Introduction: Interdisciplinarity and Cognitive Approaches to Performance

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Performance studies and the cognitive sciences have much to offer each other. Research in performance and theatre can embrace such topics as memory, attention, skill and the mindful body, perception, temporality, emotion and more – all of which have been the subject of study by researchers in various disciplines loosely grouped under the umbrella of the cognitive sciences. This is an exciting time to be working in an integrative and critical spirit across disciplinary boundaries[1].

But working across disciplines is not always easy. It can be difficult to map the terrain of an unfamiliar discipline, to distinguish among settled consensus, emergent challenges to that consensus, outmoded or discredited theories, and work that is simply marginal to the target discipline. Our deep knowledge of our own disciplines extends not only to the content of research, but also to its conventions; we know implicitly what matters and what 'counts' as a credible research question and methodology for investigation, and this knowledge can be difficult to convey explicitly. But this deep familiarity with our home disciplines does not necessarily aid us in navigating even closely related fields. For example, in the field of English Renaissance Literature, some of the vicissitudes of interdisciplinary work became apparent during the early years of new historicist studies. The work of historian Lawrence Stone was taken by many first-generation new historicists as representing consensus about the family in early modern England, but in fact Stone's model was highly contested by a wide range of social historians. This situation led one prominent historian to describe the so-called interdisciplinary programme as 'one-way traffic'.[2]

Today the so-called 'cognitive turn' in the humanities poses even more challenges, both because cognitive science is itself a highly diverse interdisciplinary field, and because of the greater distance between the disciplinary assumptions and methodologies of the source and target fields. Few researchers are equally conversant with both disciplines, making it difficult properly to evaluate interdisciplinary research. One response to this challenge is to build teams in which researchers with distinct areas of expertise meet around questions of common interest. Such an approach has the advantage of using the deep domain knowledge that is only made possible by long immersion in a particular subject area, while also testing new methodologies alongside researchers with different training and assumptions. Such collaborations take time, energy, tolerance and commitment, but can be hugely rewarding. The aim is to achieve the level of integrative teamwork found, for example, in the interdisciplinary collection of essays *Thinking in Four Dimensions: Creativity and Cognition in Contemporary Dance*, in which 'aesthetic theory, cognitive psychology, and dance criticism merge, as authors are appropriately driven more by the heterogeneous nature of their topics than by any fixed disciplinary affiliation'.[3]

In our own collaboration, a Shakespeare scholar works with a cognitive philosopher to develop an approach to historical cognitive science based on the framework of distributed cognitive ecologies. We have been working together, off and on, for nearly seven years now; while we continue to discover new challenges to integrative work of this kind, our ongoing interaction has also transformed our independent research in our specialist disciplines. We discover new complexity in our own fields as a result of thinking through old problems with the different perspective of each other's discipline, and we find new shared problems which are historical, cultural and cognitive all at once. What follows are some thoughts on going about interdisciplinary research in the cognitive sciences, aimed primarily at relatively new researchers in the field, and with emphasis upon potentially productive lines of enquiry for researchers and practitioners in performance studies.

Our initial point is simple: 'Cognitive Science' is not a monolithic entity. A corollary to this point is that the 'cognitive theory', while apparently a convenient shorthand, is not a meaningful term on its own. As we recently suggested, 'The contemporary cognitive sciences are not settled and inert background accounts of mind, or, worse, the brain. Instead, they are much less

homogeneous, much more intriguingly messy and open, than that. These sciences are driven by their own ambitions to encompass and address more complex domains than reasoning – to deal with memory, affect, action, embodied expertise, motivation, imagination, moral decision-making, and the like – and, in some cases, to do so in increasingly contextualised terms.'[4] Cognitive science is itself an interdisciplinary and multidisciplinary field, riven by internal tensions and disagreements, and encompassing a wide range of disciplinary perspectives, many of which are not obviously compatible one with another.[5] It involves researchers in fields as disparate as philosophy, psychology, linguistics, artificial intelligence, anthropology, neuroscience and linguistics, among others.[6] In turn, each of these fields is itself wildly diverse. Psychology alone, for example, includes sub-disciplines as distinctive as cognitive, developmental, social, clinical, personality and comparative psychology. Each such sub-discipline, unsurprisingly, employs dramatically different methods. Developmental psychologists, for example, can study anything from parent–child conversations in the family home, through rigidly controlled laboratory experiments with infants, to the neurochemical correlates of specific emotions in children's brain.

A shared interest in mind, cognition, and flexible intelligent action characterises research across these disciplines, but this does not take us very far, especially given the rapid development of diverse approaches to research within the cognitive sciences. Early, narrower definitions of 'cognitive science' identified the field with the claim that mental processes are certain kinds of information-processing activities, specifically computational ones.[7] While this so-called 'classical cognitivist model' remains influential,[8] the last 20 years have seen concerted internal challenges to this relatively restricted definition of cognitive science.[9] Institutional and disciplinary liberalising has left such classical cognitivism in place as one fruitful approach among many, but has also decisively opened up the cognitive sciences to address the embodied, affective, kinesthetic, situated, social and distributed dimensions of mind.[10] Critics from outside the field sometimes still identify 'cognitive science' with some stereotypical assemblage of rationalist, individualist, universalist, essentialist, nativist, logicist and reductionist views, but this is no longer historically or conceptually legitimate. Immersion in Margaret Boden's magnificent two-volume 2006 history of cognitive science, *Mind as Machine*, will engender a feeling for the great variety of more or less successful internal critiques of such classical ideas, and for the multiple waves of the alternative movements which have been revivifying the interdisciplinary project since its inception.

Because there are such widely variant assumptions, methodologies and research questions among cognitive scientists, one commentator has argued that 'cognitive science… is composed less of a coherent body of knowledge than a differentiated and often opposed collection of claims'.[11] Researchers in the cognitive sciences disagree fundamentally, to take just one example, on whether the brain employs specialised and relatively encapsulated modules for specific tasks, or operates primarily by way of more flexible, permeable general-purpose mechanisms.[12] For these reasons, then, the term 'cognitive theory' as it is often used in the humanities lacks sufficient specificity. In literary studies, 'cognitive theory' is sometimes used interchangeably with 'cognitive linguistics', particularly with conceptual metaphor theory or the model of 'blending' proposed by Gilles Fauconnier and Mark Turner, but the term potentially embraces all of the cognitive sciences and should not be subsumed into one or two contested sub-fields.[13] None of this means that there are no areas of consensus at all; considerable agreement on certain aspects of particular topics or specific cognitive domains can co-exist with ongoing disputes both about questions of greater complexity and about matters of theory. Such points of controversy or trouble are, of course, often fruitful points of entry or focus for the interested outsider; by setting specific ideas in the context of alternative views in cognitive science, the humanities researcher can not only avoid the accusation of cherry-picking, but also more confidently identify worthy opponents, rather than straw targets.

Responsible and productive cross-disciplinary research presupposes requires familiarisation with the shape, history and debates within the broader field of the cognitive sciences, as well as the particular sub-field of interest. For gaining knowledge of such debates, journals such as *Behavioural and Brain Sciences* and the more recent *Topics in Cognitive Science*, which regularly publish target articles along with a range of invited responses and critiques, are especially useful points of departure. Similarly, targeted special issues in journals about areas of current controversy are excellent ways to for a non-specialist to quickly map a field, as are journals dedicated to a particular domain such as *Emotion Review*. Books written for a general audience (e.g. Damasio,

Ramachandran, Pinker), while useful resources for those unfamiliar with a scientific field, should be regarded as a starting point only, an entry point into the relevant primary literature.[14] It is also worth noting that many of these writers, gifted as they are, are sometimes venturing far beyond their own disciplinary expertise. Stephen Pinker's recent foray into the history of violence is only the most recent example, but many others could be found.[15] A further drawback to over-reliance on books of popular cognitive science alone is that it is often not part of the remit or intent of such works to state explicitly just which of the ideas they discuss or defend are still controversial, and how much so. This is one of a number of reasons to recommend that newer entrants to the field might also find a way in by way of some of the excellent textbooks on various parts of the cognitive sciences. Even where a textbook is written by an active participant in a research domain, with particular agendas and assumptions built in, it is at least meant to signal the status of the ideas it discusses, and offer fair evaluations of competing views. Humanists can retain and develop a critical and historical awareness of the potential normalising ideological force of textbooks as instruments of Kuhnian 'normal science' even while playing the apprentice themselves. For example, Andy Clark's 2001 textbook *Mindware: An Introduction to the Philosophy of Cognitive Science* sets the author's own more radical ideas about cognitive technology and dynamical, action-based approaches in the context of the computational, connectionist and philosophical views from which they (partly) spring.[16] Introductory surveys and textbooks such as these can provide a foundation of reading and evaluating the scholarly literature. The point is not to become an expert, but to gain a sense of the shape and contours of the target discipline.

It can be as useful to find papers that challenge prevailing models as it is to find work that confirms them. For example, there are vigorous debates around Conceptual Metaphor Theory as espoused by Lakoff and Johnson, as well as intriguing recent work that has sought empirical confirmation of their hypotheses. Briefly speaking, Lakoff and Johnson argue that our conceptual categories are formed through our experience of embodiment. But some have argued that Conceptual Metaphor Theory (CMT) has a rather limited view of the body.[17] Some theorizing about embodiment and embodied cognition can leave the 'body' seeming depressingly inert and unconnected to the external world.[18] As Chris Sinha suggests, the embodiment thesis breaks with one aspect of dualism – the mind /body split – but instantiates another, 'leaving intact the dualism or opposition between the individual and society – ' a 'residual dualism that leaves it open to the dangers of collapsing into "neural solipsism" '.[19] But contemporary cognitive linguistics should not be reduced to conceptual metaphor theory alone; it includes a much more diverse array of empirical and theoretical approaches that seek to meet these challenges, many incorporating close attention to the microprocesses of bodily, affective, social and verbal interaction in methods that draw on ethnomethodology, conversation analysis, narrative theory and gesture research.[20] Further, the interest of Sinha and others in the relationship of language and material artifacts might well be of relevance to work in performance studies.[21]

The current interest in mirror neurons provides another useful test case. Consider Susan Keen's enthusiastic account of mirror neurons at the outset of her influential article, 'A theory of narrative empathy':

> We are living in a time when the activation of mirror neurons in the brains of onlookers can be recorded as they witness another's actions and emotional reactions. Contemporary neuroscience has brought us much closer to an understanding of the neural basis for human mind reading and emotion sharing abilities – the mechanisms underlying empathy. The activation of onlookers' mirror neurons by a coach's demonstration of technique or an internal visualization of proper form and by representations in television, film, visual art, and pornography has already been recorded. Simply hearing a description of an absent other's actions lights up mirror neuron areas during fMRI imaging of the human brain. The possibility that novel reading stimulates mirror neurons' activation can now, as never before, undergo neuroscientific investigation. Neuroscientists have already declared that people scoring high on empathy tests have especially busy mirror neuron systems in their brains.[22]

Keen cites Vittorio Gallese, who indeed is one of the foremost researchers in the field. However, this account of mirror neurons presents the work as rather more settled and stable than it is. Humanities researchers would benefit from more familiarity with the

ongoing nature of the debate over mirror neurons, which includes researchers sceptical about their function in humans. A recent symposium on the debate in *Perspectives on Psychological Sciences* provides an excellent account of the competing claims and counter-claims around mirror neurons.[23] The point is not to adjudicate or become enmired in such disputes, but to be aware that these are ongoing debates within an emergent field of research and its precise implications for other disciplines are not yet clear.

Moreover, although allusions to 'neural firing' and brains 'lighting up' have become common in cognitively-oriented work in the humanities, such references do not always advance the specific claims under discussion and in fact may overstate the implications of the very research upon which they rely.[24] We might be suspicious or uneasy when the disciplines seem to be getting on too well, lest each discipline end up simply re-describing the same phenomena in different terms. In a 2011 interview, Vittorio Gallese time and again rejected invitations to make grand claims about the neurobiology of complex cultural phenomenon, pointing out that there is a 'huge gap' between MNT and, say, the history of mimesis in storytelling. At one point, Gallese noted that 'we are dealing with different levels, which nevertheless belong to the same manifold. Learning things from a different level of description can help, as I get a lot of help studying what the human being is, starting from the personal level of description, provided by writers and artists, or literary scholars, or philosophers or anthropologists.'[25] In cross-disciplinary work, researchers communicate not only across disciplines, but also at different levels of description and analysis. All human actions have a neural basis – how could they not? – but this is not always a relevant level of analysis. While Matthew Reason and Dee Reynolds refer to mirror neurons several times, their work amply demonstrates that it is possible to discuss empathy, audience reaction and expertise while remaining agnostic on the role of mirror neurons.[26] A recent relevant challenge to the current enthusiasm for mirror neurons has been vigorously mounted by Maxine Sheets-Johnston, a philosopher of phenomenology with a background in dance.[27] Sheets-Johnston argues that 'mirroring depends on, is contingent on, our own kinesthetically experienced human capacities and possibilities of movement' (391). In focusing entirely on the 'neural firing', researchers neglect 'the sensory modality of kinesthesia', (396) which is produced by humans moving in the world.

Research of the kind done by Sheets-Johnstone reminds us that scholars in the humanities need not sell their own distinct expertise short, since methods and assumptions from our own areas can usefully intervene in pressing questions in the cognitive sciences. Work in the sciences should not be treated as an inert or agreed-upon backdrop to less settled questions in the humanities. So it is important both that we not overstate areas of consensus and that we remain aware of ongoing debate and emerging research in the target areas. The ideal, of course, is for the interdisciplinary encounter to give rise to two-way benefits, as we shuttle back and forth across the distinct specialist enterprises. Just as testing a cognitive theory against specific historical cases should help us sharpen that theory, so keeping an eye on existing debates in cognitive science may help us ask new questions about particular performances or cultural phenomena.

The need for such collaboration and insights have been recognised by researchers in the cognitive sciences themselves. In a recent piece, Ed Hutchins and colleagues argue that the cognitive sciences have too long treated culture as a kind of 'independent variable' that might be included in cognitive analysis when convenient; on the contrary, he argues, its integration is 'essential for the future health of the cognitive sciences'.[28] From the perhaps unexpected quarter of experimental psychology, a similar call has been made by Joseph Henrich and his colleagues, in a provocative paper entitled 'The WEIRDEST people in the world'.[29] From within the behavioural sciences, Henrich questions many commonly held assumptions about base-level cognitive mechanisms that have been put forward in the psychological literature. WEIRD stands for White European Industrialised Rich Democratic; Henrich *et al*. point out that a great many supposedly universal human cognitive mechanisms have been derived from studying a small and probably outlying group: American undergraduates majoring in psychology. Their work is based upon an exhaustive meta-analysis of cross-cultural studies that reveal that WEIRD subjects, far from being representative of the population at large, are outliers in many areas. Even such apparently base-level functions as visual perception can be strongly enculturated. Such critiques within the

discipline might also implicitly invite literary, performative and historical contributions to questions within the cognitive sciences. Historical and discipline-specific work too could help to tease out the relationship between underlying relatively stable cognitive mechanisms and social cultural and historical particularities.

One possible example is the work of the psychologists Tony and Helga Noice, who have been studying the nature of actors' memories for many years, and are indeed among the very few seriously researching this question. The Noices have conducted ambitious and valuable qualitative studies of the memorizing techniques of contemporary professional actors. One of the real strengths of their approach is to design experimental models that make use of the expertise of trained actors, rather than relying upon studies using only novices drawn from the university student population easily available to experimenters. This method allows them to study memory in an 'ecological' way, outside of strict experimental conditions.[30]

Despite these strengths, limitations of the Noices' research remain, at least when seeking to extrapolate their conclusions to historical situations remote from contemporary theatre. They construct a 'general model' of acting cognition, arguing that actors remember not by verbatim memory practices, but by scanning the text carefully for beats of goal-directed dialogue and elaborating the lines in search of clues to motivation and ways to turn the dialogue into action. These are valuable conclusions, but the Noices do not fully acknowledge the extent to which the actors they study are embedded in very specific and historically situated material and social circumstances, entirely remote from, for example, the heated and time-pressured demands of the early modern playing system. Though such techniques may seem to be intracranial, they in fact depend upon a vast array of material and social practices. Moreover, the material practices are supported by social practices and modes of professional organisation, such as the hierarchical relationship of actors to directors; the demands of the technical elements such as sound, set and lighting; the search for novelty in staging classic plays; employment insecurity and the relative rarity of established companies that promote familiarity with fellow actors; the existence of competing methods of rehearsal and play preparation, which may require the actor to adopt unfamiliar practices in a new production; and so on. Lack of knowledge about how the contemporary theatre differs from that of the early modern period causes psychologists to confuse a particular set of practices with a general cognitive mechanism.

The model of Distributed Cognition or cognitive ecology that we prefer sees cognition as spread across more or less internal mechanisms such as attention, perception and memory; objects and environments; and other people.[31] These disparate resources are coordinated, in any one particular case, in ways that cannot be specified in general or in advance. As Lawrence Shapiro writes, summarizing Esther Thelen's position, 'cognition is embodied insofar as it emerges not from an intricately unfolding cognitive program, but from a dynamic dance in which body, perception, and world guide each other's steps'.[32] Likewise, Andy Clark's enormously influential book about embodied and distributed cognition, *Being There* (1997), began from the claim that 'brain, body, and world are united in a complex dance of circular causation and extended computational activity'.[33]

Performance theorists may be pleasantly surprised to find dance thus in place as a guiding metaphor for certain approaches in cognitive science. But, as with the generic invocations of 'embodiment' we mentioned above, such abstract references to movement and dance need to be fleshed out in richer studies of particular skills and practices.[34] Some work closely related to the distributed cognition framework addresses the nervous system as a way of avoiding both the body-brain and the self-world divides. In developing the idea and methods of 'neuroanthropology', for example, Greg Downey studies culturally diverse forms and practices of balancing, inverting the body, or throwing in the context of specific practices such as capoeira and rugby.[35] Indeed it is striking that, in addition to the recent wave of interdisciplinary work on neurocognitive and neuro-aesthetic approaches to dance,[36] ethnographic methods have come to take central importance in recent work on performance, dance and movement in the cognitive sciences, broadly construed.[37] As well as studies which also draw on phenomenology and dynamical systems theory, we would single out a research programme carried out by David Kirsh and his colleagues, in conjunction with the choreographer Wayne McGregor and Random Dance. A pioneer in the theory and methods of distributed cognition and cognitive ethnography,[38] Kirsh and his team collected extensive video, observational and interview data with all participants in the creation of a new modern dance work. Among a rich and impressive array of analyses and results, Kirsh and colleagues argue that dancers and choreographers are

literally 'thinking with the body'.[39]As in many other flexible and intelligent human activities, the actions of dancers and choreographers are 'mediating structures' which transform their cognitive tasks and processes. For example, picking up on clues from interviews in which dancers would physically sketch out or 'mark' partial aspects of a movement phrase, Kirsh and colleagues observed and taxonomised all the instances and roles of such practices of 'marking' in rehearsal. They went on to design ingenious experiments which demonstrated the surprising result that, for expert dancers, such bodily sketches of movement phrases are not only more advantageous than mere mental simulation in helping the learning of a phrase, but are as good as full-body practising. But in using less detail than in a full practice, dancers not only conserve energy, but also set up a kind of partial model or 'surrogate situation', in Andy Clark's term, which allows them to focus or work on some specific feature of the movement sequence by minimising the level of nonessential detail.[40] In such physical representation, Kirsh and colleagues argue, bodily movements are themselves the vehicles of thinking rather than mere external supplements to it or reminders.

As a method for tapping the complex dynamics of distributed cognitive ecologies, then, cognitive ethnography offers a promising framework for mediating between the cognitive sciences and concrete studies of performance in specific cultural settings. We hope and expect to see performance theorists and cognitive scientists alike increasingly willing to invest the time, energy and commitment to open exchange of methods and ideas that will bring such projects to wider attention.

The chapters in this section explore a variety of partnerships between performance and cognitive science, demonstrating the different steps and choreographies of cross-disciplinary dances. In two of the case studies, dance is the form discussed in projects which bring together neuroscience, cognitive psychology, performance theory and practice to explore thinking bodies and enactive minds. While the couplings here also demonstrate some of the complexities and tensions involved in the first steps of bringing performance and science into dialogue, they also illustrate the potential for these interactions to be mutually beneficial, conceptually and methodologically informing each other.

The first account by Matthew Reason et al., discusses the 'Watching Dance' collaboration between neuroscience and dance research. The challenges of interdisciplinary modes of working are a focus of discussion and the importance of developing shared understanding of methodologies and vocabularies. Anna Furse's chapter also features a dance-based interdisciplinary collaboration between two ex-Royal Ballet trained dancers, sound and video artists and a professor of Comparative Cognition. 'Our Informed Hearts' explores memory and identity through practice-based research informed by neuroscience. The literal and metaphorical dancing in this chapter, makes contact with other theoretical perspectives, reaching out to psychoanalysis as Furse draws upon physical and sensual experience in conjunction with a Bruno Bettelheim story to bring minds and bodies together. The body is also centre stage in the final chapter by Erin Hood who considers the potential of performance to represent the intangible through its physical, visceral and sensual modalities. Taking her cue from Elaine Scarry's oft cited claim that 'to have great pain is to have certainty; to hear that another person has pain is to have doubt', Hood suggests performance offers a middle space in which perceptions and representations of pain can be played with, thereby offering form and substance to the neuroscientific theorisation 'we change pain as pain changes us'.

Taken together, the chapters in this section respond to many of the challenges we have raised in their dances with science, bravely taking some first bold steps towards new interdisciplinary methodological and theoretical approaches. This is an experimental choreography creating openings for the 'exchange of methods and ideas' we have called for.