

Introduction: the situated intelligence of collaborative skills

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Comments and enthusiastic examples or conversations about collaborative embodied cognition and performance, and related theoretical insights and implications, very welcome.

The topic: thinking with our feet

People move together, and do things together, all the time. We play and work and talk and suffer together, finding ease or joy, sharing pleasure or grief. We discover challenge, thrill, and risk.

Such joint actions may involve physical, manual, or technical skill, and may rely on tools, technologies and ordinary old objects. Collaborative actions also involve *situated intelligence*, a dynamic, lively, and social form of cognition. This book is a celebration and exploration of these things: the dizzying variety of remarkable ways that people move and think together, in unique places and settings, at a time and over time.

In initial orientation to the book's topics, we introduce in turn the five key concepts which animate it: performance, body, collaboration, cognition, and ecology. We briefly describe the domains of **performance** in question here; its bodily or '**embodied**' nature; the forms of **collaboration** addressed; the role of intelligence or '**cognition**' in expert movement; and the notion of '**ecologies** of skill'.

Performance

For practitioners and researchers in performance studies, we aim to do justice to the lived complexity of emotion, awareness, and thought in skilled, coordinated action. What makes performance, sometimes, so precise, adaptable, and marvellous? The collaborative activities we address span the full spectrum of performance, embodied practices, and ecologies of skill: from aesthetic contexts such as theatre, architecture, and music to sport and martial arts. Our primary focus is on specialist domains, in which skills must be laboriously acquired, and expertise is a gradual, fragile, wonderful outcome. We examine skilled tasks and activities operating at a range of nested and interacting timescales: from incredibly fast decision-making under severe pressure, to long-term shared histories of collaboration in rich cultures and subcultures.

Embodiment

Our contributors offer lively, animated accounts of the bodily and emotional nature of skilled performance, with many developing ethnographic or 'experience-near' case studies. Where theoretical work on 'embodied cognition' can be a little thin or abstract, here are vivid descriptions of striking bodily experiences as skills are honed and exercised. We find pain and visceral agony, and the screaming of muscles, as bodily capacities are stretched and remoulded in particular patterns of use. There is surprise and delight as experts and novices find new ways to move or coordinate. In concrete descriptions and analyses of diverse and specific bodily and emotional experiences, our

contributors illuminate with precision the flexible intelligence that dancers, divers, fighters, composers, film directors, and dedicated Front-of-House volunteers reveal in, and through, action.

Collaboration

In some cases, the forms of collaboration studied are dyadic, involving pairs of skilled actors – either cooperative or, as in martial arts, antagonistic. In other cases, collaboration is at the level of small groups or larger organisations. These are *social* units, composed of individual humans with unique characteristics, histories, and skills, such that each member of a group brings something distinctive to the collaboration. The chapter by Roberts and Krueger highlights a human-machine system, in musician Holly Herndon's collaboration with an artificial neural network *Spawn*. All collaborating groups are situated in hybrid ecologies of their own: *sociomaterial* systems incorporating technological or environmental resources. Collaborators rely on, deploy and create shared histories as essential components of their interactive skill. Such shared history can encompass emotions and emotional experiences, beliefs, worldviews and motivations, and intelligence or styles of decision-making. Shared pasts drive present performance.

Cognition

Skilled performers sometimes worry about overthinking. Practitioners and theorists alike, in sport and the arts, sometimes give the mind – cognition – bad press, fearing that too much thought may disrupt well-grooved actions, or interfere with the body's smooth, instinctive responses. Teachers, coaches, critics, and peers often support training regimes which encourage performers to 'keep it simple'. According to widespread lore, thinking is typically slow, effortful, and clunky, a sign that something has gone wrong, or that performers are stuck in their heads, in a realm of inner deliberation disconnected from intuitive practice. Hubert Dreyfus, an influential philosopher of skill, wrote that 'mindedness is the enemy of embodied coping' (2007, 353). This book builds on recent criticism of this dominant approach, arguing that mind and cognition are not absent in embodied

performance (for example Sutton, McIlwain, Christensen, & Geeves 2011; Montero 2016) to develop a very different picture of skilful action.

Our contributors describe in rich detail forms of thinking which are fast, dynamic, exquisitely adjusted to changing situations, and deeply attuned to bodily capacities. In these contexts, thinking is public, right there in the shared world, expressed in or constituted by the expert performer's actions. In this book we reclaim, revel in, and excavate the vital *cognitive* dimensions of skilled movement practices – *thinking* on and with our feet, and on the fly. We use the word 'cognition' in its broadest senses, not restricted to reasoning or to information-processing, but to include the full diversity of embodied mental life: imagining, grieving, remembering, sensing, noticing, dreaming, wondering, listening, problem-solving, strategizing, pattern-detecting, and indeed designing, balancing, or creating. In this capacious sense, cognition includes emotion and motivation, and is not located in the individual brain alone, no matter how important neural processes may be. Rather, the term signals flexible embodied intelligence, manifesting in experience and in action, in a social and material world.

Cognitive ecologies of skill

Cognitive processes, as embodied and revealed in skilled action, are richly integrated with and in the emotional, social, cultural, technological, and technical dimensions of a performance setting. In this book we apply the idea of a 'cognitive ecology' to the specific domain of skilled performance, offering a new research focus on 'ecologies of skill'. The notion of a cognitive ecology 'points to the web of mutual dependence among the elements of an ecosystem' (Hutchins 2010, 706). When we dig down into the specific ecosystems within which embodied collaborations thrive, we find vast and uneven domains of resources and components. As well as the social interactions among collaborators and those around them, and the techniques and practices and strategies they have developed individually and collectively, we also find equipment – artifacts and technologies and

devices, each with their own histories, their own formats, their own dynamics. Further, skilled performance occurs in diverse locations – places, specific sites, unique settings. Our contributors take you from the reconstructed Globe Theatre in London, to the sand dunes of Anna Bay in Eastern Australia, to gyms, studios, and pools. These are *cognitive ecologies*, underlying or constituting the flexible embodied intelligence of skilled performance processes. The physical, environmental, technological and social resources are not merely external to the performers’ mental lives, not just triggers or cues to action. Rather, our contributors show, their operations in interactive systems directly drive or sculpt what experts notice, do and decide. These rich ecologies scaffold and partly constitute the exquisite attention to salient changes that performers consistently exhibit. Such attention grounds their abilities to intuit or probe new action opportunities, or to rapidly shift tactics.

Building on this short overview of our topics, we discuss three orienting and integrative themes in more depth to highlight the distinctive contributions of this book: cognitive ecologies within the cognitive humanities, collaborative skills, and methods for tapping situated intelligence. We conclude our introduction with a brief explanation of the structure of the volume, describing its sections and sharing a preview of each chapter.

Cognitive ecologies and the cognitive humanities

Cognitive approaches to skill and expertise are an increasingly significant component of performance studies. The cognitive humanities, more broadly, flourish. The success of Bloomsbury’s well-established *Performance and Science* series, in which this book appears, as well as handbooks, overviews, and many specialist works in the cognitive study of theatre, dance, music, film, literature, and history, confirms the productive entanglement of the cognitive sciences and the study of performance and the arts (see for example Hart & McConachie 2010; Blair & Cook 2016; Kemp & McConachie 2018; Pearlman, MacKay, & Sutton 2018; Lutterbie 2019; Shaughnessy & Barnard

2020). The cognitive approaches to performance showcased and put to work in this book comprise a focussed and coherent subset of this interdisciplinary field. Most contributors apply and expand on one rich and increasingly mainstream tradition in cognitive theory, often called '4E cognition'. On this perspective, mental life is *embodied* rather than restricted to the brain alone, *embedded* in rich material and sociotechnical settings, *enacted* in histories of flexible engagement with the environment, and sometimes *extended* across non-biological or cultural resources outside the body which may become integrated into hybrid cognitive systems. The '4E' label has its limitations, but is now well entrenched (Newen, de Bruin, & Gallagher 2018). It is deployed throughout this book, where the dynamic cognitive processes involved in collaborative performance are also seen as fundamentally *enculturated*, affective or *emotional*, and intrinsically *ecological* in nature.

4E cognition emerged in the 1980s as a result of several interacting factors. Within the cognitive sciences, frustration at the failures and brittleness of classical AI systems gave rise to constructive alternatives across many fields including robotics, phenomenology, developmental psychology, connectionist modelling, dynamical systems theory, and the 'extended mind' hypothesis in philosophy (Port & van Gelder 1995; Clark 1997; Clark & Chalmers 1998; Hurley 1998). The idea of distributed cognition – of cognition as potentially spread or 'distributed' across disparate physical and cultural resources – arose in parallel in the social sciences, integrating organizational and cultural psychology, science studies, archaeology, education, studies of human-computer interaction, and especially cognitive anthropology (Hutchins 1995; on the history and on relations between these distinctive movements see Michaelian & Sutton 2013). To adapt the notion of 'cognitive ecologies' from biology and environmental science is to highlight the distinctive balances in operation across the varying components of interactive cognitive systems (Hutchins 2010; Tribble & Keene 2011; Johnson 2015; Smart, Heersmink, & Clowes 2017). The cognitive ecologies framework directs us to investigate the shifting divisions of roles and labour across different people (with diverse capacities), artifacts, and the physical and social structures of any complex environment.

Theories which treat intelligence as situated or distributed, and as a matter of active embodied practice, are natural allies for performance studies and the humanities. The 4E cognition movement in general, and the cognitive ecologies framework in particular, do not suffer from two flaws which have led many wise humanists to resist other influences from the cognitive sciences (compare Sutton & Keene 2017). First, the pervasive *individualism* of classical cognitivism, which located minds exclusively in the head or in a hidden subjective realm, is decisively rejected. Cognitive processes are not to be explained in reductionist fashion, by reference to the brain alone. Rather, these situated and ecological views take intelligence out of the head, finding it in embodied practices and in interactions ‘with culturally organized material and social worlds’ (Hutchins 2010, 712). So 4E-style cognitive humanities is not ‘neurohistory’: neural processes may be key components in larger hybrid cognitive systems, but are themselves deeply shaped by the cultural norms and practices in which they are integrated, for brains too are ‘biosocial organs permeated by history’ (Cowley 2002, 75).

Secondly, the cognitive ecologies framework is not universalising or *imperialist*, concocted to engineer a scientific takeover of humanities research. Rather, the hope and expectation is for mutual benefit across fields. In one direction, the cognitive lens provides a new angle on real performance settings, and on independently-motivated problems about collaborative skill. But then, as this book confirms, in reverse angle these analyses of performance sharpen, test, extend, and develop the cognitive framework itself, so it can embrace rich real-world case studies of joint action in context. We hope that experimental psychologists, and others who study skill acquisition, motor learning, or collaboration and joint action in laboratory settings will also find much to interest them here, in qualitative, ethnographic, and case-study-based analyses which complement more controlled methods of enquiry into expert performance. Reciprocal insight of this kind is a tough but necessary goal for insistently interdisciplinary research. Rather than randomly sampling cognitive theories to

import into performance studies, our contributors acknowledge the internal complexity of the relevant sciences, which are often deeply riven by tensions and disagreements.

Work on distributed cognitive ecologies affords a lively pluralism for performance studies and the cognitive humanities. This mode of interdisciplinary engagement elicits attitudes to cognitive theory that are subtler than either blunt critique or overconfident ebullience. Our contributors demonstrate the virtues of productive entanglement (compare Tribble & Sutton 2014; Fitzgerald & Callard 2015). They draw on the tools, concepts, and methods their domains dictate, finding resources in theoretical debate and distinctive traditions of real-world practice. A number of chapters, for example, can be read as interventions in long-running controversies about the ‘bounds’ of cognitive systems – the question of whether a distributed or ecological approach is overly inclusive, generating a vague or ‘unscientific motley’ that threatens our grip on where human agents end and the rest of the world begins (Adams & Aizawa 2001, p.62; see also Menary 2006; Sutton 2010). But our authors embrace motley from *within* their case studies, from within the worlds of practising architects, divers, or fighters, not on abstract or detached theoretical grounds. In Tribble’s dramatic expansion of the unit of analysis for theatrical performance, for example, the case for including Front-of-House stewards and the challenging management of audience behaviour in an account of theatrical performance is firmly anchored in the unique norms and expectations associated with the Globe Theatre as a unique ecology.

Like most boundary-spanning concepts, this notion of a cognitive ecology is not a magic bullet: it won’t suddenly do our explanatory work for us, or shortcut the challenges of on-the-ground studies of creativity or performance. It does not allow us to bypass existing specialist research, or excuse us from homing in carefully on tiny and revealing facets of the richer webs. But our bet is that refinement, improvement, and expansion of the theoretical framework will be most effectively achieved not by more grand metaphysical wrangling, but by building a repertoire of strong case

studies. Together, such case studies illuminate distinctive aspects of the rich ecologies of collaborative embodied performance. Readers will identify novel ideas emerging from the interaction of the component studies.

The cognitive ecologies framework affords our contributors a shared focus within their broader commitment to 4E cognition. The chapters are united by two further layers of specificity, to which we now turn. Within the wider body of work on cognitive ecologies, we focus in on ecologies of *skill*, identifying embodied joint action and expert movement as an intriguing domain for probing the fundamentally *situated* nature of performance. Finally, among many ways of studying ecologies of skill, we share a commitment to thicker description and analysis of real-world collaborative performance.

Collaborative skills

Work on 4E cognition and on cognitive ecologies has influenced many fields and been applied to many domains, such as memory, moral reasoning, and language. But these approaches have rarely been applied to performance or to skill. Leading theorists have invoked jazz improvisation, circus performance, or team sport as metaphors or models for embodied cognition or intelligent action *in general*, but have often neglected further examination of the specifics of each kind of skill in its unique settings. We take the idea of ‘ecologies of skill’ beyond metaphor, to study the bodily and emotional experiences of experts and the interactive mechanisms of collaborative performance in context, at multiple timescales (Sutton & Bicknell 2020). In attending to the integration of cognitive, affective, social, technological, and environmental aspects of skill acquisition and performance, this volume builds on recent cognitive approaches to the arts, as mentioned above, and sport (Cappuccio 2019).

On fundamental questions about the nature of skill and collaboration, these diverse case studies start from firm shared ground. Firstly, we treat skilled movement as deeply mindful and intelligent: expert performance is not automatic, not a set of fully proceduralised responses of experienced bodies simply triggered by current stimuli. Practitioners' talk of 'instinct' or 'intuition' is not the final word on the springs of action, but marks the complexity and dynamism of the multiple, meshed cognitive processes apparent in adaptive actions in context. When we dig into the real-time operations of skilled performance, where experts are seeking to improve and to go beyond their comfort zones, we find not simply smooth or hitch-free coping, but dizzying arrays of hard-won strategies and many forms of variable, free-floating awareness. In our own research group, for example, we have shown this in cricket, music, yoga, mountain biking, and trapeze (Sutton 2007; Geeves, McIlwain, Sutton, & Christensen 2014; McIlwain & Sutton 2014; Christensen, Bicknell, McIlwain, & Sutton 2015; Bicknell 2021; for similar findings from other perspectives see Fridland 2014; Toner & Montero 2021). Cognition here does not lie *behind* skilful action, encoded as fixed control plans, or transmitted as top-down instructions to an automated motor system. Rather, thinking is itself a bodily and worldly aspect of our real-time engagement with the rich resources of our shifting performance ecologies.

Secondly, in expanding such approaches to skill to encompass *joint* action, we treat collaboration as itself complex, taking many forms. In dyads, small groups, and teams, individual performers bring distinct capacities to the collective. They each play their own specific part, dividing the work that progresses shared goals. To focus on collaborative interaction in embodied skills is not to efface or downplay the role of the individual (De Jaegher, Peräkylä, & Stevanovic 2016). It's because team members have different specialist skills that they complement each other, in favourable circumstances meshing to produce a performance that is 'greater than the sum of its parts'. Such collaborative or creative *emergence* (Sawyer & DeZutter 2009) is joint intelligence in action. Of course, success is precarious: in high performance especially, things can go wrong at any

point. But in any particular case, we can examine what individuals *bring* to the collaborative skill; what individuals *do* in embodied performance; and how the cues to joint action are distributed across social and material cognitive ecologies. Fascination with the processes of teamwork and collaboration is a further shared starting point for this volume.

Fusing these themes about skill and collaboration, a recurrent topic across the chapters concerns the mechanisms of instruction in skill acquisition. It takes time to develop technically-demanding action capacities, often in arduous, dedicated training regimes over years of laborious commitment. Given that we can't simply pick up a bodily skill all at once, as we might learn a fact, it's puzzling to understand how teachers and coaches influence performance, and how expert practitioners can influence themselves in practice to respond differently in changing situations. A number of contributions address the varieties of social and environmental 'scaffolding' or support for the learning and the exercise of embodied skills. Experienced teachers – in freediving or aikido, for example – instil and deploy cues or 'instructional nudges' that are finely-tuned to the learners' current capacities, extending them to the next stage of development, and gradually exposing them to the full cultural history of practice in the domain. Peers working together – in handstand classes, or in an architecture and design studio, or a recording studio – find novel response options emerging out of familiarity in interaction, with trust and ease built up and registered, for example, through shared linguistic or emotional motifs. In each case, instruction and support is also actively guided by the intelligence of the entire ecology: the equipment in a studio or a gym, or the norms and rituals of behaviour within an established movement discipline embody and transmit lessons from the history of practice in a domain (Hahn & Jordan 2014).

The real-time exercise of embodied skills continues to be reliant on forms of scaffolding. Even if some performers – like the expert muay thai fighter in Hjortborg's chapter – can cue or influence themselves in action, with less immediate dependence on teachers, real experts never

stop seeking ways to improve. Yet much of the machinery of scaffolding, distributed as it is across complex ecologies, collaborative groups, and whole systems in motion, can be nearly invisible. This raises significant problems of method, which we consider briefly before stepping aside to let our contributors respond.

Methods for tapping situated intelligence

Complex ecologies of skill include components, resources, and practices that become so familiar to performers that they may pass unremarked or unnoticed. Practitioners need not be fully aware of their diverse support systems when all is going well, and many forms of social, technological, or environmental ‘scaffolding’ may become transparent in use. But this doesn’t mean that the scaffolding isn’t present. It may be useful to retain a background awareness of the elements of wider ecologies of skill and to be able swiftly to refocus attention on them if required (compare Wheeler 2019). Given that expert performers typically resist the full automation of their skills, and train themselves to cope effectively even in unfamiliar or challenging circumstances, their own knowledge of the full ecology may be less tacit than it first seems. Specific observation or probing can, in fact, elicit access to dynamic, task- and situation-specific embodied knowledge (McIlwain & Sutton 2015). And sometimes, events themselves may make the scaffolding visible.

Alongside invocations of skilled performance as metaphor in early 4E research, philosophers and cognitive theorists often called for more ethnographic investigation of creative collaborations in the arts and sport to produce rich, detailed accounts of skill in real-world contexts. Several of our contributors do just this: they deploy observational, participant, or apprenticeship methods (see also Samudra 2008; Pink & Morgan 2013; Downey, Dalidowicz, & Mason 2015; Wacquant 2015; Rietveld & Brouwers 2017; Hjortborg & Ravn 2020; Bicknell 2021; Kimmel 2021; Pini & Sutton 2021). Others use established methods of archival research, and a range of analytic methods from philosophy, dynamical systems theories, and interaction studies. Motivating these approaches, in common

across many distinctive methods, is a commitment to specificity and precision, to attempting thicker, experience-near description of collaborative embodied performance in action.

The ecologies under investigation may be transformed by deliberate interventions, as when Rietveld Architecture-Art-Affordances (RAAAF)'s large-scale architectural designs create new possibilities for engagement with existing sites. In other cases, subtle features of existing scaffolding may show up and change as practitioners or researchers observe or participate, as in manipulations of bodies and machines by creative artists, or in an unexpected training routine in aikido. Other disruptions are more accidental, but reveal just as clearly the structures and dynamics of a distributed ecology. Tribble's analysis of one episode at the Globe is a case in point. It also confirms that researchers should attend to glitches, to cases in which smooth collaborative action is surprised or upset, to see how systems knit together, how groups recover – individually and jointly – from interruption and disturbance (Throop & Duranti 2015). Because skilled performers often push the envelope, as they say, expanding their repertoires to include creative responses and novel challenges, they are thereby vulnerable to various forms of breakdown, jitter, or choking. Collaborative embodied skills are precarious: but differently so in each domain, each case, each circumstance. Symmetries are always being broken and redistributed in the constant emergence of new forms of order. Experts' technical aptitude is often backed by effective cognitive, emotional, interpersonal, and situational strategies to support fluent repair of momentary or persisting trouble. A core component of effective training regimes – for breath-holding or muay thai, for example – will be preparing to deploy available resources, whether physiological or motivational, whether reliant on equipment or on peer support, to resist or manage severe challenge. To understand the distributed resilience of these collaborative systems, our contributors tap in to their operation at a number of scales. We turn now to a brief description of the book's contents, showing how the chapters approach these rich systems.

The Book

We group our ten short, focussed chapters, all around 5000 words, into three sections or thematic clusters, which zoom in to increasingly fine-grained features of skilful interactions. All three sections, and the book as a whole, end with short commentaries by leading skill researchers, who riff on emerging themes to evoke and provoke further connections for the cognitive humanities, and pick out broader issues about psychology, performance, and the spaces between disciplines.

Part 1 addresses larger ecologies of embodied collaboration, in three case studies that cast the net wider than usual in studies of theatre, dance, and architecture. Drawing on a rich archive of show reports filed after every performance, **Evelyn Tribble** describes the vital, coordinated actions of the Front-of-House teams at the Globe Theatre. Though performances take place in broad daylight, the management of audience attention and dynamics, dealing with fainting, vomit, and more surprising disruptions in this unique setting remains invisible until a star performer intervenes. **Sarah Pini** examines *Body Weather*, a Butoh-inspired dance and movement practice which cultivates attention to the changing 'weather' of performers' bodies and performance ecologies. The slowness and stillness of dancers filmed moving across the dunes in a stormy wind evokes, in Pini's analysis, a form of agency embedded in the specifics of place. Unique settings are also central to the collaborative designs of the interdisciplinary studio RAAF. In a three-way conversation between **Janno Martens**, and **Ronald** and **Erik Rietveld**, encompassing philosophy, art history, and architecture, we learn how RAAF projects transform existing sites, materials, or practices in interventions which open up new possibilities for movement or expression. **Amy Cook's** commentary on Part 1 highlights the disconcerting shifts of perspective these chapters require from both our senses and our theories as they cut across the layers of rich ecologies. For Cook, they open up unaccustomed timescales and forms of movement in space, inviting us to look at well-known phenomena through different lenses.

Moving from macro-ecologies to a middle or meso-level of small group and dyadic interaction, **Part 2** examines collaborative and socially scaffolded learning in handstand classes, freediving, aikido training and in an unusual human-AI musical collaboration. **Kath Bicknell** and **Kristina Brümmer** vividly describe the fragility and instability of skill acquisition as they tried to learn a tough new movement practice together. Sharing fatigue, failure, and humour as they develop their own novel linguistic and physical repertoire, the two researchers show us how collaboration between peers operates in a specific subcommunity of practice. A group of budding divers learn together how to hold their breaths for extended periods underwater in **Greg Downey's** chapter on expert apnea. This highly individual ability, which requires divers to confront and adapt very basic physiological and neurological responses, develops gradually through four specific types of collaboration. **Susanne Ravn** reconsiders her longstanding aikido practice, explaining how subtle features of her changing bodily comportment and movement techniques directly reflect the norms and ideals of this remarkable Japanese tradition. Zooming in on one unusual practice session, Ravn describes the multilevel challenges of attuning to the energy, direction, and timing of a highly experienced training partner. Collaborative musical agency is examined by **Tom Roberts** and **Joel Krueger** in considering Herndon and her artificial neural network, *Spawn*. By considering how this human musician works with, and thinks about, this non-human technology, Roberts and Krueger test and expand the factors that prompt attributions of creativity and agency. In her commentary on Part 2, **Emily Cross** highlights the embodied nature of many learning processes: noting the difficulties faced by those trying to develop new skills at a distance under lockdown, Cross considers the inventive resilience of communities of practice as they find new ways to collaborate in 'Covid-normal' conditions, and looks optimistically toward a more closely connected future.

The chapters in **Part 3** focus in tightly on the dynamics and microprocesses of interaction, examining forms of symmetry, synergy, and entrainment across a range of movement practices.

Rachel Kallen, Margaret Catherine Macpherson, Lynden Miles, and Michael Richardson address the ecological dynamics of performance-environment systems in a study of the principles underlying social coordination across multiple contexts. Events that break and then redistribute symmetry can be identified in small-scale behavioural interactions, creative improvisation in music or sport, and the dynamics of larger-scale social systems. The authors seek a generalizable framework and tools for understanding embodied collaboration. Analysing one remarkable sequence of actions by an expert muay thai fighter, Singpayak, **Sara Kim Hjortborg** unpacks the operations of embodied intelligence in a precarious, fast-changing environment. 'Sing' sets his trap and springs it, Hjortborg shows, by way of three interlocking dynamic decision-making processes in the ring, thinking on and with his feet in the midst of a brutally antagonistic interaction. **Michael Kimmel** and **Stefan Schneider** take a micro-analytic approach to intercorporeal interaction at close quarters, developing a rich qualitative language for understanding joint action from case studies in acrobatics, dance, and martial arts. They identify principles of the structure and the dynamics of interpersonal coordination, and show how creative movement synergies assemble spontaneously through rich, multi-channel embodied communication. From the chapters in Part 3, **Tony Chemero's** commentary draws out a methodologically pluralist vision, mixing quantitative accounts of human interaction with qualitative approaches anchored in specifically human strategies, norms, goals, or rules.

Catherine Stevens provides the first of two commentaries on themes from the book as a whole. She discusses the interacting forms of knowledge apparent in collaborative action, and the complex dynamics of control in multi-agent or hybrid ecologies in terms that bridge performance studies and cognitive theory. **Ian Maxwell's** concluding commentary adds a focus on the sensibility of the ethnographer, immersed in the weave of a community's life, as a touchstone for assessing the volume's implications. Experiences of mediation, of dwelling between distinctive disciplines or cultures, Maxwell suggests, help us to reconstrue practices that seemed familiar as remarkable.

With Maxwell's encouragement, we want readers to explore and inhabit these interstitial spaces between disciplines, and to collaborate in the performance of interdisciplinary research that may challenge, unsettle, and extend our understanding of each other. We invite you to enjoy this collection of essays, and, just maybe, to seek out other curiously-minded folk with whom to think, act, and work together in studying and creating new and rich ecologies of performance.

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