneself in mazes of theories [but] to *act* in the world’ (Lemov 2005: 40; original emphasis). More on ‘mazes of theories’ and theories of mazes in the next chapter.

Quinn later looks up cases similar to that of the Stillmans throughout history, and this leads him to Stillman senior's academic work on John Milton's *Paradise Lost*, in which the scholar had identified that 'each key word has two meanings – one before the [Biblical] fall and one after the fall. [He] showed how their prelapsarian use was free of moral connotations, whereas their use after the fall was shaded, ambiguous, informed by a knowledge of evil' (Auster 2011: 43). It is this moral ambiguity that leads Stillman senior to lose his mind and try to prevent his son from learning a corrupted, bedevilled language. This is because Adam's naming of things in the Garden of Eden had 'literally brought them to life. A thing and its name were interchangeable. After the fall, this was no longer true. Names became detached from things; words devolved into a collection of arbitrary signs; language had been severed from God' (Auster 2011: 43). Quinn's reading of Stillman senior only drags him into the madness exhibited by the object of his research; studious investigation of names is shown to be no guarantee of protection from their negative effects. As Lodge states,

in all three stories [of *The New York Trilogy*] the impossibility of pinning the signifier to the signified, of recovering that mythical, prelapsarian state of innocence in which a thing and its name were interchangeable, is replicated on the level of plot by the futility of the routines of detection. Each narrative ends with the death or despair of the detective-figure, faced with an insoluble mystery, lost in a labyrinth of names.

(Lodge 2011: 40)

Indeed, an 'insoluble mystery' and a 'labyrinth of names' is perhaps the only fate awaiting neuroscience if it leans too heavily on the detective trope.³⁷

I do not agree with Lloyd that the neurocognitive deployment of detection ought to be completely whitewashed, but think more that any lessons or warnings gained from detective fiction must be taken along with its more productive and inspirational aspects. Neurology and detective fiction share common roots in the mid to late nineteenth century and in this respect they are both representative of fledgling Western modernity. It is unsurprising, then, that early on they also freely shared ideas across porous boundaries. For example, literature and neurology scholar Anne Stiles comments that, 'like late-Victorian cerebral localization theories, phrenology was often explored and exploited in [fiction]. Edgar Allan Poe critiqued phrenological theories in

³⁷ Indeed, as philosopher of science Ian Hacking notes, the supposed cultural gap between dichotomized entities such as science and literature often gets played out as a rehash of the age old metaphysical debate between realism and nominalism (Cf. Hacking 1999). Roughly, this is to say that one side contends that there are real things in the world which are then given names (realism), whilst the other side says it is only the names and the way they interact that exists (nominalism). Neuroscience is barred from any meaningful self-analysis if it thinks and acts as if it were solely realist, and disavows its nominalist complexities.

short pieces [...], while employing phrenological description in detective stories' (Stiles 2012: 11). Poe, commonly acknowledged to be the initiator of modern detective fiction, was even-handed with his use of such early localization theories, 'exploring' whilst 'exploiting', 'critiquing' whilst 'employing'. Additionally, as shown above, ever since Poe detective fiction has also been willing to self-critique and self-ironize in order to avoid simply taking its own tenets for granted. However, as neurology and detective fiction developed into and beyond the twentieth century, there has been no such even-handedness in return from the neurological sciences, nor any similar self-critique. This uneven distribution of respect between sibling discourses could be pernicious to neuroscience's image of itself as a progressive and moral bastion of truth.

This is especially so if all it does is seek this abstract truth at the expense of the self, and the materialist logic of 'Marionette' and the 'transient lesioning machine' become realities – because so long as the structure and functioning of the brain are known in ever greater detail, why bother attending to the messy problem of the person attached? Such an admonitory view is corroborated by literary critic John T Irwin:

In creating the detective story, Poe produced the dominant modern genre, [...] preeminently the genre of an age dominated by science and technology, an age characterized by mental-work-as-analysis. [...] From psychoanalyst to literary critic, from particle physicist to diagnostician, the most (self-)satisfying description of what one does (and thus what one is) seems to fall naturally into the scenario of a knotty problem and its solution – the patient amassing of clues, the false leads, the painstaking analysis, and the ultimate triumph – culminating with the observation (hopefully made by someone other than oneself), 'Why, you're really more interesting than you look. In fact, you're like a detective.' But we should note that in creating the detective story Poe also gave us a cautionary tale about the mastery of mind and our modern scientific world. [...] And Poe turns the detective story into such a cautionary tale by setting as the task for the mind's exhibition of its mastery the analysis of its own structure.

(Irwin 1994: xvi–xvii)

Analysing the structure of the mind with the mind itself is a convoluted prospect, which, if it is to truly *be* more 'interesting' than it 'looks', needs to do more than simply 'exhibit its mastery' at the cost of all else. In effect, it could learn this from the detective fiction which it has taken as its basis in other facets.

If no such further learning from the genre is possible, then the mysteries of the brain may be gradually solved, but will result only in Lodge's 'labyrinth of names' – this is to say, all aspects of the brain will be known and neatly labelled, but no-one will know anything about who they are, how to behave, or what to do with themselves. The complexity, confusion and meaninglessness of such a labyrinth would be supreme. This chapter has attempted to show that

the complexity of a trope such as detective work needs to be fully explored rather than only partially, if it is not to lead to such an abyssal scenario. It is fitting that this scenario can be described as a labyrinth, because the next chapter will address the incredible complexity of mazes and labyrinths. These have also served as a metaphorical spur to action in neuroscience, typified by the physical resemblance of the cerebral convolutions to the twists and turns of a labyrinth, not to mention the extensive use of mazes in neuropsychological research. However, whereas detective work is a process likened to neuroscience, and therefore neuroscientists are detectives, the next chapter will suggest an added layer of convolution. It is not only the brain that is labyrinthine, but brain science itself as well, shifting the argument from relatively straightforward epistemological detective-like activity, to a metaphorical blurring of epistemological and ontological endeavours, an accretion into activity-as-material-object. Forbiddingly complicated as this is, neuroscience has sought to reduce such a picture of its workings by claiming to map the brain, the map metaphor supposedly serving as a guide and a comfort. But as with the disavowal of aspects of detective fiction, this reduction merely amplifies the complexities rather than curbing them. When it comes to discussion of labyrinths, maps and brains, it is worth 'following the convolutions of their individual arguments, [thus] isolating a thread that runs through all three, a clue to conduct us through labyrinthine passages' (Irwin 1994: 3).

Convolution 3:

Labyrinth

The words flash before the reader's eyes: the interior and exterior spaces of the Labyrinth collapse into one another as each narrative inevitably folds back upon itself. Utopia remains a narrative fragment, an ephemeral collection of sights and sounds and gestures that takes place in the distended present of text.

(Hollings 2014: 145)

Before the labyrinth of the brain [...] we are like those thieves who know all the alleys of Paris as well as the back of their hand, though ignorant of what is going on inside the houses.

(Richerand 1801; cited in Pogliano 1991: 147)

With its convoluted twists and turns, the surface of the brain appears to be a maze seen from above. Accordingly, this labyrinth is best navigated (and indeed mapped) by cognitive/neuroscience; the currency of these scientific efforts means that previous attempts to reach the truth at the centre are revealed as fruitless and valueless. However, if the brain is a labyrinth as neuroscience deems it to be, then so too is brain science itself. From mind maps to rats in mazes, neuroscience (as well as its history) has been infected by the labyrinthine nature of the object it seeks to explicate, a challenge to simplistic notions of interiority and exteriority. Even the difference between mazes and labyrinths is obscured by the complexity of the matter, and this chapter begins by attempting to untangle this difference (if one even exists anymore). As the chapter progresses I suggest that, where the reductive aspects of the concept of mapping fail to deal with the complexities of labyrinthine thinking in neuroscience, the multifaceted and longstanding engagement with mazes and labyrinths in literature is better served to deal with such problematics, and this is typified by the works of Jorge Luis Borges, amongst others. The chapter draws to a close by discussing how the literary and the neuroscientific labyrinths might be reconciled and even synthesized, via a reading of the work of Douglas Hofstadter. Thus, continued literary analysis and theory of the figure of the labyrinth is still necessary to demystify, reinvigorate and furthermore celebrate the complexity of that same figure, especially with regard to its contemporary relationship to the brain and the study thereof.

Mazes, Maps and Minds: The World as Labyrinth and Laboratory

This chapter will focus on the motif of labyrinths and mazes. However, stating this straightforwardly like this masks some complexities. I have written that the motif is singular, yet the concepts comprising the motif appear to be plural. ‘Labyrinth’ and ‘maze’ are essentially synonymous terms and they will be treated as such in this chapter (more on this later). Yet they are still two different terms, a situation requiring clarification. Already, thinking about labyrinths and mazes is revealed to be in itself labyrinthine; in other words, and as per the second sense for ‘labyrinthine’ given in the *OED*, thinking about labyrinths and mazes is ‘intricate, complicated, involved, inextricable’. So before going too far down what might turn out to be a blind alley, some definitions and examples of use are in order, as points of reference for the discussion to follow. First, and turning back to the *OED*, it is necessary to point out straight away that both the noun ‘labyrinth’ and the noun ‘maze’³⁸ include each other several times over amongst their respective lists of definitions. This reciprocal definition would tend to suggest the synonymy of the two terms. However, there are indubitable variances and nuances in meaning and use in both of these originally medieval words’ extensive entries.

Mentioning the very first sense in each dictionary entry will suffice to illustrate the point. For ‘labyrinth’, this is as follows: ‘A structure consisting of a number of intercommunicating passages arranged in bewildering complexity, through which it is difficult or impossible to find one’s way without guidance; a maze.’ Salient here, other than the already remarked use of ‘maze’ as a defining term, is the connection between a physical ‘structure’ and the ‘bewildering’ feeling of needing ‘guidance’. A labyrinth in this sense is experienced as confusing, but is still primarily a material structure, a constructed, physical thing. By contrast, the first overarching definition of ‘maze’ asserts that it refers to ‘A state of mental confusion, and related senses’. Any semblance of physicality is here succinctly dispensed with, and remains so in subsidiary senses in the *OED*’s entry, up until the second overarching meaning is given as ‘A labyrinth, and related senses’, whereupon the notion of a physical structure is first mentioned in a subentry.

What this slight distinction between definitions seems to suggest is nevertheless something that is common to both labyrinths and mazes: that they are both somehow physical and mental instantiations of perplexity at the same time, a meeting point of the literal and the

³⁸ The *OED* lists a separate, second noun ‘maze’, which refers to the lair of a hare and has no example of usage since approximately the year 1740. Though interesting in its warren-like associations, I am taking it to be obscure enough a meaning to disregard in the body text here.

figurative experience of confusion. If anything, the minor emphasis the *OED* implies is that ‘labyrinth’ starts off as a structure and becomes a symbolic figure, while ‘maze’ begins as a state of mind which is eventually cemented as a material construction. In essence, mazes and labyrinths are ambiguous in this important way: they are simultaneously and undecidably the tangible manifestation of a metaphor and the metaphORIZATION of a built environment or space. In either case, what lingers in the ambiguity is the sensation of bafflement which requires ‘guidance’. To get to a better distinction requires the consideration that bafflement might not actually be undesirable. In the following quotation, maze and labyrinth expert Jeff Saward notes the cultural specificity of just such a consideration:

Throughout much of the non-English speaking world, practically every maze [...] would be called a ‘labyrinth,’ for the word ‘maze’ is a peculiarly English word of medieval origin that refers to a state of confusion, from which the term ‘amazed’ is derived. To be confused, let alone amazed, there must be some element of choice in the pathway that you are following, some opportunity to become bewildered. Many current writers, designers, and commentators within the field have this as a point of definition: to qualify as a maze, a design must have choices in the pathway. [Conversely]: to qualify as a labyrinth, a design should have but one path.

(Saward 2002: 8)

Saward’s observation suggests that if mazes can be designed to amaze (or simply confuse), then labyrinths can be designed to guide. So if many people think of a maze as a puzzle designed to challenge and amuse, if not to befuddle, then describing a labyrinth as a map could be equally as valid.

Unpicking this cartographic idea benefits from a distinction, as many have drawn, between a helpful, orderly labyrinth and a hindering, chaotic maze. This dichotomizes something that facilitates location and something that wilfully prevents it. However, in his pioneering study of mazes and labyrinths (first published in 1922), W H Matthews resists just such a distinction:

What is the difference, it may be asked, between a *maze* and a *labyrinth*? The answer is, little or none. [Though it] would certainly seem somewhat inappropriate to talk of ‘the Cretan Maze’ or ‘the Hampton Court Labyrinth,’ [...] generally speaking, we may use the words interchangeably, regarding ‘maze’ as merely the northern equivalent of the classical ‘labyrinth.’

(Matthews 2003: 1–2; original emphasis)

Matthews reaffirms Saward’s position that a maze might merely be a cultural variant of a labyrinth, this time a more generally ‘northern’ (and presumably more recent) phenomenon than that of the ancient Cretans and the myth of Theseus and the Minotaur. Despite recognizing this

view, and in fact noting that the interchangeability of labyrinths and mazes may be extremely old, David Willis McCullough writes that in more recent times such a distinction has still been handy:

A labyrinth is a single circuitous path that leads uninterrupted to a centre, while a maze is a puzzle with many forks in the road that demand choices. [It is possible] to think in terms of the single-path, nonjudgmental labyrinth versus the tricky, perhaps entrapping maze. A labyrinth appears on one of the oldest minted coins, and it might be useful to think of the labyrinth and the maze as the heads and tails of a coin, the rather solemn labyrinth (heads, of course) and the raffish, devil-may-care maze. It would be a mistake not to consider them together. To maintain, as some have, that the maze is a frivolous distraction from a more serious subject is to miss the complexity – and the ambiguity – of a labyrinth.

(McCullough 2004: 3–4)

Similarly, social theorist Jacques Attali writes that the cultural dissolution of the solemn labyrinth into the mere entertainment of the maze – where the former had been ‘reduced to an ironically playful challenge, and entirely erased from the paths of wisdom’ (Attali 1999: 39–40) – served a certain historical, ideological purpose which Attali claims is nevertheless being challenged in the modern day.

This tallies with Saward’s view that a recent spike of interest in mazes and labyrinths, starting in the 1970s and continuing into the present day, reflects an increased demand for leisure activities, ironically coupled with a need for the certainty of a surer path in troubled modern times (Cf. Saward 2002: 11–12). Either way, as McCullough suggests, to distinguish between mazes and labyrinths does not mean that they cannot be spoken about together in a meaningful manner. Indeed, the difference between them does not preclude this but rather suggests it, because as the discussion in this section so far has shown, there is even ambiguity about their ambiguity, and any claim to a settled definition for either term only reiterates their potential interchangeability and complexity. As Saward concludes despite his own clear distinction, ‘the dividing line between what constitutes a maze or a labyrinth can sometimes become blurred and difficult to define’ (2002: 8).

Turning, then, from fuzzy definitions to concrete examples of use, I would like to take McCullough’s advice and ‘think of the labyrinth and the maze as the heads and tails of a coin,’ only with a slight inflection on his metaphor; that is to say, the terms themselves will be treated as largely substitutable, but in the context of heads and tails, brains and stories, minds and narratives. In order to do this, here are some preliminary examples of the words in action. Beginning from the top, at the height of hyperbole, William Poundstone writes: ‘The world is a labyrinth of madly interlocking connections and relationships [and this description typifies] a fundamental and universal kind of problem – one rich in practical and philosophical significance’

(Poundstone 1991: 162). Here, the labyrinth is representative of the entire ‘world’. The comparison emphasizes how things within the world connect and relate, much like passages and nodes in a labyrinth. However, this focus on structure in the world – though ‘fundamental’, ‘universal’, ‘practical’ and ‘philosophical’ – is still somehow ‘madly’ complex, a matter of mental confusion. In the case of the ‘world’, for Poundstone, the labyrinth is no guide at all, but a marker of puzzlement, and however useful, a ‘problem’. Contrastingly, there is an effervescent positivity in the words of an anonymous writer in *New Scientist*: ‘The human brain is a fantastic maze of connections, a vast network of networks that circulates information and determines how we think and act. One of the many big puzzles left in neurology is working out which parts of the brain are connected – and how the networks function’ (‘Connectome’ 2005: 62). As in Poundstone, the focus is again on ‘connections’ and the implication that these are immense in quantity. However, the scene of these connections in the latter quotation is of a much more limited scale, this time down from the whole ‘world’ to just ‘the human brain’. Puzzlement is also now mitigated by a sense of wonder – the ‘fantastic maze’ is an opportunity rather than merely a problem.

Still, the puzzles ‘left in neurology’ are ‘many’ and ‘big’, and one ponders how correspondingly vast a field must be that has as its object a ‘vast network of networks’ like the brain and nervous system. Compare this to a yet larger field, the one in which neurology ultimately rests, and things start to be truly perplexing once more: ‘Science is a labyrinth built of questions, and a single researcher is able to creep down only a few passageways in his or her lifetime (and only a short distance in each one)’ (Davidson 2003: 87). Here, ‘science’ itself is a labyrinth, a labyrinth that must contain neurology, which in turn studies the brain, which is itself structured like a maze, which is mentally confusing and problematic and leads to questions – which, as journalist Osha Gray Davidson evocatively writes in the above quotation, are the very building blocks of the labyrinth that is science. Davidson’s question-labyrinth cannot just be entered and explored at walking pace – for some reason, it requires slow ‘creeping’, even the traversal of a ‘short distance’ taking up a fair proportion of the ‘lifetime’ of a ‘single researcher’. In opposition to the labyrinthine optimism of the brain as connectome in the *New Scientist* article, Davidson paints a picture of a dark, subterranean maze, where scientific knowledge lies murkily in potentially unreachable corners. As will be shown, perhaps this picture is too bleak for Poundstone, who counters his own assertion that ‘the world is a labyrinth’ by claiming that ‘science is a map’, so that if the ‘interlocking connections and relationships’ of the world seem intractably maddening, science can serve to escort one through its convoluted corridors.

Thus Poundstone, after an appropriately maddening, supposedly mind-cleansing detour through paradox and alternative logic (such as in the works of Jorge Luis Borges), offers an equally appropriate but contradictory doubled locus: the brain in science and science in the

brain.³⁹ Poundstone then relates both to mapping, and though oxymoronic – one thing being located/contained in a second which is in turn located/contained in the first – it is a logical corollary of the physical basis of thought:

[Pioneering neurosurgeon Wilder] Penfield's experiments demonstrate that memories occupy *engrams*, specific physical sites in the brain. [...] These brain sites may wander and interpenetrate, and the whole story about how memories are stored and recalled is probably a lot more complicated than we can imagine today. That granted, engrams are not infinitely small [and each] mental representation [...] occupies a part of your brain's storage capacity that cannot be occupied simultaneously by anything else.

(Poundstone 1991: 19–20; original emphasis)

The reason that geo-cartographic metaphors of 'sites' seems so natural in instances like this is that the topic boils down to cerebral localization, a long-sought goal going back to the pseudoscience of phrenology (whose dubiousness does not detract from its historical, neurological importance).⁴⁰ Definitive physical localization of mental functions is a double-edged sword, however: not only does Poundstone draw attention to the undoubted complexity of memories (as one example of mental processes) that 'wander and interpenetrate,' as he so vividly puts it, but knowing where a 'brain site' is means it has a size, a certain proportion (at least 'not infinitely small') of the space taken up by the whole brain. This is problematic because it both reduces the whole world (including one's head) into something that can fit in a head, just as it also enlarges the traditional immateriality of mind or mental processes into something with a definitive mass, at least larger than 'infinitely small'.

Poundstone qualifies this by highlighting that representations in the brain are therefore not 'scale models' without any flaws, but that in fact 'these models must leave out much detail. [...] There is no way a human brain can contain representations of everything in the world' (Poundstone 1991: 20).⁴¹ Considering that one component of the world requiring representation

³⁹ This resonates with Ortega and Vidal's formulation of 'Brains in Literature/Literature in the Brain' as mentioned in *Re(con)volution*, the introductory piece to this thesis (Cf. Ortega and Vidal 2013).

⁴⁰ Indeed, Thomas F Gieryn writes that 'some of [phrenology's] claims are now authoritatively encapsulated in scientific facts about, for example, cerebral localization. Phrenology has become both science and pseudoscience, both truth and error' (Gieryn 1999: 121).

⁴¹ Contrariwise, some have controversially claimed that 'there are more possible connections between the neurons in a human brain than there are atoms in the universe' (Lodge 2002: 7–8; also, Cf. Smith 2005). Debate on this has mostly focussed on the appropriate definition of the words 'possible' and 'connections', or whether or not the statement has any value regardless of its verification. In any case, 'everything in the world', as Poundstone puts it, would certainly be less than either atoms or potential neuronal connections if taken concretely to be something that takes up space in the universe – but representations, amongst umpteen other abstract concepts that arguably form part of the world too, are perhaps infinite. So Poundstone may be right – but that is only if one accepts the metaphorical blend that anything can ever 'contain representations'.

in a given human brain is specifically that brain itself, it is important exactly which ‘details’ are kept or left out in these metaphorical models: ‘That our brains work as well as they do indicates that they are selective in what they retain. The primary tool for condensing the complexity of the world is generalization. [...] Science is a conscious and collective way of simplifying through generalization’ (Poundstone 1991: 20). How the brain is represented in the brain is generalized with the tool that is science – but this tool is also in the brain, and this means Poundstone’s metaphor for the situation convolves in a labyrinthine way: ‘Science is a mnemonic device. [...] It is a map of the external world. Like any map, it omits detail. Small towns, trees, houses, and rocks are left out of road maps to make room for highways, coastlines, national boundaries, and other features judged more significant to the map’s users. Comparable judgments face the scientist’ (Ibid.). Curiously, this paradoxical arrangement, where science is outside the brain but inside it, whilst also outside the ‘external world’ it is meant to be mapping, is part of a larger discussion of paradox in general. The map of science is used to map the brain – which already contains a map of science. The brain thus seems an intractable riddle, and the only clear thing is that something remains to clear up. If it exists, the map is a convoluted labyrinth, with every path forwards somehow bending back upon itself and the goal only feeling further away with every step. To understand the map, one must understand the labyrinth.

Although mazes came to be seen as devices to puzzle and outwit, McCullough nevertheless explains that originally the opposite purpose is equally plausible. He claims that, though still mysterious, some of the earliest labyrinth petroglyphs were likely cartographic: ‘Over the years the map theories have been the most popular, partially because the same images appear on out-croppings hundreds, even thousands of miles apart, as though Neolithic travellers had common symbols to guide them from place to place or to orient them under the stars’ (McCullough 2004: 11). Indeed, it seems that both sides of the labyrinth/maze coin are valid, one side to distract and one to guide. McCullough also speculates on the famous labyrinth of Crete depicted on the thirteenth-century *Mappa Mundi* at Hereford Cathedral. He says that the evolution of church labyrinth design in medieval times was ‘the work of a geometrician’ as ‘the hand that drew it used a compass and ruler’ and therefore ‘could have also been a mapmaker’ (McCullough 2004: 19). This makes sense if one adheres to the mythological sources of the Cretan labyrinth, as ‘after all, according to legend, both the labyrinth and the compass were inventions of Daedalus’s’ (McCullough 2004: 20). Another paradoxical dimension of the labyrinth is thus revealed: Daedalus designed the first famous labyrinth at the behest of King Minos of Crete, and it was built to trap, deceive and destroy those who entered – yet the same

man who created this labyrinth knew how to make it so challenging precisely because he also knew how to measure, guide and set free.⁴²

Feeling both lost and found within the labyrinth, McCullough asks an appropriately self-contradictory question: ‘What is hidden in its well-ordered, seemingly chaotic convolutions?’ (2004: 17). McCullough’s convoluted consideration of an enigmatic ‘well-ordered chaos’ governing the labyrinth is interesting given another pair of contradictory claims. Discussing early peoples’ attempts to depict their geographic environment, to map features of the landscape via spirals and circular carvings, he posits that a ‘labyrinth, of course, is not made of concentric circles with a cup at its heart, and it is not a graceful spiral. [...] That the labyrinth is a created and not a natural shape is important’ (McCullough 2004: 13). This emphasis that mazes or labyrinths are not observable in nature appears at odds with a later statement on how the general shape was spread by humans: ‘One thing seems clear: [...] it seems to emerge naturally’ (McCullough 2004: 17). In both instances, McCullough points out how evident (‘of course’ or ‘clear’) the matter is, conflicting as his views are. Perhaps the two can be resolved if it is simply taken that whether the labyrinth occurs in nature or not, early human communities always somehow found it lurking within the swirling mass of theretofore unexplained and confusing sensory data (to provisionally impose an anachronistic scientism on them) that they encountered in the world.

Attali is far less equivocal in stating (and listing examples of) the occurrence of labyrinthine structures in nature, and despite his protestations, McCullough himself betrays a hidden predilection for this idea in his recourse to the ‘well-ordered chaos’ of the labyrinth. This is because something both ‘well-ordered’ and ‘chaotic’ is not as strange or unnatural as it seems to him, and is certainly evocative of the science of chaos, which as scholars have pointed out, has metaphorically infiltrated discussions in many disparate fields (Cf. Maasen and Weingart 2000: 91–133). Literature and science theorist N Katherine Hayles describes this prevalence evocatively:

the orderly disorder of chaos is all around us, from cream swirling in coffee to the rise and fall of the Nile River, from global weather patterns to outbreaks of measles epidemics. In fact, so extensive are chaotic systems that they dwarf the ordered systems which science has traditionally regarded as norms for the universe.

(Hayles 1989: 306–307)

⁴² Historian Peter Pesic and psychologist Paul Dudchenko both have pictures of compasses on the covers of their respective books – the former’s book being on labyrinthine science and the latter’s on cognitive mapping, and more on both these topics later in this chapter.

Informing Maasen and Weingart's abovementioned focus on the metaphor, Hayles's extended point is that against any received wisdom, chaos is pervasive, both in the natural world and in its representation (in literature, in art, in public discourse, and so forth). When both McCullough and Attali list the symbolic underpinnings of the labyrinth motif in nature, this ceases to be such a far-flung thing and instead seems quite in keeping with chaos, or with the notion of pareidolia – that is, the common psychological phenomenon of compiling bits of predominantly random visual (or aural) information into significant figures, much like seeing shapes in clouds. Seeing labyrinths is natural, so to speak.

So to see them in brains (or brains in labyrinths) is not that far-fetched either, and both McCullough and Attali attest to the consistency of this perception throughout history, part of a wider series of metaphors aligning concepts with biological features and structures. A good pair of examples (which also serves to demonstrate, once more, the entangled relationship of the terms 'labyrinth' and 'maze') comes from as far back as 1615 and Helkiah Crooke's *Microcosmographia*, as quoted in the *OED*. In sense 2a for the noun 'labyrinth', Crooke mentions 'A mazy laberynth of small veines and arteries', while in sense II4b for the noun 'maze', he speaks of 'The Labyrinthæan Mazes and web of the small arteries'. This 'mazy' description of arteries also extends to the brain itself, and the labyrinthine artery which connects blood flow from brain to inner ear, whereupon it 'passes into the temporal bone and supplies the organ of equilibrium' (Hirsch 2000: 68). This latter 'organ of equilibrium' is in a part of the ear also itself sometimes called the labyrinth, and though technically this places a biological labyrinth outside of the brain, it does of course bring an important influence to bear on the nervous system, so much so that in 1825 early neuroanatomist '[Pierre Flourens] suggested that the labyrinthine apparatus exercised a moderating influence on the brain' (Jeannerod 1985: 101).

Moving on from ears and arteries, Attali is forthright about the prevalence of mazziness: 'Everything in anatomy and physiology is labyrinthine. Fingerprints were long ago noticed to be systems of meanders, each of which is unique to one individual [...]. The best current representation of the brain is also a labyrinth where complex information circulates' (Attali 1999: 45). Typically unequivocal in delivery yet rich in potential meanings, he explicitly ties markers of individual selfhood, identifying features like fingerprints and brains, and their encompassing domains of anatomy and physiology. Though McCullough is more circumspect in approach, he still also links disparate biological structures in their labyrinthine nature:

[A labyrinth's] sinuous symmetry reminds some of the coils from entrails of sacrifices studied and poked over by ancient mystics to predict the future. It reminds others of the convolutions of the brain. Indeed a medieval Indian manuscript about the brain is illustrated not with an anatomical drawing but with a sketch of a labyrinth.

(McCullough 2004: 17)

Where Attali chooses to be definitive but general, McCullough takes a more historically contingent tack, reporting on others' reports.

Nevertheless, McCullough later includes a more specific, contemporary example, quoting from a Parkinson's patient on her employment of a labyrinth drawn on the floor for her treatment regime:

Walking the labyrinth one day, she writes, 'I was struck by the observation that the twirls and turns of the labyrinth reminded me of the brain, my brain. If I was walking in my brain, I was wholly part of it and it was part of me. Thus my Parkinson's was part of me, not an external 'It' that had a separate life.' It was a turning point in her being able to live with her disease.

(McCullough 2004: 186–187)

'Turning point' is unwittingly right, each twist and turn walked on the labyrinth providing an enriching, therapeutic reflection on a truly difficult situation; but more than this, this Parkinson's patient avows the undecidable interchangeability of interiority and exteriority, of brain and labyrinth, of self and world. It is one thing to claim 'I am my brain', reducing all of human experience to a comprehensibly physical structure, but it is quite another thing to claim 'I was walking in my brain'. This helpful exteriorization of the brain through use of the labyrinth demonstrates the possibility that the two items, brain and labyrinth, might be complexly coterminous.⁴³

This principle of exteriorization has informed much of the scientific investigation into brain, mind and behaviour. It has necessitated the widespread use of representation, either of the physical structures of the brain, or of the physical substantiation of the interior life of the mind, such as it has been construed or imagined. The former camp includes imaging techniques such as: positron emission tomography (PET); electroencephalography (EEG); functional magnetic resonance imaging (fMRI); or simply anatomical drawings, heuristic devices to study, interpret and predict what happens in an otherwise unavailable, skull-encased organ. In the latter camp are the techniques and devices used to simulate the mind in the world, so as to investigate externally

⁴³ Journalist Mary Eck, ventriloquizing a friend's experience of a stroke, writes of her recovery: 'It's a labyrinth, this path back to myself' (Eck 2000: 25). Here, it is the entire self and not just the brain that is exteriorized, and is characterized in a far less positive fashion. However, return to the self is the result of recuperation from brain injury, and thus a labyrinthine path which leads back to the self is like an accretion of epistemologies (wandering to find knowledge) into an ontology (the object of knowledge, the brain).

Just such a labyrinthine exteriorization of self is difficult to conceptualize, let alone remedy, but can be usefully contrasted with what bioethicist James Lindemann Nelson has described as the 'medical labyrinth' (Cf. Nelson 2003). This view of the complicated and impersonal bureaucracy faced by those seeking healthcare tallies with the narrativized representation of Eck's friend's experience, who is made to suffer almost as much by the medical establishment as by her condition itself. Navigating all these multi-dimensional takes on the labyrinth – interior/exterior, institutional/personal, narrative/medical – may well require an imaginative, dextrous and inclusive interpretation of interdisciplinarity, such as that suggested by literary scholar and medical humanist Stella Bolaki's illuminating recent coinage of 'critical interloping' (Cf. Bolaki 2016).

how organisms react internally. In either camp, however, there is a marked stage of mediation between the object of study (the mind/brain) and its representation; a repeated figural attempt to close this gap has been the labyrinth. The reason that the labyrinth is used so extensively in science, as will be shown below, is perhaps because its metaphorical qualities are both abstract and concrete; a maze has a known physical structure but has extensive and well established figurative connotations too, and in these respects it acts as a way of embodying mind in matter, or vaporizing brain into thought. Not only is this an attempt, successful or otherwise, to bridge that divide between mind and brain that mainstream science has long disavowed; it also complicates the relationship between parts and wholes, or layers of existence and the relative distances between them.

So what is it that actually connects labyrinths with the brain? Are they the same thing? If not, is the brain part of a labyrinth or is it the other way round? Is there any literal or physical link beyond the figurative ones mentioned above? There are a number of possible answers: one is the way that classical antiquity had of describing the ventricular system of the brain as a series of interconnected chambers. For a long time, this system was considered to be where the soul of the individual was housed, and in fact served as an early precursor to theories of functional localization, with each chamber corresponding to a mental faculty (Cf. Clarke and Dewhurst 1972; Clarke and Jacyna 1987; Finger 2000). Neuroscientist Susan Greenfield summarizes the desire to locate the soul thus: ‘The Greek physician Galen (AD 129–199) pointed to a part of the brain that was the least solid, the most ethereal, and clearly discernible to the naked eye. Deep within the brain is a labyrinth of interconnecting cavities, formed during development in the womb and containing a colourless fluid’ (Greenfield 1998: 5). Greenfield covers this as historical background for a description of cerebrospinal fluid, highlighting the early speculation on how personhood, somehow imbued into this fluid, flows through this part of the brain.⁴⁴ Although Greenfield intends to demystify such a theory before passing on to others, she seems to retain some of Galen’s labyrinthine thinking. Greenfield later writes about the development of embryonic brain cells, which form a cylindrical shape in the womb:

It is due to the closed neural tube that cavities in the brain – ventricles – are formed. These ventricles constitute an interconnecting labyrinth that finally opens onto the spinal cord, and through which pores allow for the circulation of the colourless fluid that is going to bathe the entire brain and spinal cord for life. It is this cerebrospinal fluid that the philosopher Galen [...]

⁴⁴ The ventricular system of the brain is not to be confused with the vestibular system, which forms part of the earlier mentioned labyrinth of the inner ear, though I would note in passing that both involve a series of chambers filled with fluid, and as most humans have two ears, if Galen’s view on such fluid were right, it might be possible for every person to altogether have three souls.

had thought many centuries ago was the ‘psychic pneuma,’ the seat of the soul.

(Greenfield 1998: 123)

This account of the cerebrospinal fluid and its movement through the ventricles might have been updated into a more scientific idiom, but the use of the labyrinth as an explanatory image remains the same. Though the discussion has moved on from ancient notions of the soul, the ancient symbol of the labyrinth, which predates the thought of Galen (whom Greenfield first calls a ‘physician’ and then a ‘philosopher’), still informs Greenfield’s modern physical description of part of the brain.⁴⁵

In the above, the labyrinth is inside the brain, formed along with the rest of the foetus in the womb. Compare this with the view of early nineteenth-century physiologist Friedrich Tiedemann, also from the standpoint of developmental neuroanatomy, but different in an important, subtle way: ‘In my opinion the only two paths than can lead to a knowledge of the structure of the brain, but that are still infrequently used, are those of comparative anatomy and the anatomy of the foetus; for [the investigation of] this labyrinth they are like the thread of Ariadne’ (Tiedemann 1826: 4; cited in Clarke and Jacyna 1987: 22). Here, the labyrinth is not a structure *in* the brain, but *is* the ‘the structure of the brain’, with the study of infant and animal anatomy the true way to arrive at the ‘knowledge’ at its centre. It appears it is no longer a question of constituent parts, because the brain is the labyrinth is the brain. The metaphor becomes complicated once again, however, if one notes that neuroanatomy, a type of study of the brain, is considered as part of that same brain – it is one of the ‘paths’ of the labyrinth whilst also the ‘thread’ showing that this path is correct. Tiedemann’s labyrinthine metaphor simultaneously contains and exceeds itself in an overly convoluted way. Perhaps it is better to simply take his advice and fully externalize the problem, by turning to the animal models provided by comparative anatomy, or just the realm of animal experiment in general, as will be considered below.

From Galen to Tiedemann to Greenfield, it appears that maze and labyrinth metaphors have endured well in cultural memory, including in neuroscientific thought. This longevity is intimated by science journalist Emma Weissmann: ‘From myth to movies, mazes are a cultural icon and a powerful tool for studying the brain’ (Weissmann 2014). Contrast this with a different scenario, where instead of the labyrinth’s obduracy across the ages, recollection fails; instead of

⁴⁵ Also, it is of interest that on the header banner of Greenfield’s personal website, there is a small icon next to her picture and above the words ‘Susan Greenfield: Scientist. Writer. Broadcaster’ (Cf. Greenfield 2016). The icon is what seems to be a small yellow cerebrally-shaped object composed of stylized and angled lines which lend it the distinct appearance of a puzzle-book labyrinth. Appropriately enough, wherever one navigates to on the site, clicking on this icon brings one directly to the front page, or ‘home’ – the labyrinth as brain is the familiar turf of a neuroscientist’s headquarters.

mazes in memory, memory is tested in mazes. A prototypical, historical example is summed up by Greenfield:

Psychologist Karl Lashley [...] trained rats on a memory task in mazes, and then removed different portions of cortex to see if he could identify where the memory [...] might be stored. To his surprise and consternation, removal of different parts of the cortex did not result in a precise matching between one specific area and the retention of a specific memory. Rather the more cortex was removed, irrespective of specificity of region, the worse the rats became at the memory task. Perhaps not surprisingly, the entire cortex plays an important role in the storage of memory.

(Greenfield 1998: 169–170)

This, as Greenfield notes, has parallels with the brains of humans, and lessons learned about people's memory from neurosurgery. Lashley's rats stand in for human beings, as it is harder to justify letting humans loose in a maze to study them (though Weismann's above-cited article does suggest this), much less with part of the brain purposely removed to see how memory is affected. But the point is the same – understanding the priority of parts versus wholes.⁴⁶ The ventricular labyrinth is part of the brain, but then rats are let loose in a maze, with different parts of their brains removed – the desire is to see if a missing portion of an internal labyrinth will affect movement through an external labyrinth, which in turn is somehow represented or coded or mapped back onto the internal labyrinth (so long as the relevant portion is not the missing one, which as it turns out, could be any or every portion).

Hence the mapping of the brain onto mazes and labyrinths became equivalent to the mapping of mazes and labyrinths onto the brain – such experimentation 'slipped into society at large and overflowed its bounds, no longer contained or containable in a laboratory. [...] The microcosm became the macrocosm. The laboratory became the world and extended into it' (Lemov 2005: 247; 249). This extends beyond the ventricles in the way that the cerebral convolutions can be described as branches of a labyrinth (for example, as mentioned by McCullough above); but these convolutions spill over from their designated boundaries, forming part of a larger convolution that is their scientific description (just as the convolutions somehow 'contain' both the concept of 'labyrinths' and 'convolutions' in miniature). Interior and exterior dimensions multiply, as one considers together: the labyrinth of the ventricular system deep in the brain; the labyrinth of the convolutions at its surface; outside, studying this, the labyrinth that

⁴⁶ For an excellent, in-depth discussion of parts and wholes, content and form, literature and science, Cf. Rogers 2014. For a detailed technical overview of mereology (the study of parts and wholes) in neuroscience, Cf. Craver 2007.

is science; and as William Poundstone contended, that labyrinth that is the world itself. All of these can somehow, again, be found in the labyrinth that is the brain.

This is undoubtedly a lot to cram into a brain – an entire world which includes that brain itself, in fact – and it is no wonder that if the brain is a maze, it is so because it is bewilderingly easy to get lost in the glut of supposed contents. Poundstone’s idea of a map to guide one through this all is therefore a seductive one. Indeed, mapping the labyrinth of the brain has been the logical conclusion of some, simply by positing thought itself as a map. Behavioural neuroscientist Paul A Dudchenko sums up that ‘the history of psychology is, in part, a history of how rats find their way in mazes’ (Dudchenko 2010: 9), and in his survey of this ‘history of “maze” psychology [he] concludes with a description of [Edward C] Tolman’s influential “cognitive map” view’ (Ibid.). Dudchenko is an expert on memory and spatial navigation, and is right in designating Tolman’s theory as ‘influential’: it forms the foundation of his own work with his colleagues, as well as the equally influential work of John O’Keefe and Lynn Nadel in the 1970s, which posited a material location for such a cognitive map in the brain, specifically in the hippocampus (Cf. O’Keefe and Nadel 1978). It is also evident in the broad current spectrum of flavours of mapping in psychology and neuroscience, from less to more materialist (but all equivalently positivistic), as shown by titles such as *Mapping the Mind* (Cf. Carter 1998) and *Brain Mapping: From Neural Basis of Cognition to Surgical Applications* (Cf. Duffau 2011).

Despite its obvious explanatory power, a cognitive map can be disarmingly simply defined as ‘A mental representation of a portion of the physical environment and the relative locations of points within it’ (Colman 2009: 145). For his own part, Tolman is repeatedly humorous and self-deprecating (perhaps as a rhetorical strategy) in his ground-breaking paper. For instance, he writes: ‘What I am going to say must be considered, [...] simply as in the nature of a *rat* psychologist’s *ratiocinations* offered free’ (Tolman 1948: 207; original emphasis). What is interesting given his title, ‘Cognitive Maps in Rats and Men’, is the distinct lack of experimental focus on ‘men’ or humans, which instead falls squarely on rats alone. Where this influential paper does talk about people is briefly at its start and its end. In the latter, the then barely nascent cognitive maps theory is not employed in the simple sense quoted from Colman above, but instead as an ethical, psychosocial rumination on the future of humanity, which concludes thus: ‘We must, in short, subject our children and ourselves (as the kindly experimenter would his rats) to the optimal conditions of moderate motivation and of an absence of unnecessary frustrations, whenever we put them and ourselves before that great God-given maze which is our human world’ (Tolman 1948: 208). The ‘human world’ is also a ‘maze’ to Tolman, which renders intriguing the opening of his paper, with its description of competing contemporary rat-in-maze theories (and theorists), not to mention his jocular asides about his students working harder than himself. If the theory of cognitive maps is true, then as O’Keefe and

Nadel posit, it is no less true that ‘Scientific theories have been likened to maps. Like maps they provide a means for finding one’s way in an unknown domain. And also like maps, they are a social product, the culmination of considerable effort by a large number of people’ (O’Keefe and Nadel 1978: vii). Amongst these people they mention on the same page are geographers, explorers, surveyors, geometers, draughtsmen and parchment-makers, but they forget to point out that in general, there is often something of the colonial about map-making.

Herein lies the crux of the matter as regards brain science: it is itself the labyrinth it seeks to map; it contains the world it aims to describe, and in which it is itself contained. Brain science *is* the brain, insofar as it is also the brains of those who conduct brain science, an almost unbearably convoluted paradox better served by surrogacy to rats, which can then be generalized to humans, providing mastery over the facts whilst masking the labyrinthine abyss at the centre of the knowledge thus produced. But the problem in such attempts to colonize the terra incognita of the brain/mind is that ‘the promise of liberating oneself by controlling others – by building [maze] structures in tiny rooms – proved elusive [and] experiments rebounded, like some karmic rubber band’ (Lemov 2005: 249). According to historian of science Rebecca Lemov, the (still-current) fashion for testing albino rats in laboratory mazes – and the wealth of subsequent scientific (as well as generally public assumptions) about ‘human nature’ directly linked to such tests – can be traced almost exclusively to the originator of behaviourism, John B Watson.⁴⁷ Lemov affirms:

Watson cemented a specific equation: the activities of animals under experimental conditions were equivalent to human activities under all conditions. Understanding animal behaviour was the key to understanding human behaviour in all its forms, even the ‘highest.’ [...] It validated the use of animals as experimental stand-ins.

(Lemov 2005: 27)

This, of course, is the principle that then permits Tolman to so freely describe himself and his children (and those of others) as rats, as well as extrapolate from his experiments with rats in mazes to humans in the world.

It is the very desire to map from animals to humans that provides for cognitive mapping. But as Lemov observes, it is not just the lab rat as test object that was standardized during Watson’s time (to the point of seeming cliché, or even crucial to any psychological experiment) – it is also the maze itself that became standard. As Lemov writes:

⁴⁷ For illuminating discussions of behaviourism’s interrelationship with literary criticism and with literary modernism, Cf. Gang 2011 and Gang 2013 respectively.

Mazes won out because in a sense they were the most general, the most representative, and the most perfect models available of the original problem situation, life itself. [...] The maze had long stood for the struggle to find one's way when the truth was elusive and the way fraught with monsters and despair. [...] The maze promised a great deal, for it provided the design for the new 'human maze.'

(2005: 37)

In this respect, the title of Lemov's book, *World as Laboratory*, is telling, because her sketch of the human maze based on the rat maze also suggests the laboratory as the design for the world, rather than its reflection. 'Life itself' is the 'original problem' being modelled by the maze. She draws her chapter on behaviourism to a close by writing that this strand of psychology had 'set about changing not only laboratory practices but the ordinary life outside. [...] The maze-running tradition had arrived' (Lemov 2005: 45). However, as people themselves, the behaviourists and the multitudes of brain/mind researchers who have followed them are also subject to the conclusions of their own logic. Lemov states that 'the scientists were also, in a sense, lab animals and human subjects. Although they believed in a firm separation between themselves and those who ran their labyrinthine mazes, [...] in fact such separation never existed. The experimenter cannot be distinguished from the experiment' (2005: 247). In effect, Tolman became one of his rats after all, just as his logic dictated, and the terrain being mapped was exceeded by its representation, or indeed the representation became the terrain being mapped – only with uncanny little versions of the cartographers included in the representation, which of course resembled a labyrinth leading inwards.⁴⁸ It is a situation exemplified by, though by no means limited to, the bizarre literature of Jorge Luis Borges, and how such labyrinthine literature ties in with neuroscience will be the basis of the next section.

⁴⁸ Novelist Thomas Pynchon evokes something almost identical to this sentiment when he writes: 'this lab here is also a maze, i'n't it now . . . behaviourists run these aisles of tables and consoles just like rats 'n' mice. Reinforcement for them is not a pellet of food, but a successful experiment. But who watches from above, who notes *their* responses?' (Pynchon (1995: 229; original emphasis).

Jorge Luis Borges: That Patient Labyrinth of his own Face

At the end of the previous section, I delineated a convolution, a paradoxical way of thinking about thinking which re-enacts in its procedures the problem it seeks to clear up. Roughly recapitulated, science maps the world onto the human brain, the human brain onto the animal brain, the animal brain onto the maze, and finally, the maze back onto the world – or onto life itself. The aim of this process is successful, in a way, yielding a kind of knowledge on which future brain science is predicated and may proceed – but in another way, it ever so narrowly misses its target and veers away unpredictably, leaving psychologists and neuroscientists stranded in tiny labyrinths on their maps of the brain. As Jorge Luis Borges hauntingly phrases it, when ‘a man sets out to draw the world [...] he discovers that that patient labyrinth of lines traces the lineaments of his own face’ (Borges 2000b: 327). Yet cognitive maps and cerebral localization, for instance, are current, authoritative concepts, legitimately part of the neuroscientific edifice despite having labyrinthine foundations, as discussed. Ironically, this is because mapping the convolutions of the labyrinth, a powerful figure borrowed from literature, actually serves to demarcate science from literature and buttress its authority over the nature of the brain/mind in the eyes of society, whether labyrinthine aspects are avowed or not. Sociologist Thomas F Gieryn observes that

people all over learn about science from maps of it. The layered interpretations that surround scientists and scientific facts with a special believability often come in a rhetorical form best described as cartographic. ‘Science’ becomes a space on the maps of culture, bounded off from other territories, labelled with landmarks showing travellers how and why it is different from common sense, politics, or mysticism.

(Gieryn 1999: x)

To this closing list one might easily add literature, and thus I suspect it is cold comfort for scientists trying to locate themselves on such maps that the ‘layered interpretations’ of rhetoric surrounding them offer little insulation against the alienating, confusing chill of the labyrinthine. If ‘people all over’ learn from ‘maps of culture’, then this includes scientists themselves too, and there is therefore no harm in recognizing the contribution and authority of other ‘territories’, especially considering that in science the labyrinth is something that has been steadily assimilated from literature and philosophy since at least the early days of neurology, perhaps before.

The cartographic link between disciplines cannot be underestimated. Thus, Kerstin Pilz

writes that

the reliance of both the scientist and the poet on metaphors as an essential form of representation is a result of our privileging of images as a conceptual means. This practice dates back to the beginnings of thought. One example is the ancients' 'mapping' of the night sky with familiar images as a way of rendering it an accessible surface which mirrored their own terrestrial environment.

(Pilz 2005: 83)

For Pilz, this tradition is exemplified in the modern day by author Italo Calvino, whose interests spanned labyrinths and scientific metaphors in general. Pilz describes how 'the dominant metaphors of knowledge in recent decades have been inspired by game theory [...] and cartography [...]. Both of these metaphors are central to Calvino who employs them as conceptual metaphors as well as actual narrative models. [...] He sees literature as a form of mapping the labyrinth [...]' (Pilz 2005: 84). As has been shown, modern neuroscience also uses this seemingly timeless metaphor of cartography and 'mapping' to speak about the object of its investigations. However, the idea of 'mapping the labyrinth' is just as valid – only with the labyrinth already acting as a map for doing so. The brain is a map used to map the brain is the typically convoluted nature of the logic in play.

This chimerical idea persists because of the modern-day inurement to its antithetical aspects. The labyrinth motif masks its own complexity or self-contradiction, and bizarrely, instead stands in as a paragon of confident stability and order. As science journalist Carl Zimmer writes, this is in stark contrast to the pioneers of what is now brain science, who lived in uncertainty about their place in the universe. They then projected this misgiving onto the anatomical structure they were investigating, so that unveiling the brain would in turn unveil a comforting new cosmological, ontological stance. Zimmer sets up this distinction between eras in evocative, almost poetic language: 'Today, when we look at a brain, we see an intricate network of billions of neurons in constant, crackling communication, a chemical labyrinth that senses the world outside and within, produces love and sorrow, keeps our hearts beating and lungs breathing, composes our thoughts, and constructs our consciousness' (Zimmer 2005: 5). This 'chemical labyrinth' is not a figure of disorientation, but one of well-known terrain, easily navigable and providing a direct link between 'the world outside and within' – the brain's many, varied responsibilities are something simply 'seen' upon 'looking'. By contrast, the heyday of anatomist Thomas Willis's new coinage 'neurologie' in seventeenth-century England is depicted

by Zimmer as far less existentially confident:

Willis and his friends [...] were seeking signs of God's work in a universe that had become terrifying and alien. They were scarred by civil war and hoped that a new conception of the brain would bring order and tranquillity to the world. Their claims were often accepted not so much because they were true (which, fairly often, they were not), but because the world itself had developed an appetite for them.

(Zimmer 2005: 6–7)

Here, the world's hunger is for that very 'chemical labyrinth' which would safely signpost the way from that same world's insecure exteriority to the cosy warmth of the brain's interior.

But if down the years the brain's passage through the labyrinth of neurology has diminished the world's insecurity, this is because the process has obscured its labyrinthine intricacies, covering its tracks as it goes along. Zimmer compares Willis's era with what he calls our own 'Neurocentric Age',⁴⁹ this latter a time 'in which the brain is central not only to the body but to our conception of ourselves'. While Willis's circle of proto-scientists 'created a new way of thinking about thinking,' for all the progress since, our Neurocentric Age still has to contend with many fresh new obstacles: 'The maps that neuroscientists make today are like the early charts of the New World with grotesque coastlines and blank interiors' (Zimmer 2005: 7). Confidence in 'brain mapping' is based on an at best patchy picture. Yet more and more detail is perennially expected of these maps, to an impossibly infinitesimal degree, so that what is charted of the brain somehow comes to exceed what is charted of the world. As Borges puts it in the appropriately titled 'On Exactitude in Science':

In time, those Unconscionable Maps no longer satisfied, and the Cartographers Guilds struck a Map of the Empire whose size was that of the Empire, and which coincided point for point with it. The following Generations, who were not so fond of the study of Cartography as their Forebears had been, saw that that vast Map was Useless.

(Borges 2000b: 325; capitalization from original)

Not for nothing are the adjectives 'Unconscionable' and 'Useless' capitalized along with the more understandably capitalized nouns; the map that strives for direct equivalence with what it

⁴⁹ Though Raymond Tallis rightly points out that in fact cerebral centrality is a much older phenomenon than Zimmer has it, Tallis nevertheless chimes with Zimmer (if much more forcefully) in proclaiming the 'neuromanic imperialism' of the present day (Tallis 2011: 73).

maps gets so huge it comes to be part of that same landscape and thus needs to include itself, becoming unforgivably, uselessly bigger than the terrain mapped.

The conflation of cartographic and labyrinthine idioms, though designed to illuminate and simplify, can have unexpected, complicated, perhaps even dangerous and unwanted outcomes. This is because the measure of control they imply is in the hands of one who becomes lost in the labyrinth being mapped; the authority of a literary author, a scientific investigator or a labyrinthine architect is superseded by the labyrinth itself, producing fear and discomfort. Labyrinth mapping is supposed to provide clarity in shorthand, miniaturizing and making manageable the world; what mapping is not supposed to entail is the undoubted claustrophobia of cramming oneself fully into someone else's head along with the rest of the world one inhabits, as the idea suggests. But following the world as it crams and convolves itself into the labyrinth of the head need not be seen solely as a negative option. For as literary scholar Wendy B Faris notes, the loss within the maze of its own designer offers an opportunity:

Often the wanderer in the labyrinth is also its creator, the prisoner of the labyrinth is also the liberated spirit, the potential victim also the potential victor. The path is at once the means and the end, the voyage and the destination. And like a text, a labyrinth is a half-closed, half-open space, which both reveals and hides, invites entry and prevents easy penetration; like any puzzle, it incites and delays its own solution.

(Faris 1988: 8–9)

And like a labyrinth, neuroscience is as likely to attract attention, as it is to entrap, as it is to emancipate – leaving a scientist, who is a mere mortal after all, to wander about both lost and liberated in his or her own creation, a mapped out version of his or her own aspirations which have exceeded the fleshy bounds of the brain.

Aspirations, brains and mere mortality are all traits that scientists share with every other human, so the labyrinth is traversed and grappled with by everyone, which explains its confusing allure for wide-ranging spheres of society. Faris posits that the labyrinth is so ubiquitous because it has passed into and beyond culture, now actually guiding ways of thinking; it has gone from myth, through literature and art (in all eras, as Faris and Weissmann note), and on into the modes of thought underlying science, amid myriad other cultural practices. Faris writes that ‘the presence of the labyrinth as a significant figure of thought extends beyond literature to other areas of culture, as Umberto Eco has suggested by describing all thought as a labyrinth’ (Faris 1988: 189). Faris also quotes mathematician Pierre Rosenstiehl, saying that the labyrinth also preserves a great variability of meaning, indicating that ‘it cannot have an official function, and that “its role is [rather] to provide a receptive geometry for the spatial vision of the workings of the mind” – a useful formulation of the labyrinth’s cultural function’ (Ibid.). In other words,

labyrinthine thinking is helpful in all ambits because it permits a link between verbal and visual ‘workings of the mind’, giving actual shape to thought whilst also making it easily explicable in words.

The endurance and impressively varied discipline-hopping of maze and labyrinth figures is quite simply built into thought as a ‘receptive geometry’. Faris continues by outlining how this applies to science:

The receptive geometry of the labyrinth is demonstrated in [an] article in *Science* magazine, which claims that our mouse in his maze is the most common form of scientific joke, and thus suggests that our current multicursal, decentred spatial vision of the labyrinth encompasses the process of scientific inquiry as well. This is because it really encodes the design of inquiry itself, of the routes of exploration and error, the experience of taking a wrong turn and correcting it before proceeding forward.

(Faris 1988: 189–190)

This also underpins, she contends, labyrinthine images of computing, diagrammatic associations of forking paths running between some nodes but not others, depending which ‘turn is taken’ at each one; and to update Faris’s late-1980s context, one can now add in the Internet, not to mention computational models of the brain and the supposed binary of neuronal states.

However, if a labyrinth has no ‘official function’ – just like surfing the web can be aimless or pointed – then simply treating it as a puzzle requiring as rapid a solution as possible is only one option. As Faris highlights,

there is an important distinction to be made [...] between the labyrinths of scientific inquiry and the labyrinths of language [in her book], and that is the value accorded efficiency in the scientific varieties. [The] mathematical solution to a labyrinth consists of never taking the road already travelled except as a last resort, when there is no other way. But the repetitions, backtrackings, and alternate paths that intrigue the voyager in literary labyrinths distinguish his journey from the mathematical one, for they induce him to value the journey equally with arrival at its end.

(Faris 1988: 190)

If this were not the case with ‘literary labyrinths’, one could simply turn to the last page straight from the first and thus have the supposed answer – there would be no more efficient way of reading, however insubstantial, valueless or downright befuddling this would be. It is, after all, the ‘repetitions, backtrackings, and alternate paths’ that give a work its colour and make it a labyrinth instead of a straight line drawn between events. Occasionally wandering away from a straightforward, sequential account may take longer, but can be a more interesting way of recounting information, and is what distinguishes a literary labyrinth from a police report or a

railway timetable. Nevertheless, Faris's take on scientific efficiency intimates that science is not always conducted the mathematical way, and can equally involve 'repetitions, backtrackings, and alternate paths' that characterize the opaque quotidian aspects of human scientific labour.

This non-linearity and reversibility is well represented in the relationship of experimenter and experimentee. The life of the rodent destined for the maze in the lab – a creature unlike the morally ambiguous Theseus, who in some mythical accounts of the Cretan labyrinth coldly abandons his saviour Ariadne after their escape – is governed by a different but related ambiguity: that of the simultaneous exteriority and interiority of the labyrinth. The lab maze is exterior whilst the brain and guiding labyrinth of the inner ear are interior to the rodent. As mentioned previously, this ambiguity is exacerbated if the labyrinth is taken to exist as a guiding principle for the experimenter, again external to the rodent, but both exterior and interior to the experimenter (the lab maze and the conceptual puzzle in (or that is) the brain). Again, the experimenter is thus a human mouse in his or her own maze, surrogating the search for selfhood that is brain science to the rodent. Though likely unconscious, this is no accident but a wilful piece of self-fashioning, perhaps even celebratory in its positivism – the comforting, liberating certainty of outsourcing this confusingly reflexive task to an extraneous, observable lab rodent and objectively ensuring the verifiable (or falsifiable) position of the brain-bound self amidst the chaos of existence.

This is the seduction of the labyrinth, counterbalanced by the dismayingly intermittent awareness that metaphorical walls are being raised around oneself as this self-fashioning occurs. It is, again, something prefigured in literary study, itself infected by the labyrinths it seeks to describe. For example, in his introduction to literary critic Northrop Frye's collected notes, editor Robert D Denham writes that

the late notebooks are a kind of labyrinth that Frye is both building and trying to extricate himself from: he sometimes ascends to moments of pure illumination; he sometimes descends into the dark abyss; he often gets lost in the maze; he is beleaguered by false starts and dead ends; he is haunted by a multitude of ghosts that keep flashing across his inward eye, which is clearly not the bliss of solitude.

(Frye 2000: xxi)

Frye himself suggests the labyrinth of selfhood he is in, and locates it in his head: 'I'd like to think (or perhaps only my ego would) that my greater simplicity came from a deeper level than the labyrinth of the brain (Frye 2000: 62–3). Frye's charming but oxymoronic formulation, where physical and psychic parts and wholes undecidably intermingle with unorthodox descriptions of their size, position and complexity, is collapsed in the now standard idea 'the labyrinth of the

brain’ – an expression floating on the taught meniscus of a linguistic-scientific ocean hidden underneath.

To briefly recap, then, neuroscience convolves because its pursuit by sentient, culturally embedded human beings casts doubt on whether it is inside a labyrinth looking out, or outside looking in. Brain science, itself a labyrinth, has as its goal itself, which is why it constantly retains an air of mystery, or paradox; one that constantly demands but blocks investigation of itself.⁵⁰ Similarly, it is fair to say that one cannot look directly at one’s own eyes; use of a mirror, or a photo, or someone else’s report is always distancing and thus always maintains a flavour of otherness. This is reminiscent of the high-sided ‘hedge maze whose available paths were dictated by the rest of the world,’ as described by Douglas Hofstadter (2007: 339), or a maze which models the ‘original problem’ of ‘life itself’, as Lemov puts it. A bird’s eye view is best for appreciating the overall structure but allows no direct experience of actually being in the maze, while the knowledge acquired through being inside can be simply confusing⁵¹ – though potentially exhilarating at the same time. Full knowledge, from outside, is relatively pointless, but inside knowledge is always partial. Thus these two ways of knowing the labyrinth exist in oscillation, moving back and forth between each other. Hofstadter describes it like so: ‘A combination of pressures, some internal and some external, collectively dictates our pathway in this crazy hedge maze called “life”’ (Hofstadter 2007: 339). The labyrinth, cast as life itself, is again maddening. However, given that ‘throughout Western history [the maze] had served as a potent literary and religious symbol of the difficulties of finding meaning’ (Lemov 2005: 37), could looking at labyrinthine literature, for example, usefully harness the push and pull of Hofstadter’s ‘internal and external pressures’? Faris writes about the labyrinth and its history of just such a productive tension in literature – but she could just as well be writing about scientific preoccupation with the brain/mind:

The labyrinthine space is the realm that is always beyond our reach and therefore the object of our desire, our curiosity, our investigation, and it is also, paradoxically, the trace of that very investigation. In a sense, then, it figures both [...] the forward motion of the mind, and the anteriority that is the opposite of that forward motion, but which is often its object; it represents both quest for knowledge and origin of life.

(Faris 1988: 194–195)

⁵⁰ Peter Pesic claims that ‘nature has secrets. This idea is strange, despite its familiarity [and] requires viewing familiar things as if they were strange and questionable. This reflects the emergent character of human thought’ (Pesic 2000: 1).

⁵¹ Lemov claims that ‘since the [rat] “subject” running the maze was a stand-in, a throwaway, the scientist, having stepped aside to look on from above, was now in God’s position: instead of a Seeker in search of meaning or absolution, one had a Scientist in search of mechanism’ (Lemov 2005: 38).

The ‘motion’ of push and pull through the maze is here reconstituted in temporal terms. The complicated sense of time is something Faris says modern writers borrow from the labyrinth’s occurrences in mythology and religion, refiguring it in narrative techniques which disturb straightforward notions of chronology or causality. They may be modern but their concerns are just wanderings down uncharted forks of an age-old maze.

However, Zimmer goes further, narrativizing the enigmatic, labyrinthine objectives of neuroscience, only with a broader, deeper historical remit:

The brain is far more interesting than that. It is a mysterious network, made of hundreds of billions of cells joined by trillions of connections. Somehow it gives rise to our feelings, our memories, and our sense of ourselves. It is not three pounds of perfection; it is the quirky result of billions of years of evolution, and its history is folded into its convolutions.

(Zimmer 2010: xi)

Zimmer’s superficial point is that the human brain is a product of its own ‘quirky history’ of evolution, imperfect among many other examples thereof. But underlying this is the history of how the brain is categorized and quantified, a ‘mysterious network’ enumerated in colossal efforts to understand its vast inner, temporal scale, where ‘billions of years’ and ‘hundreds of billions of cells’ and ‘trillions of connections’ are all ‘folded into its convolutions’. This leaves little space for further numbers or items: ‘three pounds of perfection’ is negated, while ‘feelings, memories and sense of self’ are left ‘somehow’ vague and unnumbered, a minor remainder of the mystery still haunting the unknown, uncatalogued corridors of the labyrinth. If one takes Faris and Zimmer together, a reasonable summary is that the brain, the object of ‘investigation’, is also ‘the trace of that very investigation’ – that the ‘history’ of the brain is also the history of neuroscience, where ‘both the quest for knowledge and origin of life’, the end and the beginning, are ‘folded into its convolutions’.

In this version of things, history and mystery are both folded neatly away into the brain, ready to be put away in one’s pocket, as if it were a portable map of a landscape nevertheless populated by a nigh-infinite number of entities such as those Zimmer lists above. Massively compressing the time between life’s origin, which lies at the start of the labyrinth, and the knowledge at its centre, which is the future goal, the study of the brain is narrativized as an arcane, privileged pursuit reserved for the worthy few. Masking the complexity of this arrangement is achieved by recasting a figure of motion, that of wandering through the labyrinth, as a concrete aim, the labyrinthine brain, underscoring the mysterious complexity of the goal rather than the process of getting there. The way of knowing is hidden behind the thing known, an epistemological journey through passageways blocked from view by the ontological walls themselves. Put another way, the labyrinth, an old but still human invention, is taken as

prehistoric and natural in order to narrate the supposedly secretive mystery of the brain, and simplify the labyrinthine rationale of its investigation.⁵² It is a combination in science of both the detective and the quest trope at once, where there is clearly an adventure of universal importance afoot, but the way to its goal remains utterly shrouded in mystery. Historian Peter Pesic describes this well: ‘The new science turned away from the traditional pursuit of the occult, which repeated old arcana rather than seeking fresh understanding. Nature seemed a labyrinth requiring new heroes capable of finding their way through those unknown, intricate passages’ (Pesic 2000: 3). In this maze-like admixture, the brain is the (unknowable) goal, the way to the goal, the place where the goal is, and, of course, the hero of the piece who is seeking the goal. When confusion like this reigns, ‘maps of science get unfolded and read by those of us not so sure about reality, or about which accounts of it we should trust and act upon’ (Gieryn 1999: x). It is my feeling that maps of labyrinths from literature might serve just as well, if not better, or at least complementarily.

Above, Pesic is writing generally of the historical beginnings of modern science, however literarily he puts it. Yet more contemporary, explicitly literary examples are available, such as in Dan Lloyd’s *Radiant Cool*. At the novel’s apex is its most formally unorthodox section, wherein Miranda Sharpe encounters ‘The Labyrinth of Cognition’. This is a computer program supposed to simulate what the novel calls ‘brainspace’ or ‘mindspace’, described as: ‘The brain from the brain’s own point of view’ (Lloyd 2004: 143). Sharpe experiences the program’s attempted mapping of brain/mindspace via a discussion of her own consciousness and thoughts. This is presented in the book as a deviation from the otherwise standard text-block format, into twelve pages of something between a graphic novel and a data-imaging software package. The reader’s Sharpe-mediated experience of ‘The Labyrinth of Cognition’ is thus multimodal, textually intermingled into the visual, cognitive and phenomenological substance of the section. At one point, in a typical free-floating text box, where who or what is speaking is not entirely clear, it says: ‘I imagined an arrow swooping like a blackbird through the labyrinth. It says, “YOU ARE HERE!” in a point that gets its meaning from the map. The labyrinth was the pattern of all patterns. Out to the edge of being. “You are here.”’ (Lloyd 2004: 139; original emphasis). The map mentioned refers to the computer-programmed 3D map of the contents of consciousness, but is curiously counterpoised with the idea that the contents of consciousness themselves comprise a map – a map that is also a labyrinth. In summary, consciousness is both an

⁵² The title of a book by neurologist Richard Restak, which accompanies a five-part documentary of the same name by filmmaker David Grubin, actually allocates the agency for investigation of such a mystery to the brain itself – it is called *The Secret Life of the Brain* (Cf. Restak 2001). A true instance of convoluted ‘brainhood’ in effect, this implies the brain has its own ‘life’, presumably separate to that of the particular person attached to it, but this life is ‘secret’, and so this means that to solve this mystery, the brain must investigate itself.

internal and an external map, but this map, rather than acting solely as a key to clarify positions, attributes, distances, etc., acts also as a puzzle (which is obviously a commonly interpreted purpose for a labyrinth). Furthermore, whatever the interior/exterior status of this labyrinth/map, it is ‘the pattern of all patterns’, which makes it a (or the) meta-pattern, and ‘meaning’ is contained in or derived from each ‘point’ of which it consists.

With his discussion of labyrinths and patterns of patterns, it is unsurprising that Lloyd makes extensive use of Borges in *Radiant Cool*. Indeed, the ‘pattern of all patterns’ is highly evocative of Borges’s cartographic, labyrinthine ruminations in ‘The Garden of Forking Paths’ (first published in Spanish as ‘El jardín de senderos que se bifurcan’ in 1941). Though brief, the story is an in-depth contemplation of the labyrinth motif, cunningly using the motif itself to do so, a meta-labyrinthine complement of form and content. This is encapsulated by the story’s narrator when he imagines the landmarks of a lost labyrinth melded into the background landscape of the world, a mind-mapped hybrid maze-world which is ‘infinite, no longer composed of octagonal kiosks and returning paths, but of rivers and provinces and kingdoms.... I thought of a labyrinth of labyrinths, of one sinuous spreading labyrinth that would encompass the past and the future’ (Borges 2000a: 48). Indeed, ‘The Garden of Forking Paths’ could be described as this same ‘labyrinth of labyrinths’, an attempt to map a concept which by virtue of attempting to do so cannot help but be labyrinthine itself. It is a form which fuses readers and characters, reality and fiction, in a confusingly entwined geography of the mind. But before unpacking this further, it is worth asking why Borges was at all concerned with labyrinths in the first place.

Even answering this has its unanticipated maze-like twists and turns. Literary and art historian Rex Butler paraphrases Borges’s self-avowed predilection for certain ideas when he writes: ‘Of the “nine or ten words” that got along with Borges’s soul, the word “labyrinth” is undoubtedly the one with which he is most closely identified. It is an association that first begins, for English speakers at least, with the publication in 1964 of *Labyrinths*, which was a collection of stories and essays’ compiled from several other publications (Butler 2010: 16). The first twist, however, is that it was this translated collection (whose title was in turn based on Roger Caillois’s decision to name his 1952 French translation equivalently) rather than any conscious choice on Borges’s part which pulled focus from the many other conceptual spotlights in Borges’s oeuvre. As Butler remarks: ‘It is certainly possible to argue that the international reception of Borges in terms of the labyrinth retrospectively began to affect his work’ (Ibid.). This means that the labyrinth somehow reaches back and insinuates itself into the history of Borges’s output in a way that for Anglophone readers is now irresistibly attached to him, a ‘sinuous spreading labyrinth that would encompass the past and the future’ as mentioned above.

The Borges quotation above (originally from a 1958 translation by Donald A Yates) therefore merits examination, as well as comparison with a different, more recent translation.

In his explanatory notes accompanying this later version, translator Andrew Hurley quotes Borges (who was also a notable practitioner and theoretician of translation) on the importance of more than one interpretation:

Borges makes it unmistakably clear that every translation is a ‘version’ – not *the* translation of Homer (or any other author) but *a* translation, one in a never-ending series, at least an infinite *possible* series. The very idea of *the* (definitive) translation is misguided, Borges tells us; there are only drafts, approximations – *versions*, as he insists on calling them. He chides us: ‘The concept of “definitive text” is appealed to only by religion or weariness.’

(Borges 2000b: 519; original emphasis)

So, back to Borges’s words on the meta-labyrinth, this time as rendered by Hurley: ‘I pictured it as infinite – a labyrinth not of octagonal pavilions and paths that turn back upon themselves, but of rivers and provinces and kingdoms.... I imagined a labyrinth of labyrinths, a maze of mazes, a twisting, turning, ever-widening labyrinth that contained both past and future’ (Borges 2000b: 122). Though both versions capture the essence of the original Spanish (Cf. Borges 1999: 58) and are perhaps largely interchangeable, there are nevertheless some subtle and revealing differences between all three. Contrary to his professed goal of concision, Hurley apparently dispenses with the ‘quietness’ and ‘laconic terseness’ he claims to emulate of Borges’s original (Borges 2000b: 518): ‘a maze of mazes’ is added onto the already plentifully tangled scenario where it does not appear in the Spanish nor in Yates. Similarly, Borges’s three words ‘sendas que vuelven’ are reduced to ‘returning paths’ in Yates but amplified loquaciously to ‘paths that turn back upon themselves’ in Hurley, while the word count and relative simplicity of Borges’s ‘un sinuoso laberinto creciente’ is matched in Yates’s ‘one sinuous spreading labyrinth’, but not quite preserved in Hurley’s inflation into ‘a twisting, turning, ever-widening labyrinth’.

If it seems, however, that Hurley does not display as much fidelity to Borges’s words as he says he does, then this is perhaps because of a more global feature of Hurley’s treatment which arguably does comply with a Borgesian world-view. Adding further convolutions to the ones already present in the 1941 original and in the best known (and predominantly faithful) English translation of 1958, Hurley betrays as strong a commitment to Borges’s philosophy of the meta-labyrinth as its first professor. As opposed to mere description, Hurley has been infected by the labyrinthine strand of thinking that Borges proposed. This is why the choice of word, and furthermore, grammatical mood and tense to translate the third person imperfect subjunctive ‘abarcara’ in the Spanish is the most interesting aspect of the section in hand. Where Yates preserves the forward looking sense in ‘would encompass’, Hurley, debatably truer to the

collapsing of time into the space of the labyrinth, chooses the past simple ‘contained’ – this latter implying that the predicted enfolding of the future into the past has by Hurley’s time come to pass, and Borges’s labyrinthine prophecy has extended its reach over all modes of thought. That reaching this state of affairs took a deviation from the strict sense of Borges’s words is not as startling as it seems,⁵³ and Hurley does well to cover his tracks by underscoring the ‘chiding’ tone of Borges’s view that the ‘concept of “definitive text” is appealed to only by religion or weariness’. The concept of the labyrinth is just as perplexing and perpetually partial in its definition, and if as Butler claims the tangled history of its translation and dissemination has caused the labyrinth to insert itself retrospectively into Borges’s work, then Butler also notes that ‘in his later years even Borges himself could declare that he was “weary of labyrinths”’ (Butler 2010: 16). If the definitive labyrinth is turned to only as a result of weariness, even by its chief literary and philosophical champion, what can be done to salvage it – or at least come to terms with it? How is one to approach the ever-present yet unresolved matter of the labyrinthine? If so endlessly elusive, can the labyrinth ever be fully comprehended, and what implications does this have for the sciences of the mind/brain? It is with these questions in mind that a different angle will be sought in the next section.

⁵³ One might also note here the teasing relationship between ‘patience’ and ‘labyrinths’, as suggested in the subtitle of this section of this chapter. It is precisely to attempt to do justice to the Borgesian notion of the labyrinthine that I wandered away from sustained coverage of his work at the start of the section, despite its announcement there, only to arrive at it more fully here at the end.

Douglas Hofstadter: An Eternal Golden Brain

Via various purposeful turns which have resulted in as much back-tracking as forward progression, I have made the claim that brains are labyrinthine and labyrinths are brain-like, an accretion of the epistemological wanderings in *Convolutions 1 and 2, Quest and Detective*, into a concrete (if elusive) object of ontology. This is a claim that is itself subject to labyrinthine thinking, a complicated convolution which jumps around from level to level of discourse, at points seemingly talking about itself. The claim is made on the basis, as has been mentioned in previous chapters, that discussions of brains and brain science by their intrinsic nature require digressions onto topics of perceived disciplinary heterogeneity, prominent among which (but by no means sole) are literature and literary study. A prime example of this digressional centrality, or explicitly formalized non-linearity, is Douglas Hofstadter's thick 1979 tome *Gödel, Escher, Bach: An Eternal Golden Braid*, whose twentieth-anniversary edition includes an author's preface almost as fascinating as the main text. The preface, which mainly details the book's circuitous genesis, acknowledges the unexpected, sometimes lucky and sometimes not so lucky forks in the road taken by Hofstadter while writing, and he stresses that the original edition's ambiguities or misdemeanours have for this very reason been preserved, without being updated for a later audience. However, even without recourse to this retrospective preface, it is abundantly clear that Hofstadter's view of the brain is reliant upon fields other than the cognitive science domain into which he fell after starting out in physics. Indeed, even Hofstadter's stated priority in *Gödel, Escher, Bach*, to get back to his roots and his childhood love of mathematics, does not make him commence by discussing Austrian born mathematical logician Kurt Gödel, as one might expect. He begins the book instead with some anecdotal ruminations on the life and works of composer J S Bach.

As his title suggests, this is not the limit of his digressions away from cognitive science and artificial intelligence, Hofstadter's day job. Throughout the book he intersperses the argument with figures taken from Dutch graphic artist M C Escher. It is as if Hofstadter has taken to heart some words of philosophers Gilles Deleuze and Félix Guattari, actually first published (in French) a year after *Gödel, Escher, Bach* in 1980, introducing the French pair's concept of the 'rhizome': 'Here we have made use of everything that came within range, what was closest as well as farthest away' (Deleuze and Guattari 1987: 3). From genetics to Zen Buddhism – Hofstadter even wanders into these in his extended preamble to talking directly about brains. Indeed, Zen is deployed as a sort of mind-clearing corrective for the concerted effort of formal logic which dominates large swathes of the book. Zen, lacking any full explanation here nor anywhere else (according to Hofstadter), is invoked as the very description and justification for

wandering onto the terrain of Zen itself. In one of their typically allusive dialogues, Hofstadter's Carrollian loan characters Achilles and the Tortoise stray onto the subject after attending a heavy-going talk on genetics. Trying to give some rational account of the seemingly irrational twists and turns of Zen, Achilles offers the following: 'It seems to me that you may begin approaching Zen through any path you know – even if it is completely antithetical to Zen. As you approach it, you gradually learn to stray from that path. The more you stray from the path, the closer you get to Zen' (Hofstadter 2000: 233). Aiming for Zen takes you away from it, while deviating from this original aim paradoxically somehow brings you back to being on course for Zen.

To recap, then, everything Douglas Hofstadter wants to say about mathematics (and eventually about the brain) first leads him away from discussion about maths and into many other realms, principally those of music and visual art. For sure, the examples he chooses are in keeping with a mathematical view of the world. The works of Escher and Bach are of interest as much for their encapsulation of mathematically, logically extrapolable patterns, as they are for more traditionally aesthetic reasons. But it is not merely out of admiration that Hofstadter includes them, nor even for their undoubted overlap with the (admittedly sprawling) main topic of his book. It is also because of their explanatory power – even, one senses, their inevitable centrality to his mathematical argument. This is why digression into other fields is not where Hofstadter draws the line; the strongest, most elucidating feature of his thesis is not the esoteric breadth of content, but of form. He wilfully meanders away from scientific disquisition and punctuates every orthodox chapter with a dialogue.⁵⁴ A suggestive allusion on the cover of *Gödel, Escher, Bach* is its secondary subtitle – 'A metaphorical fugue on minds and machines in the spirit of Lewis Carroll' – and these dialogues are overtly, purposefully literary, a re-appropriation of characters already appropriated by Carroll from the history of literature, mythology and philosophy. Whilst the title of Hofstadter's book loudly pays homage to luminaries of mathematical logic, graphic art and baroque music, it is clear that its quieter literary intertextuality is the real engine driving the delineation of his ideas. Wandering away from cognitive science precisely in order to talk about it is itself the type of recursive meta-narrative, the 'strange loop', that Hofstadter so painstakingly and admirably preaches in *Gödel, Escher, Bach*.

Hofstadter's is a gesture contrary to that of Borges in many of the pieces in *Labyrinths*. In this latter, and supposedly in the name of literature, alternative versions of mathematics and scientific logic are postulated and even presented as fact. Much has been made of Borges's

⁵⁴ The dialogue is itself an important generic form which historically unites literature, science, politics and philosophy (Cf. Cox 1992), and stretches back to the argumentation style attributed to the Socratic method. The form is used in many contemporary fields, such as in the sociology of scientific knowledge (Cf. Ashmore 1989; Mulkay 1985), or in environmental studies (Cf. Briggles 2014; in passing, it is of note that Briggles, in one of his dialogues, also mentions that 'science is a labyrinth, not a monolith' (2014: 98)).

imaginative connections to logic and philosophy (for instance, Cf. Sassón-Henry 2007; Bloch 2008). Cuban proponent of ‘Sciencepoetry’ Rafael Catalá puts it baldly: ‘Borges is one of a few writers who can make scientific principles emerge as literature. Many times scientists cite his short stories as examples in their own work’ (Catalá 2002: 51). In this rendering, scientists owe some debt to Borges, in whose work they find allegorical value or powerful explanatory clarity of scientific concepts; and although many tend to emphasize his mathematical and physical scientific aspects, Catalá cites neurobiologist Steven Rose, whose *The Conscious Brain* (1973) linked the writings of Russian neuropsychologist A R Luria with those of Borges (as explored more recently in Quian Quiroga’s *Borges and Memory*). It is evident that Borges has had a marked impact on the envisioning and writing of science. So what is it that associates Borges and Hofstadter specifically? It is their shared interest in the labyrinthine – no less in Borges’s aforementioned *Labyrinths* than in Hofstadter’s inter-chapter dialogue titled (after Bach) ‘Little Harmonic Labyrinth’ (Hofstadter 2000: 103–126). Their mutual treatment of labyrinths is emblematic of the wider cultural identity uniting brain science and literature. The aim of this section is to trace this joint labyrinthine identity, of which Borges eventually grew weary, but in which self-described ‘strange loop’ Hofstadter revels (Cf. Hofstadter 2007). In doing so, Hofstadter sees himself in miniature, included on the neuroscientific map of the labyrinth, and heartily waves hello, acknowledging this self-recognition as the true boon of the maze metaphor in brain science.

Rather than look at one’s own unmediated brain directly – and for good reasons to do with the current physical impossibility of just such a scenario – it is the habit of the neuroscientist to disavow this end goal, and surrender to a more generalized purpose, that of the externalized labyrinth of other people’s brains, and the overall concept of ‘the brain’ in general. However, though this surface goal is less self-consciously complicated than the underlying goal of stable self-identity, the study of brains is still a vast and rocky terrain. This is why a map is so desirable. Hofstadter describes the objectivity of mapping as a way of masking the urge to avoid solipsistic discomfort: ‘How far back do we ordinarily trace the “I” in a sentence? The answer, it seems to me, is that we look for a sentient being to attach the authorship to. But what is a sentient being? Something onto which we can map ourselves comfortably’ (Hofstadter 2000: 608). The contrast of the collective ‘we’ Hofstadter employs throughout with ‘it seems to me’ sandwiched in the centre of this extract shows an overall understanding but also a central non-conformity. It seems to me, just as is the intention of this entire chapter, that Hofstadter does not want to eschew brain science because of its simultaneous use of labyrinths and effaced labyrinthine thinking, but merely for science (or any theoretical view of selfhood) to recognize and perhaps even celebrate the complexity lying behind its reductively cartographic impulse.

Of course, far from eschewing science, Hofstadter is a cognitive scientist, with plenty to say about minds and brains; but again, his discussion of brains in *Gödel, Escher, Bach* is concentrated in the centre of this long book, therefore beginning relatively late on – despite ostensibly being one of the book’s primary goals. Additionally, mapping makes a prominent appearance in this section, not least in the subsection ‘Mappings between Brains’, wherein Hofstadter asks:

If thinking does take place in the brain, then how are two brains different from each other? How is my brain different from yours? Certainly you do not think exactly as I do, nor as anyone else does. But we all have the same anatomical divisions in our brains. How far does this identity of brains extend? Does it go to the neural level?

(2000: 341)

Discernible even here is Hofstadter’s implicit dissent of the simplistic use of mapping, a way of reducing the riddles of the brain, or his own brain, that he is confronting. Mapping here is concerned with differentiation, not just identification or representation, and so instead of using the labyrinth as a map, Hofstadter uses the map as a labyrinth. His startling answer about the potential sameness of brains all the way down ‘to the neural level’ is that – based on the brains of worms, admittedly – yes, essentially all brains are the same. Therefore, all neurons in all brains correspond to each other, or map onto each other neatly in a way that should be comforting – but is clearly not, as the fact that ‘you do not think exactly as I do’ seems unquestionably certain. This is one of the many playful false turns that Hofstadter takes in order to illustrate his ideas, and soon after the brain identity of all worms is established, he concedes that ‘such one-to-one mappability between individuals’ brains disappears very soon as you ascend in the thinking-hierarchy and the number of neurons increases – confirming one’s suspicions that there is not just one human!’ (Hofstadter 2000: 342). Despite the sarcastic tone, the message is not that mapping is pointless, only that it is not without its complications, and Hofstadter continues to oscillate between positions on the brain, between each ‘one’ across the divide of ‘mappability’. In doing so, he demonstrates what he wants to say instead of baldly saying it, the demonstration serving to heighten the persuasiveness of one of the book’s central arguments – the desirability yet perpetual elusiveness of isomorphism.

Isomorphism manifests itself in many ways in *Gödel, Escher, Bach*, including across many different levels of abstraction – so additional to the above isomorphism of form and content in the reflection on brain ‘mappability’, Hofstadter also takes in the potential isomorphism between something and part of itself, claiming Escher to have done just the same in the woodcut *Fish and Scales* (1959). In this ingenious figure, small black and white fish tessellate just as they

make up larger black and white fish, implying that every individual is merely the fish-scale on some other. There are labyrinthine ramifications in this sameness across levels:

these fishes and scales are the same only when seen on a sufficiently abstract plane. Now everyone knows that a fish's scales aren't really small copies of the fish; and a fish's cells aren't small copies of the fish; however, a fish's DNA, sitting inside each and every one of the fish cells, is a very convoluted 'copy' of the entire fish – and so there is more than a grain of truth to the Escher picture.

(Hofstadter 2000: 146–7; original emphasis)

At the heart of Hofstadter's thinking, then, is the significance of equivalence – what counts as the same and what does not, and what can adequately stand in for something else, adequately enough to carry at least a 'grain of truth' from one level of abstraction to another. Rephrased, he asks if 'one-to-one' mapping can ever make intelligible, even visible, some labyrinthine, unwieldy and complex structure. It is a philosophical issue which, as Hofstadter rightly points out, most conspicuously arises in the field of neuroscience in the pursuit of localization; that is to say, in the idea that mental functions and processes can be precisely located inside the brain.

The pursuit of localization is again a cartographic impulse, an urge to be able to assuage uncertainty by assigning specific human attributes to the different points on the map of the brain. However, cartography often deals with contested territories. The various parallel vicissitudes that the specific concept of 'brain mapping' has taken alongside the history of cerebral localization is extensively demonstrated by historian Katja Guenther in her suggestively titled *Localization and its Discontents* (2015). These intertwined histories of mapping and localization, which could be said to map onto each other, reveal the convoluted problematics of the enterprises themselves, and indeed, as Guenther mentions early on in her discussion of brain mapping, 'Neuropsychiatrists did not simply map psychological functions onto brain anatomy. Rather, this mapping was conditioned by the institutional, practical, and social context of hospital medicine' (Guenther 2015: 14). This implies the need to localize the very process of localization; there will always be a higher level map needed to guide what is being mapped, which 'conditions' how these activities are carried out. Cartography does not dispel complexity, but merely reduces and codifies it, perhaps even totally obscuring the picture of a historical and ongoing debate.

In principle, cerebral localization is a meritorious practice which, since the time of aphasia pioneers Paul Broca and Carl Wernicke in the mid-nineteenth century, has yielded productive working theories for scientist and clinician alike. In practice, however, the wish for a simple picture has not been vindicated by research and still today there are debates about the applicability or even the basic validity of localization. In a recent article, 'Cerebral Localization of Functions and the Neurology of Language: Fact versus Fiction or Is It Something Else?',

neurologist Elliott D Ross claims the picture has actually only become more complex. This has become especially so with the advent of imaging technologies, the mounting ways of representing the brain introducing potential pseudoscientific obscurity to the overall picture. He writes that ‘there is a need to reassess what localization of functions is and is not. Otherwise, there is no rational way to interpret the escalating claims of localization in the functional imaging literature that is taking on the appearance of neurophysiologic “phrenology”’ (Ross 2010: 222). Phrenology is here invoked as a cautionary tag, scare quotes and all, an indication of the confusion inherent to the topic of localization.

This confusion is echoed by Hofstadter, in the title of the subsection ‘Localization of Brain Processes: An Enigma’ (Hofstadter 2000: 342). Here, he intriguingly contrasts the fates of two men mentioned briefly in this chapter: Karl Lashley and Wilder Penfield. Hofstadter writes that Lashley, ‘in a long series of experiments beginning around 1920 and running for many years, tried to discover where in its brain a rat stores its knowledge about maze running’ (Hofstadter 2000: 343), but found his well-documented failure to do this utterly perplexing and dismaying, somewhat spoiling his long career in memory-research just at its zenith. On the other hand, Penfield built no mazes and instead studied humans, patients already undergoing epilepsy surgery and thus with conveniently exposed brains. During such surgical procedures, Penfield used electrodes to precisely isolate and stimulate one neuron or another, triggering discrete memories and other sensations in the patients. Therefore, his results ‘dramatically oppose the conclusions of Lashley, since they seem to imply that local areas are responsible for specific memories, after all’ (Hofstadter 2000: 343). Not only are each investigator’s experimental outcomes depicted as confusing binaries, Hofstadter essentially posits a fallacious isomorphism between rats and humans by placing them together. This is rhetorically intensified if the repeated use of the word ‘running’, with reference to Lashley, is noted: the ‘long series of experiments’ becomes a seemingly endless corridor in an impossible maze of Lashley’s own making.

Hofstadter’s purpose is not to bash Lashley, nor to say that rodent experiments are of no value – it is merely to advise caution when placing one’s entire faith in a map that may turn out to be a labyrinth. Hofstadter knows this caution well from his job as an Artificial Intelligence researcher. In proposing an abstract isomorphism between how computers and brains deal with arithmetical problems, Hofstadter remarks that

this seems quite plausible when the domain referred to is number theory, for there the total universe in which things happen is very small and clean. Its boundaries and residents and rules are well-defined, as in a hard-edged maze. Such a world is far less complicated than the open-ended and ill-defined world which we inhabit.

(2000: 569)

Once more, this is not to say that this ‘open-ended and ill-defined world’ should not be investigated, but simply recognized as a much softer-edged labyrinth, where meaning spills over the walls with ease and regularity. This is why anchoring meaning in such a shifting sea seems so pressing; to provide a much clearer way of navigating it. It appears, then, that neither maps – nor mice – will be dispensed with any time soon.

For instance, fundamentally lucid and well-informed science writers such as Zimmer still lean heavily on maps as explanatory devices. He writes about Penfield’s previously mentioned open-brain experiments and what patients reported at the time regarding their own bodies: ‘Penfield drew a map of these responses. He ended up with a surreal portrait of the human body stretched out across the surface of the brain. In a 1950 book, he offered a map of this so-called homunculus’ (Zimmer 2013). Zimmer then discusses newer research where, contrary to Hofstadter’s isomorphism, Penfield’s principles were used to study the body perceptions of mice – resulting in a corresponding ‘mouseunculus’. The reliance on a cartographic metaphor barely conceals the twisting labyrinthine paths where clean, direct relationships are assumed:

The sensory map and the neurons that feed it data turn out to be entangled in an intimate conversation. Signals rising from the skin shape the map, while the genes in the map’s neurons influence it as well – and their influence extends downward into the pathway. This dialogue may be crucial for fine-tuning the entire nervous system, so that we develop sensory maps and sensory neurons that match each other tightly.

(Zimmer 2013)

Zimmer employs a simplistic yet convoluted set of naturalized idioms (where maps are ‘fed’ by neurons whilst also engaged in a ‘dialogue’ which somehow results in ‘fine-tuning’) to elucidate a complicated, intertwining set of ideas, and pattern-spotting unwittingly becomes the pattern itself. This is because it is not just these mixed metaphors that are at stake; the ‘sensory map’, ideally so ‘tightly matched’ to its corresponding neurons, is supposedly already in our heads (and those of other creatures, amongst them mice), yet also tightly matched to schematic drawings used by scientists to study the brain. The situation is nothing if not ‘entangled’, as Zimmer unintentionally suggests.

This larger pattern of entanglement, and the possibility of yet higher levels of entanglement (or meta-patterns), deserves attention from a science itself entangled therein. It is this which no map of a mouse’s body-image can offer, and which underpins a pull towards codification, or reduction of human self-consciousness. The map and the code are useful and important, not to mention almost unavoidably alluring. It would be foolhardy to claim otherwise, and there is no reason not to continue with their employment – but not without questioning their smoothness and simplicity, nor their roles in a larger, labyrinthine framework which humans use

to attach meaning to existence. As Hofstadter says throughout *Gödel, Escher, Bach*, consciousness arises in the change from meaningless to meaningful symbols, or to put it in terms just used, in the deciphering of a previously impenetrable code. If the code is at the microscopic level (and Hofstadter indeed relates alphabetic letters to numerals, then to characters used in the notation of a formal system, to musical notes, to biological cells, to neurons) then meaning is recursively imbued backwards upon each particle of the code as it combines with every other particle – a letter on its own has little relevance to anything, but gains steadily more as it combines with other letters to form morphemes, then words, then sentences, chapters, stories, life narratives, histories of the universe and so on. So language, a labyrinth of labyrinths and a product of the workings of the brain, is itself the most powerful metaphor for how meaning springs from those very workings, and thus understanding a brain depends on decoding its constituent parts.

Although this can proceed at the neuronal level, there is not much to say other than bare-faced (or ‘meaningless’) facts about the state of each neuron – each one is active or not. But it is when taken collectively, at progressively higher levels of complexity and greater sophistication of arrangement, that some understanding, that some appreciation of meaning, occurs. According to Hofstadter, it is at these higher levels that what happens in the brain more and more recognizably matches what happens in the world. At the very highest levels – what is called consciousness in its common interpretation as self-awareness – the brain’s representation and monitoring of itself is symbolically matched to its place in the world. Letters are not equivalent to objects in the world and neither are the states of neurons, but brought together in larger pattern-forming collections, they edge ever closer to equivalence. This is why Hofstadter’s justification of drawing parallels between formal logic, computer language and operation of the brain/mind is reminiscent of Oliver Sacks’s article ‘A Man of Letters’, as mentioned in the previous chapter. Hofstadter writes that

compared to a typical formal system, human language is unbelievably fluid and subtle in its patterns of tracking reality, and for that reason the symbols in formal systems can seem quite arid; indeed, without too much trouble, one can look at them as totally devoid of meaning. But then again, one can look at a newspaper written in an unfamiliar writing system, and the strange shapes seem like nothing more than wondrously intricate but totally meaningless patterns.

(2000: xxi)

But they are not meaningless when viewed as part of a larger pattern of patterns, one that is itself evolving as part of another, larger pattern of evolution, and so on.

In this respect, it is interesting that Zimmer, a meticulous, knowledgeable and sensitive science communicator, graduated in English, and simply wanted to be an author before turning

wholeheartedly to science writing (Cf. Romero 2004). It is not that an English degree is needed for this (many would argue the opposite, no doubt) but Zimmer's career trajectory shows that wandering away from one's topic can often give one a better overview of it. Indeed, the messy admixture of labyrinthine perspectives advocated here is a good metaphor for neuroscience or evolution, the two main focuses of Zimmer's work. This is evidenced by the Darwinian title of one of his books on evolution, *The Tangled Bank* (2009), because what Hofstadter calls a 'strange loop' (and what I have been trying to expose as a convolution), is also synonymous for him with a 'tangled hierarchy'. This latter term is important because it conveys something about level swapping whilst also implying an order of importance. What the tangled hierarchy suggests is that consciousness emerges from the inherent recursiveness of symbols at one level talking about another level of understanding above or below, which in turn responds in kind or refers to another level beyond or before, and so on. This interaction between levels is for Hofstadter what gives a system of symbols, when complex enough (such as in the brain's neural network), the vastly entangled self-referentiality to engender a sense of self in a person.

But it seems important to dwell on the other implication of the word 'hierarchy' here. If cognitive and neuroscience are given untold amounts of resources and an unchallenged remit on the objects of their study, whilst other fields are left to languish and stagnate (if not largely peter out), what ramifications does this have for an intellectual or epistemological 'tangled hierarchy'? Would this not mean that eventually this one level of understanding of the world would have nowhere to go above itself in order to seek a thorough meta-understanding? The gist of the 'tangled hierarchy' idea, readily appreciable in 'strange loops', 'convolutions' or 'labyrinths', is that knowledge needs to go somewhere else before coming back and attaining its full relevance. As much as a fuller understanding of the brain occasionally requires a pinpoint, neuronal focus, just as vitally this very focus needs to be examined, treated and played with by sources outside of itself in order to properly consider its limits. Hofstadter's 'tangled hierarchy', a term coined in an exceedingly digressional work on the mind/brain, suggests that this nuanced, level-jumping interpretation of a hierarchy of interpretations needs to be remembered and respected if the true possibilities of knowledge are to be explored.

Note again that in its subtitle, Hofstadter describes *Gödel, Escher, Bach* as 'a metaphorical fugue on minds and machines'. Given that the book's characteristic discussion of loops and recursion proceeds by first examining the music of J S Bach, particularly centring on his fugues and canons, it is safe to say that this 'metaphorical fugue' signifies a literary or verbal version of the 'interweaving repetitive elements' the lexicographers at *Merriam-Webster* attribute

to the ‘fugue’ in their definition of this musical form.⁵⁵ However, as both the *OED* and *Merriam-Webster* confirm, in addition to its musical meaning the word ‘fugue’ also denotes something completely different – a psychiatric, perhaps neurological condition in which one’s mental state and behaviour become entirely dissociative, and memory of this ‘fugue state’ cannot thereafter be recalled by the affected. Not only is this intriguingly congruent with my neurological theme, but a fugue in either instance is etymologically tied, coming from the Latin for ‘flight’ or ‘to flee’, evocative of the necessity to wander away or escape from one’s intellectual starting point. Turning to the canon, the musical definition is related to that of the fugue in its reiterative, imitative, looping aspect, but it again has meanings beyond that of music.

A ‘canon’ can variously be a member of the clergy, a religious law, a general rule or, as in the idea of a Western literary canon, a supposedly definitive set of texts against which items of a cultural ambit are judged. Most interesting, however, is that although etymologically unrelated to the above, according to the *OED* the spellings of the words ‘canon’ and ‘cannon’ were for much of their history interchangeable when referring to a large gun or piece of ordnance. Besides their mutual polyphony, both ‘canon’ and ‘fugue’ are beguilingly polysemous, and if wandering away from ‘fugue’ can yield fruitful elaboration on the movement of convolutions, so too might turning to the ballistic, explosive connotations of ‘canon’. Thus, in the chapter that follows, I would like to change the topic of convolving puzzle from labyrinths to ballistics, contending as I do that the writing of neuroscience is riddled with conceptual bullets taken from the world of firearms and long-range weaponry. In doing so, the stakes also change, from the physical and external, mental and internal ambiguity of the brain labyrinth, to the compression of time and space offered by the literary, metaphorical basis of neuronal guns firing.

⁵⁵ In his book *Labyrinth: A Search for the Hidden Meaning of Science*, Pestic makes a strikingly similar claim to Hofstadter on the musicality of scientific labyrinths: ‘In musical terms, this book is a triple fugue, an interweaving of [...] interrelated themes concerning the character of the scientific enterprise and the deep effects it has on human character’ (Pestic 2000: 3).

Convolution 4: Ballistics

The forces of relativism are gathered about the last and most well-defended castle of realism [...], laying siege to it and in the process suffering a blistering bombardment –

Bang! Bang! Bang!

(Edwards, Ashmore and Potter 1995: 27)

And there is more to this than ballistics. [...] . . . somewhere in his brain now two foci sweep together and become one . . . zero ellipse . . . a single point . . . a live warhead, secretly loaded, special bunkers for everyone else . . . yes that's what he wants . . . all tolerances in the guidance cooperating toward a perfect shot.

(Pynchon 1995: 425)

Every neuron is a gun – it does not simply interact with its neighbour in a friendly manner, but instead fires at it. The idea of neurons ‘firing’ is so normal and idiomatic as to seem entirely natural and unquestionable. But by the extension of this logic, every brain module or neural assemblage is a tactical unit and every brain is an arsenal or perhaps a missile silo. At the neuronal level, whose finger is on the trigger? And at the brain level, whose finger hovers above the red button? In either case, the major issue is speed: be quick or be dead, an arms race of sorts. The action of neurons firing, constitutive of cerebral processes which in turn constitute one’s self, happens much more quickly than that self is capable of assimilating, or cognizing. A single neuron has no intelligible agency of its own, meaning it does not fire itself – so it is more proper to say that neurons are fired, not that they fire. However, if this is the case, and yet it still happens too fast for one to be aware of in oneself, who is it that is doing the firing? One answer is the totality of other neurons that together contribute to the firing of each single neuron; but of course this simply defers the issue backwards indefinitely, with no originary moment of firing to speak of – all of this in a fraction of a second, unnoticeable and fundamentally incomprehensible to the human consciousness which somehow arises from the whole neuronal volley of shots. As I will argue in this chapter, the thread running from small measures of time and space through to the evanescent agency propelling ballistically-charged cerebral functions means that brains and bullets convolve in a necessarily political way, relating the notions of military and biological defence. The metaphorical, temporal implications of thinking about neurons alongside guns and missiles has remained unexplored since they were silently yet wholeheartedly incorporated into scientific jargon by early neurophysiology. Conversely, metaphorical ballistic ramifications, as this chapter will demonstrate, have been much better examined by literary study than science, despite ballistics’ overwhelming centrality to scientific thought on the brain. This imbalanced convolution requires swift attention if weapons are not to fall into the wrong hands – if they have not already.⁵⁶

⁵⁶ As neuroethicist Neil Levy writes: ‘The sciences of the mind threaten our conception of ourselves as able to engage in rational reflection in many ways. [...] The evidence here comes largely from work in social psychology, on the *automaticity* of actions. Automatic actions are effortless, ballistic (uninterruptible once initiated), and typically unconsciously initiated; that is, they are not made in response to conscious reasons of ours but are instead more like reflexes, triggered by features of the situation in which we find ourselves’ (Giordano and Gordijn 2010: xvi; original emphasis). The mind/brain is an ‘automatic’ weapon, ‘triggered’ by situations into irreversible ‘ballistic’ actions.

Ballistic Metaphor: Standard (Phineas) Gage Rounds

Douglas Hofstadter writes that

whenever a neuron's threshold is surpassed by the sum of the incoming signals, BANG! – it fires. It never happens that a neuron forgets its arithmetical knowledge – carelessly adding its inputs and getting a wrong answer. Even when a neuron dies, it continues to function correctly, in the sense that its components continue to obey the laws of mathematics and physics. Yet as we all know, neurons are perfectly capable of supporting high-level behaviour that is wrong, on its own level, in the most amazing ways.

(Hofstadter 2000: 575; original emphasis)

I include this melodramatic 'bang' and its links to higher-level moral (mis)behaviour to foreground the coming discussion – that rightly functioning neurons 'fire' despite the consequent actions of wrongly functioning humans. There is nothing odd, or unethical, or destructive, it seems, in anthropomorphized neurons 'forgetting', 'adding', 'supporting' or 'firing'. The actions of neuronal agents are supposedly reliable and above suspicion, regardless of how a person ends up behaving. So for the time being, one can instead ask of this last, most common neuronal procedure of firing: is neuro-time faster than a speeding bullet? Or is it more like the topmost section of a loop, disguised as a straight line but actually best described by the movement of a cannonball arcing through the air, racing away yet somehow appearing to be statically suspended at the same time? Even these thoughts themselves have sped away. To catch up, I suggest a brief detour through something more familiar, more visible to the naked eye.

Borges's short story 'Death and the Compass' is a labyrinthine work of detective fiction. To start with, it explicitly and repeatedly plays with the idea of the labyrinth, culminating in detective Lönnrot, who is staring down the barrel of his imminent death at the time, speaking these words: 'I know of one Greek labyrinth which is a single straight line. Along that line so many philosophers have lost themselves that a mere detective might well do so, too' (Borges 2000a: 117). Like a labyrinth, the title of the story is a simultaneous gesture towards chaos and order, the measureless oblivion of death and the measured orientation of the compass. Similarly, the story itself is a commentary on the tension between these two poles, not just in the narrative, but in the form the narrative takes (or apes); it is both a recognizable piece of genre fiction whilst also an attempt to explode that same detective genre. J Hillis Miller's take on Lönnrot's straight line labyrinth (which is quite plausibly read as a version of Zeno's paradox of Achilles and the

tortoise)⁵⁷ is that it casts doubt on the narrative neatness of Lönnrot's supposed death at the hands of his arch nemesis Red Scharlach at the story's end – there is at least the possibility of uncertainty in that Lönnrot is shot 'off camera', so to speak.

This leads Miller to question his own presuppositions in this regard and thus to a curious commentary on the repercussions of the act of shooting itself:

The story ends not with the death of Lönnrot but with Scharlach's firing. 'Hizo fuego': literally, 'he made fire.' The story concludes not with a literal statement, but a figure even beyond the image of the labyrinth of a single straight line. 'He fired' is a figure of speech in both English and Spanish, but it is even more obviously so in Spanish. The locution is a metonymy turned into a catachresis. It displaces the actual expulsion of the bullet from the barrel to a prior act, the striking of a spark. In antique pistols, that spark starts a fire that ignites the fuse that ignites the gun powder that expels the bullet. What is temporally contiguous to the movement of the bullet, prior to it and its proximate cause, then becomes the normal 'literal' word for the pulling of the trigger in a more modern weapon. By another series of mechanical displacements pulling the trigger strikes the cartridge and 'fires' the gun. To say 'hizo fuego' is, strictly speaking, a catachresis, since it is not really 'making fire,' but saying that does not substitute for some other more literal word or term. 'He made fire': that is the proper way to say it. The effect of this figure is to hint that a potentially endless series of delaying relays intervenes between the intentional act of pulling the trigger and the actual speeding of the bullet to its goal.

(Miller 1992: 252)

This extended consideration of the temporality and physicality in the metaphorical figure of firing a gun is revelatory. As Miller shows, ballistics is inevitably thought of in this literary way, a product of its metaphoric roots in the physical processes of old-fashioned weaponry. But a convolution is in play here: using one's brain to think literarily about ballistics involves neurons which also 'fire', meaning that in a manner of speaking, this ballistic metaphor is used to think about itself. Why is it so normal for people to speak about this aspect of the mind and brain in the same fiery, explosive terms? And which is quicker: the bullet or the brain?

However, simply comparing the speed of bullets with that of nerve impulses only jumps the gun, so to speak. This is because the way each is measured does not stem from the analogy, but vice versa; historically, methods of ballistic measurement were fundamentally constitutive of how nerve experiments were conceived in the first place, and thus of the now widely accepted ballistic metaphor. As historians Marco Piccolino and Marco Bresadola write, in 1850 the German scientist Hermann von 'Helmholtz succeeded in measuring the nervous signal speed by

⁵⁷ There have been many discussions and expansions of this riddle, and Borges himself was an astute collector and commentator of their history, such as in 'Avatars of the Tortoise' (2000a: 237–242), or 'The Perpetual Race of Achilles and the Tortoise' (2010: 1–8).

means of [...] a method derived from the ballistic procedures used in artillery to measure the speed of cannon balls or bullets' (Piccolino and Bresadola 2013: 276). As this was the first successful nerve-reading of its kind, it is appreciable here that ballistic thinking was foundational to the very possibility of talking about nervous impulses.⁵⁸ Laura Otis also shows that this ballistic thinking was not limited to Helmholtz alone, but was a product of the overall intellectual and technological milieu in which he found himself:

In addition to university lecturers, the [Berlin Physical Society, founded by Emil du Bois-Reymond in 1845] included instrument makers and technicians from the Prussian military who wanted to collaborate with physicists. As they shared technical tips, these young experimenters inspired each other and formed passionate scientific bonds.

(Otis 2007: 111)

Indeed, even before this 'Helmholtz agreed with his father that the best way to learn science was on a military medical scholarship' (Otis 2007: 112). For physiological pioneers such as Helmholtz and du Bois-Reymond, the 'best way to learn science' – and thus to think about nerves and electrophysiology – was utterly entangled with techniques and tools borrowed from the military.⁵⁹

Naturally, this could simply be interpreted as the interrelated notions of medical and military discipline, something reflected in senses 7a and 8 respectively of the *OED*'s entry for 'discipline': 'A branch of learning or knowledge [or] a field of study or expertise' on the one hand; and on the other: 'Training or experience in the practice of arms, military manoeuvres, tactics, etc.' In this line of reasoning, the disciplinary relationship between medicine and the army means the ballistic metaphor might be subsidiary, a mere by-product of pragmatically shared vocabularies and environments; Helmholtz's adaptation of ballistic measurement procedures would be just a coincidental one-off. However, other examples of the direct influence upon neurophysiology of weapons, warfare and the military abound. For instance,

Gustav Fritsch and Eduard Hitzig, two German physiologists, [obtained] evidence of localization of function in soldiers who had sustained brain wounds during the Franco-Prussian War. [...]

⁵⁸ It seems certain that a related ballistic convolution is at play when it comes to the term 'torpedo' (though one beyond the remit of the current chapter). This begins with proto-electrophysiological experiments by Luigi Galvani and others on the torpedo ray, a type of electric fish (Cf. Finger and Piccolino 2011; Piccolino and Bresadola 2013), and leads to the more common current usage of the word as an underwater missile.

⁵⁹ The various important relationships between the military and electrophysiology (as well as other biological sciences) in mid-nineteenth-century Germany are evident throughout Otis's book *Müller's Lab* (2007). Her insistence upon the rhetorical literariness of these relationships is well encapsulated by her description of biologist Rudolf Virchow: 'Virchow launched his political career as he had built his scientific one: by writing. [He] used writing to create a reputation and spread his views [and] saw the printed word as the best way to shape people's vision, whether the subject was cell structure, military spending, or medical history' (Otis 2007: 153).

Fritsch and Hitzig continued with laboratory studies on animals, using excitation and extirpation, after the idea of doing such experiments had come to Fritsch on the battlefield.

(Wertheimer 2000: 25)

Neither are such examples restricted to nineteenth-century Germany. Piccolino and Bresadola trace the ballistic influence upon physiological thinking from eighteenth-century Italy, via the Germans already mentioned, through to twentieth-century Britain and the Nobel-prize-winning work, first of Edgar Douglas Adrian, and later his student Alan Hodgkin (Cf. Piccolino and Bresadola 2013: 285–289). Specifically, they note that

the analogy between the explosion of gunpowder and the muscle contraction had been already evoked by [proto-physiologist] Felice Fontana in his elaborations on the theory of irritability, and had probably influenced Galvani in his electric research [...]. It was also invoked by Helmholtz when he published in full form the results of his measurement of nerve conduction speed.

(Piccolino and Bresadola 2013: 287)

Both ‘muscle contraction’ and ‘nerve conduction speed’ were imagined in terms of the progressive ‘firing of a train of gunpowder’, as neuroscientist Keith Lucas wrote of an experiment by his student, the abovementioned Edgar Douglas Adrian (Cited in Piccolino and Bresadola 2013: 286).

Therefore, one sees a clear lineage here, which continues into the present day, from the ‘explosion’ of gunpowder ‘firing’ to neurons ‘firing’. A differing perspective on such contemporary biological ‘explosions’ is found in Catherine Malabou’s tantalizing yet cautionary commentary on the prevalent neuroscientific discourse of brain plasticity. She emphasizes that plasticity is as much about giving form as receiving it – a plastic brain is changeable just as it actively changes things – but then makes an unexpected and perhaps darker connection:

it must be remarked that plasticity is also the capacity to annihilate the very form it is able to receive or create. We should not forget that *plastique* [...] is an explosive substance made of nitroglycerine and nitrocellulose, capable of causing violent explosions. We thus note that plasticity is situated between two extremes: on the one side the sensible image of taking form (sculpture or plastic objects), and on the other side that of the annihilation of all form (explosion).

(Malabou 2008: 5)

In this light, Malabou’s etymological side-step here buttresses the view that the history of investigation into brain function has at least a partial ballistic, explosive basis, as well as highlighting its potential violence. Plasticity underpins some of the foundational phrases and ideas of neuroscience today, such as the well-known description of Hebb’s law: ‘Neurons that

fire together wire together' (Hebb 2000; cited in Armstrong 2013: 39, note 27). But long before plasticity achieved its widespread currency in the neuroscientific literature, the history of brain function has had an important, if haphazard, relationship with the history of brain structure. Debates have raged over the centuries about how function and structure are related, if at all, but these debates reached their apex in the mid-to-late-nineteenth century, centring on two experimental practices remarkably similar to Malabou's formulation of 'taking form' and its 'annihilation'. Basically, the function of the frontal lobes was investigated either by stimulation or ablation, or as mentioned of Fritsch and Hitzig above, by the equivalent terms 'excitation and extirpation' respectively. In other words, experiments into brain function of these structures either tried to make something happen in particular convolutions of the brain – or simply removed and destroyed them.

Seemingly there is a parallel between plasticity-oriented descriptions of destruction and generation in the brain, and a history of destroying and generating activity in the brain in the name of experimentation – a perhaps problematic relationship between what the brain does and what the brain has had done to it. This topic is given a good airing in Malcolm Macmillan's exhaustive account of the case of Phineas Gage, titled *An Odd Kind of Fame: Stories of Phineas Gage* (2000). Macmillan's purpose is to place at centre stage the very oddness of Gage's now indubitable fame, and thus the title of the book. The reason for this is that Gage's case is often invoked yet rarely deeply explored; in this respect, resorting to Gage is essentially resorting to his fame, an aporia which clearly leads to exacerbating itself with each mention. Thus Macmillan surveys what is actually, concretely known of Gage (remarkably little, it turns out), how it has historically been deployed in the service of various scientific theories about the brain and its workings, and how Gage therefore came to represent a kind of neuroscientific and psychological standard, a go-to reference in arguments and new hypotheses on the mind and brain. This is because during an accident in 1848, hapless railroad worker Phineas Gage had an iron rod pass entirely through his skull and brain, yet lived on for a further 11 years. The episode especially turns on the supposedly drastic alteration to Gage's personality after the incident. Hence, in an equally accidental way, Gage had an important, albeit indirect effect upon how the brain and cerebral localization were regarded thereafter. Of interest in the present chapter is that the accident and injury he suffered was the result of a small but uncontrolled explosion of his own making, a ballistic mishap.

Summarizing Gage's story as an 'accidental explosion of his own making' appositely ties together ballistics, literature and the brain, suggestively encapsulating how their shared relationship convolves in several ways. Firstly, Malabou's dual reading of plasticity is again invoked: Gage inadvertently facilitated a step forward in knowledge about the brain by destroying some of his own. Secondly, neither the neurological step forward, nor the cerebral

destruction, nor the mythologizing of Gage's life thereafter, happened immediately – they all have different relative speeds to that at which the rod was fired through Gage's head. Different temporal dimensions of the historical brain are here opened up to scrutiny. To rephrase, the speed of brain processes has a history, while this history itself has its own speed, both of which are related to the speed of ballistic entities and how these are variably rendered in writing.

Creation and destruction are obviously not the same thing, but have a shared, paradoxical influence on how time figures in the idea of speed. Something in this spirit is captured by the work of cultural theorist Paul Virilio. In 'Logistics of Habitable Circulation', Benjamin H Bratton's introductory essay to the 2006 reedition of Virilio's *Speed and Politics* (1977), Bratton sums up Virilio's stance on the societal centrality of the concept of speed, and this clearly resonates with the brain/ballistics nexus I am trying to define: "History progresses at the speed of its weapons systems;" that is, at the speed of the competitive capacities to envision, draw, map, curtail, mobilize, contour, stabilize and police the polis' (Virilio 2006: 11). This is to say that the metaphor of an 'arms race' is mirrored in societal values and practices; the history of competition to improve weapons systems means that the speed of the weapons themselves is as important as how quickly the innovation was made or the technology developed. That this crucially shapes social relations and policing is hardly surprising, and means an emphasis on speed pervades all walks of cultural life – as information and communication technologies also emphasize speed, there is a natural connection between an everyday conception of the increasing pace of modern life, and the weapons designed (and designed more rapidly each time) to end this life ever more quickly and efficiently. That neuroscience extensively uses, recycles and concretizes the now naturalized and widespread expression of ballistic speed is therefore no great departure.

Can a literary analysis of such metaphors provide important corrective insights? To begin with, Paul B Armstrong takes the opposite tack. He instead investigates neuroscience's influence on discussions of long-held literary-theoretical intuitions, and the resulting research on the social and personal value of reading. Taking a phenomenological, embodied stance, Armstrong covers an exhaustive amount of material exploring the relationship between 'The Social Brain and the Paradox of the Alter Ego', in his recent book *How Literature Plays with the Brain* (2013). The 'alter ego' referred to is the other, textual self that one inhabits when reading, a paradox because one obviously still remains oneself during this process: something Armstrong calls a 'doubling' of the self. This is something akin to empathy, he suggests, and may have a biological, evolutionarily advantageous underpinning. According to Armstrong,

the neurobiological explanations of our ability to understand others should make sense of the paradoxes of reading, and the paradoxes of reading are in turn a good test of the claims made by competing theories of the social brain. What does the experience of reading reveal about the

neurobiology of intersubjectivity, and what does the brain's capacity to 'double' self and other tell us about how we read?

(Armstrong 2013: 136)

Conceding the proviso that of these 'competing theories of the social brain,' 'the emerging consensus is that none alone can account for the complicated, messy work whereby the self and others meaningfully interact' (2013: 132), Armstrong goes on to focus on mirror neurons.⁶⁰ In these much-debated cells, he sees the greatest potential for discussing the similarities and differences between 'doubling' at the neurobiological level and at the experiential level (while reading literature, for example).

Mirror neurons are interesting because imaging techniques have suggested they contribute to the linking of perception with action; their activation occurs not only when conducting an activity, but also when observing another person conducting that same activity. Armstrong notes (after neuroscientist Marco Iacobini) that this signals a possible neural basis for empathy and social cognition. This foregrounds Armstrong's claim that 'doubling' traverses disciplines: if mirror neurons indicate learning by imitation, or help infer others' intentions by internally simulating their actions, he says that the same kind of intersubjectivity is in play when reading. Immersion in another's world of motor skills and intentions, Armstrong hypothesizes, is alternated with one's own thoughts and cognitive processes regarding why and how that world exists as it does. This lends literary fiction its aesthetic, affective force, just as participation in the social realm allows people to learn from and communicate with each other. However, Armstrong's even-handed, completist manner involves weighing up the variously overinflated claims or underestimated ramifications of all the social brain theories. Thus, he squarely dismisses any overly self-congratulatory conclusions drawn from a neuroscientifically-supported interpretation of reading as the ultimate source of cultural and moral value. Alluding to brain plasticity and its role in the genesis of social life, Armstrong argues that the 'socially induced neuronal recycling through which the brain learns to read is a primary example of [cultural anthropologist Michael Tomasello's concept called] the ratchet effect'. This means that due to human 'collaborative activity, culture can "ratchet up" specieswide change more rapidly and more broadly than biological evolution could accomplish' (Armstrong 2013: 172). In this view culture (including literary aesthetic effects) and nature (including the neurobiological correlates of these same aesthetic effects) have a reciprocal, mutually-affecting relationship. However,

⁶⁰ A mirror neuron is 'a neuron that is activated when a person performs a certain action or has a certain experience and also when the person observes someone else performing the same action or having the same experience' (Colman 2009: 467). For an overview of mirror neurons, Cf. Stamenov and Gallese 2002.

Armstrong stresses that this does not mean the ‘to-and-fro play of reciprocal social interaction staged in aesthetic experience [such as] reading is inherently benevolent and socially productive, any more than our mirror neurons make us essentially moral beings’ (2013: 172).

Even if mirror neurons offer some insight into the social brain, such as what role imitation plays in learning, there is nothing to say that any particular instance of imitation is not motivated by something immoral, or conversely, innocently imitative of covertly immoral behaviour, or devoid of morality altogether. Armstrong points to the example of represented violence, such as in movies and video games, and its effect on the behaviour of children. He usefully surveys the debate still surrounding this issue, which goes back at least to the oft-cited study by Albert Bandura et al. entitled ‘Imitation of Film-Mediated Aggressive Models’ (1963). Armstrong’s argument is that neither mirror neurons nor aesthetic experience definitively prove anything about violence and its representations; if imitation is not intrinsically moral, then it is not intrinsically immoral either, with other factors tipping the scales on an individual, case by case basis. This is because the doubling he writes about is not a direct duplication of the self (which would problematically suggest a dissolution of all identities into each other), but again a paradoxical ‘me’ and ‘not-me’ at the same time.

Despite the fanfare surrounding mirror neurons, the overall ‘me’ is still in effect and brings overall influence to bear in decisions regarding what Armstrong calls an ‘as if’ scenario (which, it is worth remembering, only occurs in a certain portion of one’s neurons, be they of the mirror variety or otherwise).⁶¹ Armstrong writes that

Observational learning of aggression is not an automatic response, then, but is an ‘as if’ relation that may vary according to how the behaviour is received, understood, and processed by the recipient. A doubling of me and not-me characterizes an observer’s response to represented violence. Doubling is an inherent feature of all imitative behaviour, and doubled relationships leave open variable possibilities of response.

(2013: 173)

Armstrong’s typically measured, inclusive coverage of all pertinent issues means the door is equally left open to both literary study and neuroscience to continue assessing what the self is and how it relates to society. He makes no conclusive remarks, whether positive or negative, about

⁶¹ An ‘as if’ scenario is essentially a mental simulation of an activity or event. Literary critic Nancy Easterlin basically concurs with Armstrong, using a similar turn of phrase: ‘Imaginative literature engages with our everyday modes of thinking and feeling but, locating the reader’s experience in as-if situations, resides a safe distance from everyday social and practical interactions’ (Easterlin 2012: 57–58). However, her expression ‘a safe distance’ seems to suggest more than just mundane ‘social and practical interactions’ and perhaps violent or even explosive ones.

the significance of mirror neurons, other than to dismiss the conclusiveness of previous remarks and call for a reinvigorated atmosphere of collaboration:

What we need from both neuroscience and the lettered humanities is, not politically correct programs for social and moral improvement, but, rather, explanations from their different perspectives of the mixed picture of weal and woe that is repeatedly evident in human history. At least part of that story is to be found in the wonderfully and horribly disparate possibilities for how self and other can relate to each other that are inherent in the paradox of the alter ego and the capacity for doubling of the social brain.

(Armstrong 2013:174)

With this, Armstrong concludes the chapter. However, it seems to me that some aspect of his undoubtedly balanced analysis and useful commentary on doubling leaves open a problem which itself contains a sort of doubling – a double-edged problem. First edge: if neuroscientific explanation of imitative behaviour unreflectively relies upon terminology couched in the language of violence, such as the ballistic-inflected ‘neurons firing’, who is to say that violence does not creep into the equation here? This leads to the second edge: while Armstrong’s suggestion that ‘doubled relationships’ may well ‘leave open variable possibilities of response’, whereupon an intersubjective, social component can sway an individual’s behaviour one way or another, what if this social and cultural component is explained using that same, essentially unquestioned ballistic language? This is why, although collaboration is indeed a commendable goal and not one that is being disputed here, an analysis of the explosive linguistic suppositions at the heart of a dominant cultural paradigm such as neuroscience continues to be necessary. These suppositions may well be metaphorical, but this is very much what is at stake, because is not a metaphor precisely a ubiquitous linguistic instantiation of that doubling that is being considered? Neurons are not guns, so they do not fire – yet they do at the same time.

Ballistic metaphors are not new and certainly not limited to discussions of the brain and nervous system. Historian of science Geoffrey N Cantor has noted their extensive use in eighteenth-century scientific hypotheses on the nature and movement of light (Cf. Cantor 1987). Meanwhile, philosophers of science Bernadette Bensaude Vincent and Sacha Loeve write that the early-twentieth-century concept of the ‘magic bullet’, proposed by Nobel laureate Paul Ehrlich to designate an extremely specific therapeutic agent, is still in evidence today in the field of nanomedicine:

the image of the ‘therapeutic missile’ commonly used to present targeted drug delivery devices emphasizes precision, control, surveillance and efficiency. Such values are highly praised in the

current context of crisis of pharmaceutical innovation where military metaphors foster a general mobilization of resources from multiple fields of cutting-edge research.

(Bensaude Vincent and Loeve 2014: 1)

Bensaude Vincent and Loeve list a number of variations on ballistic metaphors such as ‘magic bullet’ and ‘therapeutic missile’ just within nanomedicine, and note that ‘such metaphors used in popular journals and scientific publications have shaped the conceptual structure of the research field’. As I have stipulated above of neuroscience, however, they also stress that: ‘To be sure, this is not specific to nanomedicine. Warfare metaphors have pervaded medicine and healthcare for a very long time’ (Bensaude Vincent and Loeve 2014: 2); as Susan Sontag notes, military metaphors have dominated descriptions of treatment as well as disease (Cf. Sontag 2002: 65–68). While Bensaude Vincent and Loeve survey nanomedical uses and abuses of such metaphors, they openly admit that their main emphasis is the insufficiency and impracticality of ballistics as a metaphorical framework for research in nanomedicine, regardless of moral objections.

Cultural semiotician Irene Machado extends this analysis of ballistic metaphors, beyond weaponry or projectiles in flight, to the notion of the ‘impact’ these make. Her consideration of ‘impact’ does not solely take in science, but also the broader discursive regimes underpinning academia, and in particular the inflated character of technological explanations. Thus, the ‘impact’ one’s work has on the world, the dissemination it might achieve via today’s digital technologies, if all neurons are also perceived to be ‘firing’ correctly – this can be seen as doubly technologically ballistic. Machado, basing her position on the semiotic and anthropological work of Clifford Geertz, Mikhail Bakhtin and Juri Lotman, writes that it is ‘necessary to evaluate the relevance of the use of ballistic metaphor as the degree zero of the explosive movements of culture’ (Machado 2006: 246). It is Lotman’s writing that most governs her sense that ‘impact’ and ‘explosion’ have differing potentialities in the current climate. She claims the former term has exhausted its insoluble oxymoronic value as a metaphor (the positive ‘impact’ of a writer, for instance, also impossibly implying the destruction wrought by his or her writing), while on the other hand ‘explosion’ expresses the opposite paradox – the slowly progressing, deeply productive, evolutionary starting point of the Big Bang invested in each and every smaller cultural sphere of human life. It is a position not without its complications, not least of which is a somewhat simplistic trade-off of paradoxes, but it seems fair to say that Machado’s analysis is at least correct in bringing to the fore the paradoxical nature of the items under investigation. This is in contrast to the obfuscating, or as she puts it, ‘neutralizing’ tendency of ‘impact’, something which quietly and without challenge divests itself of its ballistic roots, just like the firing of neurons.

Lotman’s espousal of ‘explosion’ as a creative rather than a destructive force is certainly interesting, especially in light of its resonances with Malabou’s dual reinterpretation of

‘plasticity’. For his part, Lotman writes in *Culture and Explosion* (first published in Russian in 1992) that above all, ‘The moment of explosion is the moment of unpredictability’ (Lotman 2009: 123). He then unpredictably comments on the similarities of the deaths by pistol duel of Russian poet Alexander Pushkin, and Pushkin’s own literary creation, the naïve romantic Vladimir Lensky, killed by the eponymous protagonist of verse-novel *Eugene Onegin*. Lotman considers the various factors in this extraordinary instance of life imitating art before pronouncing:

These reflections are necessary if we are to consider, following Pushkin, what potential possibilities remained unrealized at that moment when Onegin’s bullet was still located in the cannon of his pistol [...]. In the novel the death of Lensky was predetermined by the poet’s intention; in real life, at the moment when the shot takes place, there is no predetermined future – there is only a cluster of equally probable ‘futures’ [...]. Thus, the moment of explosion creates an unpredictable situation.

(Lotman 2009: 124–5)

The explosion could equally kill a real poet or create an important poem (whose literary ‘impact’, in deference to Machado, will not be overstated here); the shot in either case could remain in the barrel, nobody ultimately choosing to shoot, and both creation and destruction are avoided as possibilities. As it stands, the actual occurrences, both fictional and real duels, recast their previously wavering, ephemeral possibility as something that had always been written in stone. Thus the semiotic reading of Lotman gives ballistic metaphors a different timbre, opening up a curious rift in time and possibility.

However, such a rift, just like the ballistic roots of neurons firing, is smoothed over by neuroscience, along with the consequent yet tacit implication of the subject with the object of its scope. This is to say that if aspects of the human brain are couched in ballistic or militaristic terms, humans are inevitably thought of, a priori, as ballistic selves.⁶² Since it is still human beings (and thus ballistic selves) that hypothesize, propose and conduct brain science, the values and cultural presumptions that come attached with ballistic metaphors must in some way propagate themselves in this research, a cycle that once again places conflict at the core of the human animal’s existence. Although Cantor limits his study of ballistics to one of several metaphors in eighteenth-century texts on optics, his conclusions are still pertinent here. Not only does he write that ballistic metaphors are ‘highly malleable [and] could be used to establish a

⁶² This is true of the neurons and brains of animals other than humans too, but only insofar as humans, the inventors of ballistics, are concerned; whether animals think of themselves as selves at all, let alone ballistic ones, is evidently a matter for further consideration elsewhere.

variety of incompatible tensive relationships'; he also argues that they 'can act silently and imperialistically [which] suggests a further role for metaphor in connection with cognitive psychology since metaphor may lead scientists to presume the structure of nature' (Cantor 1987: 142). Cantor then questions what he sees as a common but erroneous distinction between metaphor as a didactic tool and a mere descriptive measure, used to guide or elucidate future research. His analysis of metaphors from ballistics leads him to write that while the teaching/research distinction has some uses, 'the position towards which I am moving makes metaphor *constitutive* of scientific discourse' (1987: 142; original emphasis).

If this is so, then it is not unfair to say that ballistic metaphors are constitutive of neuroscience, guiding theory, informing the empirical research to back up that theory, and providing the basis for the training of the next generation of scientists who then plug back into that theory. Merely looking at how the metaphors play out within the discipline never breaks out of this circle. Therefore, the next section attempts to do just this, to reinstate Lotman's productive rift and leave the circle of neuroscience for a while. The goal is to inspect the literary use of ballistics, to see if this provides a convoluted loop back to neuroscience, or conversely, the bullet simply flies straight and true at its new mark. As mentioned, ballistics becomes a nexus for both neuroscience and literature in the relationship between time and space captured by the concept of speed. The brain, after all, can be considered that locus where the mind's perception of time and its actual, physical extension in space find some manner of conceptual overlap – as Dan Lloyd writes, 'I swung the analytical tools for deciphering temporality around toward the brain, and found strong evidence that we are time in the flesh' (Lloyd 2004: 329). Generally, science only seems capable of offering a third-person picture of speed which jars with the experiential aspect of existing in time and space. Phenomenology, and more recently neurophenomenology, have both worked to correct this picture, sometimes in dialogue with science.⁶³ But far before this, literary authors and theorists experimented with textual depictions of time and space, experiments which compress and expand both in a way that is legible and comprehensible. In this way, they provide an accessible third-person account, but recognizable also as an adequately realistic version of lived, first person experience. So the next section considers three different 'ballistic' texts from different places and times, to see if they manage to converge upon a target. The aim is to see if the wilful use of warfare and weaponry as material for themes as well as forms means that overtly, ballistically-charged literature can offer any insights to neuroscience, and its tacit, uncritical adoption of ballistic metaphors.

⁶³ For an overview of neurophenomenology, Cf. Lutz and Thompson 2003; for an extensive set of discussions, Cf. Petitot et al. 1999; for the relationship between literature and neurophenomenology, Cf. Lloyd 2004 and Armstrong 2013.

B S Johnson: Mean Point of Impact on the Brain

In *Corpsing* (2000), Toby Litt punctuates his contemporary hard-boiled novel with six ballistic reports – italicized descriptions distributed evenly through, and distinct from, the narrative proper. The reports consecutively detail the flight and damage of each bullet fired at protagonist narrator Conrad and his ex-girlfriend Lily at the novel's start. Thus, there is a strange rift in temporality at the novel's core: these bullets, product of the first event of great significance in the narrative, give the entire story its impetus, but they also carry through into its development, shot as they are through the text. The bullets occur at the beginning of the narrative in the blink of an eye yet simultaneously they reoccur in print throughout the text, skewing any stable interpretation of their speed or temporal nature. One can appreciate something similar sixteen years previously, when Jacques Derrida writes that '*At the beginning there will have been speed*' (Derrida 1984: 20; original emphasis) – this statement not quite beginning his own projectile-infused text '*No Apocalypse, Not Now (Full Speed Ahead, Seven Missiles, Seven Missives)*'. The number may be different, but in a parallel manoeuvre to Litt's in *Corpsing*, Derrida's essay is peppered with seven of these typographically divergent (that is to say, once again italicized) statements to represent the missiles that suffuse and are also the topic of the text. Going yet further back in time, and in a pre-emptive strike to both of these ballistically-informed writings, B S Johnson's 1970 short prose piece 'Mean Point of Impact' more or less begins where Derrida's essay ends: with the name John. In Johnson's text, the will of this pseudo-historical figure John is to erect a cathedral in honour of St Anselm, and the narrative outlines the obstacles, architectural innovations and fluctuating opinions this project encounters over time, starting with its inception in some unspecified but seemingly medieval age. Careening at intervals throughout this all is an ostensibly modern series of radio messages, military style, explaining the bombing of the same cathedral from the point of view of some unknown agency as they adjust and aim the rocket-launcher – again, these interjections presented as distinct from the main text by nesting within it in an easily appreciable set of typographic variations.

All three texts begin with the launching of missiles which are both inside and outside their main discourses, virtually instantaneous as they are fired yet with devastating and longer-lasting consequences. This raises some questions: what is the phenomenology of ballistic writing and reading? What is it about the temporality and trajectory of ballistic objects that attracts these three disparate writers, Litt, Derrida and Johnson? What impels them to so similarly fire projectiles through their own writings, upsetting the linear flow of meaning through time and space and causing unpredictable ruptures in the body text? I contend that the uncanny

congruencies between these pieces of writing might be teased out through a process touched upon in Johnson's chilling yet somehow also humorous text, where the off-camera bomber fires speculatively and concludes that to effectively attack at a distance, one must '*observe, split difference, two more ranging shots, observe, split difference, which should then give me the mean point of impact*' (B S Johnson 1973a: 48; original emphasis). An initial such 'ranging shot' is the 'Introduction' to the recent reedition of Johnson's *Albert Angelo*, which was written by Litt (Cf. Litt 2013a). Litt's work is generally shot through with a Johnsonian spirit, and thus he provides an interesting perspective on his forebear. Indeed, 'shot through' is an apt way to see the relationship between Litt and Johnson. A shot fired through a body is almost instantaneously outside and inside, passing imperceptibly quickly through this object – unless of course said shot ends up wholly lodged within its target. In *Corpsing*, Litt treats the book itself as the object of six shots, bullets which are both periodically its subject, inside the text, but also themselves racing through it as discrete, italicized and numbered sections cleaving or nesting in the regular flow of chapters. The singular narrative event of the shooting is described relatively quickly at the beginning of the book, yet still the bullets that pierce it mean its otherwise regular chronological progression is ruptured as they appear like open wounds throughout.

This appears to ape Johnson's 'Mean Point of Impact', first published in the 1973 anthology *Aren't You Rather Young to be Writing Your Memoirs?*. 'Mean Point of Impact' does a similar thing to *Corpsing*: a missile attack is both subject and object, the primary story perforated by the shrapnel of the typographically variant secondary story, the first occurring over a long period of the history of a cathedral and the second occurring in the short period leading up to the bombing of said cathedral at this history's apex. As literary theorist Miriam Havemann explains, 'Mean Point of Impact' involves 'the concurrent presentation of two entirely separately and anachronistically working narrators [which means that Johnson] is able to achieve an immediacy which further emphasizes the inevitability and horror of the destruction' (Havemann 2011: 269). This is another way Johnson is shot through Litt; they may have been 'entirely separately and anachronistically working' authors, but *Corpsing* shows how Johnson's ballistic offering in 'Mean Point of Impact' can continue past the author's death and into the present. Stating Johnson's influence might be pure conjecture if it were not for the fact that recent critical interest in his work has yielded new editions of his oeuvre in 2013, thus bringing to the surface concrete evidence of Litt's interest in Johnson, via the aforementioned Introduction to *Albert Angelo*. Ballistics therefore appears to be both a trope and a logic that ties one writer to another across the expanse of years.

So what did Johnson actually know of ballistics? In *Like a Fiery Elephant: The Story of B S Johnson*, Jonathan Coe writes that Johnson had been 'a keen amateur gunsman in his youth,

[who kept] a shooting rifle back at his parents' house' (Coe 2004: 37), and that

as a teenager, he belonged to a rifle club in Barnes, which was how he came to own a gun. Years later, in the course of their taped interview in 1973, [Johnson's] father Stanley would tell him that his paternal grandfather had been a keen marksman, and 'that's probably where you get your shooting from.'

(Coe 2004: 59; unnumbered footnote)

Evidently Johnson had some formal knowledge, if not of ballistic science itself, then at least of guns and their general principles and operation. Drawing ominous conclusions about Johnson's potential propensity for suicide (to which he eventually did succumb, though not with a gun), Coe comments on an episode in which Johnson describes shooting a rabbit: 'The bullet makes "a bluish hole in its flank towards the tail," and there is a good deal of detail, rather morbidly dwelt upon [...]. Johnson then kills the creature off with another bullet, and "watched as the blood flushed over the edges of the smashed bone and across the mass of grey-white brain [...]"' (Coe 2004: 59). Coe is quoting from a short piece called 'Clean Living is the Real Safeguard', in which Johnson depicts with precision the rifle involved, and also claims that 'the bullets fascinate me' (B S Johnson 1964: 29). Rather than 'dwell' equally 'morbidly' upon Johnson's death here, the episode highlights instead that during his life, in addition to knowledge of guns, he had some actual experience of gunshot wounds – the subspecies of knowledge formally designated, in contrast to the 'internal' one of firearms and the 'external' one of the trajectory of projectiles, as the realm of 'terminal' ballistics (Cf. Denny 2011).

Like a Fiery Elephant is also intriguing because the strange temporality of missiles or bullets, instantaneous yet with potentially long-lasting consequences, seems to have infected Coe in his description of Johnson's life. Coe justifies his choice for the book's structure by appealing to Johnson's own belief in the intrinsic chaos and messiness of life. Thus, instead of a linear narrative, he opens with an Introduction which includes the above justification, followed by short but involved summaries-cum-potted-histories of those best known parts of Johnson's oeuvre, his novels. After this, Coe recounts his own archival rummaging, resulting in his first experience of what might be seen as textual empathy with the long dead Johnson – a supernatural experience Johnson claimed to have had with the vague figure of 'The White Goddess'. The point is that it is only at the end of this prefatory chapter, itself already preceded by the Introduction and novel synopses, that Coe states the following: 'And now, bullets must be bitten, decencies must be observed, and it really is time to start at the beginning' (2004: 41). What can Coe possibly mean by 'starting at the beginning' when he has already covered so much ground?

The *OED* gives the meaning of 'to bite (on) the bullet' as 'to behave courageously; to avoid showing fear or distress'. No doubt this figurative use of the bullet is meant by Coe as

nothing more than a throwaway gesture, a self-conscious mental build-up to the actual nitty-gritty of relating Johnson's complicated life, which his comment perhaps suggests he had been delaying. However, given Coe's convoluted preamble to actually 'biting' them, the mention of bullets can be interpreted as a fear of starting at the beginning itself – a worry that the starting pistol has already gone off and the cartridge is already speeding through one's mouth before one has had the chance to bite down, let alone speak about the experience – a fear that starting will only reveal that starting had already occurred. A version of this aversion is also displayed in Derrida's essay 'No Apocalypse, Not Now (Full Speed Ahead, Seven Missiles, Seven Missives)'. Its title alone shows it is ballistic-infused, and in what will be shown to be strikingly similar ways to Litt's and Johnson's texts. The uncanny non-previousness of starting is in 'No Apocalypse...' described more as an inevitability than a fear. Derrida begins (if the term 'begins' still applies) in a convivial tone, straddling friendly and conspiratorial: 'Let me say a word first about speed. *At the beginning there will have been speed*' (Derrida 1984: 20; original emphasis). The unsettling nature of the future perfect tense in 'there will have been' derives from its incongruence with the directly preceding 'at the beginning', finding self-negation in that this supposed 'beginning' is still to come – nevertheless, it already drags along with it the baggage of some prior 'speed', the latter of which has already been twice mentioned but remains as yet undefined. With the text ostensibly begun, one reads that something ('speed') came before it, but that the beginning is still only on its way anyway. A complex state of affairs, undoubtedly confused further by the fact that this italicized, emphasized line is indeed not the first line, but the second; awareness of the coming beginning only comes after the beginning.

Asking permission of his invisible audience, Derrida playfully proceeds to say he is about to pronounce his first word – which of course has already happened in saying this. This relates to his concept of the 'supplement', something both inside and outside a given text, extraneous but additional to it. As creative and critical theorist Nicholas Royle explains, the supplement is 'at once what is added on to something in order further to enrich it [...] and it makes up for something missing, as if there is a void to be filled up' (Royle 2003: 48–49; original emphasis). A supplement, a written supplement, both exceeds yet complements, and thus co-exists in the time of a text. So in 'No Apocalypse...' one can refer to its so-called 'first word' about 'speed', which is not its first word; having been 'said' by Derrida too quickly even for itself, it exists on the page with words before it. So does the 'real' opening word, which is printed with a numbered section title before it, or as Derrida has it, 'First missile, first missive' (which is itself, of course, preceded by the essay title, which is preceded by the journal title, which has itself been historically preceded by other journals, other writings and so on). Whilst not a new idea in Derrida's oeuvre, the significant thing here is the typography and layout: the missiles/missives, of which there are seven as the essay's title suggests, are out of sync with the

main body of text, printed in the margin but overlapping, coming both before and during the text, indicating points where there is a short italicized section like the aforementioned ‘*At the beginning there will have been speed*’. These piercing written projectiles leave visible typographical wounds in the body text and are a visual display of the supplement at work, both in terms of their simultaneous status as subject and object of the essay, but also in that they exist on the page at the same time as the rest of the text but were shots fired at the start, providing the text’s structure by continuing through it.

Derrida’s main topic in ‘No Apocalypse...’ is the possibility of a final, ‘remainderless’ nuclear war, something very much still in the minds of writers, politicians and the general public at the time he was writing in 1984. Rather than make outright claims about such a disastrous occurrence, Derrida’s strategy is to instead comment on the rhetoric of others – hence his insistence in the third missile/missive that ‘*We can therefore consider ourselves competent [to comment] because the sophistication of the nuclear strategy can never do without a sophistry of belief and the rhetorical simulation of a text*’ (1984: 24; original emphasis). Crucially, the ‘nuclear referent’⁶⁴ he refers to subsequently and throughout is something that thus far exists only in writing – nuclear war belongs solely to the realm of argumentation and commentary that would be wiped out were it to ever actually, really happen. A similar tack, *mutatis mutandis*, is taken in Litt’s 2001 novel *deadkidsongs*. Set in a fictional English town, the novel tells of four young boys with vivid imaginations and obsessed by playing at war, who are involved in what they specify is called ‘Gang. Not The Gang. Just Gang’ (Litt 2001: 9). Explicitly dropping the definite article serves to colourfully illustrate the strong sense of identity ‘Gang’ provides the four boys, and their rigidly observed, militaristic rituals and beliefs are described in detail.

What seem like highly organized but nonetheless childish games take on increasingly sinister (if occasionally humorous) overtones throughout the novel. An early description of the boys’ collective mind-set hints at this progression:

Between us, we felt as if we could cope with just about anything that might come along. This confidence didn’t make us complacent, however. Gang-life was a constant preparation for the unexpected. The greatest fear we had was that the coming war would be nuclear right from the start, and that we would none of us get the opportunity to perform the glorious actions we had so often imagined.

(Litt 2001: 11–12)

⁶⁴ For an extended discussion of this term and its history, Cf. Solomon 1988. However, seeing as ‘the use of long-range buzz-bombs and ballistic missiles [...] grew out of the technology and utopian enthusiasm of [Fritz] Lang’s [1929 film] *Woman in the Moon*’ (Frayling 2005: 82), the thus far solely rhetorical, written nature of the nuclear referent does not necessarily preclude the outbreak of nuclear war, and can even make it happen. The literary imagination can cause things to occur in the ‘real’ world – if fantasies of rockets can lead to the Nazi rocket program, as Frayling suggests, then so too nuclear fantasies can break their imaginary bounds.

The escalation of war to a nuclear level and the realm of the imagination are here connected – war is inevitable, something always on the horizon and deserving of mental preparation, along with the dream-like prospect of glorious involvement. The story’s essentially bucolic, peacetime setting provides much of the dramatic impetus, this setting being so at odds with Gang’s zealous belief in an altogether improbable Russian invasion of Britain, not to mention that the nuclear threat, along with all life, would obliterate the boys’ chance at heroically participating in battle. This glorification of war, and the almost unthinkable disappointment of its potential fictionality, is what links *deadkidsongs* to Derrida’s idea of the nuclear referent as belonging to the domain of the imaginary.

It is the boys’ mythologization of past conflicts (such as discussing when Matthew’s grandfather ‘[saw action] on the beaches of Normandy’ (Litt 2001: 9)) alongside the depicted period’s media coverage of the Cold War, that elevates nuclear conflict to a war beyond wars. But it is precisely this, the lack of direct knowledge of nuclear conflict and its consequent uptake by the imagination that makes it what it is – for Derrida, a solely textual, literary beast. Tying in with this, philosopher Liam Sprod provisionally defines ‘the Heideggerian schema of the ontico-ontological difference [as] the difference between particular scientific, technological, cultural or historical knowledge of the world (which is ontic) and the conditions of possibility of both the world and that knowledge (which is ontological)’ (Sprod 2012: 15). He then goes on to explain Derrida’s third missile/missive in ‘No Apocalypse...’: the ‘competence’ mentioned means literary (or the newly titled ‘nuclear’) critics are uniquely qualified to critique the machinations of the nuclear rumour mill specifically because of the textual and rhetorical nature of the ‘nuclear referent’.⁶⁵ As Sprod points out,

the integration of the ontico-ontological difference within the textuality of nuclear war means that while at one level the text will *be* and at the same time *produce* ‘reality,’ at another it will also allow a way of understanding and interpreting reality, a way clearly within the domain of the nuclear critic as a mechanic of texts.

(Sprod 2012: 22; original emphasis)

To return to Gang in *deadkidsongs* then, it could be argued that Litt, in his critical capacity of author, uses the boys’ anticipation of war to comment on the textual, literary ways that nuclear war is thereby ‘produced’.

⁶⁵ As Daniel Cordle puts it in the introduction to his book *States of Suspense*, ‘this is a book about things that did not happen and the cultural consequences of their not happening’ (Cordle 2008: 1). Others have also remarked that the ‘nuclear referent’ – and the debate, not just amongst nuclear critics, but in society and culture as a whole – is solely, thus far, textual/rhetorical: Cf. Mannix 1992; C A Carpenter 1999; Gery 1996. In particular, Gery makes interesting connections between what he calls ‘ways of nothingness’, the ‘nuclear referent’ and Derridean *destinerrance*.

Litt here shares Derrida's concerns with the nature of war, its links to writing, and the strange (a)temporal (non)climax of both in the nuclear. Litt even shows an irreverent appreciation of Heidegger's ontico-ontological difference – only here with reference to the constituent parts of a knickerbocker glory – in a short story called 'The Gloop':

We here are the chocolate sauce and the strawberry sauce and the vanilla ice cream and the whipped cream, flaked almonds, sliced strawberries, quartered grapes, cubed melon chunklets; we are all of these edibles equally and at once. (Friend.) But we are not the tall ice cream sundae knickerbocker glass, and not the long metal stirring spoon.

(Litt 2013b: 111)

However comical the vehicle, the conceptual thread of 'The Gloop' plus its many parenthetical references to 'Friend' punctuating the text give a similar conspiratorial, confessional tone to the start of 'No Apocalypse...'. As Sprod points out, Derrida's preoccupation with nuclear war is inextricably tied to a concern about the future, not only in the banal (or ontic) sense of things to come, but in a more pervasive (ontological) sense of temporality and the meaning of the futural in general. Litt obviously demonstrates the same preoccupation, seeing as his story is published in a collection that overtly sets out to deal with futurity in the present, titled *Beacons: Stories for Our Not So Distant Future*.

In the gloop's own consideration of itself in 'The Gloop', every possible facet of existence starts to fold in upon itself and become – of course – gloop. The narrating gloop then asks "What then?" This results in a rejection of the question itself as something that is also subsumed by the all-encompassing logic of the gloop:

'What' (in 'What then?') being wrong because whatness, as a quality, will have been subsumed in total is-ness or un-ness or post-ness or sur-ness (sur-sur-ness, sur-sur-ness-ness, etc) – and 'then' (in 'What then?') being even more wrong because temporality depends upon event and event depends upon change and change depends upon integrating or disintegrating forms. When all is background, when 'when' (in 'when') is moot, all as all will continue its dissolutions into unending, even though once provably beginning, all-all-all.

(Litt 2013b: 113–114)

In this undeniably convoluted passage, Litt nevertheless displays an intricate understanding, not dissimilar to Derrida's evocation of the 'absolute' in 'No Apocalypse...', of the 'whatness' as well as the 'whenness' of 'unending all-all-all' – something like the future, including the future right now, being a complete collapsing of space and time into each other. This was 'once provably beginning' and later Litt concludes by returning to his own ontological entities' effects upon the (gradually less) ontic character of gloop: 'The glass loops us and the spoon gloops us.

(Don't they?) And, at the end of the beginning of the end, we gloop' (Litt 2013b: 115). Glooping, in this fatalistic rendition, was always already in effect, with multiple beginnings and ends beyond our control or awareness as mere ontic beings. Funny, yet idiomatically almost phenomenological in character, this curiously echoes Derrida's first missile/missive in 'No Apocalypse...', that 'at the beginning there will have been speed'.

Running a nuclear relay race, Sprod takes up Litt's baton by connecting two conceptions of 'speed' – that of Derrida plus that of Futurism, the early-twentieth-century art movement.⁶⁶ Within the collision of the ontic and the ontological experience, Sprod writes that

Derrida explicitly spells out what is at stake in this new double experience, both as a reformulation of the idea of speed and as a new experience which will be speed itself. What is required is a rethinking of the very foundations of temporality itself, or, to give a literal meaning to [leading Futurist Filippo Tommaso] Marinetti's catchphrase, time and space died yesterday.

(Sprod 2012: 17)

For Derrida, this rethinking resides in nuclear rhetoric, not just in the physical manifestation of the warhead as a missile, but also as a missive (a letter or a message). The warhead can thus be written and deployed figuratively, this capability arising only because a 'real' deployment would signify a remainderless end. This results in the impossible but necessary situation whereby the future allows the present to exist, by rendering itself (the future) utterly erasable. All this is contained for Derrida in the new variability of speed – the arms 'race', mass destruction at the swiftest push of a button, one strategic decision being quicker than another, and so forth – that is represented by the missive/missile.

In Litt's *Corpsing*, this commentary on the temporal effects of literature or text is achieved by a more modest projectile: the bullet. Litt has been taken by many critics to be a postmodern, conspicuously self-conscious writer of genre, and there are strong grounds for such an interpretation (Cf. Wilson 2006: 105–106). However, it is also safe to say that Litt uses genre in a highly thoughtful way to make larger points about writing and its history. Interviewed in 2006, he says: 'With *Corpsing* I wanted to do something where the action, and the speed of the writing about that action, was at points very mismatched. I was fascinated by the writing of action, partly as it is the great twentieth-century achievement in prose' (Litt 2008: 73). Note here that Litt mentions speed is something pervading both action and writing, speeds which are 'very mismatched'. But action is not merely a genre or its trait; it is also a phenomenological category,

⁶⁶ For further elucidations of the concept of 'speed' during this time period (and especially with relation to its centrality in Modernism and Futurism), Cf. Duffy 2009 and Kern 2003.

a facet of perceptual experience with which writing has had to, and only recently managed, to catch up. Bearing in mind this non-generic aspect of action, Litt later says of *Corpsing* that ‘I wanted to write action. The first bullet section, which takes six or seven minutes to read, is describing something which takes place in less than a second, and to have a huge mismatch between the time of the action and the telling of the action was interesting’ (Litt 2008: 74). This considered approach to the temporality of bullet and text, and how these two might interact, is what Litt means by wanting to ‘write action’ – a seemingly impossible but necessary task.

As literary critic Philip Tew observes, Litt goes beyond mere genre or self-ironizing postmodern features. So, despite

the shifting ground of perception [when *Corpsing*’s] protagonist, Conrad Redman, is able to pass off his public brandishing of a gun as a rehearsal for a film [...], Litt indicates something of the perceptual persists, for the textual replay of the bullets that strike Conrad and his girlfriend reminds the reader of an ultimately physical law, that of materiality, causality and death.

(Tew 2007: 120)

If ‘something of the perceptual persists’ – namely the prospect of bodily harm, and one’s inevitable mortality – then Tew’s reading harmonizes with Derrida’s logic of the nuclear referent. The latter can only ever be textual, precisely because of its self-erasure were it to become a material reality. Thus in *Corpsing* the ‘textual replay of the bullets’ acts not just as a replay but as a portent, that the characters are only ‘alive’ because they can ‘die’, and that in these terms, death does not only occur at the end of life, but throughout it. So the first bullet section in the novel, wedged between ‘proper’ chapters 6 and 7 and before the shooting has even taken place in the main narrative, says:

The first bullet (there are to be six: evenly distributed – three for her, three for me – though not equally destructive) enters Lily’s body approximately two inches beneath her left breast. Slowly, or if not slowly then gradually, or if not gradually then at least moment by moment, leaving no gap in actual proceeding time, jumping no millimetre completely, the bullet begins its inevitable passage into Lily’s thorax.

(Litt 2000: 12; original emphasis)

That ‘there are to be six’ definitely reads like an omen, not just a bald statement of fact but a glimpse into the future for the reader, reminiscent of the (in)famous cut-out pages of B S Johnson’s *Albert Angelo*. Litt’s Introduction to *Albert Angelo* begins as follows: ‘There’s a shock coming up. A big, glorious, true shock. It’s at the bottom of page 163’ (Litt 2013a: v). This is clearly another foretelling, a premature revelation which Litt spends the rest of the page

justifying. Additionally, and intriguingly, the cut-outs in Johnson's novel reveal a coming snippet of text which has the same clinical, pathology-report tone of Litt's bullet sections: 'struggled to take back his knife, and inflicted on him a mortal wound above his right eye (the blade penetrating to a depth of two inches) from which he died instantly' – this text is printed on page 153 of *Albert Angelo*, but can be read because of the cut-out from as early as page 149 (Cf. B S Johnson 2013).

Returning to the first bullet in *Corpsing*, also of note is that the six bullets will be 'evenly distributed', meaning distributed amongst Conrad and Lily, but Litt surely also means amongst the book's scattered bullet sections, the textual bullets thus once again returning to solid materiality, in this case of the printed page. This 'inevitable passage' back to materiality and thus, as Tew puts it, to the grave, is invoked in the inexorable, excruciatingly slow movement of the bullet through Lily's body (like the supplementary bullet sections through the novel's body text). This recalls Zeno's paradox as in Borges, but this time the bullet duplicates the dimensions of the paradox, by 'leaving no gap in actual proceeding time, jumping no millimetre completely'. This massive spatiotemporal distortion is then totally reversed in the fifth bullet section, which consists entirely of: '*The fifth bullet missed me completely*' (Litt 2000: 199; original emphasis). Whilst fairly humorous, almost providing some darkly comic relief from the overall bleakness of the novel, this also serves to highlight the strong possibilities and effects of the bullet sections upon the text. This particular bullet speeds up time enormously whilst the other five do the opposite, both for the reader and also ostensibly for the here rather blithely glossing narrator Conrad.⁶⁷

To recap briefly, then, both Derrida and Litt use a series of ballistic supplements, neither inside nor outside, neither belonging nor other to, some 'main' text they have written. They do this in order to make a commentary on, or simply demonstrate something about the 'speed' or the 'time' of the text. In the case of Derrida, it is unknown how much technical knowledge he had about ballistics or arms – and clearly his chief point is that being a philosopher or a critic provides technical knowledge enough, albeit of a different sort, to pass comment on such matters

⁶⁷ Another Conrad, the author Joseph Conrad, also considers embodied, ballistic, time distortions. In his novel *The Secret Agent*, first published in 1907, Chief Inspector Heat is pondering the supposed instantaneity of death by explosion: 'No physiologist, and still less of a metaphysician, Chief Inspector Heat rose by the force of sympathy, which is a form of fear, above the vulgar conception of time. Instantaneous! He remembered all he had ever read in popular publications of long and terrifying dreams dreamed in the instant of waking; of the whole past life lived with frightful intensity by a drowning man as his doomed head bobs up, screaming, for the last time. The inexplicable mysteries of conscious existence beset Chief Inspector Heat till he evolved a horrible notion that ages of atrocious pain and mental torture could be contained between two successive winks of an eye' (Conrad 2004: 65).

Yet more striking is Borges's character Jaromir Hladik in the short story 'The Secret Miracle', a fictional writer whose sad destiny is to be executed by a Nazi firing squad. Feeling not only terror, but that his life has amounted to nothing, Hladik prays to God for more time to finish his final, most significant book. Just as the rifles are raised to shoot at him, 'The physical universe came to a halt. [...] He had asked God for a whole year to finish his work; His omnipotence had granted it. God had worked a secret miracle for him; German lead would kill him at the set hour, but in his mind a year would go by between the order and its execution' (Borges 2000a: 123–124). At the very moment Hladik finishes the book in his head, time restarts, and he is killed.

– but with Litt in *Corpsing*, his ballistic knowledge is easier to establish. In parallel with his character Conrad, who says he ‘stayed home all day, spending equal amounts of time reading (books on anatomy, firearms and bullet wounds) [...]’ (Litt 2000: 50), Litt admits reading exactly these same books while preparing the manuscript, but in a different kind of supplementary text, the post-narrative Acknowledgements section (2000: 376). Whilst not claiming deep understanding or ownership of the technical knowledge therein, nor any less textual (rather than hands-on), Litt’s is a differing take to Derrida’s. In any case, as physicist Mark Denny observes, ‘the development of firearms has greatly influenced the conduct and outcome of wars. Much of our understanding of ballistics principles came directly as a result of military development’ (Denny 2011: 1). The spur for knowledge of ballistics and projectiles has always stemmed from a concern with war, a concern which as shown earlier is something that Litt and Derrida definitely do share, and which is yet more strikingly evident in the writings and biography of B S Johnson.

Writing during the 60s and 70s, with global events like the Cuban missile crisis occurring in 1962, Johnson was living like everyone else beneath the shroud of the Cold War and its nuclear threat. Yet his work only seems to allude to this in an off-hand, perhaps even parodic manner. Coe comments of Johnson’s days as a supply teacher that

by March 1960, as [Johnson] wrote to one correspondent, he had already taken ‘English [...], Basket-making [...], some Maths, lots of Library periods, Religious Knowledge, Current Affairs (I nearly got them to send a telegram to Macmillan over Nuclear Disarmament; but failed because sufficient money could not be raised [...])’.

(Coe 2004: 92)

Later references to nuclear arms come across as even more flippant, for example in the novel *Christie Malry’s Own Double-Entry* (1973). In a characteristically mischievous metafictional gesture, protagonist and proto-terrorist Christie recalls something that occurs not in his narrative, but in the physical pages of the book containing it: ‘Christie first considered that a limited tactical nuclear weapon of a type similar to that referred to on page 111 [of the novel] would be most suitable for [his] purpose’ (B S Johnson 2001: 171). So, while certainly conscious that his was an atomic age, Johnson’s preoccupation with war stemmed instead from that pre-Cold-War time when nuclear power was first harnessed: World War 2.

A born and bred Londoner, Johnson’s evacuation at school age from the city during the Blitz generated his interest in war and its effects upon the civilian population. War pervades much of his oeuvre, both as a topic and a site of trauma, a constant coming to terms with it. From the memory dredge that is the novel *Trawl* (1966), effectively a memoir of his evacuation, to the compilation of various people’s recollections of the period, *The Evacuees* (1968), which Johnson edited and to which he additionally contributed a section of *Trawl*, his wartime experience

surfaced again and again. Indeed, the nuclear spectre (including its temporal aspect) is briefly mentioned in a rare instance of seriousness by Johnson in his Introduction to *The Evacuees*: ‘It had never been necessary before, and there will not be time for it in a nuclear war: evacuation’ (B S Johnson 1968: 9). Johnson goes on to explain the circumstances and logistics of the relocation programme, but constantly focuses on how painful it all was despite the ultimately life-preserving goal, and the manner in which he concludes the Introduction highlights his almost radical ambivalence towards wartime memories:

Evacuation undoubtedly did result in the saving of life. The figure of 60,595 civilians who died in the bombing of British cities would certainly have been increased without it. Whether the number of lives saved was worth the psychological damage to several million schoolchildren is one of those unanswerable questions of balance which war throws up.

(B S Johnson 1968: 20)

‘Unanswerable’ perhaps, but questions wrestled with interminably and in a variety of manners by Johnson, such as in another edited collection, *All Bull: The National Servicemen* (1973), or more to the purpose here, ‘Mean Point of Impact’ (1970).

In his Preface to the anthologization of Johnson’s shorter prose and drama titled *Well Done God!* (2013) – which includes the Introduction to *The Evacuees* and ‘Mean Point of Impact’ – co-editor Coe claims the latter ‘proceeds from a [...] contrapuntal device’, and is one ‘of [Johnson’s] finest pieces of work in any medium. “Mean Point of Impact” brilliantly juxtaposes the building of a cathedral in medieval France with its destruction by aerial bombardment in the Second World War’ (Coe 2013: xiii). It is strange that, given his high praise here, there does not appear to be even one reference to ‘Mean Point of Impact’ in Coe’s otherwise comprehensive *Like a Fiery Elephant*. I also cannot find anything within the story itself to indicate definitively that it is ‘set’ in France, or in either the medieval or WW2 periods. However, these are still fair assumptions if some of the historical features are taken less as facts than as symbolic clues. For example, ‘Elias of Caen’ or ‘Magister Elias’ (B S Johnson 1973a: 45) might serve as a composite character, mostly based on Master Elias of Dereham, who in the thirteenth century did indeed work at Salisbury as the story’s Elias did, and spent some time in exile in France too (Cf. Vincent 2004). Tew sketches out another potential clue to this riddle:

The irony of the passage is that Caen was destroyed by allied bombardment and bombing during the liberation of France [during WW2], a curious accident to history that Johnson uses as an intersection inserted into his narrative of its grandeur and significance as architectural and cultural object. A shared experience evolves and is expressed in material form, which acts as the mean

point for a variety of lives and periods across the historical divide [...].

(Tew 2001: 233)

So the mention of ‘Elias of Caen’ designates not specifically one event, place or person, but a site where all of these meet, though otherwise evenly distributed across time and space, as Tew’s reading of the story’s title suggests.

I deliberately use the phrase ‘evenly distributed’ to draw a parallel with Litt’s aforementioned use of the same. Just as the bullet sections in *Corpsing* offer a re-evaluation of narrative time and how this ultimately relates to death, the ‘contrapuntal device’ described by Coe affords Johnson a ballistically-informed way of recalculating, as Tew puts it, ‘the mean point for a variety of lives and periods across the historical divide’. Though not specifically a ‘nuclear’ text per se, the importance of the missile strike orchestrated throughout ‘Mean Point of Impact’ by ‘BATCOM’ (or Battalion Command) – and the unknown pilot who claims to ‘*just fire and hope, it’s not a science like they make out it is*’ (B S Johnson 1973a: 49; original emphasis) – is that this is exactly how the story hinges on Derrida’s last missile/missive in ‘No Apocalypse...’: ‘*The name of nuclear war is the name of the first war which can be fought in the name of the name alone, that is, of everything and of nothing*’ (Derrida 1984: 30; original emphasis). The mean point of impact in Johnson’s short piece occurs both at its beginning and its end, the destruction of its central ‘character’, which is in fact a cathedral and precisely what allows the history of its construction to be told.

Derrida’s final missile/missive, so focused on the relationship of nuclear war to war in general and most importantly to naming, leads onto the essay’s uncanny concluding statement: ‘The name of the man to whom he was speaking, the one who was appointed to send messages, to deliver the seven messages, was John’ (Derrida 1984: 31). As Sprod points out, this mysterious final passage refers to an

apocalyptic tradition of literature [...] started by the Book of Revelation which was a missive which St John sent to the seven churches of Asia Minor. [Thus Derrida foreshadows] the importance of experimental literature and the place of the [missive, but also] explicitly ties it to an apocalyptic tradition beyond the idea of total nuclear destruction as some sort of secular apocalypse, such as Marxism, socialism, or in some ways fascism.

(Sprod 2012: 125–126, note 29)

Much has been made of Johnson’s distaste at being called an ‘experimental’ writer, outlined so eloquently in the Introduction to *Aren’t You Rather Young to be Writing Your Memoirs* (Cf. B S Johnson 1973b: 19–20), but it seems undeniable that Sprod’s mention of ‘some sort of secular apocalypse’, of an utter wiping clean of the slate of writing and ideology, is equally evidenced on

those very same pages of Johnson's Introduction. He therein justifies constant creative experimentation alongside remorseless rejection of poor work, and thus the confluence of a destructive and creative moment.⁶⁸

This is the mean point of impact: that in 1984 Derrida uncannily ends 'No Apocalypse...' with the apocalyptic revelation of John while Johnson 14 years previously begins 'Mean Point of Impact' with the creative will of another John, Elias's employer; that 30 years after Johnson's prose piece, Litt almost inevitably repeats the ballistic slowing down and speeding up of text and death in *Corpsing*, as if Johnson knew he was to come; that it was Johnson's appreciation and dread of the coming chaos, of the possibility and irony of the destruction by friendly-fire of a cathedral, that allows him to write the history of its building, or as co-editor Julia Jordan puts it in her Foreword to *Well Done God!*: 'if Johnson can be said to be reading contingency backwards, he is also concerned with its forward trajectory; one of his great themes could be described as a kind of proleptic anxiety' (Jordan 2013: xviii). Across and through space and time, in writing and beyond death, traced in the trajectories both backwards and forwards of various missiles, texts and lives – and perhaps even with some prescient and 'proleptic anxiety' about when these words I am writing will be read, that they will outlive me in the mind/brain of someone else reading them – this is the mean point of impact.⁶⁹

⁶⁸ It is this thought, and Johnson's writing of 'impact' in the story, which gives fresh perspective to Machado's earlier-mentioned counterpoint between 'explosion' and 'impact', and the creative/destructive nexus (or paradox) therein. Machado's aversion to 'impact' is not outwardly shown by Johnson, either because its rhetorical prevalence on the academic scene was not, in his time, as exasperatingly pronounced as it has been more recently, or because Johnson is quite wilfully employing the term ironically. My feeling is his social prescience (to some degree thematized in 'Mean Point of Impact') and his somewhat fractious relationship with academia mean that Johnson may well have been aiming somewhere in between these two possibilities.

⁶⁹ In some ways, Thomas Pynchon's novel *Gravity's Rainbow* could be considered an extended rumination on the relationship between ballistics and literature. This is appreciable not only in its discussions of (and digressions from) trajectories in rocketry, but in the sprawling novel's own narrative trajectory and form. That this mirrors what I have been saying about 'Mean Point of Impact' is demonstrated neatly and microcosmically when in *Gravity's Rainbow*, pacifist aerodynamics expert and Zen practitioner Fahringer guiltily blurts out: 'Do you find it a little schizoid [...] breaking a flight profile up into segments of responsibility? It was half bullet, half arrow. It demanded this, we didn't. So. Perhaps you used a rifle, a radio, a typewriter. Some typewriters in Whitehall, in the Pentagon, killed more civilians than our little A4 [rocket] could have ever hoped to. You are either alone absolutely, alone with your own death, or you take part in the larger enterprise, and you share in the deaths of others. Are we not all one?' (Pynchon 1995: 453–454; original emphasis).

Speed versus Timing: Rhizomes, Frog Pistols and Military Neuroscience

With this weighing heavy upon anybody's shoulders – the unnerving ballistic insights of literature into the compressed, looping nature of space-time – it is a fitting moment for a brief story interlude:

It had worked! A loud explosion echoed around the valley and a satisfyingly enormous cloud of grey smoke enveloped the excited boys. The blast had almost knocked them off the orchard wall. The thick wooden barrel of the cannon had remained intact, but the tacks and cobblestones that the boys had selected as projectiles had vanished. It was soon to become apparent where they had gone. The billowing plume slowly cleared and Santiago and his comrades were greeted by the wonderful sight of the devastation they had exacted on their target. The neighbour's beautiful new garden gate was torn into tiny splinters, and the proud gateway was now filled with nothing but its angry owner, soon to launch himself toward his tormentors with immense ferocity. The cobblestones were soon flying in the other direction, albeit with slightly less speed, but a few of them clipped the boys as they fled into the Iberian afternoon.

One boy, Santiago, was caught, and as the manufacturer of the homemade artillery, he had to bear the brunt of the punishment. The mayor was soon informed of his explosive misdemeanour and the eleven-year-old was soon locked in the local prison cell, a stinking and cockroach-infested pit into which the locals peered and yelled through a small barred window. His father was fully in favour of this punishment, and the boy was allowed to languish in the small rural prison for four days and nights with neither food nor water. Even the cockroaches had started to look succulent by the time his mother and aunts started to smuggle meat and pies to the captive. Some youngsters learn slowly, however, and on his eventual release Santiago would redouble his attempts at cannonry, although the next weapon was to destroy itself rather than any intended target. It also sent a sliver of brass deep into his eye, tearing through his iris to leave a permanent scar.

(Bainbridge 2008: 93–94)

One might be forgiven for thinking, at least for the majority of the first paragraph of this short narrative, that this was another extract from Litt's *deadkidsongs*. After all, it concerns a group of 'excited boys' who are also 'comrades', and bears all the hallmarks of their youthful exuberance in the face of the 'wonderful sight of the devastation' wrought by a war machine. However, as becomes clear, though the setting is rural as in Litt's novel, the English countryside has here given way to an 'Iberian afternoon' and the name 'Santiago' might already have been an earlier flag that this piece is set somewhere else.

Indeed, it is actually popular science writer David Bainbridge's account of an episode in the early life of Santiago Ramón y Cajal. 'It had worked!' are the opening words of the second of three parts in *The Zonules of Zinn: A Fantastic Journey Through Your Brain* (2008). They represent a 'Eureka' moment in Cajal's life, but as can be appreciated in the quotation, not in his stellar career as histologist and neuroanatomist. This explosive moment, so explosively exclaimed in Bainbridge's words, comes to underpin and thus charge, in its vividly ballistic and bellicose terms, this chapter on Cajal. The chapter opens the centrepiece section of the book, colourfully entitled 'An Assault on the Senses'. In turn, the final chapter in the section – in which Bainbridge recounts helping a colleague and friend with a fMRI experiment, thus having to announce any piece of metal that had pierced him in his lifetime and which could affect the machine's magnet – is subtitled 'Shrapnel and Magnets'. Giving some thought to why any such metallic trace might be in him, Bainbridge cheerily attests that he has no body jewellery, but in addition: 'Although I feel I have lived a full life so far, I have not to my knowledge been showered by shrapnel in a combat situation' (Bainbridge 2008: 221–2). As he reminds the reader just before this, 'The middle part of this book really has been an assault on the senses' (2008: 220). Cumulatively, these instances become more than an attempt to overwhelm or analyse the sensory organs, the double meaning Bainbridge is aiming for, and actually evoke a modern, technologized assault. Warfare and ballistics clearly pervade this middle third of his book, and the way Bainbridge introduces Cajal allows one to interpret a gleefully explosive formative experience of the so-called father of modern neuroscience as something that then carried through into the resulting field – a suggestion that the field is foundationally ballistic.

The 'permanent scar' Cajal received as a youth after 'redoubling his attempts at cannonry' is indeed something he took with him into his later career, an ever-present reminder of the need for speed motivating a man Bainbridge ironically implies was a slow learner. Cajal's undiminished fascination with the violent speed of the cannon contrasts sharply with the slow violence of his punishment, and that Cajal copes with the latter at all is testament to his hard-headed commitment to the ideal of speed, even when faced with the languorous prospect of a repeat stint in prison. This as a young boy, too, shows an early ingrained obstinacy, not an inability to learn quickly. Most children play war in an unserious manner, but just as with the protagonists of Litt's *deadkidsongs*, for Cajal it was no doubt a real and important manifestation of an obsession with the exciting, explosive swiftness of near-instant annihilation. That Cajal had the intellect, concentration and patience for his undoubtedly glittering scientific research career cannot be questioned – that he had a life-long taste for the eruptive pace of the Eureka moment, as Bainbridge suggests, is perhaps speculative. But it is interesting nonetheless, given Cajal's fomentation of a modern neuroscience centred on the neuron doctrine he so fiercely defended – and these being neurons that fire, as has been discussed.

Is there any reason to think that Cajal was alone in this impulse to the fast and the fiery, or is it at the heart of any other (or all) scientific effort? Speculating about Cajal is one thing, but there is no doubt at all that Oliver Sacks and speed are intimately related, and this is because he explicitly says so in his article ‘Speed’:

As a boy, I was fascinated by speed, the wild range of speeds in the world around me. People moved at different speeds; animals much more so. The wings of insects moved too fast to see [...]. Our pet tortoise, which could take an entire day to cross the lawn, seemed to live in a different time frame altogether. But what then of the movement of plants? I would come down to the garden in the morning and find the hollyhocks a little higher, the roses more entwined around their trellis, but, however patient I was, I could never catch them moving.

(Sacks 2004: 60)

Sacks’s charming article describes how trying to ‘catch them moving’, or to slow down the blur of insect wings to the point of visibility, led him to consider time-bending possibilities. This first involved photography, and later the literary works of authors such as H G Wells, both permitting alternative frames through which to perceive speed, time and the natural world.

Connecting the nearness in both spirit and period of Wells’s early science fiction writing and the nascent cinema of the late nineteenth century, this then brings Sacks to another important contemporary of the two, which Sacks discovered later at university: William James’s seminal *The Principles of Psychology* (1890). The particular chapter in James that interests Sacks is of course ‘The Perception of Time’, wherein James speculates on what life would be like, how it would be perceived, by one for whom time moved at an altogether different rate than normal. James vividly describes some potential consequences:

Mushrooms and the swifter-growing plants will shoot into being so rapidly as to appear instantaneous creations; annual shrubs will rise and fall from the earth like restlessly boiling-water springs; the motions of animals will be as invisible as are to us the movements of bullets and cannon-balls; the sun will scour through the sky like a meteor, leaving a fiery trail behind him, etc.

(Cited in Sacks 2004: 62)

The rhythms of natural phenomena are mirrored in the ability to visually process them; the ebb and flow of small- and large-scale physical and biological events depend in this reading upon the human capacity to measure and record them, which, as Sacks comments in conclusion to his article, is aided, sped up and these days even dictated by the development of ever more elaborate and useful technological implements.

So it is interesting that in the passage quoted from James, so full of natural imagery of the fast-moving and glacially-slow alike, the only human-made items, sticking out like sore trigger fingers, are ‘bullets and cannon-balls’. The desire to see what is normally too fast or too slow is a desire for mastery over a human inability, and ballistics is the only metaphor (in James’s case specifically a simile) that potentially represents this mastery. This is also, no doubt, reflected in the super swiftness of ‘plants [that] will *shoot* into being so rapidly’ that they emulate weapons that *shoot* (bullets) into beings almost instantaneously – the danger of guns reflected in the potential agricultural endgame of engineering such fast-growing plants, which perhaps masks current concerns over the dangers of genetically modified crops, over-farming and possible global food shortages in the future. The ‘shoot’ of a plant, a thing as commonplace as can be, nevertheless encompasses an expression that belies its own speed, languorously slow under normal circumstances but coming neatly into line with immensely increased ballistic speed in James’s way of putting it.

As Sacks remarks, all the examples he uses in the opening part of his article have something of a cinematic quality, of time-lapse photography and slow-motion action sequences. The unavoidable corollary of his observations lends greater significance to the fact that if neurons fire, it is also true that, like plants, film-makers also ‘shoot’ their scenes into being. The act of creation occludes an explosive beginning and a ballistic trajectory. Whether this beginning and trajectory are cause for concern or celebration is still up in the air; but given that airing this issue at all is rare (the rarity itself a further issue for consternation), its consideration is hampered by a regulative norm that equally wishes flights of fancy and of bullets to come back down to earth and be grounded. This is what drives Deleuze and Guattari, taking their line on speed from Virilio, to see the botanical and ballistic interface of shooting as an opportunity, and encourage their readers to ‘Make rhizomes, not roots, never plant! Don’t sow, grow offshoots! Don’t be one or multiple, be multiplicities! Run lines, never plot a point! Speed turns the point into a line! Be quick, even when standing still! Line of chance, line of hips, line of flight’ (Deleuze and Guattari 1987: 24–5). This short quotation on their network-like concept of the ‘rhizome’ is undeniably and typically convoluted, thick with variable meanings dependent upon context, and it is clear that doing justice to it fully (if at all possible) would take much more space than permissible here.

However, it can relatively simply be seen to relate to the topics touched upon in the present chapter. The admonishment to ‘never plant’ is advice not to plant one’s feet, not to ever come back down to earth after all, and again, to ‘grow offshoots’ begins botanically yet shoots off and ends ballistically. The ‘lines’ the reader is instructed to ‘run’ (which can be taken as instruction not to plot the static reference points of a map, but to instead draw a continuous set of lines (or just one) making up a labyrinth) – the lines of ‘chance’, ‘hips’ and ‘flight’ – may well refer to the luck of the draw experienced by the pistol-wielding duellist, the fatalistic contest of

speed and chance relying on the swift assumption of the correct body position and the true flight of the bullet. At first, ‘be quick, even when standing still’ can seem paradoxical, but not if, as in this interpretation, it can be rewritten as ‘be quick or be dead’ – let the brain and arm be quick even if the feet are not. Recalling the abovementioned intertwining fates of two such duellists, the real Pushkin and his fictional character Lensky, creation and destruction are once again ambiguously tied to each other. This is yet further appreciable in translator Brian Massumi’s note that in Deleuze and Guattari’s writing, ‘to draw is an act of creation’ but also that ‘what is drawn does not preexist the act of drawing’ (Deleuze and Guattari 1987: xvi). Far from implying the annihilation of an opponent, the act of drawing one’s weapon is actually constitutive of that opponent.

Even if their stance in the above quotation is endlessly reinterpretable, what Deleuze and Guattari do demonstrate is a fundamental undecidability underlying human attitudes to speed. Whether regarding the slowness of the rhizome or the quickness of a bullet, whosoever influences speed in either direction exerts that influence over matters of life and death, nothingness and genesis from the void – which is why influence over ‘speed turns the point into a line’. Controlling the rate at which plants grow, or at which people are able to adequately perceive the world: these are things that are in some sense desirable to humanity, but also possibly dangerous if the control goes unchecked by those segments of society themselves not quite up to speed. This is because any supposed altruistic, generative or productive intention underlying the control over speed is but a whisker’s breadth away from being just as menacing and destructive. Speed instantiates itself here in a number of sometimes contradictory ways. The inability to think through such a crucial, risk-laden dilemma quickly enough to make the correct decision is the irony within the human conundrum of speed. Acting and thinking need to keep pace with each other, because lives may depend upon it, which ironically may sometimes result in inactivity – to keep from acting, to slow down the unfolding of events, is still a reflection of a desire to control speed. To recall once again here the abovementioned words of Lotman, ‘the moment of explosion creates an unpredictable situation’ (Lotman 2009: 125), whereas not acting, neither pushing the boat out nor pushing the button, so to speak, may prevent the creation of a positive situation but may equally prevent a killing.

On this reading, delaying the moment of explosion, therefore, produces predictability. This applies as much to nervous individual duellists as it does to larger units of people and even global superpowers as they tensely, hesitatingly contemplate full-scale wars. As Deleuze and Guattari write,

the war machine possesses as much weight and gravity as it does speed (the distinction between the heavy and the light, the dissymmetry between defence and attack, the opposition between rest and tension). [Phenomena] of ‘temporization,’ and even of immobility and catatonia, so important

in wars, relate in certain cases to a component of pure speed. [...] It can happen that speed is abstracted as the property of a projectile, a bullet or artillery shell, which condemns the weapon itself, and the soldier, to immobility (for example, immobility in the First World War).

(Deleuze and Guattari 1987: 396–397)

Sometimes the manifestation of speed, when it comes to war, is actually paralysis. Or a total lack of speed, such as in the decision not to act, to remain completely immobile, could itself still be considered the ultimate form of mastery over speed – and as shown by each wave of soldiers going over the top in the First World War, interrupting that immobility can simply result in unadulterated carnage rather than any further domination over speed.

Whichever way one comes down on it, speed is a complicated notion, far from self-evident as might at first be assumed. The human impulse to understand speed comes very much under the banner of trying to master its complexities. If, then, this pervasive compulsion extends to the study of the brain, it is hardly surprising. When nineteenth-century pioneers of physiology such as Hermann von Helmholtz and Emil du Bois-Reymond were unable to fully comprehend how electrical signals in the nervous system related to the realms of thought and motor action, then at least they could seek to measure these things, and take it from there. Indeed, they and others set out to measure the very speed of thought. As Carl Zimmer notes in an article itself titled ‘The Speed of Thought’, that the everyday, unquestioned, immediate process of thinking even had a speed to speak of, let alone one that could be expressed in numbers and compared with other speeds (or other things in general), was utterly bizarre: ‘The notion that the speed of thought was as measurable as the density of a rock was shocking [because it] clashed with people’s gut instinct that they experienced the world as it happened, with no lag between sensation and awareness’ (Zimmer 2010: 66). But Zimmer points out that by analogy with the then-burgeoning technology of the telegraph, such scientists had a good reason for questioning the theretofore inviolable presumption of thought’s instantaneity. Telegraphy similarly did something considered impossible, which induced widespread incredulity despite its genuine efficacy, but still did so at an appreciable, measurable rate.

When it comes to thought, however, the fact that this gap, or ‘lag between sensation and awareness’ has indeed proved to measurably exist, has neither reduced an instinctive disbelief at the state of affairs, nor the scientific ardour to somehow bridge that gap. As mentioned earlier, Zimmer notes that despite increased understanding in the present day, not just of neural speeds but also why they are so conceptually, metrically challenging, ‘researchers have been trying to get more precise results ever since, [even though] today it is clear why they have had such a hard time’ (Zimmer 2010: 67). The continued incredulity and fascination with the issue of brain speed is again equivalent to the continued need for mastery over mystery, a complex nexus of thought

processes and desires eloquently summed up by Douglas Hofstadter:

We are used to the rigidity of our physiology: the fact we cannot, at will, cure ourselves of diseases, or grow hair of any colour – to mention just a couple of simple examples. We can, however, ‘reprogram’ our minds so that we operate in new conceptual frameworks. The amazing flexibility of our minds seems nearly irreconcilable with the notion that our brains must be made out of fixed-rule hardware, which cannot be reprogrammed. We cannot make our neurons fire faster and slower, we cannot rewire our brains, we cannot redesign the interior of a neuron, we cannot make *any* choices about the hardware – and yet, we can control how we think.

(Hofstadter 2000: 302; original emphasis)

How is it possible that people can create larger, faster, more powerful and more sophisticated weapons (and create them ever more rapidly and efficiently); or how is it possible that with an amazing effortlessness ‘we can control how we think’; yet still ‘we cannot make our neurons fire faster’? The triumphant, routinely successful, onward march to colonize space and time finds here its gallingly banal roadblock.

For the time being, measuring brain speeds continues to represent an impossible yet yearning pursuit to find a chink in the armour of this perennial conundrum. Understanding, coming to accept and eventually superseding the telegraph has long since been accomplished; how could the same not be true of the relationship between neural chatter and thought? It is the indefatigable energy devoted to this cause which sadly obscures the very real problematics of ballistic metaphors in brain science. It seems to me that taking a couple of steps back and starting again without the a priori assumption of ‘firing neurons’ would be the best way to attempt to disarm this tendency. So to follow suit here, a brief return to Zimmer and telegraphy in the nineteenth century. His observation that the development of long distance communication technologies was influential upon scientific models for the mind and brain is not unique (for example, Cf. Winter 1998; Noakes 1999). However, it is subtly interesting that he posits a kind of evolutionary reason why speed is vital to the way organisms work, subtle because it also implies a reason why speed dominated the inevitably reflexive way the early physiologists took ballistic militarism for granted in their thinking about thought itself: ‘The need for speed in the nervous system is not hard to understand. Many animals depend on their nerves to sense danger and to escape from predators; the predators, in turn, depend on their nerves to mount a fast attack’ (Zimmer 2010: 67). The so-called ‘need for speed’, present in predators and prey alike, is perhaps ballistically couched because to claim dominion over thought, over how quickly signals travel oxymoronically huge yet tiny distances, ultimately translates to true dominion over defence and attack – with the contemporaneous evolutionary argument playing out to back this up. It is at bottom a principle of reification, with the intangibility of thought and mind made into something

material, physical and capable of being used to dominate and lead – or of being used as a weapon.

A case in point is that of the proto-electrophysiologist du Bois-Reymond. His biographer Gabriel Finkelstein relates that he ‘devised classroom aids [...], each of which was an answer to the problem of conveying laboratory experience to large audiences. Such talent in teaching enabled him to train an entire generation of scientists’ (Finkelstein 2013: 179). Without elaboration, Finkelstein lists several of these innocuous seeming ‘classroom aids’, though some are vividly imaginable, sounding either usefully illustrative, or amusing, or both – the ‘twitch telegraph’ or the ‘frog alarm’, for example (Ibid.). However, the one that really stands out is the ‘frog pistol’. This physical instance of ballistic science’s juxtaposition with science of the nervous system was apparently named by the very students it was designed to teach, according to a recent exhibition in London’s Science Museum curated by historian Phil Loring, and this shows that du Bois-Reymond’s students at least had no qualms with this material combination of the two fields. This exhibition, which ran from December 2013 to October 2014 and was entitled ‘Mind Maps: Stories from Psychology’ (Cf. Reyes-Peschl 2014), describes this amphibian-based gun thus: ‘A newly dissected frog leg was placed inside the glass tube with its nerves threaded through the metal clips at the end. Pressing one of the ivory keys made the leg kick, demonstrating that contact between different types of metal generated a current in nerves.’ It is on the basis of just such a demonstration that du Bois-Reymond’s major importance rests.

According to Finkelstein, ‘du Bois-Reymond solved the problem of contact electricity, set forth a program of biological reduction, and demonstrated the electrical nature of nerve signals. In a little less than two years – from March, 1841 to January, 1843 – he created the discipline of electrophysiology’ (Finkelstein 2015: 1). However, it is clearly not just the physical principle, but the manner in which it was explained that marked him out. This is indeed something that Finkelstein stresses, namely du Bois-Reymond’s passion for rhetoric and persuasion, and is attested to yet further by striking material artefacts like the ‘frog pistol’ which he memorably used to back up his stance. Even if his students named it, he still consciously designed the ‘frog pistol’ to explicitly look like a gun, associating ballistics, nerves and brains forever in the minds of the future scientists who studied under him. And as Finkelstein covers in his biography, in his day du Bois-Reymond was a hugely important figure on a number of fronts, lecturing publicly on a wide range of things, and therefore influential beyond the halls of academia.

This leads Finkelstein to tacitly but tellingly question his own concise summary of du Bois-Reymond’s achievements: ‘That’s the short version of du Bois-Reymond’s innovation. We know that it’s true because winners write history – at least, that’s what we’ve been told. In the

case of du Bois-Reymond, however, the truth is closer to this: those who write history win' (Finkelstein 2015: 1). 'Winning' what, exactly, is not explained, but it certainly paints the Prussian scientist as competitive at least, if not downright combative. Between writing history and inventing powerful pedagogic tools, du Bois-Reymond's utmost eminence is colourfully painted by Finkelstein:

The significance of du Bois-Reymond's instruments escaped his French and English colleagues at first, but within a generation even du Bois-Reymond's sceptics adopted his methods. In fact, it wouldn't be that much of a stretch to describe the history of neuroscience in the image of du Bois-Reymond: a march of technological progress from the galvanometer to the optogenetic sensor, all originating in table-top experiments that he carried out with apparatus he built himself.

Du Bois-Reymond's instrumental methods embodied a positivist commitment to measurement that permanently changed the practice of science.

(Finkelstein 2015: 2)

The salience of this man's neuroscientific legacy cannot be underestimated if Finkelstein is to be believed – especially those beloved 'table-top experiments' and 'instrumental methods', like the 'frog pistol'. Additionally, his 'commitment to measurement' certainly tallies with the doubled need for speed mentioned earlier, an inherent desire to claim dominion over that aspect of the body which developed in order to claim dominion over other creatures (or avoid being dominated, killed, rendered immobile and speedless).

This focus on technological demonstrability, measurement and instrumentation brings its own issues, however. As Geoffrey N Cantor remarks, in certain circumstances 'we need to interpret the [scientific or experimental] apparatus itself as the reification of a metaphor. In so doing we encounter a further use of metaphor for the historian of science, since metaphor is not confined to discourse or to texts but also takes on a materialized form in instruments' (Cantor 1987: 140). His point is that a vehement eighteenth-century believer in, say, the idea that light consists of particles rather than waves, will design an experiment employing mechanical rather than optical apparatus, and the outcome is thus more likely to favour the original hypothesis. The same could no doubt be said of the nineteenth-century physiological employment of examples from ballistics. Experimental design can physically extend the tacit assumption of a guiding metaphor which then theoretically underlies the desired result from the start, Cantor claims, and afterwards the result is then also explained in the same metaphorical terms, all of this influencing the way further theories are composed, experiments designed, research conducted and science taught. 'Like the thief in the night, metaphor works silently [...]. The experiments and experimental reports, then, take on a symbolic role, articulating the known rather than offering a crucial test' (Cantor 1987: 141).

Even though nerve impulses move at a variety of speeds, Loring's 'Mind Maps' exhibition alludes to a much more stable and uniform truth: 'Helmholtz famously adapted a technique invented by military engineers to measure bullet velocity and proved nerve impulses travelled much slower than bullets do.' This type of experiment is among those that prompted the move towards utter naturalization of the ballistic metaphor, or in Cantor's terms the 'thief in the night' that 'silently' led bullets to guide brains and not the other way around. This is because, although at first glance Helmholtz's demonstration seems to be flying in the face of common knowledge, and thus providing a stern test of unscientific assumptions about nerve impulses, it was actually the towering superiority of military engineering over everyday thought that Helmholtz really proved – thus symbolically 'articulating the known' rather than anything else.

Unchecked and unexplored, the need for speed (neural or otherwise) extends outwards, from individuals to communities, to nations and military blocs, and even to a general way of talking and thinking and going about cultural life. Defending oneself becomes defending ourselves which in turn becomes the utterly reductive idea of Defence with a capital D. In some sense, the ballistic metaphor that underpins the widely accepted concept of neurons firing is born of a defensive violence, and carries through its violence into the assumptions of neuroscience. Militarism and domination go hand in hand with the discipline at the fundamental, conceptual level, so that it seems unworthy of report or simply unsurprising and natural that neuroscience should be funded in great part by governmental military agencies. Far-fetched as it may seem to some, neuroscience convolves in that it takes a metaphor to do with weaponry as its guide for practice in the real, everyday world, and then reproduces that metaphor in its disciplinary propagation, which more or less brings the circle back round – but not quite. As Zimmer hints in his conclusion to the abovementioned article on measuring impulses in the nervous system, the need for speed will never quite be enough: 'When Helmholtz recognized that thought moves at a finite rate, faster than a bird but slower than sound, he missed a fundamental difference between the brain and a telegraph. In our heads, speed is not always the most important thing. Sometimes what really matters is timing' (Zimmer 2010: 69). Ultimately, a judicious use of speed, or of the ballistic metaphor, comes down to knowing when *not* to be too swift, when *not* to increase velocity, when to take one's time and allow things to simply develop and when not to be too quick to become defensive – because as I have tried to show, there is a positive aspect to explosive metaphors which comes part and parcel of the generally negative, and vice versa.

This commingled, chaotic admixture is at the heart of Malabou's commentary on plasticity, and also of Deleuze and Guattari's touting of the rhizome, but the convolving nature of ballistics – their ability to raze or raise spirits depending upon the timing of historical as well as

individual fluctuations – is best expressed by Lotman:

At the present moment, European civilisation (including America and Russia) is experiencing a period of general discreditation of the very idea of explosion. Humanity lived through a period between the eighteenth and twentieth Centuries which may be described as the realisation of the explosive metaphor wherein the image of explosion in popular consciousness came to be associated with gunpowder, dynamite and the nucleus of the atom rather than its potential as a philosophical construct. To the contemporary man, explosion as a phenomenon of physics, transferable to other processes only in the metaphorical sense has come to be associated with ideas of devastation and has turned into a symbol of destruction. But if, at the core of our contemporary representations, there lay the kind of associations that existed during periods of great openness such as the Renaissance or in art in general then our understanding of the concept of explosion would evoke in us such phenomena as the birth of a new living creature or any other creative transformation of the structure of life.

(Lotman 2009: 10)

In and of itself, the ballistic metaphor is neutral. It permits potentially enlightening, useful and creative knowledge of speed – but just as easily it can provide for the sedulous over-determination of a killing machine, the whole idea backfiring, with bullets trying to emulate the complexity, precision and speed of neurons. This is down to the steadfastly instrumental rationality that interprets explosion in literal, material terms, rather than ‘as a philosophical construct’. Indeed, in this reading Lotman seems to suggest that science could learn something important from ‘art in general’.

As has been discussed, literature has explored the potential of the ballistic metaphor, while neuroscience does not even seem to recognize it – neuroscience does not even credit its entirely unmetaphorical ties with military technologies and defence strategy (these two so often simply translatable as ‘preparations for future war’). In a review of just such issues entitled ‘Neuroscience, Ethics, and National Security: The State of the Art’, Michael N Tennison and Jonathan D Moreno reveal that in 2011 in the USA alone, Department of Defence spending ‘to pursue cognitive neuroscience research’ more than doubled that of spending on the Army, Navy and Air Force combined (Tennison and Moreno 2012: 1). They say that despite the goals of scientific research and the military often clashing, this does not necessarily stop scientists from (knowingly or otherwise) participating in DOD projects in order to pursue their own ends, which might be construed as ethically problematic: ‘Although they may receive funding from national security agencies, neuroscientists may not consider how their work contributes to warfare.

[Neuroscience] does, and will continue to, play a role in military operations' (Tennison and Moreno 2012: 3).⁷⁰

Their conclusions are that

scientists themselves could become more aware of [...] whether their work is specifically funded by national security bodies or not, in order to create a more self-conscious scientific enterprise. [Furthermore], neuroscientists could consider and promulgate their perspectives on the military implications and ethical issues associated with their work.

(Tennison and Moreno 2012: 3)

One of the co-authors of the quoted review, bioethicist Jonathan D Moreno, has himself served as an adviser to the US government in just such a capacity of consideration and promulgation. The problem when it comes to neuroscience, he suggests, is that while the potentially monumental outcomes are often loquaciously bandied about, by stark contrast, any talk of links with the military renders taciturn those same loquacious researchers and funders – this despite much of the work being nonclassified, done in the public eye with no suggestion of foul play (and Moreno himself admitting to in no way trying to radicalize the field, nor even vaguely eliminate the idea of national security) (Cf. Moreno 2012). In many ways, it is probably the very positivity, or positivism of the overall neuroscientific project which obstructs widespread discussions of just such ethical conundrums, or the potential insights from other fields such as literature or Lotman's 'art in general'.

A similar set of concerns is displayed in E L Doctorow's novel *Andrew's Brain* (2014), which comically yet tragically satirizes the situation of a cognitive neuroscientist. The eponymous Andrew is the protagonist but unreliable narrator, a status further complicated by interjections from some unspecified therapist, bringing into question all of Andrew's story. An unbelievably unlucky man, Andrew moves to a small college town in the USA to get away from a number of severe personal problems, and to teach his speciality. The steamrolling positivism mentioned above guides his didactic outlook:

I was inspired to give the students only good news: how much neuroscience is advancing almost day by day. I was positive, always anticipating a resolved future of essential discoveries, it was the guarded optimism of the classroom, the assumption of any science course, that we would get to the truth eventually. I harked back to Whitman, who knew better than anybody what we are and

⁷⁰ For a more general discussion of 'the inevitable future interplay of warfare and neuroscience', Cf. Lynch 2009: 153 and passim.

sang of 'the body electric.' How pleasing to those children to learn, body as brain and brain as body, that it all came together. Of course I wouldn't tell them he was a poet. Ruin everything.

(Doctorow 2014: 108)

Never mind Walt Whitman's vast fame – if at all possible, why even risk arresting the onward march of neuroscience with the contribution of a mere poet? The ante is later upped, when Andrew for a short period becomes a consultant on matters of neuroscience to the then-President of the USA.

This section, which leads to the book's melancholic, pathetic conclusion, is particularly strange because it turns out, susceptible as he is to the vicissitudes of fate, that Andrew got the job because he had been roommates at university with the thinly veiled George W Bush. Andrew tells the shadowy but increasingly fractious and disbelieving off-screen therapist of a childish governmental boys' club run by the President, nicknaming his closest advisers 'Rumbum' (for Rumsfeld), Chaingang (for Cheney) and Android (for Andrew himself). Thrown in amongst this nonsensical crew, who take national matters less seriously and maturely than 'Gang' in Litt's *deadkidsongs*, Andrew describes himself as unwittingly drawn into a constant game of puerile one-upmanship, a mere pawn in the President's cabinet charades. The reason Andrew lasts such little time in the influential position correlates with the waning novelty to the President of a right-hand neurological man, leading the bedraggled, star-crossed Andrew to finally snap:

So there came that moment of realization and it was time to let them know who they were dealing with. I gave them Android's last lecture on neurological developments around the world. I told them the great problem confronting neuroscience is how the brain becomes the mind. How that three-pound knitting ball makes you feel like a human being. I said we were working on it, and if they valued their lives, or life as they knew it, they would do well to divert whatever government funding there was for neuroscience and add it to the defence budget. More rockets, landmines, jet fighters – all those things you love, I said. Because if we figure out how the brain gives us consciousness, we will have learned how to replicate consciousness. [...]

So what, you mean computers who talk back?, Chaingang said. I've seen that in the movies. Computers, of course, I said, and animals genetically developed to have more than the primary consciousness of animals. To have feelings, states of mind, memory, longing. He means like in Disney, Rumbum said, and they laughed. I laughed as well. Yes, I said, and with all of that the end of the mythic human world we've had since the Bronze Age. The end of our dominion. The end of the Bible and all the stories we've told ourselves until now. [...]

How insulated these men were. They were imperial in their selfhood, these corporate culturists running a government. They lived, heedless, infallible. They understood contention and expected nothing else. I told them it depressed me to be in the same room with them. The president looked at me – did I mean him as well? You all live unquestioningly inside the social

reality – war, God, money – that other people invented long ago, I said, and you take these things for raw existence. It was quite a speech I gave them.

(Doctorow 2014: 187–189)

Andrew's bitterly ironic tone here delivers another expression of Johnson's 'Mean Point of Impact', a point where history and the future collide in the present lives of those who can effortlessly destroy others, even worlds. But these destroyers are now themselves governed by the promise of a science that would effectively prove all human institutions – including those propping up their power – as essentially moot.

The historical and cultural processes that effect governmental power, that bear its weight and its capability to destroy and subjugate, are challenged precisely by the military neuroscience funded by this same governmental power – and simply because making neuroscience ballistic makes it capable of breaking off and firing back. Doctorow's gloomily beautiful tale gives ample warning to heed those historical and cultural processes, to focus on timing over speed, to ensure the continued investigation of all this alongside neuroscience. This is because, if the workings of the brain become intimately, fully known, but without any other perspective than the mechanical, then neuroscience, however advanced, is merely a weapon – potentially humanity's greatest weapon, against itself. Essentially, attaining mastery of the brain, and total power over consciousness, is to render the human obsolete. If this is so, then perhaps *Andrew's Brain* is not so much about one individual's erratic, failing consciousness and his consequent inability to avert a life-long series of disasters, as first appears. Instead the point is that, whether unwell or perfectly healthy, consciousness and the brain always need to be considered alongside, or rather within the appropriate historical and cultural context, and only in this way can a tragedy even larger than Andrew's unending misfortunes, a specieswide tragedy, be avoided. In this, Doctorow's literary lesson seems to echo and update a well-known (perhaps clichéd) saying attributed to philosopher George Santayana: 'Those who cannot remember the past are condemned to repeat it' (Santayana 2011: 172).

Convocations: A Re-Introduction

Science! true daughter of Old Time thou art!
Who alterest all things with thy peering eyes.
Why preyest thou thus upon the poet's heart,
Vulture, whose wings are dull realities?
How should he love thee? or how deem thee wise,
Who wouldst not leave him in his wandering [...]?
(Poe 2006: 22)

What is the writer going to say? How many convolutions will it involve? But let us next admit that the writer doesn't *have* to choose a static position from which to speak; that the writer can speak *as* they move [...].
(Litt 2016: 173; original emphasis)

And so the loop of historical thread swings back round, doomed to repetition. Or does it? A convolution comes back again to its start point and looks as if it were about to land there definitively, but at the very last moment, it swerves off again without actually having touched that start point. It looks for all the world like a repetition, but is not quite that; it is more of a reiteration, or as poet John Robert Colombo's rival cliché to Santayana's has it (similar but different enough to be considered a reiteration itself): 'History never repeats itself but it rhymes' (Colombo 1970: 46).⁷¹

So here is the reiterative rhyme, as the question comes back around once more in the guise of a conclusion: what is a convolution? This question may appear to be the end of this thesis, but it is also its opening, in terms of temporality as well as teleology; the question has come before, at the beginning of the introduction, and thus it led up (and back) to this repetition of itself, as its own causal impetus. When speaking about convolutions it is entirely natural, then, to end at the beginning. This may seem illogical or counterproductive, but is not too far off the mark if one considers the sometimes overlooked truth as elucidated usefully by cognitive scientist and author Dan Lloyd, that when it comes to 'novel expressions of our emerging vision of the conscious human being [the] most thorough thought experiment [...] is a novel' (Lloyd 2004: 332). Thus the concluding question was in some way only illusorily conclusive, and will be answered now, but only with more questions, its novelty endlessly emergent and its novelistic or literary basis having been continuously reemphasized. Becoming a reconvolution, the original interrogation resets itself and begs for yet further interrogation.

⁷¹ This piquant but opaque, semi-anthropomorphic witticism is often attributed incorrectly to Mark Twain – probably because Colombo's poem 'A Said Poem' (from which the aphorism stems) is presented as a list of quotations and sources, and thus itself claims playfully but erroneously that the saying originates with Twain.

Interrogating Silence: Getting Involved, Getting Convolved

Interrogation is never innocent, however – never, that is to say, an uncomplicated, straightforward case of subject questioning object, an unproblematic, hierarchical exercise of a disinterested interrogator merely demanding transparent answers from an eventually yielding, powerless, subservient source of information. There is a silent, unspoken part to interrogation. This is because interrogatory activity is not, simply, a case of researcher interpreting text, detective questioning suspect, author exploring concept, lawyer examining witness, analyst analysing analysand or, indeed, scientist investigating world with unrestricted, unmediated access. Interrogation is or can be all these things, but in each circumstance it is always more, because it entails involvement. By this, I mean involvement in a situation which is not one-sided, but reciprocal: text interprets author, suspect questions detective, concept explores author, and so on. This is a concept that I have described elsewhere as ‘mutual interrogation’ (Cf. Reyes-Peschl 2016).⁷² If it seems at all counterintuitive, unnecessarily convoluted, it can be more simply exemplified: when I read a text, it is not only the text that is affected, but myself as well; I have reinterpreted the text, and in doing so, I am also changed. Something real has happened, no matter how small. The same goes for the other examples listed above, none of which exist in isolation, each connected to every other in a possibly infinite web of connections and relationships that make up the phenomenal universe. The reader of these words, whether they like it or not,⁷³ is now made to at the very least consider this possibility just by their involvement in reading.

It is true, too, of the silent imposition or assumption or resumption of metaphors ubiquitous in science. Thus, as Thomas F Gieryn writes: ‘Cultural cartography is not idle play with Venn diagrams: maps of science give definitions of situations real in their consequences, both for those who rely on them and those who draw them’ (Gieryn 1999: 12). To some degree, scientific activity produces truth – but not just for the artificially exteriorized world that is its object, also for the activity itself, and for its participants. This possibility is antithetical to science’s claims to objectivity, or merely taken to be negligible in amount, or unimportant in

⁷² In that same article, I describe ‘mutual interrogation’ as a two-way street, and philosopher of science Ian Hacking writes something similar of assessing the social construction of madness, also suggestively intimating it has a labyrinthine nature: ‘One of the defects of social-construction talk is that it suggests a one-way street: society (or some fragment of it) constructs the disorder (and that is a bad thing, because the disorder does not really exist as described, or would not really exist unless so described). By introducing the idea of an interactive kind, I want to make plain that we have a two-way street, or rather a labyrinth of interlocking alleys’ (Hacking 1999: 116).

⁷³ ‘They’ meaning either ‘words’ or ‘reader’ (or both). I will let *them* decide.

impact. Thus, again, the uncritical, silent uptake of the metaphors – which in and of themselves are not necessarily problematic, but which nevertheless run through and in part govern scientific thinking – is kept silent and uncriticized. I am not saying metaphors should be avoided – this is not possible anyway – but they should be identified, acknowledged, investigated and mined for their possibilities, even (or particularly) when this challenges institutional or personal identities. This happens constantly in literature and literary studies, a domain of activity which continuously brings itself into question and grapples with its own worth. Even the controversies of literature's major current meta-discourse, or 'capital-T Theory', to borrow once again Joshua Clover's expression, are forever debated and defended and debunked by its own practitioners (and for an extensive set of perspectives on Theory, including many dissenting voices, Cf. Patai and Corral 2005). It is a shame that on the whole this is not the case in science, because the type of reflexive interrogation I see and advocate in convolution, and which I have attempted to identify throughout this thesis via active engagement in the very process, could well have important, even emancipatory consequences. This is because the notion of convolutions might have important ramifications beyond neuroscience and literature – for new textual methodologies and epistemological categories, for new interdisciplinary endeavours, and above all, for new conceptions of the self.

Therefore, the thesis will conclude by offering: first, a brief reiteration of what has been said so far; second, a final case study of the problematic disavowal of convolution, illustrating the very silence of 'case studies'; third, a suggestion, taken from characters and concepts from the previous two parts, for a wandering path out of this problem; and finally, a series of four 'convolutions' that will encapsulate all the issues touched upon, miniaturized demonstrations of the implications of the four main Convolutions that make up the core of this thesis. First, then, some recapitulation. The introductory chapter of this thesis interrogated the revolutionary rhetoric of neuroscience, and proposed how the convolutionary approach, gleaned from literature, could replace it. The first chapter proper, or rather the first Convolution, explained that science sees itself as a quest with the brain its ultimate goal, but that more often than not, this quest is quixotic – and that if acknowledged, quixotism can actually be illuminating. The second Convolution argued that neuroscientists paint themselves as literary detectives, and in doing so, are as susceptible to the genre's pitfalls as to its boons. The third Convolution claimed that if the brain is a labyrinth, as brain science suggests, then so too is brain science itself – and literature's treatment of the figure of the labyrinth (the treatment itself labyrinthine) can provide a productive framework for analysing this claim. The fourth Convolution examined the unchallenged but ubiquitous metaphorical assumption that lies behind the idea of neurons 'firing', and asked whether the overlooked ethical quandary at the nexus of brains and bullets would not benefit from the more self-aware ballistic analyses of literary texts. All of these Convolutions have in

common that they have remained uncritically silenced, dormant but present, in the assumptions, practices and writings of neuroscientists, philosophers, theorists, historians, journalists and other writers for some time now.

This is because identifying convolutions amidst the messy noise of complex systems such as science or history is difficult, but it does not mean that they are not there. One merely has to be able to strain a little harder against the prevailing dissonance and find amidst the din those voices outshouted by the more obvious of soapbox proselytizers. From this ear-straining for the unheard, patterns emerge; indeed, there is no speech recognition, or music appreciation, without silent pauses or rests to give definition to the sounds around them as they unfold over time. This is why the particular example of neurology and aphasia is emblematic, in a sense, and still pertinent in the present day.⁷⁴ As historian of medicine L S Jacyna puts it, while ‘research into aphasia was central to the generation of an intellectual identity for neurology,’ it is also true that ‘aphasiology is very much an ongoing enterprise as the most casual survey of current medical bibliographies will reveal’ (Jacyna 2000: 3). But as Jacyna goes on to make a case for the historiographical rationale behind his writings on aphasia, he also makes important claims for a methodological approach with an almost exclusively textual focus: ‘classic aphasiological texts can be read in novel ways to show within them the presence of unexpected contingencies. [This is because] a scientific text is not a transparent window upon reality but itself a dense object of study’ (Jacyna 2000: 4). Although Jacyna’s idiom of ‘windows’, ‘showing’ and ‘revealing’ is largely visual in nature, this only serves to further highlight the incongruence between the doctors expressing their thoughts, and the relatively inexpressive (or expressively incapable) states of their objects of study; pioneering neurological researchers and clinicians spoke for – made audible – those who could not properly do so themselves, and this megaphonic relationship continues today.

However, Jacyna advocates reading this relationship against the grain, to tease out from its archive that which remains unsaid (or is actually occluded) by its amplifications – a convolution which as he rightly points out finds individuals on both sides of the medical exchange, and the texts that unite them, mirroring the historical sweep of neurology across time. Given that they demarcated and disseminated the vast majority of what is now considered orthodoxy in neurology, it is no stretch to compare doctors with the neurological canon itself. By the same token, aphasics or other patients can be considered central to, but somehow still quiet within, that same orthodoxy. I set up this somewhat elaborate comparison in order to illustrate the micro- and macro-movements of a self-constituting, selectively redacting discourse. This can be

⁷⁴ Aphasia refers to ‘an impairment of expression or comprehension of language caused by injury or disease in the language centres of the brain’ (Colman 2009: 47).

demonstrated in what Jacyna contends ‘amounts to a rather anomalous appendix to the aphasia literature’ (Jacyna 2000: 21), this so-called appendix encompassing long-term therapeutic approaches, as opposed to the predominant (and rather more quickly satisfied) urge for classification and diagnosis. Of this ‘anomalous’ attitude to time-consuming speech therapies, Jacyna once again opines that the latter’s very marginality speaks volumes:

Texts describing these regimes provide a view of both patient and practitioner that differs in important respects from that inscribed in the main body of the aphasia canon. By means of ingenious techniques the aphasic is made to utter new truths about his condition; but at the same time the doctor reveals previously unknown sides to his nature.

(Jacyna 2000: 21)

Returning to the earlier comparison, the anomalous, marginal but highly significant stories (or ‘new truths’) voiced by neurology are better heard if due attention is paid to both the ‘ingenious techniques’ as well as the ‘unknown sides’ of neurological orthodoxy, and in particular its written manifestations – its literature.

Taking a Bakhtinian view of prototypical aphasiological writings, Jacyna deems them literary and narrative-like, yet still varied enough

to justify their classification into distinct genres. A literary genre may be considered as both an enabling and as an inhibitory device: it facilitates certain discursive possibilities while precluding or at least hindering others.⁷⁵ Genres perform a regulatory role with respect to individual utterance [...]. The use of language within a genre is therefore as much a performative as merely a descriptive act; it creates the reality that it describes. An ability to write *within* a particular genre may, moreover, be a qualification for participation in a given way of life.

(Jacyna 2000: 25; original emphasis)

A precedent, seemingly from thin air, was set in those halcyon days of the study of aphasia, in the early nineteenth century. The nascent field of aphasiology, in Jacyna’s terms a literary sub-genre of what was itself the still immature field of neurology, was from the start already divided into sub-genres which jockeyed for position, not just for disciplinary currency and prestige, but to be constitutive of the very reality being described – of what would and would not count as admissible in an aphasiological account of the world. If aphasiology’s importance to the

⁷⁵ Going further than Jacyna and overtly advocating ‘new literary forms’, sociologist of science Malcolm Ashmore justifies this by asserting that ‘the standard empiricist research report inhibits the development of any serious and sustainable reflexive practice, and [...] therefore other alternative formats are to be preferred’ (Ashmore 1989: 66; also, Cf. Woolgar 1988).

sustained success of the neurological project is not to be underestimated, then it is not only what patients could not impart that counts, but also what practitioners in the overall field omitted from their writings. As Jacyna writes: ‘The silences of the canonical neurological case history will be seen to be as significant as what it allows to be said’ (Jacyna 2000: 25). He is here orchestrating a specific argument that ‘will be seen’ in the pages that follow, but there remains a sense that he is simultaneously talking about the central, formative role of silence in the unfurling of neurological discourse over the next two centuries or so.

I am a Strange Convolution: Literary Literality

That this is an ongoing situation in the modern day is corroborated by Oliver Sacks. He sticks out for being willing to comment on himself and his neurological profession in the capacity of patient, as well as practitioner, as well as a writer well versed in the act of producing narrative discourse, just as much as participating in it. Sacks's first best-seller was *The Man Who Mistook His Wife for a Hat*, which he sometimes affectionately refers to simply as *Hat*. A prolific raconteur even before the success of the book, Sacks thereafter became exposed to a much larger – and more highly appreciative – pool of readers than previously. He had become a bona fide famous person, whose words might then easily be taken as gospel by readers. This was a potential which exacerbated Sacks's painstaking, self-conscious fastidiousness about avoiding the misrepresentation of those patients that had, in effect, made his name – patients who could not hope to speak for themselves to such large numbers of people, if indeed they were able to communicate their experiences normally or effectively at all. Willing to listen as much as expound, and then again, to additionally question his own conclusions, Sacks provides an example of convolution in practice, straining to properly hear what has been missed in the cacophony, or what has been simply rendered mute.

However, not everyone shared the enthusiasm of Sacks's readership, and to his self-professed lifelong chagrin, the dissent shown in the face of *Hat*'s (and previously *Awakenings*'s) large-scale success chiefly stemmed from his peers and colleagues in the medical establishment:

My fellow neurologists, however, remained somewhat remote and dismissive. Now to this was added, I think, a certain suspicion. I had, it seemed, defined myself as a 'popular' writer, and if one is popular, then, ipso facto, one is not to be taken seriously. This was by no means completely so, and there were some colleagues who saw *Hat* as solid, detailed neurology embedded in a fine, classical narrative form. But by and large, the medical silence continued.

(Sacks 2015: 258)

Trying to break the individual silence experienced by each of his patients, Sacks seemingly came up against the barrier of a larger institutional silence, an entrenched mutism permeating the closed corridors of specialization. In addition was the galling contradiction of an imposing edifice of medico-scientific knowledge influenced only by huge seismic changes rather than the efforts of particular people within the structure itself – even or especially when 'popular'. Bearing in mind Jacyna's observation about the 'ingenious techniques' and 'unknown sides' of neurological practitioners which are revealed by closer reading, Sacks's meticulously crafted case studies say as much about himself, a subject he is never shy to directly comment on either, as they do about

his patients. Despite or perhaps because of its popularity, this is the type of foundation-shaking view of selfhood abhorrent to the medical establishment.

Thus, back to the ‘popular’ science writer Steven Johnson and his historical sketch of emergence and complexity theory, as mentioned in *Re(con)volution*, the introduction to this thesis. To recap, Johnson selects specific visual images to denote whole technological and scientific eras – ‘web’, ‘explosion’, ‘grid’ – each of which is the central metaphoric idea of a wholesale seismic shift. This is enough to establish Johnson’s tacit but clear belief in the power of metaphor in science, but as Jacyna claims, spotting and touting these metaphors does not exclude one from incorporating yet other metaphors in one’s own writing:

close reading reveals that metaphor pervades even the most overtly literal forms of writing; the most powerful metaphors are those no longer recognized as such. [Thus it is important] to draw attention to some of the constitutive but effectively invisible metaphors that permeate discourse about language and the brain.

(Jacyna 2000: 8–9)

Putting this aside momentarily, the recap continues: whether consciously or not, Johnson incongruously refines his metaphorical set of eras by bringing into question a dichotomy of intellectual-historiographical styles, essentially the ‘genius’ versus the ‘spontaneous paradigm shift’. These styles reflect the same problematic suggested by Sacks in the relationship between medico-scientific individuals and institutions, a problematic entirely eliding the role of supposed bit-part players such as patients. Although Johnson’s middle way solution posits disparate geniuses working on roughly similar projects in numbers large enough to bring about an emergent paradigm sway, the bit-part players in this process are again conspicuous by their absence – and these no doubt include popularizers of science such as Johnson himself. Unlike Sacks, Johnson’s attempt at convolving stops short of overtly acknowledging his own role in the metaphorical system; his involvement submerges rather than emerges.

Nevertheless, if he chooses not to go upstream to the individual source from this point of submersion, Johnson certainly intrigues by looking downstream at the repercussions of the so-called ‘complexity theory’ which describes ‘emergence’. Here, Johnson demonstrates his middle way hypothesis precisely by considering the historical genesis of studies into emergent behaviour, and finding that indeed, the now accepted, widespread discourse of emergence itself suddenly emerged from seemingly unrelated and miscellaneous, yet ultimately crucial units of knowledge production. As he says, ‘a field of research that had been characterized by a handful of early-stage investigations blossomed overnight into a densely populated and diverse landscape, transforming dozens of existing disciplines and inventing a handful of new ones’ (S Johnson 2002: 65). Up till this point, Johnson had been sketching all these outwardly unconnected yet

thematically linked projects, events and individual participants, culminating as he sees it in this ‘overnight’ ‘blossoming’, ‘transforming’ and ‘inventing’. He concludes by describing a huge groundswell in activity throughout the 60s and 70s, mentioning that in 1972 a

professor named Gerald Edelman won the Nobel prize for his work decoding the language of antibody molecules, leading the way for an understanding of the immune system as a self-learning pattern-recognition device. [Non-equilibrium thermodynamics pioneer Ilya] Prigogine’s Nobel followed five years later. At the end of the decade, Douglas Hofstadter published *Gödel, Escher, Bach*, linking artificial intelligence, pattern recognition, ant colonies, and [Bach’s] ‘Goldberg Variations.’ Despite its arcane subject matter and convoluted rhetorical structure, the book became a best-seller and won the Pulitzer prize for nonfiction.

(S Johnson 2002: 65)

Johnson briefly glosses Hofstadter’s famous book, describing it as ‘convoluted’. This description is highly appropriate and interesting because unlike Johnson (but like Sacks), Hofstadter is willing to include himself in the emergent equation. Not only does Hofstadter’s prize-winning text possess the ‘rhetorical structure’ of a convolution, but it deals with the very nature of what he extrapolates from mathematician Kurt Gödel as the concept of the ‘strange loop’; Hofstadter even goes so far as to describe himself in the title of a later book as the very same, that is to say, Hofstadter claims of himself in 2007 that *I am a Strange Loop*.

This self-styling is perhaps not as bizarre as it seems, or as the name itself suggests. Hofstadter’s multitudinous and even sometimes wandering interests led him to write his most famous book *Gödel, Escher, Bach* during the 1970s. This title, a reference to a pattern he identifies running through the works of the respective mathematician, graphic artist and musical composer, is reflected and reorganized in the same initials of the book’s subtitle: *An Eternal Golden Braid*. Drawing attention to this pattern is Hofstadter’s chief purpose, especially as regards himself (or any ‘self’) as he would further elucidate some thirty years on in *I am a Strange Loop*. The cardinal obsession with ‘braids’ and ‘loops’ which comes to dominate the imagery of his works can be seen again as a variation on a convolution. This is illustrated not in one of *Gödel, Escher, Bach*’s passages on the brain, or Hofstadter’s various expostulations on the workings of the mind, but in a virtuosic metafictional literary dialogue between classical hero Achilles, a Crab, a Tortoise, so-called ‘father of the computer’ Charles Babbage, and the author Hofstadter himself. Achilles has joined the Tortoise and the Crab at the latter’s home in order to play music together, specifically canons from Bach’s *Musical Offering*. However, this attempt at performance is repeatedly scuppered by the characters’ collective dwellings on music theory, dreams, literature, free will and determinism, to the point where the Author (transcribed as such) appears on the scene to dispel the notion of any final authorial authority. He does so by admitting

that whilst his interlocutors, the other characters in this dialogue, may well be his puppets to move around the page, he himself as Author might also be the mere figment of someone else's imagination, and so on *ad infinitum* – just as the sleeping magician in Borges's story 'The Circular Ruins' attempted to create a son in his dreams, but in the end the magician 'understood that he too was a mere appearance, dreamt by another' (Borges 2000a: 77).

Just as all of Hofstadter's characters seem to accept this and the performance is once again attempted, Charles Babbage arrives, and inspired by this celebrated personality's entrance, the whole party decides instead to play with the Crab's many odd computer-like contraptions ('smart-stupids' as they are called in the book). Babbage, as computer pioneer, shows great skill in immediately programming an algorithm which calculates pi to a great number of digits, and then another to generate beautiful graphics – and here the Author's earlier existential quandary is mirrored in the short, adulatory exchange the characters share on the nature of the graphical patterns Babbage has 'created':

- Crab:* How harmonious and pleasing these swirling shapes are, as they constantly collide and interfere with each other!
- Author:* And they never repeat exactly, or even resemble ones which have come before. It seems an inexhaustible mine of beauty.
- Tortoise:* Some are simple patterns which enchant the eye; others are indescribably complex convolutions which boggle and yet simultaneously delight the mind.

(Hofstadter 2000: 728)

Despite superficially referring to a series of graphics on a screen, the characters (including their ostensive Author) are here alluding to their own pattern of existence within the text, a convolving reoccurrence in which they remark their own self-awareness as ontologically textual beings that come round again every so often, but never in quite the same way. They are themselves these 'swirling shapes', these patterns which 'never repeat exactly,' as is the text in which they are contained. They are convolutions, as well as components of another larger convolution.

This type of playful but deeper-level encoding of conceptual metaphors runs throughout *Gödel, Escher, Bach*, to the point where identification of the pattern is embodied as the very same pattern in the book, which is then itself identified and specifically remarked upon. Just prior to the Author's entrance above, the Crab reminds Achilles and the Tortoise of a previous strange encounter they all had in the park (recorded in an earlier chapter of the book). The three unwittingly try to account for the palindromic structure of that previous conversation, dismissing various other theories for the encounter's oddness. In doing so, some lines from that earlier

dialogue are used without being referenced as such; that is to say, they reappear as if spontaneous. But this eventually jogs their memories:

- Achilles:* Say, something about this conversation strikes me as familiar.
Haven't I heard some of those lines somewhere before?
- Tortoise:* You said it, Achilles.
- Crab:* Perhaps those lines occurred at random in the park one day,
Achilles. Do you recall how your conversation with Mr T ran that day?
- Achilles:* Vaguely. He said "Good day, Mr A" at the beginning, and at the
end, I said, "Good day, Mr T". Is that right?
- Crab:* I just happen to have a transcript right here...

*(He fishes around in his music case, whips out a sheet, and hands it to Achilles.
As Achilles reads it, he begins to squirm and fidget noticeably.)*

- Achilles:* This is very strange. Very, very strange... All of a sudden, I feel sort
of – weird. It's as if somebody had actually planned out that whole set
of statements in advance, worked them out on paper or something... As
if some Author had had a whole agenda and worked from it in detail in
planning all those statements I made that day.

*(At that moment, the door bursts open. Enter the Author, carrying a giant
manuscript.)*

- Author:* I can get along very well without such a program. You see, once
my characters are formed, they seem to have lives of their own, and I
need to exert very little effort in planning their lives.
- Crab:* Oh, here you are! I thought you'd never arrive!
- Author:* Sorry to be so late. I followed the wrong road and wound up very
far away. But somehow I made it back.

(Hofstadter 2000: 724)

This long quotation justifies its inclusion here because it illustrates what it is trying to say by circuitously performing it. As Malcolm Ashmore puts it, the dialogue is a rare example of a 'self-exemplary text,' one 'in which what is said is exemplified by the way in which it is said, or in which the form echoes the content' (Ashmore 1989: 76).

Seemingly out of the blue, lines that the characters have already said are repeated, but in a different context. Not only does this repetition then become their focus, but so does the fact that both the first occurrence and the reoccurrence are enshrined in text, immortalized in the

‘transcript’ which the Crab ‘just happens’ to have. This is then in turn re-preserved again in Hofstadter’s book, the ‘actual’ one from which the quotation is taken making an appearance within itself (albeit in manuscript form). All this is corroborated in the Author’s first utterance upon impossibly entering the scene, which taken on its own is a simple retort to Achilles’s suggestion that what is being written (that is to say, what is happening in the scene) has been meticulously planned by the Author. However, his statement ‘I can get along very well without such a program’ is also a phrase uttered by the characters several times earlier in the same dialogue, only in different contexts (for example, with reference to a radio program, or a schedule of musical rehearsal). Thus the Author appears here for the first time in a manner of reappearance, or call-back; no wonder his characters’ lives require him ‘to exert very little effort’, as he himself is one of them, and even then only as a variation on an already well-worn theme. Just as Borges deems it inevitable that the man trying to fashion reality from his dreams in circular jungle ruins ends up imagining ‘his unreal child was practising the same rites, in other circular ruins downstream’ (Borges 2000a: 76), Hofstadter (again, unlike Steven Johnson) is unafraid to look both up and down the river of selfhood, of time, of convolution.

Indeed, before the Author’s arrival, the other characters have pre-empted this arrival by dwelling on the repercussions if they were merely characters in someone else’s story. This leads them to debate whether or not they are real, given their somewhat fantastical qualities, or just the made-up inhabitants of another’s brain:

- Achilles:* What an absurd idea! And yet, I do enjoy trying to find the cleverly concealed holes in your sophistry, so go ahead. Try to convince me. I’m game.
- Tortoise:* Did it ever strike you, Achilles, that you keep somewhat unusual company?
- Achilles:* Of course. You are [both] very eccentric [...].
- Tortoise:* But Achilles, you’ve overlooked one of the most salient features of your acquaintances.
- Achilles:* Which is...?
- Tortoise:* That we’re animals! [...] How many people do you know who spend their time with talking Tortoises, and talking Crabs?
- Achilles:* I must admit, a talking Crab is –
- Crab:* – an anomaly, of course.
- Achilles:* Exactly; it is a bit of an anomaly – but it has precedents. It has occurred in literature.
- Tortoise:* Precisely – in literature. But where in real life?
- Achilles:* Now that you mention it, I can’t quite say. I’ll have to give it some thought. But that’s not enough to convince me that I’m a character in a Dialogue.

(Hofstadter 2000: 723)

Hofstadter here comments on the literariness of what he is trying to convey throughout his strangely looping book, even though the title purports it to cover maths, music and visual art, as well as the cognitive science implied by the author's main area of expertise in 'real life'. Having myself started with the use of the word 'convolutions' in Hofstadter's text and worked backwards from this usage to describe how the text creates the conditions for the usage by convolving, I would like to suggest that literature is also a part of 'real life' – to enough of a degree in a reader's (or author's) brain that Hofstadter's book exists as much as the Tortoise who graces its pages. I may not be 'a character in a Dialogue' but I am causing these words to really exist in the brain of my reader. Hofstadter repeatedly mentions (himself mentioning) this type of confusing but exhilarating self-referentiality, and relates it to the potentialities of the mind/brain. This is what definitively welds the idea of convolution as a literary conceptual metaphor to its anatomical cerebral counterpart.

This difference between what can legitimately happen in literature and what can happen in so-called 'real life' is crucial but nuanced. It is reminiscent of Derrida's assertion that

experience of Being, nothing less, nothing more, on the edge of metaphysics, literature perhaps stands on the edge of everything, almost beyond everything, including itself. It's the most interesting thing in the world, maybe more interesting than the world, and this is why, if it has no definition, what is heralded and refused under the name of literature cannot be identified with any other discourse. It will never be scientific, philosophical, conversational.

(Derrida 1992: 47)

Derrida here makes a complicated claim; he is talking about the specific quality of literariness, its essence, something he denies is inherent solely in any text, whilst equally failing to correlate perfectly with anything in the world to which it refers. Hence, literature exists at 'the edge of everything,' both physical and metaphysical, never quite belonging to either camp. If literature is 'the most interesting thing in the world, maybe more interesting than the world,' this is because the world (or 'real life') can only contain the world, but literature can contain the world plus anything else, including itself.⁷⁶ Literature is in this theoretical respect free and unbounded in a way that the other discourses Derrida mentions cannot be. However, as he goes on to say,

if it did not open onto any of those discourses, it would not be literature either. There is no literature without a *suspended* relation to meaning and reference. *Suspended* means *suspense*, but

⁷⁶ This is similar to the complicated notion of the brain somehow containing the world which also has that same brain in it, mentioned in Convolution 3: Labyrinth in this thesis, and again suggesting that literature and the brain have parallel potentialities.

also *dependence*, condition, conditionality. In its suspended condition, literature can only exceed itself. No doubt all language refers to something other than itself or to language as something other.

(Derrida 1992: 48; original emphasis)

In short, literature cannot only be about itself or it ends up becoming self-negated; it has to contain the world, or talk about other things, in order to be literary.

Derrida's stance is usefully elucidated (or deconvoluted) by Nicholas Royle:

The interest of literature goes far beyond aesthetic or formalist concerns: [Derrida's] focus is on the importance of the literary work in having transformed and in continuing to transform the ways in which we think, for example not only about 'writing' in its narrow sense, but about history, politics, democracy and law, the world itself. The literary works to which he is most drawn are works that participate in a more general transformation, in that trembling and upheaval of western thinking that we might, provisionally, call deconstruction.

(Royle 2003: 86–87)

Derrida's idea of a 'suspended relation to meaning and reference', as in the nebulous quality of literariness almost hanging over all signification, recalls Steven Johnson's conception of shapes and patterns 'hovering' over moments in time, 'haunting' but also defining them, reifying or allowing them to be thought of as objects, events, things in the 'real world'. Recalling this 'animated' ghostliness is helpful because literature's 'trembling and upheaval' of 'western thinking', as Royle describes it, also recalls Johnson's 'paradigm shifts'. Literature and metaphors can have seismic effects.⁷⁷

So what does this have to do with convolutions, literary or neuroscientific or otherwise? Literature's fundamental 'hovering' or 'haunting', what Royle suggests is its transformation of things in general, is at the heart of the near but not-quite-circular thinking I am trying to capture. As Royle continues,

this transformation is historical but [...] also a transformation *of* the historical, insofar as historiography has always been founded on presence, on the history of the past as what was once

⁷⁷ Historian Hayden White writes: 'I have long thought that the relation between literary discourse (where writing is supposed to be free and even abandoned) and historical discourse (where factuality, realism, and rational commonsense are supposed to prevail) provides a microcosm of modern Western thought's effort to relate imagination (the vision of what might be) and commonsense (the thought of what is the case, what goes without saying). In trying to show the literariness of historical writing and the realism of literary writing, I have sought to establish [that each] is an example of a distinctively Western practice, not so much of representation as of presentation, which is to say, of production rather than of reproduction or mimesis' (White 1999: ix). White's account suggests that the 'abandon' of 'literary discourse' can actually result in the 'production' (and not just the reflection) of historical events – it can make 'real' things happen, just as the writing of history does.

present: [the literary texts Derrida deals with] are also shown to be concerned with notions of the present that are strange or ghostly, with kinds of thinking and experience that fracture and disturb linear, calendrical conceptions of time and history.

(Royle 2003: 87; original emphasis)

I am not trying to make a direct equivalence between literature and science, or history, or any other discipline, and neither is Derrida, nor Royle. The suggestion is more that literature, at least since neurology's heyday in the nineteenth century, has contaminated or seeped over into all the other discourses it has touched (and vice versa). This is specifically because of its concern with its own language and writing, what Derrida says is its own presence, and the knock-on problematization of all writing that this entails – inclusive of retrospective or prospective repercussions. In theory, literature can encompass (or inhabit, or engender, or haunt) all other writing that has ever existed or ever will – and this is not so the other way round.

So, if literature questions literature, its own existence, it then questions any form of knowledge production based on writing. As Derrida claims

if the question of literature obsesses us, [...] this is perhaps not because we expect an answer of the type 'S is P,' 'the essence of literature is this or that,' but rather because in [the twentieth] century the experience of literature crosses all the 'deconstructive' seisms shaking the authority and the pertinence of the question 'What is . . . ?' and all the associated regimes of essence or truth.

(Derrida 1992: 48)

These 'seisms' are those texts that, by asking themselves what they are, already beg the question of their own existence – it is a crucial operation which serves to undermine any attempt at concrete ontology, because of an originary leap in logic, a presumption of existence in order to even ask the question. As Royle remarks, 'two questions go hand in hand, and have been especially audible since the end of the nineteenth century: not only "What is literature?" but also "What is the present, what is presence, what is this 'is'?"' (Royle 2003: 87). Given the earlier discussion about the amplificatory convolution of aphasiology, note here the parallel historical time-frame, and what Royle and Derrida say is the literary seism of all writing, rendering 'especially audible' what had theretofore been ontologically central – but mute.

This brings up the tricky business of thinking about thinking, and in particular using the brain to address the brain. These tasks appear ridiculously easy, but again involve a slight leap, essentially the effacing of a presumptive process. This is because the leap relies upon exteriorizing and then carefully listening to items which are necessarily quiet in order to function – both the brain and thinking itself. Raymond Tallis puts it well:

My brain, the biggest thing in the head, is silent for most of the time. When it does speak, its locutions tend to be referred elsewhere: activity in the brain is ‘about’ the non-cerebral body or the world. In short, the presence of the head to its owner is an intermittent, spatially discontinuous blossoming out of absence. [...] If all the places in the head that might be called upon to do their duty were required to be constantly iterating their presence, there would be such a cacophony of cephalic sensation that it would be difficult to see how the necessary attention could be paid to the parts that mattered or any attention could be paid to anything that was not a part of the head.

(Tallis 2008: 8)

As with literature, the brain is somehow in the world just as it contains the world, an unavoidable presumption of ‘presence’ which nevertheless ‘blossoms out of absence’. For Tallis, completely attenuating the potential extremes of auditory existence, that is to say, finding the perfect volume between silence and ‘cacophony’, is nigh on, if not totally impossible.⁷⁸ He makes an ultimately neurophenomenological query: ‘What is the relationship between what I am feeling now and the scientific account of the world that has had such an impact on what I am feeling now?’ (Tallis 2008: xv), but finally is forced to admit that his work is itself ‘haunted, or at least bothered, by this: our experiences of our head are not fact-shaped. We cannot bridge the gap between what we feel ourselves to be [...] and the innumerable facts [...] about us’ (2008: xvi). It is my contention, however, that the bridge between facts and feelings – that which indelibly connects knowledge of wavelengths with the perception of sounds – is cerebro-literary convolution.

Thus Hofstadter is often found wilfully using a literary idiom to think through thinking, to consider the many convoluted (but ostensibly non-literary) problems he addresses in his works. One of the many running jokes in *Gödel, Escher, Bach* is that every time Achilles, the Tortoise and the Crab mention something inherently incongruous, such as their own non-existence, they jokingly conclude, via an almost scoffing interruption, that this must merely be ‘an anomaly, of course’. The irony is that every such instance makes the entire notion less and less anomalous and more the norm. Indeed, the first time this in-joke occurs, the Tortoise and Achilles are discussing logic and geometry, but out of the examples they discuss, an outlandish image hits them:

“A tortoise playing football would be —” Achilles was beginning.

⁷⁸ Despite this, Laura Otis vibrantly depicts that her ‘mental world functions acoustically [and is] supported by sensitivity to sound’ (2015: 1). Otis may not be able to hear thought itself, but she thinks with sound, using this as a vivid and reflexive opening example to her fascinating recent book *Rethinking Thought*. Crucially, Otis’s repeated sentiment is that while scientific generalization is invaluable, what the starkly varying (and indeed, changeable) nature of individual thinking styles demonstrates is that the convolving relationship between the generalizable and the singular needs far greater attention.

“– an anomaly, of course,” the Tortoise hastily interrupted. “Don’t wander from the point.[...]”

(Hofstadter 2000: 44)

The point here, in fact, is precisely to ‘wander’ away from the point, as is shown by the return to this entire set-up a few more times before culminating in these characters questioning how animals can even talk, or whether they are the mere imaginings of some external author. Hofstadter covers a lot of disparate and perhaps esoteric ground in his book, but does so in order to come back to these anomalies and highlight their non-anomalousness. As he says when his own textual avatar enters into the final dialogue, ‘I followed the wrong road and wound up very far away. But somehow I made it back’ (Hofstadter 2000: 724). This wandering away, following a supposedly ‘wrong’ path and winding up far away, only to make it back again, somehow – this itself again reads very much like a convolution, and it also reads very much like another Derridean concept – that of *destinerrance*.

In order to deal with this concept in an appropriately ‘destinerrant’ fashion, I should first remark that this juncture brings me to a series of four short sections by way of tentative conclusions – and though the four correspond roughly to the four large Convolutions at the core of this thesis, just as with these central chapters, they all overlap, the overarching link being precisely their partiality, interchangeability and tentativeness.

De Te Fabula Destinarratur: Humanistic and Scientific Self-Convolution

Convocclusion 1 (Quest)

Whilst Derrida's *destinerrance* has served as a guiding principle in my investigation of convolutions, it has purposefully not been directly addressed in too much detail, specifically because that seems to me the *modus operandi* that the concept prescribes – to stray in order to stay on track. Wandering as a concrete aim: this is a more orthodox and perhaps also softer (but easier to understand) description of *destinerrance*. Thus, *destinerrance* as autotelic wandering has been used as a figure and a method at the same time. This allows one to think through what one is doing whilst one is doing what one is thinking, a synthesis (or better put, a symbiosis) of form and content which simultaneously shows in its very fabric the process that one is attempting to describe. This is also perhaps why I favour J Hillis Miller's reading of *destinerrance* over Derrida's own. It is not only due to Miller's exceedingly lucid writing style nor his fastidious, exhaustive scholarship on the trope – it also seems entirely appropriate of the very idea of *destinerrance* not to aim for fidelity to its original conceptualization, but to instead champion a reformulated, convolved version which side-steps (or wanders away from) the relationship between its origins and goals.

Indeed, designating the trope as an 'aim' is already a step too far down the wrong path, because as Miller says, 'any utterance or writing I make may escape my intentions both as to what it should mean (for others) and as to the destination it is supposed to reach. It may be destined to err and to wander, even though it may sometimes, by a happy accident, reach the destination I intended for it' (Miller 2009: 33). As a written word, *destinerrance* was Derrida's gambit that whilst the term might move from context to context like an erring knight errant looking for sanity in random-seeming corners of the landscape – and often failing – if it were to achieve any success, it would be largely due to the mysterious workings of serendipity. *Destinerrance* is both destiny and error, like the goal of a convolution looping back upon itself is to veer off again before reaching its goal.

However, though the wandering of the term *destinerrance* from text to text and language to language means it may well have no calculable end, it may paradoxically be without any discernible beginning either. Miller encapsulates this in two statements. First he writes that '*Destinerrance* is like a loose thread in a tangled skein that turns out to lead to the whole ball of

yarn.⁷⁹ It could therefore generate a potentially endless commentary.’ However, soon after, he concedes the following:

A peculiarity of many places where the word or the concept [...] of *destinerrance* appears is that they tend to say [...] something like: ‘as I have elsewhere explained, with examples.’ I have not yet found, in the labyrinth of Derrida’s writings, what might be called the ‘mother lode,’ the place where the word appears for the first time, with full explanation [...]. Perhaps no such origin for the word exists. Perhaps the word itself is the consequence of a *destinerrance*, a wandering from locus to locus that to some degree takes for granted its meaning as something always already established somewhere else.

(Miller 2009: 29; 31)

This constantly deferred meaning could begin to indicate the metaphysical presupposition that Nicholas Maxwell, as discussed in Convolution 1: Quest, says is inherent to all scientific and, by extension, academic endeavour – but equally, as with Hofstadter, it could simply be the necessity to expressly, literarily explore other ambits (even far flung ones) in order to ‘somehow make it back’ anyway. Nevertheless, for the time being, it seems that even the quest for *destinerrance* itself goes on, which paradoxically means moving away from it once again here.

Convocclusion 2 (Detective)

But this movement away does not last very long before coming back into consideration, because as part of a convolution, it evidently convolves. This is not as redundant or simplistic a statement as it seems. Convolutions acquire definition precisely by defying it – no magnifying glass or imaging technique permits full access to their intrinsic meaning (if there even is any). They are thus a complicated idea requiring continuous reformulation, to be seen from constantly adjusted angles and viewpoints, with ever finer-grained lenses or more sophisticated software. This is because a convolution, as I am trying to elucidate it, is simultaneously a visual representation of a concept *and* the metaphoric use of the resulting image in the verbal description of the idea being

⁷⁹ In true destinerrant fashion, a brief digression on ‘yarn’ here: ‘yarn’ conjures E L Doctorow’s description of the brain (as mentioned in Convolution 4: Ballistics), as ‘that three-pound knitting ball [that] makes you feel like a human being’ (2014: 188). Meanwhile, as the *OED* attests, ‘yarn’ is etymologically related to words meaning ‘guts’ and ‘intestine’, providing a vivid reminiscence of Clarke and Dewhurst’s assessment, after Erasistratus of Alexandria, that ‘the convolutions of the brain [...] were comparable to coils of small intestine’ (Clarke and Dewhurst 1972: 60). ‘Spinning a yarn’ can of course also mean telling a long-winded, perhaps convoluted story, and with this, Miller’s ‘ball of yarn’ can remind one of Dan Lloyd’s words, which he attributes to an unnamed colleague of his: ‘the brain is a story’ (Lloyd 2004: 331). For more on the inter-braided yarn of science and fiction, Cf. Sleight 2015: 30.

represented – plus the convolution takes on another layer of complexity by being at once these things and the very oscillation between them itself, the very process of convolution. This is why it is as valid, though more difficult, to speak of convolving as it is of convolution, the notion flip-flopping all the time from verb to noun (and from singular to plural) and back. The convolutions of the brain (visual, metaphorical, conceptual) are the first instantiation in this regard that I have noticed and the inspiration behind all else here, but the term ‘convolutions’ might well be adapted and harnessed for any other conceptual or intellectual field that seems appropriate.

This means that any and all possible leads need to be followed, as all are equally likely to provide insight, or at the very least clues about one’s initial concern. None of them are a waste of time; if an intellectual detective (an intellective? a detectual?) is to be properly thorough, then no avenue of investigation will ever be a priori rejected out of hand, even though in practice time constraints mean one or another avenue will no doubt present itself as the path of least resistance. Nevertheless, the necessary implication is repetition, reiteration, having more than one good stab at explaining things in detail. And when it comes to *destinerrance*, this repeated attempting is exactly the case for Miller:

What is *destinerrance*? Discussing it fully would be a virtually endless task. It is a concept, or better, motif, or better still, spatiotemporal figure, [because] it is a spatial figure for time. It names a fatal possibility of erring, by not reaching a predefined temporal goal, in terms of wandering away from a predefined spatial goal.

(2009: 28–29)

Miller also importantly notes that ‘the word [*destinerrance*] is a concocted present participle used as a noun’ (2009: 28). Thus, as for convolving, so too for ‘destinerring’ (which would arguably be the best possible English translation for the original French of Derrida’s concept). It is not merely that the discussion of either convolving or destinerring is potentially interminable, but that the verbs themselves are ‘virtually endless tasks’, masquerading as they do as nouns. Convolution or convolving, terms which a sharp investigator would by now see are almost interchangeable, are spatiotemporal figures themselves, mere reiterations in an endless sequence on loop in the brain.

Remarking one particular instance or another entails the manifestation of a pocket of cerebral time, an inevitable part of the sequence which is thus also in the process of being remarked – like Borges’s would-be dreamer-creator in ‘The Circular Ruins’, trying to espy an individual convolution bizarrely invests one in the convolving of something larger and more long-term, ‘for what was happening had happened many centuries ago’ (Borges 2000a: 77). It ultimately denotes detecting the convolution not just of one brain, but of brain science as a whole.

As Laura Otis points out, the same is true in reverse:

The relationship between literature and science is one of mutual feedback and suggestibility, each contributing to and drawing upon the 'culture medium' out of which it grows. Culture, however, does not 'determine' science or literature any more than science and literature determine culture; personal vision persists, despite all indoctrination and all scientific training.

(Otis 2000: 3)

Maverick detectives, who disregard their 'indoctrination' or their 'scientific training', still have their place: grasping an overall or composite or meta convolution is necessary, but this shape does not predetermine what its constituent parts are going to be like, only that they will have an impact upon the system as a whole. The 'persistence' of each 'personal vision' means that the convolution of each individual brain must also in some sense be accounted for or witnessed.

Convocclusion 3 (Labyrinth)

And thus, as I also have a brain and a 'personal vision', it is possible for me, as I write this here, to hear an implicit call of *de te fabula narratur* coming from my own writing.⁸⁰ At the risk (necessary, calculated) of descending with abandon into narcissism, the largest part of convolutions is the recognition of oneself in the search. If my contention is that individual scientists belie or mask their own search for intrinsic, individual selfhood in the grander, more general project of science, then my own commentary on such matters has to admit its own part in such a convolving discourse. One then has to mention the convolution at the heart of pointing out convolutions – that the texts one is highlighting are often chosen because they comment somehow upon oneself, even if this choice had been unconscious. I do not contend to be a neuroscientist, nor even a scientist of any sort, at least in the ordinarily limited senses in which these terms are used. I also do not wish to outright condemn the potential, theoretical unity of an overall neuroscientific project. I simply wish to draw attention to the fact that this theoretical project does not tend to unity but to a proliferation of concepts (a prominent one being literature), and a convoluted, labyrinthine structure from which individual technicians, theorists, writers, medical practitioners, sociologists, historians, etc., cannot disentangle themselves if they are to at all participate; this, of course, now goes for myself as well. The convolution of the labyrinth, for

⁸⁰ *Merriam-Webster* gives the definition of the phrase *de te fabula narratur* as 'the story applies to you'.

instance, thus seeks to clear up something about my own person and my own place in the literary-neuroscientific edifice I am trying to describe; at its most distant point it turns back to reflect on me just as I do on it. I can, in this regard, highlight two passages of an epiphanic nature, both instances of the same uncanny *de te fabula narratur* feeling, in Umberto Eco's *The Name of the Rose* (first published in English in 1983).

In the first, Benedictine novice and pseudo-detective Adso of Melk, dwelling on and dazzled by the fine line between saintliness and sin, enters the library-labyrinth which is as much the centrepiece of the story as it is of the abbey where the story is set. Adso is confused and alone, entering the labyrinth much against his better judgement, and, randomly wandering about, finally ends up where he had started. Equally randomly, he opens some books and looks through them in a daze. Vivid depictions of a lion and an exotically armoured man cause him to experience his own fated and emergent literariness, his own *destinerrance*:

The [man's] head, which emerged enigmatically from a castle of rubies and topazes, seemed [...] that of the mysterious murderer whose impalpable trail we were following. And then I realized why I linked the animal and the armoured man so closely with the labyrinth: both illustrations, like all in that book, emerged from a pattern of interlocking labyrinths, whose lines [...] seemed all to refer to the tangle of rooms and corridors where I was. My eye became lost, on the page, along gleaming paths, as my feet were becoming lost in the troublous succession of the rooms of the library, and seeing my own wandering depicted on those parchments filled me with uneasiness and convinced me that each of those books was telling, through mysterious cachinnations, my present story. 'De te fabula narratur,' I said to myself, and I wondered if those pages did not already contain the story of future events in store for me.

(Eco 2004: 240–241)

With eyes in his feet, wandering the library-labyrinth has led Adso only to read his own story; the confluence of walking, looking and thinking has, however unsettling, crystallized other times and spaces for him.

This lends Adso something of the air of what Tallis calls a 'metaphysical flâneur' – 'the words on the page he is holding up to his gaze gather up such absences from a multitude of nears and fars and make them present in the light here and now' (Tallis 2014: 20). Indeed, if neuroscientist, physician and staunch defender of humanism Tallis is awed by the metaphysical qualities of reading, Adso takes a dimmer view of his own bodily immersion in the process, even when it comes to love:

I had only to see that book and I was forced to say, 'De te fabula narratur,' and I discovered I was more sick with love than I had believed. I learned later that, reading books of medicine, you are

always convinced you feel the pains of which they speak. [...] I was frightened to read that the sincere lover [...] must fall into a wasting state [...], and sometimes the malady overpowers the brain, and the subject loses his mind and raves.

(Eco 2004: 322–323)

Reading is bad for the brain if one's brain ceases to comprehend that one is merely reading, to the point where love becomes illness simply by reading about it.⁸¹

Convocclusion 4 (Ballistics)

Tallis's recent oeuvre, if not all of it, can be characterized as a defence of humanism as mentioned, and what for him is not at all incongruous with that: a simultaneous defence of scientific medicine. Doing these two things together, he contends, sustains human progress whilst restoring a diminished sense of wonder at existence. And it is this complicated but compelling call to arms that leads Tallis to one of his most oft-repeated stances: 'Are persons like you and me brains? The short answer is no, but I think I owe you a longer answer' (Tallis 2014: 29). Who is Tallis addressing when he writes this? And why does he feel that the long way round is needed in order to get from the question to the answer 'no'? The basic premise of his claim, the radical non-equivalence of a person with that person's brain, is not under contention – I agree wholeheartedly and feel that nobody has made the point as clearly, emphatically and consistently as Tallis. However, self-styled metaphysical flâneur that he is, yet firm derider of Derrida that he has also been, the *destinerrance* at work in Tallis's formulation is striking (but appropriate), because it essentially answers what Miller (after Derrida) refers to as the call of the Other.

Tallis implies a different equivalence to that of brains and selves, namely that of himself and presumably me reading, added to which is that all these supposed 'persons' are textual; they are also equivalent to text. The person reading cannot be known at all to Tallis, yet referring to himself in the third person, he recognizes the unknown 'you' and himself as 'fellow members of civil society, and the Other will therefore be afforded a greeting' (Tallis 2014: 15). Tallis 'owes' this other something, feels the need to be courteous to the unknown person. This means that he

⁸¹ The idea that books and reading could actually affect one's body, and especially one's brain/mind, is redolent of Don Quixote's reason for sallying forth in the first place, as mentioned in the first chapter of this thesis. Exploring this in greater detail in his book chapter 'The Physiology of Reading', historian Adrian Johns asks 'what early modern men and women thought actually happened when they read. They saw letters on a page through eyes that resembled the device known as the camera obscura, which conveyed images, through the body's animal spirits, onto the brain's *sensus communis*. There imaginative and perceptual images combined, and animal spirits mingled and departed to drive the body's responses to both' (Johns 1998: 442). According to this theory, reading really could make one sick, as well as have a range of other physical effects upon the body (including the brain).

does not simply cut to the chase by saying what he reveals in advance will be the inevitable ‘no’, but instead he takes the time ‘to capitalize on *destinerrance* by saying yes to whatever call from the wholly other comes our way. That call commands us to deflect our course and to begin again anew from a new starting point to move in a new direction, destinerred again’ (Miller 2009: 46–47). Whether Tallis knows it or accepts it or not, his gushing ‘Overture’ which comprises the ‘Reflections of a Metaphysical Flâneur’ (Cf. Tallis 2014: 1–28) is less to do with the relationship between walking, looking and thinking as he contends. It is more about his conscientious attention to such an inaudible call – the very act of straining to hear the call to wandering and wondering which might ‘deflect his course’ in such a useful manner.

It is more than can be said for other supposed humanists who do not deflect their course, and despite their best intentions, end up barraging what they are trying to save with so-called friendly fire. The problem with many attempts to salvage the humanities from the overbearing presence of neuroscience, such as Jonah Lehrer’s *Proust was a Neuroscientist* (2012), is twofold. Firstly, there is an intellectual imposture at play when regarding someone to have ‘foreseen’ the discoveries or advances of neuroscience. It is anachronistic to say the least, and involves confusing this supposed foresight with what is likely to be a far more plausible conclusion: that the notable personages gracing Lehrer’s pages – Proust, Whitman, L’Escoffier, and so on – all had useful, elevated and potentially transformative insight into an object of investigation shared with neuroscience, call it the human mind or the human condition or whatever. Foresight confuses this common object of insight for neuroscience itself. But the second issue, almost more grave, is that rather than rehabilitate the cultural standing of the arts and humanities (which in the current climate seems only ever to be unhelpfully, pretentiously over-inflated, or under very real attack by a wide spread of detractors claiming it a costly and insincere indulgence), the above-mentioned anachronistic and confused imposture still places neuroscience at the top of a gradient, with all human efforts prior to its emergence merely uncannily brilliant and left-field steps on the inevitable march towards cultural neuro-dominance. In this reading, no matter the supposed intentions of interdisciplinary communion, previous ways of explaining human life occasionally yielded moments of unlikely, untimely genius, but were still only semi-lucid precursors to the scientific study of the brain and the nervous system.

The idea is that guns must be pointed elsewhere, or put down altogether, so as to ‘deflect our course [...] to begin again anew from a new starting point to move in a new direction,’ as Miller says. The overwhelmingly reiterated novelty of the way he puts this, a radical and repeated newness, contradictorily brings one back to, but again in a fresh way, to Lloyd’s riff on the brain being a story: that when it comes to ‘novel expressions of our emerging vision of the conscious human being [the] most thorough thought experiment [...] is a novel’ (Lloyd 2004: 332). The

story of the story, that is to say, the (my) critique of just such convolutions, inevitably, destinerringly, ends with the words of a critic – but one that has been brought round by rats, rather than merely accompanying them in their maze, or their everyday race. They are the words, as I have transcribed them, of Anton Ego, the sometime nemesis of Parisian restaurateurs in Pixar/Disney's animated film *Ratatouille*:

In many ways, the work of a critic is easy. We risk very little yet enjoy a position over those who offer up their work and their selves to our judgment. We thrive on negative criticism, which is fun to write and to read. But the bitter truth we critics must face, is that in the grand scheme of things, the average piece of junk is probably more meaningful than our criticism designating it so. But there *are* times when a critic truly risks something, and that is in the discovery and defence of the new. The world is often unkind to new talent, new creations. The new needs friends.

(Ratatouille 2007; original emphasis)

Every anti-conclusion needs its anti-hero, and by following this convolution, my 'discovery and defence' is of nothing less new, less novel, than Ego.

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