Emmanuil Moraitis

Symbiotic Synergies: Adaptive Framework for Polydisciplinary Collaboration in Performance Practice

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A submission presented in fulfilment of the requirements of the University of Salford for the degree Doctor of Philosophy

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Table of contents

References

List of Figures

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List of Tables

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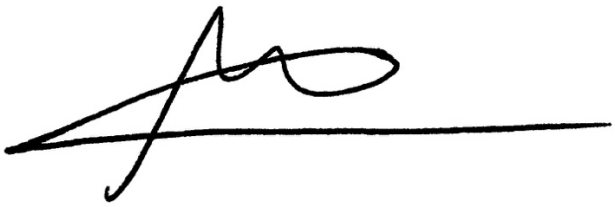
Declaration

This thesis is submitted under the University of Salford regulation for the award doctor of philosophy. Unless otherwise stated in the text, I hereby declare that the contents of this thesis are the result of my own work, and that no part of it has been submitted in support of any application for other degree or qualification at this or other institutions of higher learning.



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Abstract

What are the implications of collaboration between practitioners of distinct creative disciplines, and what approaches can enhance such engagements? This inquiry is investigated through Practice Research with project-based and iterative methodology aiming towards developing a novel framework for organising collaborative environments.

Presented here is the thesis that investigates modes of interaction between disciplines and practitioners in collaborative projects. They are nested under the rubric of polydisciplinarity, with a particular focus on the interaction between sound and movement through consumer digital tools. The conceptual basis of this investigation, distinguishing its contribution to thinking and making in its creative field, is informed by symbiosis, a phenomenon describing close and persistent relationships between organisms of different species, where the organisms establish a means to overcome the limitations posed by their environment through augmenting their biological traits. This research contends that symbiotic traits can be identified within practices between practitioners of distinct disciplines, and interprets these into a set of strategies and precepts that can facilitate effective synergies between collaborators. The practice conducted as part of this research concerns collaborations between the author's sonic arts approaches and practitioners using physical movement as their predominant expressive medium. The knowledge borne out of this practice, as well as existing models of interaction between disciplines and practitioners, are investigated through a conceptual debate with knowledge acquired from the field of biology.

The research contributions combine practice and theory; the body of practice concerns performance works created as part of the collaborators' professional engagements, as well as a number of studio-based experiments testing and activating the theoretical underpinnings, concentrating on an adaptive approach in collaboration. Then these collaborative engagements and experiments lend pathways to findings, a theoretically describable set of efficient and distinctive modes of collaboration. The practice-led contribution focuses on a framework for collaborative engagement, arranged in respect to the three types of symbiotic relationships: mutualism, commensalism, and parasitism. Identifying distinct modes of hierarchy, stages in process, and direction of active influence between practitioners and expressive medium, the framework posits an adaptive approach in collaborative engagement, with the potential to facilitate collaborations within the wider field of performance practice.

Dedicated to the loving memory of Eythimios 'Makis' Mantzavas.

Μάκη, ακόμα δεν ξύπνησα, οι προσπάθειες συνεχίζονται…

Chapter 1

Introduction

Symbioses are the ultimate examples of success through collaboration

David Relman

1.1 About this research

1.1.1 Overview

This research project aims to investigate an approach for performance practice through collaboration between practitioners of distinct disciplines. It is a Practice Research project (Hann 2015), with its contribution focusing on generating 'new understanding about practice' (Candy 2006, p.1) through the insights emerging from my sonic-arts practice and collaborations with practitioners expressing through different mediums.

Underlying this research, and informing my approach to collaboration, is symbiosis, a biological phenomenon describing the diverse means by which interspecies relationships manifest in the natural world. As will be often reiterated through this thesis, my aim is to further understanding of collaborative performance practice by using knowledge from the wider field of biology in an **interpretive** manner; examining the ways organisms of different species interact in nature serves as the conceptual basis towards achieving the main contribution of this thesis, that is the development of a system able to facilitate practitioners of distinct disciplines to interact, communicate, and organise their collaborative endeavours.

Initiating the activation of this interpretive approach, the first of many biological metaphors I will be using concerns the contextualisation of the term **polydisciplinarity**, used here to describe the different manners of interaction between distinct disciplines. Although the term 'interdisciplinarity' has in recent years become habituated to refer to all types of disciplinary interaction[1], I posit that this approach is erroneous, and ignores established principles of taxonomy. In the context of biology, organisms are classified in groups connected through shared characteristics, with groups identified from 'kingdoms' (broadest) to 'species' (most specific). Interpreting this taxonomical system in the context of disciplinary interactions, 'interdisciplinarity' constitutes a specific mode, or 'species', of interaction; therefore, using the term to describe all modes of disciplinary interaction would be akin to using the name *Balaenoptera musculus* (Blue whale) to refer to all Cetaceans, an infraorder consisting of several living species of aquatic mammals. In other words, such an approach proves **inefficient** in the context of research, and in communicating the scope and aims of a particular interaction.

[1] Indeed, even the most ardent proponents of this lexicological approach admit that it in fact delimits a single specific interaction (Moran 2010, p. 14). This issue is further detailed in section 2.2.2.

1.1.2 Motivation

Mentioning efficiency bring me to the core motivation for conducting this research project: despite the extended studies in collaboration, within the arts and beyond, many practitioners struggle to understand, and more importantly, activate the theories emerging from current research on collaboration[2]. I argue that the reason behind this is that current theories are either focusing on a narrow field of practice, or in their attempt to encompass a wider spectrum their practical expediency becomes diffused in practice. To a large extent, this too has been my experience.

A commonly cited challenge of polydisciplinary collaboration is the classification of its outcomes, often remaining inconclusive, or reduced to one of its constituent disciplines. Embarking on a Practice Research as a sonic-arts practitioner who regularly collaborates with artists expressing through physical movement[3], this inconclusiveness of my disciplinary placement has been the source of several challenges faced during both my practice and my candidature; ambiguousness in relation to the context in which my work is assessed in respect to its media, incorrect categorisation within funding bodies, the necessary expertise of my supervisory team, and even the title of my award. This **in-betweeness** is further evident in my practice; my approach to working with the medium of sound encompasses influences from electroacoustic composition, live electronics, noise music, and sound art, practices which I first became acquainted with during my early postgraduate studies. My background in popular music contributes further influence to my current practice, in the form of sonic aesthetics, approaches in working with technology, and ethical values stemming from my previous activities as performer and producer of Jungle music, and a life-long follower of the rave movement – from its tentative introduction in my first hometown's nightlife in the mid-nineties, up until its swan song towards the end of the past decade with the corporate commodification of the warehouse party format. And of course, the aforementioned influences

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[2] In clarifying an argument than may see to err towards a generalisation, my conclusion on the stated challenges is reached through examining the experiences of other practitioners, particularly focusing on those I have come to contact through my practice. As I discuss later in this chapter, this has been one of my limitations in the scope of my research (see 1.3.2), as well as an approach embedded within the methodological approach (see 1.3.1).

[3] In this case, the practices I refer to are dance, performance art, acting, and their intersections. Expression through physical movement is the common aspect among these practices, without excluding other mediums, such as sound and visuals. What places those practices under different disciplines is their distinct cultures, communities, histories, and other criteria of identity, as detailed in the second chapter (see 2.2.1).

concern the medium of sound alone, before I begin to consider the influences from the wider performing arts field, introduced by the contributions of my collaborators.

Similar **in-betweeness** is also found in my cultural identity; born and raised in Athens, Greece, and having resided in Northern England since early adulthood, my cultural makeup is an amalgamation of two European nations with rich, albeit tremendously differing histories, cultures, and dispositions, of which I often feel not wholly belonging to either. Reminiscing on my earlier years as an alien, I found that the most efficient method in furthering my understanding of the intricacies and customs of this new to me place was through interacting with the local community. Despite cultural and language barriers, it was through these persistent interactions that I managed to integrate with and develop understandings of my new surroundings. Ten years later, at the beginning of my postgraduate degree, I again find myself a migrant, this time my movement being between practices related to sound. Similar to my previous experience, the main source of knowledge was through direct contact with this new to me community of practitioners. As such, I was already well aware of the powerful integrative qualities of cooperation.

While debating culture and art can be largely abstract and subjective endeavours, I often sought inspiration in the objectivity of science, merely as a casual yet curious buff. It was this initial admiration of the natural world which prompted me to name my early collaborative endeavours *Symbiosis*, and the subsequent curiosity which led me to delve deeper into my work's namesake phenomenon.

Celebrated biologist Rene Dubos posited that 'all living things are mutually interdependent' (Sapp 1994, p. iv). John Cage quipped that art should avoid expression of emotion but rather imitate 'nature in her manner of operation' (Feisst 2009, p. 41). These two statements encapsulate my core motivation and what I aim to achieve through the practices and arguments presented in this thesis; firstly, an appropriate framework for collaboration should promote cooperation and reciprocity, and be able to develop connections and dependencies between willing practitioners of radically dissimilar mediums and cultures. Secondly, and as a way of achieving the former aim, a framework for collaboration based on knowledge established through rigorous biological research will steer away from the emotiveness and sentimentalities often appearing in the art world, and instead benefit from nature's pragmatism and the transparent accounts of science.

1.1.3 The relevance of symbiosis

Collaboration across practitioners and disciplines presents several challenges (Earnshaw 2017, p. 14), and is also considered a task that is neither democratic nor transparent (Williams, personal interview, June 7 2018), where the challenges of creative practice are compounded by the complexities of social interaction. Considering the competitiveness of the arts industry, despite the challenges of collaboration, such endeavours hold the potential to act as powerful statements against individualism and antagonism. The promotion of cooperation over antagonism was also a core aspect in the research of symbiosis, with its historical trajectory starting from being a fringe theory based on 'mere sentimentalisms' (Sapp 1994, p. xiv), to the scientific community universally accepting the phenomenon to be 'a major source of evolutionary innovation' (Kiers & West 2015, p. 392).

Humanity's first assessment of the natural world pointed towards an ever-present antagonism, with organisms engaged in a 'gladiator show' (Sapp 1994, p. 21) where survival of the fittest prevailed over weaker species. Through these early interpretations of Darwin's theory of evolution, the assessment of the natural world as a competitive 'gladiators' show' began to influence social organisation. Towards the end of the 19th century, Thomas Huxley and Herbert Spencer, among other theorists of the time, were proponents of an ideology promoting a competitive society. Branded by its opponents as Social Darwinism (Hodgson 2004, pp. 428-30), the ideology interpreted the Darwinian notion of 'struggle' within early human communities:

> the weakest and stupidest went to the wall, while the toughest and shrewdest, those who were best fitted to cope with their circumstances, but not the best in another way, survived. Life was a continuous free fight…
>
> (Huxley 1888, p. 165, in Kropotkin 1902, p. 11)

In the context of British society during the industrial revolution, this ideology appears to share common features with what is nowadays branded as *laissez-faire* capitalism. The 'toughest and shrewdest' refers to the higher echelons of society, who according to Huxley should be driven to employ cunning and opportunism to accumulate political power and material wealth, and

serve as aspirational symbols for the lower classes, who will be led to self-improvement through their struggle (Bowler 2003, pp. 301-2).

It was around the same time that the theory of symbiosis began to emerge; first articulated by Heinrich Anton de Bary in 1879, 'symbiosis with its themes of cooperation and teamwork sat uneasily within this framework of conflict and competition' (Yong 2017, p. 35). In a manner reflecting Huxley's previous interpretation of Darwinian principles, the theory of symbiosis was soon adopted by individuals aiming to challenge competitive societal models through a scientific basis, with most notable publications Peter Kropotkin's 1902 essay *Mutual Aid*. Although the publication is nowadays considered a seminal publication of anarcho-communist philosophy, Kropotkin's arguments of a cooperative society were firmly established in biology through his observations of the natural world (Todes 1989, pp. 104-6), and the mutually beneficial interactions between different species through symbiotic relationships, as these were understood at the time.

It was not until the 1960s (Sapp 1994, p. xiii) that the importance of symbiosis was better understood, chiefly due to the research of evolutionary biologist Lynn Margulis on the association between two distinct classifications of microorganisms, bacteria and archaea, which went on to prove the theory of symbiogenesis (Sapp, 2012, p. 54). Suggested in 1910 by Konstantin Mereschkowski, symbiogenesis described the mechanism by which simpler prokaryotic organisms fused and evolved into complex eukaryotic cells. That fortuitous fusion between two independently evolved microorganisms resulted in an entirely new type of being which combined the traits of both of its constituting organisms, and from which eventually all larger plants and animals evolved. This example of cooperation is described as 'perhaps the most important and dramatic event in the history of life' (Mayr 2001, p. 48), with the 'two great domains of life merging to create a third, in the greatest symbiosis of all time' (Yong 2017, p. 9).

Nowadays symbiosis is a universally accepted phenomenon, and it is understood to be both pervasive (Leung & Poulin 2008, p. 107), as well as to have played a crucial role in the evolutionary process of all life (Moran 2007, p. 871). Moreover, the phenomenon has influenced fields beyond biology; computer science (Jacucci et al 2014), architecture (Kurokawa 1994), sociology (Dennett 1995), as well as creative practices, with notable works by Ken Rinaldo and Stelarc (Herath et al. 2016). While the resonance of interspecies relationships beyond the biological domain is undeniable, these examples appear to conceptualise the phenomenon in the context of its lexicological definition, not unlike my initial forays in collaborative practice (see 4.1.1), which describe symbiosis as a harmonious

and peaceful relationship between individuals. However, as will be detailed in the following chapter, symbioses in nature are not always harmonious, and even when peace is achieved among dissimilar organism, that peace was achieved through struggle, persistence, and often serendipity.

Considering that this thesis serves to employ the concept of symbiosis towards furthering understanding on polydisciplinary collaboration in performance practice, my aim is to construct my arguments through a rigorous understanding of the biological phenomenon, akin to the approach employed by Huxley and Kropotkin. While of extremely opposing values and worldviews, Huxley and Kropotkin exploited their expertise in related fields of science (the former a biologist and the latter a geographer) towards conceptualising principles of social organisation among humans. Their conclusions were informed by evidence of animal behaviour, with each resulting theory evidently influenced by their respective author's ideological inclinations towards individualism or collectivism. Reflecting on the aforementioned 'imitation of nature in her manner of operation' (Feisst 2009, p. 41), the common thread between Social Darwinism and *Mutual* Aid is the appropriation of existing knowledge towards advancing knowledge within an entirely different field. Similarly, I posit that examining the mechanisms through which organism of different species cooperate in nature in a useful source of knowledge towards developing a system for collaboration among dissimilar practitioners. As evident from the phenomenon's fundamental function in the operation of nature, such a system holds the potential to assist practitioners in overcoming the challenges of collaboration, and promote of cooperation over competition by emphasising the enduring benefits of dynamic hierarchies, as observed throughout the natural world.

1.2 Thesis outline and research questions

Having already discussed my research motivation and the relevance of its underlying concepts and significance in a wider field, the first chapter further describes the employed methodology, as well as the self-imposed limitations on my practice, placed as to generate a focused research context.

In chapter two I present the key theories informing this research. These concentrate on three distinct subjects: symbiosis, polydisciplinarity, and collaboration. It is there where I go to answer the first research question:

Q.1: What parallels can be drawn between the interactions of organisms engaged in symbiotic relationships and those between practitioners engaged in polydisciplinary collaboration?

Starting from a question that encompasses a wide range of practices (those featuring polydisciplinarity or collaboration), I examine the different modes of interaction between practitioners and disciplines through the lenses of the typology in which symbiotic relationships manifest.

The next question focuses on the extended milieu of interactive performance practices, where a tighter integration between symbiosis and my practice begins to emerge:

Q.2: How can the core traits of symbiosis be interpreted into a framework for polydisciplinary collaboration in performance practice?

The strategies articulated within the symbiotic framework, presented in chapter three, are the result of the conceptual debate between **theories** from the fields of biology and artistic research. However, it is crucial to stress that this debate served as complimentary grounding to my **practice**. It is through reflection on the **process** of my practice that I collected the data through which my arguments emerged as the **outcome** of this research. This reflection is presented in chapter four, where the most relevant collaborations I conducted during my candidature are examined, reflected upon, and analysed through a process of analytical autoethnography, as I explain further in the following section on methodology.

The final question becomes specific to the tools and expressive mediums my collaborators and I have utilised in the works conducted as part of my Practice Research:

Q.3: **How can the interpreted symbiotic traits inform a model of interaction between sound and movement through gesture recognition technologies (GRT)?**

My answer to this question is presented in chapter five, through the interaction framework devised for and activated in the work *Symbiosis (Zero)*.

The final chapter six concludes with a summary of my findings, their evaluation through reflecting on its applications from peers and students. Finally, I go on to present the thesis' strengths, weakness, and limitation, and conclude by stating its contributions in the field and scope for future development.

1.3 Research approach

1.3.1 Methodology

As mentioned in the opening paragraph of this chapter, this thesis employs a Practice Research methodology. Emerging in recent years as a reaction 'away from the micro-politics of practice as/through/based/led' (Hann 2015) the term encompasses a range of methodological approaches, defined according to their aims and outcomes. Not unlike the earlier discussion on polydisciplinarity, it is important to define the two strands most relevant to this thesis, practice-based and practice-led research inquiries. While both concern 'all knowledge borne of practice' (ibid), the former focuses on creating 'an artefact… [i.e.] an object, installation, exhibition or performance, in any given creative field, that is made by the practitioner during the research' (Candy 2011, p. 36), whereas the latter concerns the generation of 'new understandings about practice' (ibid). Linda Candy contextualises the purpose of creative outcomes, or artefacts, in both strands:

> The role of the artefact in the research process may differ according to the practitioner's primary focus of attention. For practice-based researchers, making an artefact is pivotal and the insights from making, reflecting and evaluating may be fed back directly into the artefact itself. For practice-led researchers, whilst artefacts play a role, the understandings from the research are directed primarily towards the evolution of new practices in a given field or organisation.
>
> (Candy 2011, p. 36)

Candy further highlights the experimental nature of creative practice, with practitioners 'driven by personal frameworks that are continually being renewed, transformed and even abandoned as a result of their experiences with new works' (ibid). Indeed, this sense of adhering to a framework while also being able to adapt to its emerging findings reflects my experience during this project. My initial intention was to conduct this research through a practice-based approach, with symbiosis serving as little more than a loose concept. However, as my candidacy progressed, so did my knowledge on the phenomenon, and patterns began to emerge between symbiosis and *Symbiosis* following the conceptual debate between the fields of creative collaboration and interspecies relationships in the natural world. Compounded by a

change in my supervisory team towards the end of my second year, due to the departure of Professor Stephen Davismoon from the University of Salford, I decided to refocus towards a practice-led inquiry. It is important to stress that this was not a retrofit, neither a compromise; Robin Nelson advises that Practice Research candidates should 'in the first instance' indicate 'a clue to the intended research inquiry' (Nelson 2013, p.27). With symbiosis persisting as the clue of my inquiry, and making up what Nelson describes as the 'clew' (ibid) supporting the research, the new focus was a way of respecting the emerging findings, and identifying the significance of the generated knowledge in its potential of reaching and facilitating practitioners beyond those whose work employs my specific aesthetics, tools, and expressive mediums.

While Practice Research concerns the **doing** of this project, that is the manner in which the experiences borne out of practice constitute new knowledge, my approach in articulating these experience is sourced from the field of analytic autoethnography. Considering that my research investigates the **process** of collaborative practice, knowledge lies in the experiences created during my work with different individuals, with their accounts being of equal importance to my own. Leon Anderson presents a framework for analytical autoethnography made of 'five key features… (1) complete member researcher (CMR) status, (2) analytic reflexivity, (3) narrative visibility of the researcher's self, (4) dialogue with informants beyond the self, and (5) commitment to theoretical analysis' (Anderson 2006, p. 378). CMR status requires the researcher to act as both an active participant and contributor in the group whose activities are analysed, in which case the collaboration, as well as aiming to document the lived experiences as to provide material for reflection. These materials are then reflected analytically through 'self-conscious introspection guided by a desire to better understand both self and others through examining one's actions and perceptions in reference to and dialogue with those of others' (ibid, p. 382). As will be seen in chapter four, accounts of those experiences are obtained through interviews with my collaborators. Furthermore, my dual role as both practitioner and researcher are made visible through my own accounts of the events taking place during each collaboration, as well as my understandings of those events in the context of the research inquiry. Particular care is given to highlight the evolution of my theoretical analysis as it was understood at the time of those events, and the conclusions reached in **reflection** once the analysis had provided further findings.

1.3.2 Delimiting the field

> What delivers me from the anguish into which an unrestricted freedom plunges me is the fact that I am always able to turn immediately to the concrete things that are here in question… Let me have some finite, definite - matter that can lend itself to my operation only insofar as it is commensurate with my possibilities. And such matter presents itself to me together with its limitations...
>
> (Stravinsky 1942, p. 64)

In a strikingly poetic excerpt, Igor Stravinsky highlights the challenges of operating in an unrestricted field. I have often pondered this issue, particularly during my transition from Electronic Dance Music (EDM) into sonic arts; where my previous work conformed to a highly formulaic approach in regards to each subgenre's established tempo, rhythm, and frequency domain of each element, entering a relatively unrestricted area of practice I soon realised the efficacy of setting limitations in my creative process, be that on the sound sources, tools, methodologies, or concepts set for each project. Similarly, setting limitations in the scope of this research was one of the earliest tasks I undertook.

In adherence with a Practice Research methodology, I decided that any direct knowledge, i.e. not derived from literature research, would predominantly derive from the environment of my practice activities. Having been active as performer under the alias Manoli Moriaty, and curator of the Metanast[4] collective, I was fortunate enough to be in frequent contact with a wealth of practitioners. Therefore, the aim of this limitation was to allow my findings to emerge from those interactions, both with my collaborators, as well as my peers who I came into contact through my activities.

The next limitation I set myself concerns the tools utilised in my practice, again reflecting my previous approaches in EDM. While it is common within the culture of sonic arts for practitioners to develop their own sophisticated tools, be that software or hardware, my aim was to continue using out-of-the-box tools. Ableton Live serves as the main platform for arranging and organising sound sources, with processing and control software achieved through using various Max for Live devices, largely obtained by the vast repository of contraptions made freely available by the programming community, which in a way further

[4] See http://metanast.wordpress.com

reflects the notion of collaboration, indirect as that particular example may be. In developing interaction between the mediums of sound and movement, although I trialled several commercially available solutions, e.g. Source Audio Hot Hands, Sonic Geometry OTO, and bespoke Arduino-based systems, the relatively humble Wii Remote by Nintendo proved to be gestural controller I most relied upon. Launched well-over a decade ago, it is certainly not the most sophisticated system, nor does it produce the most accurate gesture data. However, due to its venerable reliability, affordability, and congenial feel it provided to my collaborators, it remains a device which I still heavily use to this day. Another limitation concerns the generation of knowledge; while the arguments presented in this thesis are grounded on knowledge deriving from the field of biology, the knowledge contributions focus on the field of creative practice, generated through the 'conceptual debate' (Nelson 2013, p. 31) between the two distinct fields.

The final 'definite matter' I set myself concerns the often brutal honesty and often inconvenient transparency of the accounts I present. Considering that collaboration is heavily reliant on social interaction, tensions are unavoidable, a point concordant with the positon of many researchers of joint work (see 2.3.2), as well as those examining interspecies relationships (see 2.1.4), with Forest Rohwer concluding that 'it's not a nice relationship. It's just biology' (Yong 2017, p. 82). Driven by the biological semantics I used towards analysing and reflecting on creative practice, it was often that I felt uncomfortable with the way I illustrated some of the conclusions reached in this thesis. However, 'politeness is the poison of all good collaboration in science' (Ramachandran 2004), as suggested by Nobel laureate Francis Crick. I too believe the same to be true for artistic research, and, luckily, so did my collaborators. As such, the strength of my arguments stems from their transparency, adherence to the defined conceptual debate, and in trusting that an honest account of my experiences is the most effective way for me to both understand as well as illustrate the emerging new knowledge. Despite the seemingly cruel and competitive mechanism of nature (and ditto of the art world), looking away from what occurs forthwith and into its definitive aims, cooperation forms species' predominant arsenal in their genetically programmed struggle for survival. This underlying longing for cooperation is perfectly encapsulated in the notion and function of all symbioses, which are undeniably 'the ultimate examples of success through collaboration' (Relman, in Yong 2017, p.25).

Chapter 2

Key theories

In this chapter I present theories and precedents from the three core areas pertinent to my research, namely symbiosis, polydisciplinarity, and collaboration, which go to inform, contextualise, and position my investigation. The first section describes the phenomenon of symbiosis through sources from the wider field of biology. Rather than interrogating these theories, the aim is to draw information towards constructing a conceptual context through which to investigate the two subsequent fields. Theories on interaction between disciplines and practitioners are respectively discussed in the following two sections. In this case, the theories are used to define the two subject areas and its associated terminology, and are then examined in relation to the earlier information on symbiosis. This examination is presented separately for each subject, as to establish the connections between the fields, and identify similarities in the interaction between symbiotic relationships and polydisciplinary collaboration.

2.1 Symbiosis

2.1.1 Definition, core traits, & typology

The term symbiosis – deriving from the composite Greek word *συμβίωσις*, from the prefix *σύν* 'together' and *βίωση* 'living' – refers to a biological phenomenon where '[i]ndividuals of different species form persistent associations from which they all benefit' (Douglas 2010, p. 1). The fundamental traits of a symbiotic relationship dictate that such an association must be **interspecific**, **close**, and **persistent** (Martin & Schwab 2012b, p. 12), meaning that it must involve organisms of more than one species – as opposed those between organisms of the same species – their interaction must involve direct contact, and the relationship is of significant duration. In addition to the aforementioned traits of interspecificity, closeness, and persistence, a symbiotic relationship stipulates that the outcome of an interaction results in benefit towards their fitness for one, some, or all of its parties. This particular aspect of benefit, or **fitness outcome**, is the central attribute in identifying the different types of symbiotic relationships, or symbioses, with the three main types referred to as **mutualism**, **commensalism**, and **parasitism**, and the interacting organisms identified as the **host** and its **symbiont**:

> symbiotic relationships are divided into three categories based on whether the symbiont has beneficial, harmful, or no effects on the host. In the case where both the host and symbiont reciprocally benefit from the relationship, the association represents mutualism, whereas if the symbiont utilises the host without benefiting or harming it, it is considered as a commensal. In contrast, if the symbiont is using the host as a resource and causing it harm as a result, then it qualifies as a parasite.
>
> (Leung & Poulin 2008, p. 107)

As such, while the symbiont always experiences increased fitness, the type of the relationship is identified through the fitness outcome experienced by the host, as summarised in table 2.1.

Type of interaction	Fitness outcome	
	Symbiont	**Host**
Mutualistic	Positive	Positive
Commensalistic	Positive	Neutral
Parasitic	Positive	Negative

Table 2.1 – Summary of typology and fitness outcome

Having defined the core typology of symbiotic relationships[5], certain questions arise as a result of the assigned terminology. Firstly, the partners' roles define the host as the base of the relationship providing resources that are consumed by the symbiont, with the latter seeking the host towards establishing a relationship (ibid). While this interaction mechanism is self explanatory in the cases of parasitism and commensalism, one can question the lack of benefit for the host in mutualisms. However, the symbiont is not just a **consumer** of its host's **resources**, but also the **provider** of **services** that benefit its host (Ferriere et al 2007, p. 115), therefore completing the **reciprocity** of benefit that is evident among mutualistic symbioses. As such, the terminology persists among all types of relationship, which, as I present later, is due to the evolutionary trajectory of interspecies interactions. Another query concerns the motivation behind interspecies association; with the initial Darwinian viewpoints of the natural world (see 1.1.3) suggesting an antagonistic nature comprised of predators and prey, what force may drive dissimilar organisms to engage in prolonged interactions? Leading researcher Angela E. Douglas provides a succinct answer in the opening lines of her first book:

> symbiotic interactions are those relationships between organisms that permit some species to overcome their physiological limitations by **exploiting** (emphasis added) the capacities of others.
>
> (Douglas 1994, p. i).

[5] Further to the core typology described here, several more types of relationships are identified by researchers, with each specific type having its own specified name according to the effects, necessity, topology, and persistence. In order to avoid digressing from the scope of this research, discussing the core types of symbiosis will refer to mutualism, commensalism, and parasitism. Readers wishing to gain more clarity on the other types and their associated used terminology can refer to the thorough review conducted by Bradford Martin and Ernest Schwab (2012a).

Here Douglas defines symbiosis as the **combination** of **evolutionary traits** across species as means of increasing an organism's chances of survival within environments which may not be suitable for a single set of traits alone. The next section provides an understanding of those mechanisms through three examples demonstrating each of the core relationship types, noting the specific ways each relationship results in benefit for one or both organisms.

2.1.2 Examples of symbiosis

One of the most cited example of symbiotic relationship (Douglas 1994, p. 496) is the mutualism between clownfish and sea anemones. The symbiont fish spends most of its lifecycle swimming in close proximity to its host anemone (Fautin & Allen 1992, p. 3), with the relationship resulting in significant benefits for both partners. In terms of nutrition, the fish feeds on small arthropods crawling on the anemone's tentacles, while excrements from the fish provide nutrients that can be digested by the anemone (ibid, p. 51). Protection is also reciprocally provided, with the clownfish aggressively attacking other fish that prey on the body of its host, as well as removing the aforementioned arthropods that can damage the anemone. In return, the stinging tentacles of the sea anemone deter larger fish that can attack the clownfish, the latter being immune to the anemone's venom due to a protective layer of mucus (ibid, p. 5). In this example, we see two dissimilar species **overcoming** several of their **limitations** through an intimate association: the immobile anemone is unable to defend itself from both larger predators and smaller parasites, and therefore relies on its partner for protection. At the same time, the clownfish enjoys a beneficial location by virtue of the protection its host provides against organisms praying on the fish. As such, the anemone is able to exploit traits inherent to the fish – mobility, immunity against stings' toxin, and aggressive behaviour against intruders – while the clownfish exploits the anemone's fixed location, the pray it harbours, and the predators it repels. As such, the **reciprocal** benefit **exploited** by both interacting organisms classifies this relationship as **mutualistic**.

Another often-cited example of symbiosis is the commensalistic relationship between barnacles and baleen whales (Fertl & Newman 2008, p. 2). Described as a commensalistic symbiosis, the exploitation of benefit takes place from one organism, in this case the barnacle. While adult barnacles lack means of propulsion, during their early life cycle they are able to swim freely, allowing them to locate a suitable host whale. Inherently, all barnacles need a hard substrate on which to attach. In the case of whale barnacles, through attaching to the body of

their host, they are able to exploit the whale's trait of mobility, and benefit from being introduced to environments richer in nutrients. In regards to the effect experienced by the host, it is thought that barnacles do not cause a direct ill effect on their host (Louie 2010, p. 496). However, studies suggest that the attached barnacle will inadvertently create hydrodynamic drag and skin irritations to the mammal, therefore having a degree of negative effect on its host's quality of life (Fertl & Newman 2008, p. 1). This showcases some of the complexities in identifying symbiotic relationships. This could lead to the assumption that a symbiosis where one of the organisms experiences any degree of negative effects brought by the prolonged relationship should be classed as parasitic. But the focal point for classification is again the **method** by which the **exploitation** takes place. In this case, the barnacle exploits the whale as means of increased mobility towards acquiring nutrients from the environment, rather than directly feeding on the mammal. Furthermore, the barnacles have no influence on the behaviour of the whale, which is another aspect of parasitic relationships, as I am discussing in the following example.

Parasitism is thought to be the most abundant type of symbioses in nature (Hartnett n.d.), as well as the earliest form of interspecies interactions, with competing organisms finding fertile grounds on or in larger animals (Paracer & Ahmadjian 2000, p. 7). One instance of parasitic symbiosis is that between Bont ticks and giraffes (Noda, Munderloh & Kurtti 1997, p. 3926). The smaller organism will attach itself on the host's body (see figure 2.1a), and since the giraffe lacks any defensive mechanism against the ticks (Williams 2010, p. 31), the symbiont will continue feeding on their host's blood, while exerting harmful effects ranging from skin irritations, infections, and severe pathogenic diseases such as Lyme disease (Rahlenbeck, Fingerle, & Doggett 2016, p. 492), which may prove fatal for the host. In examining the exploitation taking place within this relationship, the tick uses its host mammal as a direct food source, resulting in the aforementioned harmful effects. The first point of interest is the way this relationship affects the behaviour of the giraffe; in an attempt to reduce the amount of ticks harvesting its blood, the mammal allows oxpecker birds to perch on its body and feed on the ticks (Weeks 2000 p. 155) (figure 2.1b). As such, tick-bearing giraffes are simultaneously engaged in two parallel relationships with beings deriving nutritional benefit; the Bont ticks **exploit** the mammal for its blood, therefore causing it **harm**, and the oxpecker birds **exploit** the parasites harboured by the mammal, therefore providing **benefit**. As such, the **parasitic** relationship between Bont tick and giraffe makes possible the **mutualistic** relationship between oxpecker bird and giraffe. As this example demonstrates, the behaviour of the giraffe has been influenced by its parasite, forcing the mammal to seek a

method by which to overcome its evolutionary limitations, in this case accepting the services of another organism that is able to reduce the harm caused by the parasite.

Figure 2.1a (left) and 2.1b (right) – Three bont ticks attached on underside of host giraffe (2.1a) and two red-billed oxpecker birds on side of a giraffe harvesting ticks (2.1b)

These examples illustrate a common characteristic among the different types of symbioses. In each case, a relatively small-sized organism is lacking traits that would allow it to survive within a specific environment, and it attempts to alleviate these shortcomings by exploiting a larger animal, or more correctly, by **exploiting** the **traits** of that animal. Further characteristics are specific to each type, such as reciprocal exploitation of benefit in mutualism, influence of host behaviour in parasitism, and superficial effects within commensalism, as well as the ways parallel symbioses emerge as derivatives of previously established symbioses. While these aspects showcase a clear approach in identifying the three core types of symbiotic relationships, in reality these represent a stage in the aforementioned species' evolutionary progress. In other words, the mutualism between clownfish and anemone that is observed today is the result of evolutionary **adaption** through **persistent interaction**. While many pre-Darwinian theories on evolution suggested a stasis amongst species, i.e. each organism holding specific traits that are always present (Winsor 2003, p. 387), the theory of evolution has proven that species' traits **adapt** as a result of their environment, which environment naturally includes all other species inhabiting it. Considering that the organism in question will interact with those of other species, as detailed from the phenomenon of symbiosis, it is concluded that interspecies interactions are a driving force for evolution. And quite like these interactions affect the evolution of species, it also influences the nature of their relationships.

2.1.3 Adaptation & evolutionary trend

Symbiosis is a fluid and dynamic phenomenon. Indeed, a common thread among modern research on the phenomenon points out the adaptation of relationships over an evolutionary scale:

> Terms such as mutualism, parasitism, and commensalism are used to conveniently categorize associations. But many relationships are not static, and there may be frequent transitions from one type to another. Symbiotic associations may change because of environmental factors or internal influences caused by the development of the symbionts.
>
> (Paracer & Ahmadjian 2000, p. 7)

Furthering the Darwinian notion of the 'antagonistic' natural world (see 1.1.3), the authors also point out that '[m]ost mutualistic symbioses probably began as parasitic ones, with one organism attempting to exploit another one' (ibid). As such, symbioses have an antagonistic origin, where a symbiont aims to exploit its host as means of increasing its fitness. And since there are numerous mutualistic symbioses in nature, current theories suggest that mutualisms evolved from their initial parasitic types; species who were initially engaged in unilateral exploitation, as either **benefited symbiont** or **harmed host**, responded by evolving traits allowing them to respectively **provide service** or **extract benefit** from the relationship. This theory is backed by microbiologist Ian Goodhead, who suggests that competing organisms engaged in persistent relationships will eventually evolve traits towards extracting benefit from their environmental factors. Furthermore, Goodhead explains that the direction of the evolutionary trend is due to evolution's primary purpose, which is **increased fitness through adaptation**:

> Why prolong harmful relationships? If a parasite is too good at causing harm to its host, then the host will die, along with the parasite. There is more benefit in a prolonged **peaceful exploitation** (emphasis added).
>
> (Goodhead, personal interview, 12 December 2017)

In other words, since a parasite benefits from exploiting its host within a stable relationship, the host will only tolerate its parasite if it experiences insignificant harm, through what Goodhead describes as **peaceful exploitation**. As such, it is in the best interest of the parasite to either manage the exploitation level, or provide its host with a beneficial service, thus adapting the relationship into commensalistic or mutualistic respectively.

The theory behind this evolutionary trend is supported by several leading researchers, such as Jan Sapp (2016, p. 597), David Relman (2008, p. 724), and Angela Douglas, with the latter also pointing out the problematic mature of identifying symbiotic types:

> The definition of symbiosis widely accepted among both general biologists and the lexicographers who prepare English dictionaries is an association between different species from which all participating organisms benefit. I subscribe to this definition even though it is not without difficulties.
>
> (Douglas 2010, p. 5)

The difficulties mentioned by Douglas refer to the methods employed in identifying the different types of relationships, which traditionally have concentrated on the effect experienced by an organism in the presence or absence of its partner (ibid, p. 6), as presented in table 2.1. However, this binary classification is now understood to be inadequate, as the relationship between two organisms can be affected by several **environmental factors**. As such, while maintaining the definition of symbioses as persistent mutualisms, the identification of parasitisms and commensalisms is affected by time. Ed Yong summarises this aspect:

> labels like mutualist, commensal, pathogen, or parasite don't quite work as badges of fixed identity. These terms are more like states of being, like hungry or awake or alive, or behaviours like cooperating or fighting. They're adjectives and verbs rather than nouns: they describe how two partners relate to one another at a given time and place.
>
> (Yong 2017, p. 80)

Consequently, a seemingly mutualistic relationship between two organisms can potentially mutate into parasitic due to external environmental factors, as well as the behaviour of the engaged organisms. These issues are explored in the following section.

2.1.4 Conflict & dynamic hierarchies

It is worth reminding ourselves that the vast majority of biological organisms are amoral[6], with their behaviour driven purely by the prospect of increased fitness outcome. Having earlier discussed organisms' motivation towards engaging in symbiotic relationships, Douglas points out the economy fuelling this motivation:

> Most alliances are founded on reciprocity, that it is advantageous to help another organism only if the favor is returned. In a two-organism system, reciprocity requires that each of the organisms places a higher value on what it receives (benefit) than what it gives (cost).
>
> (Douglas 2010, p. 2)

Here Douglas suggests that organisms will capitalise on opportunities where they can extract more benefit from their relationship. This phenomenon is described as **cheating**, with Yong illustrating this issue through the aforementioned parallel symbioses between ticks, giraffes, and oxpecker birds (Yong, 2017, p. 84). As mentioned earlier, the tick-eating birds provide a service to the giraffe by removing the parasites dwelling on its skin. At the same time, the cleaner birds have also developed a preference to feeding on the blood of their host mammals, and have been observed to bite at open wounds, thus causing further harm to the mammal host. Cheating in this particular symbiosis is facilitated by the host's inability to counteract the symbiont's advances. Hence, since the symbiont experiences no repercussions as a result of its unilateral exploitation, its behaviour persists as it adheres to the aforementioned economy of 'receiving more than what it gives'. However, this lack of defence against unilateral exploitation is a relatively rare occurrence, and the most effective method of maintaining a stable relationship is the potential loss of benefit for any actions that veer away from mutual cooperation. Douglas writes on this subject:

---

[6] Researchers describe animal behaviour through malevolent anthropomorphic virtues, such as opportunism and cheating, in an attempt to explain the mechanisms of symbiotic behaviours, without these terms however having a literal correlation with the intentions of the interacting organisms. Morals and ethics are aspects of human culture; particularly the capacity of maintaining responsibility and fairness in transactions towards a partner, is an intrinsic element of a developed societal consciousness (Nietzsche, in Dennet 1995, p. 462). I will be discussing more on the aspects of human interactions in relation to symbiosis in later sections; for now, I will be concentrating on those between animals.

> Symbiosis has traditionally been viewed as a balancing act in which each organism seeks to maximise its benefit, placing the association at perpetual risk of shifting to an exploitative relationship such as parasitism. It is increasingly realised that this perspective is inadequate: although partners cheat occasionally, symbioses rarely evolve into antagonistic relationships. Conflict in symbioses is managed effectively, generally by one partner taking control.
>
> (Douglas 2010, p. vii)

Also confirming the earlier assertion by Goodhead on the trend of symbiotic relationships, Douglas suggests that while the conflict between interacting organisms is evident, there are mechanisms by which this balance can be maintained. She goes on to explain this behaviour further:

> There is now evidence that the controlling partner (generally the host) can operate in multiple ways. It can reward cooperating partners and impose sanctions against cheating partners, it can reduce conflict by controlling the transmission of its partners, and it can have specific recognition mechanisms that discriminate between acceptable and potentially deleterious partners. The concept of symbiosis as a mutually beneficial association in which conflict is managed by a controlling partner offers new insight into the processes underlying the exchange of benefits, and the establishment and persistence of stable symbioses.
>
> (Douglas 2010, p. vii)

Here Douglas points out the existence of a **hierarchy** within relationships, with the host assuming the **responsibility** of **managing** the relationship by holding its symbiont against the emergent rules that maintain cooperation within a particular relationship. This is illustrated through observations on the behaviour of cleaner fish. While serving their larger clients fish by feeding on smaller parasites and dead tissue – hence a reciprocal benefit – some cleaners will indulge by biting on their client's healthy tissue and mucus, causing them discomfort. Unlike the defenceless giraffe, however, the client host is able to exert control by disciplining their cheating partner, by either displaying aggressive behaviour against culprits, or entirely dissolving the relationship by seeking a new cleaning station (Bshary & Grutter 2002, pp. 547-8). On the same example, a further social function of particular interest is observed: even though cheaters make up just a minority among a cleaner colony, their actions have

repercussions against all cleaners of a particular station. As such, cleaners have also developed a way of disciplining their conspecific organisms, as a way of maintaining their symbiosis with the clients (Raihani et al. 2011, p. 365). As such, a code of conduct is observed among cleaner fish colonies.

In relation to the aforementioned examples, despite the perceived cunning and antagonism evident within the aforementioned symbioses, these are considered exemplary cases of mutualistic relationships, with partners persisting through their engagement regardless of any negative aspects. Yong comments that '[a]ll of these are iconic examples of cooperation... And each one of them is tinged with conflict, manipulation, and deceit' (Yong 2017, p. 85). Therefore, **conflict** neither **stipulates parasitism**, nor **prohibits mutualism**. In fact, a study on evolutionary social interactions provides evidence that cheating can **facilitate cooperation** between species by introducing variability in partner selection, or in other words, pushes a species to remain vigilant about who they enter into cooperation with: 'the presence of cheaters and cheater species in many mutualisms is central to the maintenance of partner choice and, paradoxically, cooperation itself' (Foster & Kokko 2006, p. 2233). Yong expands further on the subject of conflict within mutualisms by presenting the views of evolutionary biologist Toby Kriers, where along with his comments suggest that the evidently stable mutualisms that are observed today are the result of prolonged evolutionary processes (Kriers in quotations):

> 'We need to separate important from harmonious'… A well-functioning partnership could easily be seen as a case of reciprocal exploitation. 'Both partners may benefit but there's this inherent tension. Symbiosis is conflict – conflict that can never be totally resolved'. It can, however, be managed and stabilised… Like all the best relationships, these ones take work. Every major transition in the history of life – from single-celled to multi-celled, from individuals to symbiotic collectives – has had to solve the same problem: how can the selfish interests of individuals be overcome to form cooperative groups?
>
> (Yong 2017, p. 85)

The answer lies with Goodhead's earlier comments in regards to the long periods before stability emerges within symbioses. And as presented in the following section, the natural world measures time in distinct manners.

2.1.5 Ecological & evolutionary scales

Having discussed the significance of symbiosis on evolution, researchers examine interspecific relationships over two different temporal scales, that of **ecological** and **evolutionary** time. Identified as means of structuring natural processes and the pace by which these develop (Hairston et al. 2005, p. 1114), these timescales observe the change of an environment due to species interactions (ecological) – typically under ten generations of a species – and the ways species change over sustained periods (evolutionary), in the order of half a million years (ibid, 1115). This is further explained by Douglas:

> The implication is that symbioses fail in ecological time because they are too mutualistic and in evolutionary time because of the selection pressure to be less mutualistic. Both perspectives cannot be right and, in reality, both are wrong. The reasoning underlying each perspective is based on the erroneous assumption that symbioses are perfectly mutualistic. In reality, the partners in symbioses are often in conflict, but the conflict is managed and controlled.
>
> (Douglas 2010, p. 12)

In other words, the first assumption posits that mutualisms fail in the short-term (**ecological** time) because constant cost through providing benefit by either party will eventually reduce their fitness, while the second suggest that due to organism's inherent aim for maximising their benefit mutualisms will disappear in the long-term (**evolutionary** time). It is due to the aforementioned methods of managing conflict that symbioses exhibiting cheating in ecological time persist over evolutionary time as a result of adaptation. And as mentioned, this adaptation is the result of the interaction between organisms of different species.

2.1.6 Phenotype & genotype

The final biology-derived element informing this Practice Research investigation is the distinction between **genotype** and **phenotype**, which while not exclusive to symbiotic relationships, it concerns an important evolutionary mechanism. Richard Dawkins explains phenotype as 'the bodily manifestation of a gene, the effect that a gene… has on the body, via development' (Dawkins 2006, p. 235). In other words, an organism's genes, or its code, make

up its **genotype**, and the extrovert or visible expression of that code through the organism's body is its **phenotype**. Yong contextualises Dawkins' argument of the 'extended phenotype' in that our genotype affect not only our **body**, but also our **environment**. For example, the genes of a beaver can be responsible for changing the flow of rivers, since beavers build dams, or humans write books by having eyes, hands, and brains (Yong 2017, p. 156). Therefore, all these products of our bodies are what Dawkins considers to be our extended phenotype, which has a direct effect on our environment, and as a result, all other organisms we interact with.

2.1.7 Summary

As presented over the previous sections, symbiotic relationships occur when an organism overcomes the limitations of its evolutionary traits through exploiting the resources made available by another, thus the latter becomes the former's host. The type of each relationship is then classified according to the symbiont's influence on the fitness outcome of the host, with benefit classed as mutualism, harm as parasitism, and insignificant effects suggesting commensalism. Furthermore, these transactions of exploitation are volatile, and will often adapt to different types as a result of either conflict between partners or external factors related to their environment. While conflict is managed within the partnership over ecological time, the relationship's long-term stability is dependant on evolutionary adaptations, which takes place on each organism's genotype as a result of their phenotype interacting with their partner's.

These aspects form the conceptual basis underlying this Practice Research. In which way, will become apparent over the following sections, leading to a conclusive theoretical framework in the next chapter.

2.2 Polydisciplinarity

2.2.1 Defining disciplinarity & the emergence of new disciplines

In the fist chapter I discussed some of the ways symbiosis has affected research beyond biology, such as sociology, politics, and creative arts. In fact, the study of symbiosis itself concerns knowledge derived from several distinct fields. In providing evidence towards supporting the theory of **symbiogenesis** – the process by which organisms of different species become fused into an entirely new species combining both of its progenitor's traits (Sapp 2012, p. 54) – evolutionary theorist Lynn Margulis explited knowledge from areas of microbiology, molecular biology, evolutionary biology, and archaeobiology. While these areas are considered branches of biology, they are specialised towards examining specific biological behaviours. And through limiting a research focus from a wider field of study to a specialised topic, new areas of knowledge emerge, which we nowadays refer to as disciplines.

Joe Moran defines discipline as 'a particular branch of learning or body of knowledge' (Moran 2010, p. 2), which can also be described as 'a delimited cultural domain, a socially and culturally defined organizational arrangement that focuses on knowledge production and growth' (Lindholm-Romantschuk 1998, p. 23). As such, 'a "discipline" … defines and delimits a "field" of study, rather than the other way around' (Davies & Devlin 2010, p. 5). Scholars define certain sets of criteria by which disciplines are defined, which are summarised in table 2.2.

As a result of the sustained research and production of outcomes, a community of specialised individuals emerges, along with their specific language, literature, and culture, resulting in new independent disciplines, such as the ones utilised in the development of the aforementioned theory of symbiogenesis. This is a natural consequence of the advancement of academic knowledge and the increasing demand for new methodologies in tackling the questions posed by it:

> Over time, new disciplines naturally gain their independence from their original disciplinary homes, especially once a defined methodology is employed to determine the subject matter of each.
>
> (Davis & Devlin 2010, p. 7)

• body of specialist knowledge	• the presence of a community of scholars
• theories and concepts	• the existence of a tradition or history of inquiry
• terminologies or a specific technical language	• the presence of a mode of inquiry that defines how data is collected and interpreted
• research methods	• the existence of a definition of the requirements for what constitutes new knowledge
• institutional manifestation and professional associations	• the existence of a communications network
(Krishnan 2009, p. 12)	(Davies & Devlin 2010, pp. 6-7)

Table 2.2 – Criteria of disciplines

However, while the authors recognise the historical significance by which disciplines are distinguished, they also suggest that it can be an element of resisting external influence by other disciplines. While academic institutions traditionally think of disciplines as 'historically defined groups' (Lindholm-Romantschuk 1998, p. 26), this historic recognition does not constitute for a fixed identity, as disciplines tend to 'evolve and change' (Squires 1992, in Davis & Devlin 2010, p. 8). As such, disciplines that are more established are less likely to welcome influence by knowledge or social artefacts originating within another discipline (Becher 1989, in Lindholm-Romantschuk 1998, p. 24-25). On the subject of history and culture as significant aspect of a discipline, I argue that the establishment of new disciplines, ones that become distinct or independent from their field of origin, is directly related to the development of dedicated communities.

Considering this in relation to music, it could be argued that the field is recognised by its specific object of study, that is the temporal organisation of a specific medium of creative expression, sound. While a historically established field, through advancements in other fields, such as information technology, computer science, and acoustics, new approaches in the organisation of sound emerge, demonstrating novel methods in conceiving, creating, and delivering sound. In the case where a newly emerging set of processes and concepts becomes popular among practitioners, a specific language will consequently develop around those practices as means of documentation, followed by a body of specialist knowledge and practice outcomes. Should these new approaches become adopted by more practitioners, a dedicated community emerges, characterised by a specific culture, followed by the establishment of professional associations. And through increased recognition, demand for more specialised

knowledge on the subject results in its appropriation by academic institutions as a topic of both education and research. Therefore, the specialist topic emerges as a new discipline, as it meets all of the criteria by which disciplines are recognised, while still sharing the organisation of sound as the common trait of the wider field it emerged from.

This process bears resemblance with the aforementioned example of symbiogenesis: the phenotype of the new organism displays a combination of biological traits as a result of the fusion between the genotypes of the species it evolved from. Similarly, a new discipline embodies characteristics of its parent field, e.g. organised sound, albeit expressed through the tools and methodologies derived from other distinct fields. An example related to my creative practice is the emergent field of Live Coding; while the practice outcome resembles that of other forms of electronic music, that outcome manifests through processes that are more closely aligned with computer programming. As such, it combines traits of multiple disciplines. I will be discussing this particular example in the next section. For now, it serves as the first connection between the interaction of distinct disciplines and that of distinct species.

2.2.2 Modes of polydisciplinarity

Having discussed the processes by which new disciplines emerge, this section focuses on the diverse manners in which disciplinary interaction manifests. In the first chapter (see 1.1.1), I mentioned that the term **polydisciplinary** indicates practices combining traits of distinct disciplines through a dynamic mode of interaction. In contextualising this position, I will present several theories on identifying such modes of interaction, which, quite like the nomenclature of symbiosis, have often been a point of confusion among researchers.

In the current vernacular of both academic research and creative practice, **interdisciplinarity** appears as the prevailing term indicating the encompassment of distinct disciplines within a single object of study. Moran's uses the term to indicate 'any form of dialogue or interaction between two or more disciplines', while also adding that 'the level, type, purpose and effect of this interaction remain to be examined' (Moran 2010, p. 14). In determining these attributes, he also recognises the need to distinguish between **interdisciplinary** and **multidisciplinary**, and notes that the terms are erroneously used interchangeably (ibid). Quite like Moran, other researchers contextualise interdisciplinary through additional terms, such as Heinz Heckhausen's six categories of interdisciplinarity (1972, in Chettiparamb 2007, p. 19), and Theo van Leeuwen 'three models of

interdisciplinarity' (Leeuwn 2005, p. 3). Similarly, Davis and Devlin build on Heckhausen's typology, and propose the terms 'relational, exchange, and modification' (Davies & Devlin 2010, p. 12) as specific modes of interdisciplinarity, while also including other modes of disciplinary interaction specified under different prefixes: multidisciplinarity, crossdisciplinarity, pluridisciplinarity, and transdisciplinarity (ibid, p. 4). It is easy to understand how confusion can emerge from the number of modes combined with the etymological origins of the prefixes, which prove, at best, ambiguous in explaining the specific way by which two of more disciplines interact towards facilitating a particular endeavour.

A useful context for 'the level, type, purpose and effect' that each mode entails is provided by Bernard Choi and Anita Pak, who in providing their interpretations (Choi & Pak 2006, p. 359), advise caution when the terms are 'ambiguously defined and interchangeably used' (ibid, p. 351). Alexander Jensenius (2002) provides a similar set of defections, summarised in table 2.3, presenting the different modes across a **continuum** of **integration** (figure 2.2); multidisciplinarity presents the least integration, with each discipline working independently towards a central aim, followed by crossdisciplinarity and interdisciplinarity, with the former suggesting a closer examination of the aim through discrete disciplinary perspectives and the latter a further integrated overlap of disciplinary boundaries, and concluding on transdisciplinarity as the highest level of integration with almost no disciplinary borders. The most interesting element from Jensenius' continuum is that rather than working in a single direction, it becomes a loop where transdisciplinarity returns to intradisciplinarity. In other words, new disciplines emerge as a result of higher integration.

Mode	**Definition**
Intradisciplinary	working within a single discipline
Crossdisciplinary	viewing one discipline from the perspective of another
Multidisciplinary	people from different disciplines working together, each drawing on their disciplinary knowledge
Interdisciplinary	integrating knowledge and methods from different disciplines, using a real synthesis of approaches
Transdisciplinary	creating a unity of intellectual frameworks beyond the disciplinary perspectives

Table 2.3 – Definitions of disciplinary interaction modes (Jensenius 2012)

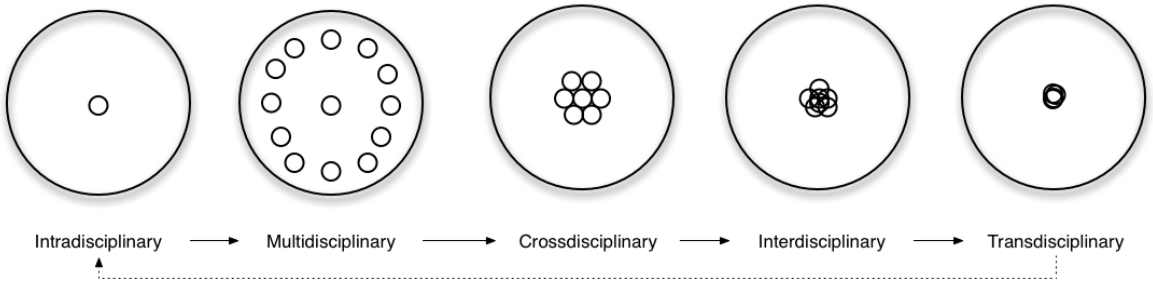


Figure 2.2 – Discipline integration continuum (Jensenius 2012)

Beyond integration, another area of disciplinary interaction is the **influence** each area exerts on both the subject under investigation, as well as its counterpart disciplines. Davis and Devlin describe yet another mode of interaction, pluridisciplinarity, as the combination of related disciplines towards researching an 'area of common concern' (Davis & Devlin 2010, p. 13). Quite like multidisciplinarity, 'the research is discipline-based' (ibid, p. 14), with the difference being that while disciplines do not integrate, there is influence between the involved subjects and individual practitioners, evident in the migration of language from one discipline to another (ibid).

> Biology needed physics at a certain stage of its development. Ecologists use mathematics when necessary. Philosophers of mind began to seek relationships with neuroscientists and computer scientists when their a priori speculations about internal representations led to a need to understand what an internal 'representation' might be. There are numerous cases in which the nature of a problem has necessitated the insights of another discipline.
>
> (Petrie 1976, in Davis & Devlin, p. 16)

Quite like the terminology of symbiotic relationships, definitions appear to differ and overlap to varying degrees, or even present contradictory interpretations, such as Basarab Nicolescu's assertion that multidisciplinarity holds the 'capacity of generating new disciplines' while it 'concerns the transfer of methods from one discipline to another' (Nicolescu 2010, p. 22), a definitions seemingly at odds with the earlier notion of transdisciplinarity being the force behind the emergence of new disciplines. In addressing this linguistic ambiguity, William Shalinsky uses the term **polydisciplinary** in his article on the management of group research in the human services. There, he recognises that what it is widely regarded as interdisciplinary

can often be a number of other modes (Shalinsky 1989, p. 205), and proposes a more general and encompassing terminology:

> When I started writing this article, I thought it should refer to interdisciplinary groups. But now it appears that interdisciplinary groups should really be called something else. I will suggest the term polydisciplinary instead.
>
> (Shalinsky 1989, pp. 203-4)

Shalinsky points out that the most effective means of determining the particular mode of interaction by which a group can best operate emerges from clearly defining the goals of the project, as well as the function of each involved discipline (ibid, p. 209). William Newell provides further support for **polydisciplinarity**, who presents it 'as a cover term for the numerous terminological and phenomenological concerns associated with the experience of disciplinary collaboration', with the term referring to a 'research (which) involves the collaboration of two of more disciplinary specialists' (Newell 1975, in Layton, 1979, p. 2). As such, as well as indicating a project-dependent mode of disciplinary interaction, polydisciplinarity by definition also indicates group work between different specialists.

In using a term encompassing several modes of interaction, the notion of meta-mode emerges. Andruid Kerne considers metadisciplinary to be a hybrid ecosystem of intertwined systems of representation, and suggests it 'as an alternative to the beneficial but ad hoc assemblages of multi-, inter-, and trans-disciplinary approaches' (Kerne 2005, p. 181). He goes on to point out the reflective nature of metadisciplinary approaches:

> Theorists are part of the environment that they theorize about. The products of theorizing are information artifacts that are also part of the environment... The term 'metadisciplinary' is developed to describe the inherent and self-referential nature of this structure. The structure of metadisciplinarity connects theory and practice. This stands in direct contrast with studies approaches, such as performance studies...
>
> (Kerne 2005, p. 181)

As such, metadisciplinarity is presented as the meshing of interaction theory and its activation through practice via reflective 'recombination of disciplinary systems' (ibid, p. 183). Kerne emphasises that metadisciplinarity exists in the **doing** of a research project where the juxtaposed disciplines initiate a process of imperfect translation between their methods, and

through the effort of the respective disciplinarians in resolving ambiguities, can 'create new species of meaning' (ibid).

> The notion of metadisciplinarity develops a structurally identical chain of self-reference… Our process of referencing is situated in our bodies, which are connected to technology and information through sensation, in experiences of reading and writing, seeing and clicking, authoring and designing. Sensation and action mesh in cognition. Action has the potential to express and create. This grounds metadisciplinary inquiry in an ecosystem of practice…
>
> (Kerne 2005, p. 183)

Kerne's metadisciplinary theory is presented due to its pertinence to the methodology employed for my Practice Research; further to the discussed approach by Robin Nelson (see 1.3.1), Barbara Bolt posits that 'research commences in practice' (Bolt 2004, p. 1) through applying the notion of Heidegger's **handlability**, arguing that 'we do not come to "know" the world theoretically' (Bolt, 2006, p. 6). Furthermore, Kerne's opposition to the theoretical approach of performance studies is in accordance with Experience Bryon's criticisms of the latter's 'liminal field' which acts as a 'between space linking a linear journey from performer to performance' (Bryon 2017, p. 40), and also relates to her core notion of the **active aesthetic** as a 'self-reflexive' process where 'knowledge of any discipline… reside[s] in the practices of its practice(s)' (ibid, p. 2).

At this point, I will clarify that it is not my principle intention to align with a particular definition of disciplinary interaction. Rather, the above theories demonstrate the need for context when using a singular term, such as interdisciplinary. My position is that this context is best provided by the subject and **aim** of the **research**, the **process** by which the research is conducted, and the **outcome** emerging from that research. In other words, while cognisant of the process stipulated by each modes of disciplinary interaction, a practitioner should be able to **activate** the most appropriate mode towards facilitating a particular **interaction** towards **reaching** a specific endeavour, which can potentially involve several modes activated within the same project between the different coalescent elements, be that disciplines, mediums, or practitioners. In accomplishing these aims, I turn to **polydisciplinary**; it reflects a practice involving more than one **discipline**, more than one **practitioner**, and more than one mode of **interaction**. Shielded from theoretical paradigms that narrowly focus on distinct modes of interaction, polydisciplinarity proposes the development of a **flexible** environment where the

mode of interaction between practitioners and disciplines is adapted according to the goals and processes of each individual project while these emerge during its **doing**, and holds the potential to overcome problems emerging through following a **preconceived** mode while a project is still in its early theoretical stages of conception. This interpretation of polydisciplinarity reflects in many ways the manner in which symbioses are identified; quite like mutualisms, commensalisms, and parasitisms are identified through the properties of a relationship – the fitness outcome experienced by the host – the context of a polydisciplinary endeavour is determined by the **doing** of a project – the influence between the involved disciplines, objects, and practitioners. And as symbioses are **context dependent** and **dynamic** according to environmental factors, a polydisciplinary endeavour remains **flexible** and **adaptable** according its requirements as and when these **emerge** while the project **progresses**.

2.2.3 Polydisciplinarity in creative practice

This section provides a summary of the interactions modes that are most relevant to my practice, and consequently to this Practice Research, illustrated through examples of creative practices activating different modes of polydisciplinarity. This analysis will be then related to the symbiotic concept, used as a basis on which I construct the analytical framework presented in the third chapter.

While the theoretical context of disciplinary interaction provides definitions for each mode, a question that may arise is whether this is also reflected in practice; how many practitioners, especially those active within artistic practices, identify their practice as pluridisciplinary or metadisciplinary? In my experience, few do so. As the principal curator of the Metanast collective, I, along with a team of co-curators, producers, and volunteers, have for the past four years produced events of experimental practices, with a particular focus those expressing through sound. As part of our early activities, a series of open calls for submissions attracted well over four hundred applications, many of which included works which combined more than one discipline. What is of interest to this section's topic, is that the vast majority of those practices were self-identified as multi-, inter-, and trans-disciplinary, with fewer carrying the cross-disciplinary label. I am not claiming that creative practices are not able to activate pluri-, cross-, or meta- modes, but rather that practitioners are, firstly, more likely to appropriate the terms familiar within the culture of the wider field, and, secondly, appear to be less interested in the more obscure theoretical details of disciplinary interaction. Instead, the

purpose of using these terms is an attempt of **communicating** a particular type of practice, rather than expressing the processes of their practice. This view of simplicity in communicating the mode of a practice is shared by visual artist and animator Alessandra Leone, who within the StratoFyzika collective interacts with practitioners working with the mediums of sound and movement. On the subject of StratoFyzika's disciplinary interaction, in an interview with Leone I asked if they identify their disciplinary interaction under a particular mode:

> We did put thought into this, and after some research on the different types we decided that interdisciplinary best represents [the collective]. But that's really an academic issue, it wasn't important to us. We only used that term as a way of explaining what we do to others, rather that defining how we work together.
>
> (Leone, personal interview, 19 February 2018)

This exhibits an aspect of creative practice that become embodied in this research; the external elements of a practice can, and often differ from its internal operations, with this deviation however not disputing their intimate connection. In other words, the manner in which a practice is **perceived**, **presented**, and **disseminated** can provide a **different** account from the way its **doing** is organised. If this is related to notions derived from the previously presented sources from the field of biology (see 2.1.6), the internal processes within a creative practice, its **doing**, can be related to an organism's **genotype**, with **phenotype** connected to the manner in which that practice **manifests** to its audience and community. This aspect of obscuring the inner processed of creative practice is a subject that also concerns collaborative practices, and I will be addressing in more detail during later sections. Here, I will present examples of practices which concern the utilisation of more than one discipline, and manifest through a single practitioner[7].

One such practitioner is musician and computer programmer Alex Mclean, who is most notable for setting the foundations of the Live Coding practice by developing the TidalCycles programming environment (Bell, 2015), and being one of the founders of Algorave (Muggs, 2013). McLean, who self-identifies as 'an interdisciplinary researcher, with interests

[7] As will be discussed in more detail in section 2.3, the lack of apparent collaborators within a practice does not imply that the practitioner in question has not benefited from interactions with other artists, technicians, scholars, or facilitators. Rather, it suggests that the outputs emerging from that practice acknowledge a sole author.

surrounding computer programming as a cultural activity, particularly in music performance' (McLean n.d.), performs music through the use of text-based programming environments, with the outcome related to the aesthetics of Electronic Dance Music (EDM). What is interesting from examining Mclean's practice is the multiple modes in which disciplinary interaction manifests. On one hand, his performances involves an overlap between computer programming and EDM music, with each discipline **supporting** each other yet remaining **distinct**; TidalCycles was designed specifically to facilitate the performance of live electronic music, with the resulting music being shaped by the limitations and additions of the programme when compared to the more traditional approaches in performing EDM, i.e. those made possible through the use of platforms designed specifically for this practice, such as Ableton Live or Bitwig Studio. As such, interdisciplinarity is evident in that the two involved disciplines are affected and altered by each other, yet remain distinct; TidalCycles is different to a programming environment used to perform non-musical tasks, and the resulting EDM compositions are different from those created with more traditional software[8]. However, in recent years Live Coding has been established as a distinct discipline within the field of electronic music performance, with dedicated means of dissemination, practitioner community, language, methodology, series of peer-reviewed publications (Magnusson & Sicchio 2016) (Dean & McLean 2018), and articles in mainstream media. As such, it can be said that the manifestation of Live Coding as a distinct discipline is an emergent property of transdisciplinary interaction. At the same time, the development of TidalCycles was conducted independently from EDM, while however maintaining the production of that particular genre as its perspective, in which case a multidisciplinary approach at the conception of Live Coding is evident. This examination serves as the starting point towards identifying different stages within a creative practice, a subject pertinent to my symbiotic framework, as presented in chapter three.

With McLean's practice exhibiting disciplinary **support**, other practitioners approach their engagement in more than one discipline through juxtaposition rather than integration. One such practitioner is Marc Yeats, whose practice is described as a 'boundary pushing contemporary composer and visual artist' (Noel Music n.d.). While Yeats is notable for his

[8] I reach this conclusion as someone who possesses a general understanding of text-based programming and an extensive knowledge of EDM as a consumer, curator, producer, and performer. Having experienced performances of Mclean, my understanding was that the music generated by TidalCycles through the performer's text inputs was referencing EDM, without however considering it a typical example of the genre.

compositions, with regular commissions and awards internationally, his visual arts practice is also prolific. From examining Yeats' written accounts, the outputs of the two disciplines he is active in are generally kept separate, with each medium presented within separate exhibitions. However, it is also evident that his knowledge and experience in the two disciplines have a reciprocal effect on each other. In his contribution for the project Viscerebral, Yeats explores the 'association between music and painting' (Yeats 2013). His further statements posit a salient point in exploring disciplinary interaction:

> I know it is impossible to 'paint music' in any real [truthful] sense and have observed that when most visual artists cite a connection between their visual work and music it is through affectation [a purely emotional, indulgent or even nostalgic response], illustration or pure fiction. I felt it necessary, as far as I was able to avoid these pitfalls.
>
> (Yeats 2013)

In acknowledging the difficulties in connecting sonic and visual mediums[9], Yeats explains his approach of **embodying musical gesture** in the **visual medium**. He describes these paintings as 'mapping exercises' which 'petrify a moment in time, an event or gesture[s]' (ibid) from one of his scores. With this in mind, it is evident that his knowledge in music serves as inspiration towards realising outputs in a visual medium, while the two remain explicitly separate yet **complementary**. While this juxtaposition of mediums suggests a multidisciplinary approach, it also raises a question on disciplinary influence; since Yeats' tools and methods do not facilitate a direct connection between the sonic and visual mediums – as opposed to practitioners engaged in electronically-facilitated audiovisual performance, e.g. Robert Henke –, the influence occurs on a personal and conceptual level. This aspect will be examined later as part of my discussion on collaboration, and forms one of my core arguments towards identifying influence in my collaborative framework in relation to organism's influence on each other during symbiotic relationships.

[9] While Yeats' actual statement refers to music and visual in a more general sense, it is worth stressing that this refers specifically to orchestral music and painting, as the mediums of sound and visuals have been effectively combined through digital applications for some time now, and have often resulted into novel transdisciplinary practices and outputs, e.g. *Molecular Music* (Hyde, Mitchell & Glowacki 2014).

From the complementary and supportive mode of multidisciplinarity, transdisciplinarity sits on the opposite spectrum of integration between the involved subjects. In conceiving a project, ideas are drawn concurrently from any source of disciplinary knowledge available to the practitioner. The project then develops through a process of balancing the contributions of each discipline, often in unequal parts, with the outcome manifesting as an artefact that proves difficult in placing within a single discipline. Thus, the unidentified area becomes a new discipline, as with the aforementioned processed of transdisciplinary **integration**. An often-cited example of such practitioner is Stelarc, described as 'one the most celebrated artists in the world working with technology and the visual arts' (Smith 2005, p. i), and further as a 'nomad who moves across institutions and nations and between discipline boundaries engaging in and reterritorialising ideas' (Thomas 2011, p. 115). Stelarc's own biography identifies him as a performance artist, a discipline which best approaches his placement within the range topics and mediums encompassed in his work. Performance art is defined by the Museum of Modern Art as consisting of 'four elements: time, space, the performer's body, and a relationship between audience and performer', with the medium being the artist's body, and the work manifesting through the actions they perform (MoMA n.d.). Seminal artists falling under this discipline include Marina Abramović, best know for performances that explore limitations of the body and the mind (Demaria 2004, p. 295), and Olivier de Sagazan, who treats his body as canvas on which he builds images with layers of clay and paint (Sagazan n.d.). Quite like Stelarc, these artists use their bodies as the first point of reference through which they will explore the relationship between other mediums, the space of the performance, and the relationship with the audience witnessing the performance. However, the main difference between Stelarc's practice and these definitions of performance art is the focus on technology, and the hybrids it creates when connected to his body. In other words, the body becomes the **connecting** and **directing** agent **between** and **for** the different mediums used in his works respectively. His works include several methods, such as sonification of electrical signals from his muscles (Linz 1992, in Donnarumma 2014, p. 10), augmentation with robotic extensions controlling audiovisual elements, and interactive digital avatars of his head (Dixon 2007, p. 263). As with the large body of writings on Stelarc's work, his practice has given basis on the development of new media art as a distinct discipline.

A contemporary example of media art practitioner is Marco Donnarumma, who identifies his practice as 'deeply transdisciplinary', drawing 'equally from live art, music, biological science, computation and cultural studies' (Donnarumma n.d.), and who considers transdisciplinarity an inherent part of artistic practice (Donnarumma 2016, p. 8). Having

experienced his work *Corpus Nil*, this particular interaction mode was illustrated through the ambiguous nature of the spectacle, with the employed expressive mediums – sound, light, and body – **integrated** to level which makes them almost **unperceivable** as **separate** entities. As with the previous assertion of the body being the connecting and directing agent in the discipline of media art, Donnarumma's body during *Corpuls Nil* is used towards controlling the sonic and visual elements, as well as expressing the work's conceptual and aesthetic aims (ibid, pp. 193-99). Similar approaches in regards to utilising body as the link between tools, aesthetics, and performance has been a central focus in my collaborative practice, as I detail in chapter four, with the modes of interaction between performers and mediums informing areas of my symbiotic framework, presented in chapter three.

2.2.4 Polydisciplinarity through the lenses of symbiosis

In previous sections I presented examples of 'close and persistent' interspecific relationships as means of illustrating the different types of symbioses in nature (see 2.1.2 – 2.1.4). With closeness being one of core characteristics of symbiosis, different relationships exhibit varying levels of closeness between the organisms, the least of which evident in those where the organisms are living next to, on to, or close to each other. One such relationship is that between cleaner fish and their clients (see 2.1.4), who exploit each other's traits through frequent yet brief interactions, with both partners remaining **independent** in terms of mobility and influence. With this in mind, the level of closeness between these symbioses relates to a multidisciplinary mode, where the interacting disciplines are **complementary**, and while exerting some influence on each other, remain **distinct** and **identifiable** as complete and unaltered disciplines. A higher level of closeness is identified in relationships where the organisms establish **interdependency** between them, making their separation a more complicated process. Such relationships are those between ticks with giraffes, or those between barnacles and whales; in both cases, the symbiont is firmly attached on its host's body, and being obligate relationships[10], the symbiont's survival depends on maintaining the **support** they exploit from their host. Considering the integration level evident in these symbioses, these are reflected in the mode of interdisciplinarity. During interdisciplinary interactions,

[10] In relationships where the symbiont's survival depends wholly on establishing a relationship with a suitable host, it is described as an obligate relationship, whereas facultative refers to engagements which aim to improve their interacting organism's wellbeing, without however being essential (Louie 2010, p. 496).

disciplines invite each other within their domain, share language, methods, and tools, and although become **interdependent** on the course of achieving their aims, remain distinct and identifiable.

The highest level of integration observed in symbiosis concerns organisms which evolved through the fusion of two or more previously distinct species, such as those emerging from the process of symbiogenesis (see 2.2.1), such as eukaryotes evolving from the endosymbiosis of bacteria and archaea, the siphonophore man o' war made of an interwoven mesh of specialised individual species, and lichens resulting from the integration of algae and fungi. In these relationships, the previously independent species have **lost** their **identities**, and their **traits** and **abilities** become **combined** within a homogenous system from which an entirely **new species** emerge. The properties of these symbioses are reflected in transdisciplinary approaches: the involved disciplines are **inseparable**, their contributions delimited to elements that can support and enrich each other within a novel area that is **indistinct** from the mere sum of its combined disciplines. And through persistence and time towards developing a community and dissemination of the new practice, as with the aforementioned definition of transdisciplinairty, a novel discipline emerges, akin to the new species.

From this **conceptual** debate between the traits of polydisciplinarity and those exhibited by symbiotic relationships, I am setting the foundation on which I will debate collaboration through the lenses of biological interactions, presented at the end of the next section, following a review of relevant theories, positions, and practices.

2.3 Collaboration

2.3.1 Defining types of group work

As with the previous topics of symbiosis and polydisciplinarity, collaboration is a subject that while has been extensively studied, the use of the term is often ambiguous[11]. Akin to the erroneous interchangeable use of modes of polydisciplinarity (Moran 2010, p. 14), collaboration is often employed to refer to all types of collective work. Paul Jeffrey observes the existence of 'significant difficulties in turning cooperation (working together for individual ends) into collaboration (working together for a common end)' (Jeffrey 2003, p. 540). This provides the first deviation from lexicological definitions, where collaboration and cooperation appear synonymous (OED n.d.). Instead, Jeffrey points out the distinction between the two types of collective work as the **shared aims** among practitioners. The same sentiment is also raised by Kathleen Blake Yancey and Michael Spooner, who identify collaborative outcomes 'as if the conceptual object were produced by a single good mind' (1998, p. 50), and then cite John Smith's distinction between collaboration and cooperation:

> Cooperative work is less stringent in its demands for intellectual integration. It requires that the individuals that comprise a group... carry out their individual tasks in accord with some larger plan. However, in a cooperative structure, the different individuals... are not required to know what goes on in the other parts of the project, so long as they carry out their own assigned tasks satisfactorily.
>
> (Smith 1994, in Yancey & Spooner 1998, p. 50)

In describing collaboration as a 'single mind', the authors point out that integration among collaborators refers to their **cognition** and **participation** on all **elements** from which the collaborative outcome emerges. Seana Moran and Vera John-Steiner identify two further types

[11] While anecdotal evidence at best, this ambiguity was encountered during two collective residencies I participated in the last year, where the facilitators persisted on referring to sharing presentations and social events as 'collaborative sessions', something which is arguably erroneous when considering the presented theories.

of joint work, 'social interaction and working together', before presenting them on a continuum of integration levels between the involved individuals:

> Social interaction involves two or more people talking or in exchange, cooperation adds the constraint of shared purpose, and working together often provides coordination of effort. But collaboration involves an intricate blending of skills, temperaments, effort and sometimes personalities to realise a shared vision of something new and useful.
>
> (Moran & John-Steiner 2004, p. 11)

While this definition suggests that shared purpose also exist in cooperation, I understand this to exist within a continuum of integrations, not unlike the way Jensenius (2012) organises the integration levels between the different modes of polydisciplinarity (see 2.2.2). As such, Moran and John-Steiner identify three traits of collective work, ranging from **discussion**, through to **shared purpose**, and onto **coordination**. However, they point out that collaboration requires a sophisticated level of **interaction** between individuals that goes beyond the elements of the work, and onto the collaborators' **dispositions** through their blending of temperaments and personalities.

With the aforementioned sources concerning the integration between practitioners, Steve Dixon explores the elements of interactivity – in the context of technologically-facilitated performance art – where he discerns a range of types from least to most interactive: navigation, participation, conversation, and collaboration (Dixon 2007, p. 563). Dixon expands on each level of interactivity, with navigation being a simple prompt to a response resulting in a flexible but determined outcome (ibid, p. 566), participation as a higher level of engagement with more evident interaction (ibid, p. 579), and conversation as similar to participation with the exception of reciprocal exchange between the interacting parties (ibid, p. 584). On collaboration, as the most 'open' level of interactivity, Dixon suggests a participant becomes a major **co-author** of the work, with the original creator being less able to anticipate the result (ibid, p. 595). Although this position was made in relation to interactive art, Dixon's analysis leads me to two conclusions which have been crucial to the development of my arguments: firstly, **determinacy** of outcome diminishes with an **increase** of **interactivity**, and secondly, higher levels of interactivity, such as collaboration, deem participants as **joint creators** of the creative outcome.

The first aspect of expected outcomes can be understood in two ways; in regards to interactive systems, a more 'open' system suggests more variables in the potential **decisions** of the **participants**, be that performers or audience. As a result, more variables and choices leads to less **determinacy** in the final outcomes. An example of this variations in determinacy is the difference between an orchestra performing a score and a free improvisation ensemble. With regard to a collaboration, by increasing the amount of interacting 'skills, temperaments, effort and… personalities' – as with Moran and John-Steiner's earlier statement – the more potential for any preconceived aims to become diffused, through either enrichment or compromise. It could be said that this is where the power of collaboration lies, which is the representation, or **expression**, of **combined** efforts within a singular **outcome**, as with Smith's 'single good mind' (Yancey & Spooner 1998, p. 50).

The second aspect of co-authorship is less clear; on one hand, it could be assumed that anyone contributing to a joint endeavour is automatically assigned authorship. However, a closer examination of research endeavours demonstrates the opposite. As often seen in past scientific journals created by more than one author, the sequence by which authors' names are listed suggest a clear hierarchy between the roles of principal investigator, research assistants, and technicians (Taylor & Francis Group 2017, p. 8). As is often the case, individuals who contribute towards the realisation of a project are not assigned claims towards its authorship reflecting their contributions, but rather that of their influence within the research project. A similar approach is evident in creative practices; using music as an example, authorship is deemed to fall entirely with the composer, especially in its romantic notion as the 'solemn genius author of the musical work', and who are 'presented as the main author of the musical pieces in programme books' (Groth 2016, pp. 687-8). This aspect of the ways collective work is **presented**, or rather how its **doing** is outwardly **expressed**, will be a salient point for this research, and the ways biological associations are interpreted within collaborative practice, as I will present over the following sections.

Having mentioned the romantic notion of the 'solemn genius author' provides a prompt for investigation, where **understanding** of what collaboration is derives from firstly **eliminating** what collaboration is **not** – an apophatic approach – which I present next.

Sociologist Howard Becker discusses the notion of division of labour within works seemingly completed by a single creator, by noting on the subject of Victorian-era publications that 'many of the great novels of the period which appear to be the unaided product of creative genius were often... the outcome of collaboration' (Sutherland 1976, in Becker 1982, p. 124). On the subject of music composition, while the composer is presented as the art work's sole

author, it cannot be said that she/he performed all necessary tasks towards the completion of the work. As with the previous point on novels, Becker points out that the creation of an orchestral work requires the completion of several tasks which often fall to different individuals – from constructing the musical instruments to advertising the concert (ibid, p. 2) – in what he describes as the production of 'patterns of collective activity we call an art world' (ibid, p. 1). It would be difficult to consider all of the people completing these tasks as co-authors of the work in question, despite their necessary contributions towards its realisation. Becker considers that the 'craftsmen who help make art works are as important as the people who conceive them' (ibid, p. ix), as a way of distinguishing between labour and artistic work, which is another area I will be discussing later, as a dichotomy that has been diminished through the advent and utilisation of new technologies in creative practice. He then goes on to define the artist as 'the person who performs the core activity without which the work would not be art', and the one performing tasks which cannot be done by others (ibid, p. 25). He concludes on the subject of collective work, and how the artist/author relates to the 'others':

> The artist thus works in the centre of a network of cooperating people, all of whose work is essential to the final outcome. Wherever he depends on others, a cooperative link exists. The people with whom he cooperates may share in every particular his idea of how their work is to be done. This consensus is likely when everyone involved can perform any of the necessary activities so that, while a division of labour exists, no specialized functional groups develop.
>
> (Becker 1982, p. 25)

From this it is understood that the author/artist serves as the person who manages the 'cooperative network' of those carrying out all necessary actions towards the completion of the work, actions which must be conducted according to the author's instructions. Considering the previous definitions of collective work, the process described by Becker is appropriately deemed cooperative, where the involved individuals are connected by a shared purpose, that is the author's work, while each individual's actions aim towards different ends. In response to Becker's sentiment, John-Steiner identifies this cooperative network in the work of author

Tony Kushner[12], who claims that the romantic notion of the isolated artist conducting all the labour towards the completion of their work is 'politically charged', and his work would have been entirely different without the participation of this collaborators and family (John-Steiner 2000, p. 13). However, in line with the aforementioned trait of participants being **cognisant** and actively **engaged** in all elements of the work (Yancey & Spooner 1998, p. 50), a practitioner's wider social circle is made of individuals who are in **direct** contact with the **author**, but not with the **work**. This distinction is important; every person a practitioner interacts with will inadvertently affect them in one way or another, and consequently their work. However, collaborations are joint endeavours, and as such any external stimuli would need to be jointly assessed before it becomes appropriated within the work. As such, what Kushner describes about external contributions would fit within the environment of **social interaction**, where people exchange ideas (Moran & John-Steiner 2004, p. 11), or under the model of 'distributed collaboration' (John-Steiner 2000, p. 118), which takes place in more 'casual settings' than the **collaborative** environment, with participants' roles often being 'informal and involuntary' (ibid). As I present later, this distinction between social and collaborative **environments** plays and important role in understanding collaborative interactions in relation to the symbiotic concept.

As mentioned earlier, an artistic output is dependent on a network of specialised personnel carrying out necessary tasks towards the development of the work under the guidance of the creative practitioner (Becker 1982, p. 124). On the same subject, Becker makes a sobering yet important observation:

> People enter a pool of personnel resources by learning how to do what people who perform a function in an art world do, by learning to do one of the support tasks that world's artists need… When called on, then, they can step in as more or less interchangeable parts capable of doing the job to be done as well as any other member of their category. One of the most important things an art world provides its artistic members is a supply of interchangeable human parts. When you can count on replacing people with others just as good, you can carry on artistic work in a routine way.
>
> (Becker 1982, p. 78)

[12] I need to stress here that while the examples in this section thus far do not concern collaboration, their analysis holds important value towards constructing a definition of collaboration, quite like the definition of symbiosis emerged from excluding associations which do not exhibit symbiotic traits.

This statements finds me particularly uncomfortable in characterising individuals contributing to the realisation of a work as 'interchangeable'; at the same time, however, I cannot entirely reject it, as it encapsulates the role of technical personnel who are necessary yet replaceable towards the creation of a work[13], and furthermore takes into account only the quality of outcome, rather than that of process, which is the product of the social interactions between the involved individuals. Nevertheless, through the aphophatic approach of identifying traits of collaborations, reversing the notion of **interchangeability** as a trait of non-collaborative shared work, **irreplaceability** emerges as a significant trait of collaboration. Considering this in line with Dixon's collaborative trait of **co-authorship (**Dixon 2007, p. 595), the conclusion is that a collaborator is one who is irreplaceable towards achieving the shared purpose; to **remove** one of the **collaborators** would be to **affect** the **outcome**. The notion of irreplaceability points towards a shared endeavour where individual practitioners exert a direct and evident influence on the work, and rather than follow explicit instructions from the sole 'genius' artist/author, 'they achieve a critical level of congruence in understanding, in purpose, and in other intellectual dimensions of a project' (Yancey & Spooner 1998, p. 51). Although it could be argued that anticipating specific outcomes of collaboration is nearly impossible, irreplaceability occurs when a partner's purpose goes beyond their skills, and demands for a higher level of contribution. If a joint endeavour simply asks performers to verbatim reproduce predetermined scores or choreography, authorship is presumed towards one partner, and it thus renders the performer as auxiliary in the work's development, and ultimately replaceable towards the joint endeavour.

From the above theories, both describing what collaboration is and what is not, a personal definition of collaboration emerges through the presented traits: firstly, collaboration requires **shared purpose**, **cognition** and **participation** on all elements comprised in a project, and although creative decisions may not always be taken democratically, all collaborators are aware of the purpose of each decision. Secondly, collaborators assume **joint authorship**[14] of their mutually developed work, in response to making their individual contributions available

[13] In Becker's defence regarding his argument on interchangeability of personnel, he goes on to clarify that the quality of the tasks carried out by each individual may differ, and affect the author's working process and outcomes (1982, p. 78), thus placing a value on each participant's individual contributions. Furthermore, he also points out that artists are themselves interchangeable in the greater scheme of the art world, with their professional survival dependent on environmental factors (to use a biological metaphor) made from the motivations of sponsors, institutions, curators, and popularity trends (ibid, p. 231).

[14] It is worth pointing out that the notion of authorship in this case refers less to the legal sense of owning a work's commercial rights, but rather to the sense of declaring a work as the result of ones' efforts and contributions.

to the shared purpose of the collaboration. Finally, the contribution of the collaborators is **irreplaceable** towards the achieved outcome, which would have otherwise been different if conducted with a different practitioner.

In the next section, I present how these traits are organised within the different models of collaboration, and the differences between a collaboration's **phenotype** and **genotype**, i.e. its internal processes and the evident expressions of these.

2.3.2 Organisation of collaborative environments

As with the previous section, my investigation of the different collaborative models begins 'apophatically', by firstly identifying what collaboration **is not**. In discussing authorship within collective work, John Roberts describes the artisan approach, where one practitioner employs their influence and resources towards bringing together a team of assistant and technicians, and guiding them towards the realisation of a creative vision while retaining 'sole authorship' (Roberts 2004, p. 558). However, as with the previously presented collaborative traits, with joint authorship absent, such model falls outside the definition of collaboration. Furthermore, with the artisan's assistants following her or his instructions, there is a further lack of creative input towards the work, in spite of the assistant holding the necessary knowledge for realising that work. Another practitioner employing the artisan model is Damien Hirst, who in accounting an exchange with an assistant of his team, reveals that the assistant's version of his spot paintings would be indiscernible to one of his, yet his would sell for a significantly higher price (Hirst & Burns 2002, p. 8). This suggests that authorship is attached to a practitioner's **creative** input, rather than **technical** craft. However, as I present next, this may not always be the case.

The 1965 *Variations V* by John Cage and Merce Cunningham is described as 'a collaborative, interactive multi-media event with choreographed dance… and live-electronic music often activated by the dancers' movements' (Merce Cunningham Trust n.d.). While documentation attributes sole authorship to Cage and Cunningham (Media Kunst Netz n.d.), *Variations V* was the result of a highly integrated collaboration between several practitioners, as detailed in Leta Miller's ethnomusicological investigation. Arguably one of the earliest examples of performance featuring interaction between sound and movement, *Variations V* used two motion sensitive systems, one made of photosensitive cells and one of capacitive antennae, responding to dancers' motions by triggering sounds loaded on tape players. With

such systems being highly sophisticated for their time, Cage – being the more technologically inclined among the two authors – collaborated with engineers Wilhelm Klüver and Robert Moog towards developing the systems (Miller 2001, p. 552), with Moog creating the antennae system 'in response to Cage's needs' (ibid), while 'Klüver's assistants at Bell Labs' constructed the photocells. Further to the two engineers, several other practitioners were engaged in developing the work; three composers, James Tenney, Malcolm Goldstein, and Fredric Lieberman, as controllers of the tape machines, Dave Tudor operating the mixer with Cage, and seven dancers alongside Cunningham (ibid, p. 545). From analysing the collaborative environment of *Variations V*, it is clear that it followed a hierarchical model, with Cage providing a detailed set of requirements for Moog and Klüver to conduct their work in response. However, the two practitioners were then at liberty to create those systems without further direction, as limited by Cage's limited engineering knowledge. In contrast, the dancers were given precise instructions by Cunningham, whose focus was on 'intense concentration on detail and extreme control…perfected through intensive rehearsal' (ibid, p. 556). Similar instructions were given to the musicians by Cage, consisting of 'thirty-seven remarks' (ibid, p. 546) governing the way sound was generated during the performance. Examining the contrasts in the the authors' interaction with the two engineers and with the performers in relation to the collaborative traits – direct **influence** and **irreplaceability** – I conclude that while the music and dance performers' contributions were the realisations of the respective authors' precise instructions, the contributions of the engineers had influence on the way the work developed by **defining** and **delimiting** the extent to which the authors could stretch their creative input. I posit that had Cage invited different engineers in the collaborative environment, *Variations V* would have been a different work. In contrast, a different set of performers would have made little difference in the creative direction, insofar the practical resources available to the authors[15]. Putting aside the unavoidable commercial concerns of artistic practice, the substantive point between this joint work was that the involved technicians (Klüver and Moog) allowed the artists (Cage and Cunningham) to expand their creative vocabulary through a set of contributions that the artists would not haver been able to implement. Similarly, I argue that the technicians had the opportunity to expand their practice towards a set of aims and outcomes

[15] This argument is based on Becker's previously mentioned notion of 'interchangeability', which concerns solely the creative skills made available by the performers, and does not take into account each individual's 'temperaments and personalities', their ability to integrate within the collaborative environment and effectively interpret and express the authors' directions, which are of course crucial towards facilitating an effective collaboration.

which they alone could not have conceived. It is in this reciprocal exchange of expertise where collaboration lies, with John-Steiner pointing out that 'collaboration offers partners an opportunity to transcend their individuality and to overcome the limitations of habit, and of biological and temporal constraints' (John-Steiner 2000, p. 57). And as I present towards the end of this chapter, this is where the core notion of symbiosis also lies.

Re-examining the issue of authorship of *Variations V*, this is solely assigned to Cage and Cunningham, with the credits of Klüver and Moog being that of technical assistants, despite their evident influence on the work. This disparity between inner workings and presentations is discussed by George Whale, who suggests this aspect is a frequent occurrence in the way collaborations between artists and technologists are outwardly **expressed**. He describes the 'artist/artisan distinction' in relation to the division of labour, with the 'artist' focusing on intellectual tasks, while the 'artisan' is concerned to the manual work (Whale 2010, p. 80). Whale points out that 'the setting apart of the "artist-as-intellectual" is deeply embedded in our culture', with the artist's ability to express their 'inborn genius' through a variety of mediums being a perception which has been perpetuated since the Renaissance (ibid, p. 84). In other words, the value of the technical 'artisan's' contributions towards the work is not lessened by the absent authorship credit, but rather it is a product of a culture which places more value on seemingly creative contributions. With this in mind, and in relation to the symbiotic concept, I posit that the collective efforts of all involved individuals contributing towards the realisation of *Variations V* – or any other creative collaboration to that respect – make up its **genotype**, while its **phenotype** concerns the manner in which that collective effort was communicated, disseminated, and **expressed** to the world outside of the collaborative environment[16].

Whale also states that today's emerging digital technologies diffuse the border between the artist/artisan distinction of past (ibid, p. 80), and allows collaborations to yield benefits for both technological and artistic disciplines (ibid, p. 86). The turning of this cultural thinking is evident in the time that has passed since the creation of *Variations V*, with contemporary practitioners engaged in technologically-facilitated performance art maintaining a collective voice from their collaborations' **genotypes** through to the **phenotypes**. Such approaches are seen in the work of Athens-based collective Medea Electronique, whose group members 'merge separate research and practice fields in an effort to develop a particular style' (Medea

[16] To put this argument bluntly, had *Variations V* been presented to the world as the work of Klüver and Moog, the commercial value of the performance would have been adversely affected.

Electronique n.d.), which while maintaining a 'flexible and dynamic' structure among its members, their collective expression always manifests under a single moniker (Drymonitis, personal interview, 19 March 2018). A similar approach is evident in the work of London-based collective shinkansen; leading members Ghislaine Boddington and Christopher Bannerman describe the collective's structure to be as 'fluid and malleable as the occasion demands' (Boddington & Bannerman 2004, p. 76), with the collective adopting a 'co/inter-authorship' model from early on in their development, against the 'romanticised vision of the single artist' (ibid, p. 77). As with Medea Electronique, their collective authorship approach is motivated by the culture from which the digital tools of their practice emerged:

> emergent, digitally influenced interactions did not allow the ideology of the single author to be maintained and challenged the doctrine by putting forward notions of collaborative endeavour and shared ownership… A key development therefore, arising from the interaction between digital technology and the performing arts, has been the growing awareness of collaborative processes, and even the celebration of collaboration as a dynamic mode of creating innovative work.
>
> (Boddington & Bannerman 2004, p. 77)

This way of thinking derives directly from the ethics evident amongst digitally facilitated practices, with online communities championing 'initiatives such as open source and the copy-left movement' opposing the 'divinely inspired artist' which dominated the traditional performing arts (ibid). The authors acknowledge some of the exceptions falling outside this criticism, such as improvised and folk dance, by pointing out that:

> there is no sense of a single individual owning the work, neither is the work diminished by this pooling of individual energies into a collective whole; rather the collective endeavour is seen as intrinsic to, and a key feature of the performance.
>
> (Boddington & Bannerman 2004, p. 77)

In describing shinkansen's structure, Boddington and Bannerman point out the collective's sense of joint authorship and lack of hegemonic hierarchy, with Boddington holding the role of 'process director', as means of indicating the management of the collaborative environment and the engagement between participants through a system of 'dynamic hierarchy' which

organically emerges between each subgroup, or 'cells', that is involved with carrying out particular tasks towards the work. The point of interest from this approach is that the collective acknowledges that while each 'cell' may develop a system of hierarchy between its members, this will not persist as the members shift between 'cells', thus maintain the 'fluidity of each individual's involvement', with the process director ensuring the 'maximum participation/inclusion of each individual and subgroup' (ibid, p. 79). In this manner, shinkansen is shown to value a dynamic engagement between its members, and stipulate that 'participants are comfortable with the kind of fluidity of identity that stems from this process and that they are willing to exchange freely with others' (ibid, p. 78). This type of organisation is reflected in the 'dialogic' environment stipulated by Lisa Ede and Andrea Lunsford, which sits on the opposite of the 'hierarchal':

> This [hierarchical] form of collaboration is carefully, and often rigidly, structured, driven by highly specific goals, and carried out by people playing clearly defined and delimited roles... Because productivity and efficiency are of the essence in this mode of collaboration, the realities of multiple voices and shifting authority are seen as difficulties to be overcome or resolved... [The] dialogic mode is loosely structured, and the roles enacted within it are fluid: one person may occupy multiple and shifting roles as a project progresses...[T]hose participating in dialogic collaboration generally value the creative tension inherent in multivoiced and multivalent ventures.
>
> (Ede & Lunsford 1992, in Yancey & Spooner 1998, pp. 48-49)

As such, the previously examined collaboration towards *Variations V* exhibits the 'hierarchal' model[17], with the authors holding the creative direction, while the 'dialogic' is evident among the fluid and dynamic interactions between the members of the two aforementioned collectives.

In line with the symbiotic concept, this **fluidity** among members' interactions organised through a 'dialogic' model is reflected within the **dynamic** nature of symbiotic relationships. And quite like the manner in which 'two partners relate to one another at a given time and place' (Yong 2017, p. 80) is susceptible to **environmental** factors, in the context of creative

[17] While the authors refer to their systems of organisation as 'modes', I maintain the previously used term 'model', as to avoid confusion with the information presented in the following section, which focuses on modes of interaction between practitioners.

practice these factors concern the **requirements** emerging from each specific project. At the same time, with conflict being an intrinsic part of symbiosis, the 'hierarchical' model of organisation is reflected in the ways the 'controlling partner' (Douglas 2010, p. vii) ensures the integrity of the symbiosis.

Having examined the distinction between the ways a collaboration **operates** and the ways it **manifests**, as well as models of **organising** collaborative environments, the next section presents the specific modes of collaboration through which practitioners **interact** with each other and their respective **disciplines**.

2.3.3 Modes of collaboration

While the previous section focused on the organisation of the inner workings of collaborative environments, and the role of hierarchy and authorships towards defining the outwards expression of collaborative outcomes, here I examine the specific modes by which practitioners interact in the **doing** of creative practice.

Having identified the aforementioned hierarchical and dialogic models of collaboration within the respective practices of artist/authors such as Cage and Cunningham and those of collectives such as shinkansen and Medea Electronique, John-Steiner identifies two types of collaboration, 'complementarity and integrative' (John-Steiner 2000, p. 197), respectively described as the 'most widely used' and the 'most likely to result to domain change'. John-Steiner defines complementarity as a juxtaposition of expertise, disciplinary knowledge, clarity of roles, and division of labour, where partners engage in 'mutual appropriation' which 'implies a very particular form of human interdependence that takes years to be fully realized' (ibid, p. 199). In the case of integrative collaborations, these result from a prolonged 'period of committed activity' where participants often 'construct a common set of beliefs or ideology' (ibid, p. 203), and whose identities merge into a 'fusion of personalities' (Moran & John-Steiner 2004, p. 14). Integrative collaborations are further characterised by a long-term association, as opposed to complementarity which allows for more space between the partners (ibid, p. 19).

Examining the collaboration of Cage and Cunningham according to John-Steiner's modes, elements of both integrative and complementarity collaboration emerge; on one hand, Cage and Cunningham were engaged in a long-term collaboration, as well as being life partners, thus suggesting a **merging** of personalities to the degree that couples engage in, as

well as sharing working approaches, such as the use of chance and stochastic methods in arranging their respective mediums (Merce Cunningham Trust n.d.). At the same time, one of the most pronounced element of their joint work was the **independence** of their mediums, and the distinct ways they instructed their artistic personnel. Cage is renowned for his use of chance procedures, and almost abstract instructions from which performers had to derive meaning through their own interpretations, an approach which was ultimately described as 'disciplined improvisations' (Kauffman, Cage, & Alfred 1966, p. 46). In contrast, although Cunningham also used improvisation and chance in constructing his choreographies, dancers were provided with explicit and unambiguous instructions, as presented in the accounts of *Variations V*. William Fetterman describes that 'Cage's music… involves notation indeterminate of its performance… Cunningham's choreography involves the minute parameters of both concept and realization' (Fetterman 1999, p. 122). He further distinguishes the independence of the two practitioners and mediums:

> The over-fifty-year collaboration of John Cage and Merce Cunningham is typically known for the independence of the music and the dance, sharing only a common duration… Cage's score for the conductor in *Concert For Piano and Orchestra*, and Cunningham's performance, constitute a summation of their nature collaborative process between the music and the dance as separate yet mutually inclusive entities…The choreography and music, independently composed, share only a common time and place of performance. It is therefore most convenient and practical to view Cunningham's choreography and Cage's music as being separate, non-causal simultaneities.
>
> (Fetterman 1999, p. 122)

Here we see how theoretical definitions of collaborative modes can be ineffective in practice, since the collaboration between Cage and Cunningham displays elements of both complementarity and integrative modes, whereas John-Steiner presents both as distinct modes of collaboration.

Reflecting on this aspect, I am drawn to the fact that John-Steiner's expertise focus on linguistics and educational psychology (University of New Mexico n.d.), with her published work on collaboration being the result of interviews with artists rather than an outcome of direct engagement with creative practice, or, in her own words, 'the study of partnered endeavours' (John-Steiner 2000, p. 191). In line with the employed Practice Research methodology,

theoretical frameworks borne out of practice seem more cogent towards this research. Sam Hayden and Luke Windsor present a set of modes by which collaborative relationships are organised by focusing on the interaction between **practitioners** and their respective **mediums**, rather than their **personalities**, as with John-Steiner's approach. The authors identify three modes of interaction in relation to collaborations between music composers and instrument performers:

> DIRECTIVE: The traditional hierarchy of composer and performer(s) is maintained and the aims to completely determine the performance through the score… The collaboration in such situations is limited to pragmatic issues in realisation, as outlined at the end of the introduction.
>
> INTERACTIVE: here the composer is involved more directly in negotiation with musicians and/or technicians. The process is more interactive, discursive and reflective, with more input from collaborators than in the directive category, but ultimately, the composer is still the author.
>
> COLLABORATIVE: here the development of the music is achieved by a group through a collective decision-making process. There is no singular author or hierarchy of roles.
>
> (Hayden & Windsor 2007, p. 33)

Unlike John-Steiner's approach, Hayden and Windsor provide accounts grounded in direct engagement with practice. Within the three modes – directive, interactive, and collaborative – previously mentioned collaborative traits are identified, such as complementarity and integrative approaches (John-Steiner), dialogic and hierarchical models (Yancey & Spooner). At the same time, Hayden and Windsor's model demonstrates that since all contributors have a direct influence in the work across the spectrum of modes, they remain authors within the collaborative environment, thus meeting the aforementioned trait of **joint authorship**. The other point of interest from the above modes focuses on the implication of variable influence between each mode in relation to the level of input expected from partners. While during a collaborative mode the diffused hierarchy stipulates that all partners will contribute to all aspects of the project, the interactive mode goes to restrict that range to suggestions and negotiations, approaching that of technical input, as seen in the aforementioned examination

of *Variations V*. And this expressive liberty is absent in the directive mode, where the traditional author-genius attempts an emergence, yet is supressed by the factor of joint authorship.

2.3.4 Collaboration through the lenses of symbiosis

Another crucial realisation occurred when examining Hayden and Windsor's modes; with their modes being the same number as the types of symbiotic relationships, and based on a varying level of liberty towards creative contributions, this can be related to the biological notion of fitness outcome, which is the central factor by which symbioses are classified. While biological associations are determined according to the host's experienced **harm** and **benefit**, collaborative associations can be determined according to **restriction** and **liberty** in creative input.

As will be seen on the following two chapters, with the compiled connections between symbiotic relationships and polydisciplinary collaboration presented in chapter three, and the practice from which these connections were observed and experienced in their activation, clear patterns between the two systems of interaction emerge. As means of introducing the connections between the two systems, I recap the central arguments from two leading figures in their respective fields:

> Symbiotic interactions are those relationships between organisms that permit some species to overcome their physiological limitations by exploiting the capacities of others.
>
> (Douglas 1994, p. i)

> Collaboration offers partners an opportunity to transcend their individuality and to overcome the limitations of habit, and of biological and temporal constraints.
>
> (John-Steiner 2000, p. 57)

From the above statements it is understood that relationships between diverse individuals facilitates the advancement of both parties towards a common goal, be that chances of survival through increased fitness, or the development of creative outcomes through joint processes.

2.4 Conclusions from key theories

The theories examined in this chapter provided an understanding of the ways interactions manifest between disciplines and practitioners, and how these can be interpreted through the modes of relationships observed between organisms engaged in symbiosis. Beyond this interpretation, three traits emerged through which creative collaboration can be identified: joint authorship, complete cognition, and irreplaceability. The following chapter will utilise these understanding towards constructing the first contribution of this research, an adaptive framework for polydisciplinary collaboration in performance practice.

Chapter 3
Adaptive Framework

In the previous chapter, I presented theories on three distinct subjects: symbiotic relationships, disciplinary interaction, and collaboration. Having gained a significant understanding of the mechanisms by which organisms of different species form mutually beneficial relationships in, this knowledge was then placed in a conceptual debate with the two other subjects of my thesis, polydisciplinarity and collaboration, as means of connecting the interactions between organisms and their evolutionary traits with those between practitioners and their disciplines respectively. This chapter aims to coalesce the conclusions resulting from these connections, and interpret them into a framework for polydisciplinary collaboration between performance practitioners.

I start by summarising the elements and characteristic of both symbioses and collaborations, and present my subjective interpretations between the two types of interactions. This is followed by a discussion on context-dependent language, where the terminology from biology is weaved within the operations taking place during collaboration, and how new understandings emerge from these connections. I then present the symbiotic framework, and conclude the chapter by presenting three case studies through which the framework's analytic function is activated.

3.1.1 Identifying Elements of Interaction

As discussed in the previous chapter, symbioses are susceptible to change in ecological time due to external factors, or incompatible metabolisms; in the case of the sea anemone being able to extract energy from its symbiont's excrements, compatible metabolisms are evident. Even in cases where a non-reciprocal symbiosis begins between incompatible partners, over evolutionary time, however, organisms' traits adapt as to better fit each other, their environment. The new traits adapt as to manage conflict, converge their functions towards a 'metabolic complementarity' (Moran 2007, p. 866), and approach towards a reciprocal exploitation, thus turning the relationship mutualistic, as with the established evolutionary trend (see 2.1.5).

Looking at this notion in the context of polydisciplinary collaboration, practitioners must blend their 'skills, temperaments, effort and… personalities' (Moran & John-Steiner 2004, p. 11), in risk, however, of the perils involved in the interactions between individuals of incompatible dispositions. The way to overcome and converge such potential incompatibilities lies in nurturing familiarity, developing 'respect for another person's different perspective…' and create **trust** among practitioners as means of moderating conflict (ibid, p. 21). While such sentiments may arise during creative interactions, it is during the practitioner's **social** interactions where these actions occur most effectively and most persuasively. And the more social interactions persist, the greater potential for convergence, akin to the evolutionary adaptations through persistent exposure to partnering organisms' traits.

This connection sets a basis on which to further interpret characteristics between the two domains. As to facilitate this interpretation, I will first arrange the elements of both systems, symbiotic relationships and polydisciplinary collaboration, over a common syntax, as to allow readers to identify the connections between the two systems. Further explanations are illustrated in the following section.

A **symbiotic relationship** is comprised of three elements: the **symbiont**, the **host**, and the **relationship** itself. Each of the partnering **organisms** belong to a distinct **species**, and consequently display a distinct set of **biological traits**. The **type** of **symbiosis** is determined according to the level of **benefit** or **harm** experienced by the **host** from the **symbiont's exploitation**. On **ecological** time, the relationship's **type** can be adapted due to **environmental factors** or due to **incompatible metabolisms**. However, through persistent interaction over

evolutionary time, partners' traits adapt as for both to **exploit benefit** from each other, as well as secure the relationship's integrity against **environmental factors**.

A **polydisciplinary collaboration** is comprised of three elements: the **instigator**, the **directee**, and the **collaboration** itself. Each of the partnering **practitioners** employs distinct **disciplines**, and consequently use a distinct **expressive medium**. The **mode** of **collaboration** is determined according to the level of **liberty** or **restriction** experienced by the **directee** from the **instigator's influence**. Within the **collaborative environment**, the collaboration's **mode** can be adapted due to the project's **emerging requirements**, or due to **incompatible dispositions**. However, through persistent interaction within the **social environment**, partners' **dispositions** adapt through trust as for both to **exert influence** on each other, as well as secure the relationship's integrity against **incompatible dispositions**.

The above links serve as the basis on which to further interpret characteristics of symbiotic relationship into a framework for polydisciplinary collaboration. First however, it is crucial to clarify the use of language.

3.1.2 Terminology

Dictionaries define symbiosis as 'mutually beneficial relationships, harmonious social interactions, and peaceful cohabitation between individuals' (OED n.d.). As presented earlier, it is through conflict that symbioses evolve from parasitic to mutualistic, thus the lexicographical definition providing a skewed understanding of its actual mechanisms. However, it can be said that both definitions are correct, as, quite like symbioses, they are depended on context.

Exploitation is another misunderstood term; while within the context of social interactions it is defined as 'the action of taking advantage of someone in an unfair or unethical manner' (ibid), in the context of interacting with resources, e.g. land cultivation or extraction of carbon-based fuels, exploitations refer to 'the action of deriving benefit from something by making full or good use of it' (ibid). In the context of creative practice involving polydisciplinary collaboration, the knowledge, skills, and commitment of each practitioner constitute the **resources** available towards the development of creative outcomes. As such, the more these resources are **exploited** by both practitioners – or made good use of – the better chances there are for a meaningful outcome to emerge.

A similar pattern is identified with the term **parasitism**: etymologically, the composite term derives from the Greek word for food, '*σίτος'* (sitos), and the prefix '*παρα-*' (para-), meaning being besides someone, with the original definition of parasite being 'one who eats at another's table' (ibid). However, even according to this definition, there is no clear implication that the human parasite is unwelcome, but rather that she or he is receiving from that particular table in that moment in time.

With these clarifications in support of assigning terms such as **parasite** and **exploitation** on human interaction, I will now present the interpretations between the two contexts.

3.1.3 Interpretation Between Systems

With the elements defined and language contextualised, this section conducts a subjective[18] interpretation between the two system of interactions. A relationship between two organisms is defined as **symbiotic** according to three core characteristics: **interspecificity**, **closeness**, and **persistence**. The interacting **partners** possess the **identities** of **symbiont** and **host**, with the symbiont most commonly being the partner to **initiate** the relationship through seeking a suitable host, typically a larger organism, towards **exploiting** the latter's biological **traits** towards **increasing** its fitness outcome, while at the same time **affecting** the host's fitness outcome in **positive**, **neutral**, or **negative** manners (see 2.1.2).

Interpreting the characteristics of symbioses with those of **polydisciplinary collaboration**, the organisms represent the **practitioners**, interspecificity is related to the practitioner's different **disciplines**, and each organism's distinct biological traits are related to each practitioner's distinct **expressive mediums**. The biological characteristic of closeness relates to the practitioner's **direct engagement** – as opposed to second-hand exchange of knowledge – whereas persistence relates to practitioner's **complete cognition** of all elements included in a project. The symbiont's identity connects with that of the **instigating** practitioner, who typically initiates the collaboration, while the identity of the host relates to the practitioner who is **directed** by the instigator, or **directee** (Merriam-Webster n.d.). The notion of fitness outcome reflects the **expressive range** that the **instigator** allocates to the **directee**, as well as

[18] I use 'interpretation' not in the sense of 'translation', but rather in its philosophical meaning, where knowledge from one system of understanding is used to explain that of another, according to the interpreter's own subjectivity and understanding of the context in which that knowledge is conveyed and utilised.

the level of **influence** in which the **directee's** discipline and expressive medium **exert** on the instigating partner. The interpreted characteristics are summarised in table 3.1.

Further to the characteristics by which symbiotic relationships are **defined**, the **type** of each relationship is determined according to the **effects** that the symbiont's exploitation **exerts** on the host's **fitness outcome**: a positive outcome indicates **mutualism**; neutral results to **commensalism**; and negative suggesting **parasitism**. Interpreting this system within the context of polydisciplinary collaboration, the level of influence determines the collaboration's **mode**[19]: **reciprocal** influence between practitioners indicates a **collaborative** mode; where the instigator only **extracts** influence from the directee suggests an **interactive** mode; and in the case where the instigator **influences** and **delimits** the directee's expression, leads to a **directive** mode.

Symbiotic relationships			**Polydisciplinary collaborations**	
organisms	symbiont		instigator	practitioners
	host		directee	
interspecificity	biological traits		expressive mediums	polydisciplinarity
closeness			direct engagement	
persistence			complete cognition	
fitness outcome	typology		influence	expressive range

Table 3.1 – Interpretation of characteristics from symbiosis to collaboration

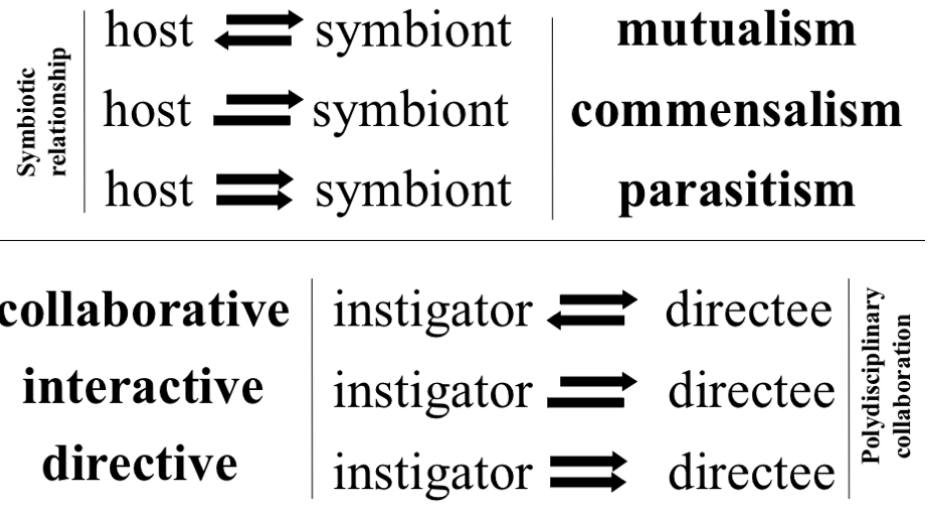


Figure 3.1 – types of symbiosis/mode of collaboration through direction of benefit/influence

[19] The interpreted modes derive from those identified by Hayden and Windsor (2007, p. 33)

The connection between types of symbiotic and modes of collaboration is graphically displayed in figure 3.1, with the arrows representing the direction of **benefit** in symbiosis and the direction of **influence** in collaboration.

In identifying the different modes of interaction, influence, which is the currency by which limitations and liberties are assigned in collaboration, is determined from practitioners actively engaging in the creative process. For example, if a composer becomes inspired from a dancer's material towards composing their joint work's score, this influence is not a result of creative decisions from the dancer, but rather material which the composer used in developing their contributions. In other words, the composer exploited the dancer's material. It is worth stressing again that exploitation concerns a collaboration's resources, which is the joint material, skills, and experience, and not in regards to the practitioners themselves.

Having presented the connections between the two systems, the next task in constructing the symbiotic framework concerns the organisation of these characteristics over the three distinct stages of collaborative process.

3.2 Symbiotic Framework

Having interpreted the effects of harm and benefit accordingly to the level of liberty and restriction of each individual and their respective practice, this approach allows practitioners to determine a flexible level of hierarchy during collaboration. In practice, one of the individuals can contribute their skills towards realising a project defined by their collaborator. Contrastingly, both practitioners can contribute towards jointly defining the expected outcomes of the collaborative project. As such, a mutualistic approach suggests the latter case, where both disciplines are at full liberty of expression and involvement, while the former directorial approach is assigned to the notion of parasitism, with additional disciplines serving as means to overcome the limitation of a single discipline's capabilities.

The employment of symbiotic modes of collaboration takes place over three distinct stages within the collaborative process, where creative range can be applied independently. The first stage concerns the conception of a project, where practitioners create a conceptual basis, set out aims and desired outcomes, and assign roles. This is followed by the stage of development, where the work begins to formulate through research workshops and assessment.

The process concludes with the manifestation of the work, or rather the planning of the final tangible outcome through the manner in which the two mediums interact (Moriaty, 2017).

As an overview of each stage, a mutualistic approach suggests a collaborative environment with diffused hierarchical roles, where practitioners are at equal liberty to contribute ideas and express through their respective mediums. At the opposite end of this spectrum, parasitic collaborations are directive, with a clearly defined hierarchy, where creative control of both disciplines falls under the practitioner instigating the project. In the centre of these approaches, commensalism refers to a unilateral multidisciplinary approach, where the symbiont practitioner draws knowledge from the host discipline, while the latter experiences no further influence. A summary of the strategies is presented in figure 3.2.

	Stage	Collaboration mode		
		Mutualism	*Commensalism*	*Parasitism*
Genotype	**Conception**	equal contribution towards brief development	one discipline /practitioner forms initial stimuli	instigator defines brief
	Development	both partners engage in both disciplines	practitioners utilise disciplinary resources independently	instigator directs both disciplines
Phenotype	**Manifestation**	structured improv. semi-determinacy performers cognisant of effects on system	free improvisation indeterminacy performers unaware of effects & act independently	score/choreography determinacy performers cognisant of effects on system

Figure 3.2 - Symbiotic framework

As seen, the first and second stages fall under the collaboration's **genotype**, while the latter concerns its **phenotype**. In the previous chapter these elements were respectively assigned to the **inner** workings of the collaborative process, and the concluding **expression** of these functions. In regards to the framework, this operates as both guidance as well as analytical; that is using the framework towards examining a collaborative process. As such, considering that the **phenotype** concerns the evident interaction between expressive mediums, interactive technologies can facilitate a connection between digital media and movement, with the expressive liberty of each medium determining the symbiotic mode of interaction.

However, the analytical properties cannot be applied to the genotype, unless the investigator possesses access to testimonials and ethnographic accounts of the collaboration, as in previously presented example of *Variations V* (see 2.3.2).

Over the following sections I describe three collaborative practice, each representative to a particular mode of collaboration, where the framework is employed in through its analytical function. In line with the note on requiring 'inside' accounts to determine a work's genotype, the first two case studies, Stratofyzika and danceroom Spectroscopy, are examined through interviews with the respective practitioners, whereas the final example, that of Marco Donnarumma, is examined through accounts sought from publications, journals, and the practitioner's doctoral thesis.

3.3 Case Studies

3.3.1 Stratofyzika

The observations informing the framework have been predominately sourced through my own practice. A similar process can be applied when analysing other collaborative practices, where the interaction between the practitioners can be assigned to the approaches presented in the framework, and thus to the interpreted symbiotic traits. Stratofyzika is a Berlin-based collective consisting of sound artist Lenka Kocisova, dancer and choreographer Heather Nicole, and digital visual artist Alessandra Leone. Examining this practice through the defined stages, their conception begins by 'one member suggesting a concept', followed by all members then 'together making a concept map through writing down key words' (Leone, personal interview, 19 February 2018). In other words, although the initial stimulus is provided by one partner, it is through collective debate that the final concept is defined, thus displaying traits of mutualistic collaboration.

During the stage of development, Stratofyzika rely on technology to facilitate interaction between the expressive mediums – sound, visuals, and movement – without however technology being the focus of the work (ibid). The collaborative partners acknowledged their limitations in developing the technology necessary towards realising their creative aims, and overcome these by collaborating with practitioners holding appropriate expertise. One of those is Thomas VanTa, who describes himself as a creative coder. As Leone mentions, VanTa was initially invited with the purpose of assisting with developing a set of

wireless GRT sensors for the collective's 2014 work *THÆTA*[20] (ibid). However, he also suggested elements towards the visualisations and they way the dancer interacts with them[21]. This contribution was ultimately adopted within the work, with the specific suggestion evident on the relevant video[22] between 1:26 and 2:05. As a result, a flexible interaction is observed in the personnel roles, with an assistant turning into an active contributor, and thus collaborator, who ultimately assumes co-authorship.

Finally, during the stage of manifestation in *THÆTA*, a dialogue between all involved disciplines is evident. This is achieved through Arduino-based sensors utilising wearable sensors containing Inertia Measuring Units (IMU) attached on Nicole, which transmit gesture data to the software systems controlled by Leone and Kocisova, visual and sonic respectively. The movement data is then utilised by the two artists in generating sonic and visual events, which in turn are interpreted by Nicole in guiding her movement. Therefore, a system of interdependence is created between the three disciplines, while their practitioners are at liberty to interpret at will the sources of stimulus from the other two disciplines. As with the previous two stages, Stratofyzika's *THÆTA* exhibits a mutualistic manifestation.

3.3.2 danceroom Spectroscopy

danceroom Spectroscopy (dS) is an 'integrated hardware setup and algorithmic framework for carrying out molecular dynamics (MD) using depth sensors' (Glowacki et al. 2014). Its conception stage concerns a commensalistic approach, identified through the interaction between the creative and scientific individuals making up the collective. The dS system was designed primarily as an interactive visualisation software representing movement of particle as means of facilitating relevant scientific research. Once the initial inventors of the visualisation system decided to make the system available for creative purposes, the team working on the sonification and choreography involved in the work *Hidden Fields* drew on the capabilities of the existing technology without any significant modifications of the initial system. Professor Joseph Hyde, who acted as both sonic artists and facilitator between the involved performers and technologists, went on to say that the visualisation system remained

[20] https://stratofyzika.com/thata
[21] http://thomasvanta.net/thaeta/
[22] https://vimeo.com/195961322

largely unchanged once it began utilised in creative manners, other than adding inputs for data to arrive and influence the visual elements:

> So the sonification system works both ways, we get data form the simulation to drive the sound, but we now use OSC[23] sometimes to control the system with sound, but more often to control with automation. When we do a dance performance, it is controlled by Ableton live, and we built a whole load of max for live plugins, which send a lot of OSC, very dense amount of information. Obviously that had to be built into the system, so now the ds system has a real complex OSC input on top of it.
>
> (Joseph Hyde, personal interview, 7 March 2017)

Considering that the core essence of the initial stimulus (dS system) remained unchanged other than modification required to accommodate its 'symbiont' expressive medium (sound), and the latter exploiting its capabilities towards expression, a commensalistic mode of collaboration emerges during the stages of conception and development.

On the manifestation stage, I discussed the perception of the interactive system by the performers with the project's principal choreographer Lisa May Thomas, who suggested that their initial understanding of the system was that 'they didn't know what they were doing' (Thomas, personal interview, 12 July 2017). Although Thomas went on to say that these issues appeared early on during the work's development, my understanding of this type of interaction correlates with a commensalistic approach; performers concentrate on their choreography, structured of improvised, almost independently of the effect this had on the expressive mediums their movement affect. As will be seen in the following chapter, this mode of manifestation was often implemented and activated through my practice.

3.3.3 Marco Donnarumma

Having discussed earlier Donnarumma's *Corpus Nil* (see 2.2.3), the work of a single practitioner might seem at odds with the scope of this particular chapter. However, through published accounts, the work emerges as a collective endeavour between Donnarumma and

[23] Refers to the Open Sound Control networking protocol. See www.opensoundcontrol.org

computer scientist Baptiste Caramiaux. The value of examining this work according to the symbiotic framework goes to showcase the possibilities of the parasitic mode, and alleviate any preconceptions borne out of lexicological misunderstandings.

In developing *Corpus Nil*, Donnarumma and Caramiaux jointly developed algorithms which are able to translate the performer's movements into control data towards generating and controlling the sonification system (Donnarumma 2016, p. 8). While the work manifests through the solo performances of Donnarumma, it does not lessen his collaborator's contributions, as showcased in multiple publicised accounts of the work (Donnarumma n.d.) (Graf 2017), where Caramiaux's role and contributions are clearly stated. In other words, it can be said that Donnarumma was successful in exploiting the resources available in the collaborative environment that Caramiaux was part of; aiming for the development of a creative outcome, the discipline of computer science supported the discipline of performance art by extracting necessary knowledge, thus achieving the manifestation of Donnarumma's creative vision through *Corpus Nil*. If this is examined according to the symbiotic framework, it can be said that this particular collaborative endeavour falls under the parasitic approach. Furthermore, this approach of parasitic collaboration differs from the models employed by Damien Hirst and Andy Warhol; whereas the artisanal model (see 2.3.2) presupposes a network of 'replaceable' (Becker 1982, p. 78) contributors who remain invisible to the public appreciating the manifesting work, the role of Caramiaux in *Corpus Nil* is repeatedly stated by the project's instigator. Comparing this approach to the traditional case of a composer providing musicians with a completed score which is to be performed as close as possible to the composer's vision, the difference between parasitic collaborations and the romantic notion of the singular genius-artist becomes clear. Parasitic collaboration presupposes joint authorship between instigating and directed practitioners, where the instigator provides a delimited field within which the directee is able to express their practice. However, that expression remains the creation of that practitioner, and it is an augmentation of the instigating practitioner's initial vision of the work, which, following the directee's contribution, is now changed and influenced. As such, examining this collaboration's development stage, Donnarumma acting as the instigator, and Caramiaux providing necessary contributions towards achieving the envisioned outcome while maintaining an irreplaceable role, a parasitic mode of collaboration emerges in the development stage.

Examining the manifestation stage of *Corpus Nil*, Donnarumma devised a choreography comprising 'five key bodily postures' (Donnarumma 2016, p. 192), each designed as to force the system to generate a specific response from the sound and lights it

controls. In order for the system to identify each of the five postures, the performer must sustain a specific position, or more accurately, is able to move only within the restrictions posed by each position. Understanding this approach through the symbiotic framework, the performer is aware of the effects their movements exert on the system, and have developed a choreography which includes positions aiming to achieve specific actions during the performance. This is in contrast to the approach employed by Stratofyzika and danceroom Spectroscopy; in the latter, performers are unaware of the ways the system interprets their movements as modulations for the other two mediums, whereas in the former, Nicole is aware of the effects her movements have on the interacting mediums, and is allowed to explore movements along with the effects these have on sound and visuals. In the case of *Corpus Nil*, Donnarumma's movements are intended to perform anticipated changes to the other mediums, and as a result have to be restricted to a predefined set of movements.

This comparison summarises the differences between the three modes of interaction during the manifestation stage. These theoretical findings are further explored and activated in chapter five, where I describe the system and interaction principles for the work *Zero*.

3.4 Summary of framework

The three examined practices comprise of distinct methodologies, tools, and number of participants, yet share the core characteristics of interacting sound and movement, as well as that of collaborative creation. The findings to emerge from analysing these works through the adaptive framework provide insight on both process and outcome; the process concerns an understanding of conceiving and developing works through polydisciplinary collaboration. The outcome focuses on organising the interaction between sound and movement. Despite the different tools used in each work, the principles of operation, determinacy of outcome, and expected actions by each participant can be classified under the three modes of symbiotic interaction during the stage of manifestation. This finding is further illustrated in video 12, a demonstration[24] of each mode performed by Shona Roberts; the structured improvisation of a mutualistic mode (0:00-1:16), the free improvisation of commensalism (1:17-2:56), and the precisely choreographer parasitic mode (2:57-5:06).

[24] The system and sound design of the demo is borne out of our collaboration on *Zero* (see 4.2.6).

Chapter 4

Process – Collaborative Practice

The framework for collaboration presented in the previous chapter is the result of practical knowledge emerging from my collaborative practice over the past four years. Chapter four presents the process by which this knowledge was amassed, by detailing the inner workings of my collaborations with different artists, resulting in thirteen works conducted as both publicly performed pieces and studio experiments. The presentation concentrates less on the utilised technology, but on describing the interactions between the involved partners, and understanding these through a set of related theories. A summary of works and collaborators is provided in the chapter introduction.

4.1 Introduction

Rachel Hann's Practice Research delineation concerns all 'knowledge borne of practice' (Hann 2016), which includes the two strands of practice-based and practice-led research, respectively aiming to reach outputs concerning 'new artefacts' and 'new understandings about practice' (Candy 2006, p. 35). These two areas of contribution are inevitably intertwined as they both emerge directly from my practice and engagement with practitioners in joint projects involving both our respective disciplines. While the **outcome** of my Practice Research is made up of artistic work and the theoretical framework, the **process** concerns the mechanisms and approaches through which these contributions were realised and developed. With chapter 3 (framework) and chapter 5 (outcome) presenting the final contributions of my Practice Research, this chapter examines the **process** by which different practitioners, disciplines, and expressive media came together in synergy towards achieving the aforementioned contributions making up the **outcome**.

The intertwined nature of **process** and **outcome** is further evident in the way the knowledge derived from the reflection on each project was fed back into the approaches used within subsequent projects, be that knowledge on collaborative methodologies, or interface design and performance techniques. In other words, the development of both artefacts and understandings resulting from my practice was made possible by applying a different set of analytical and evaluative tools to the shared findings derived from **process** and **outcome**. Whereas the analysis of **outcome** is concerned with the work which arose from each specific project, the analysis of **process** is concerned with a wider spectrum of activities which informed the procedures through which each subsequent project was realised. Combined with reflection through relevant theories, the approach completes the iterative cycle Practice Research 'doing-reflecting-reading-articulating-doing' (Nelson 2013, p. 33).

Presenting process and outcome in different chapters allows for the discussion to focus on illustrating the most relevant information. In line with this approach, with the following chapter five presenting the active elements involved in the manifestation of a performance (score and compositional methods, choreography, interface design and its ways of operation by both performers), such a presentation 'cannot account for the actual experience of the original artwork nor for the anthropological overtones of their production' (Koutsomichalis 2015, p. 15), and an examination of just the final outcome 'often fail[s] to properly account for certain aspects of their making and for the broader hybrids that sparked them' (ibid). As such,

this chapter utilises the five features (see 1.3.1) of analytic autoethnography (Anderson 2006, p. 374) as a way of illustrating the inner workings of my collaborative engagements. These engagements are presented through describing, reflecting on, and analysing my experiences in my dual role as practitioner and researcher, as well as those of my collaborators, documented through interviews, debriefs, and informal discussions. The body of practice included in this thesis is presented raw, in the sense that I include many of the endeavours which did not result in complete works, be that due to unsuccessful experiments or dissolution of the collaboration, along with all the wrong turns, fruitless decisions, and social frictions that were experienced in my collaborative practice. Throughout this presentation, I pinpoint the specific learnings and understandings I was able to derive from each experience, how these relate to the previously presented theories, and the ways each emergent finding contributed towards the theoretical framework, ultimately leading to new understandings of the ways effective polydisciplinary collaboration is facilitated by the symbiotic concept.

A summary of works, collaborators and their disciplinary fields are presented in table 4.2, while table 4.1 illustrates the development and active period of each work.

Work/Dates	**2014**			**2015**			**2016**			**2017**			**2018**		
	01	**05**	**09**	**01**	**05**	**09**	**01**	**05**	**09**	**01**	**05**	**09**	**01**	**05**	**09**
Alpha															
Scaffold#4															
Parasitism															
Beta															
Mutualism															
Commensalism															
Bound															
Merlin															
Kitty															
Vi-We-Nous															
Yellowed-out Beats															
anti:lepse															
Zero															

Table 4.1 – Periods of active engagement for each developed work

Practitioner	Engagement	Practicing discipline	Work
Alex Alexandrou	Performer	Music, painting	*Symbiosis*
Ana Berkenhoff	Collaborator	Actor, voice artist, sound artist	*Mutualism* *Merlin*
Teresia Björk	Collaborator	Contemporary dancer, choreographer	*Vi-We-Nous*
Sean Clarke	Performer	Live visuals	*Kitty*
Maria Kasapidou	Collaborator	Drawing, painting	*Symbiosis*
Frances Kay	Collaborator	Performance artist	*Alpha* *Beta* *Commensalism* *Parasitism* *Scaffold#4* *Yellowed-out Beats*
Naomi Kendrick	Performer	Drawing	*Symbiosis*
Lucie Lee	Performer	Contemporary dancer, choreographer, live visuals	*Zero*
Emma Lloyd	Collaborator	Violinist, violist	*anti:lepse*
Alison Matthews	Collaborator	Actor, singer	*Kitty*
Alexander Pepelasis	Collaborator	Percussionist	*Krotala*
Shona Roberts	Collaborator	Contemporary dancer, choreographer	*Alpha* *Bound* *Zero*

Table 4.2 – List of involved practitioners and their associated disciplines

4.2 Symbiosis

As mentioned in chapter 1 (1.2.1), my motivation to explore the biological phenomenon of symbiosis was the serendipitous outcome of adopting the term for my early collaborative performances, ultimately resulting to form the core investigation of my Practice Research. In this section I discuss the project's development, which over a five-year period became my testing ground for experimenting with interaction between different disciplines, expressive mediums, and practitioners. The project resulted in several distinct works, presented under the same title and basic concept of an interdependent fusion between sound and movement. As a practice tactic, this continuity allowed us to trial different approaches in regards to audio and gestural technologies, presentation formats, and modes of interactions, while maintaining the project's core concept and methodology, being the interaction between sound and movement through consumer GRT and audio technologies. The real strength of this approach, however,

emerged in my role as researcher, where I was able to take part and observe how applying a common concept and methodology with different collaborators could potentially result to different outcomes, thus allowing me to draw conclusions by comparing the findings emerging from each collaborative process, apply these during the development of subsequent iterations, and reflect on how different theories are activated within each engagement.

In describing the process of developing *Symbiosis*, I start by presenting the findings carried over from its earliest iteration developed with two drawing artists during my postgraduate degree, Naomi Kendrick and Maria Kasapidou, through to the ongoing development during my long-term collaboration with performance artist Frances Kay and the assistance of contemporary dancer Shona Roberts, the respective one-off iterations with actor/voice artist Ana Berkenhoff and actor/singer Ali Matthews, and concluding with the process that went into creating the most recent version of the work, with the outcome of the latter presented in more detail during chapter five. The discussion focuses on pinpointing the findings emerging from each collaboration, how I experimented with different variations of the symbiotic concept, the results of these experiments, and ultimately how these findings influenced my Practice Research and its resulting contributions. Following the discussion on theories and research, I provide autoethnographic accounts of the social interactions I experienced with my collaborators, where I pinpoint how the different relationship dynamics with each practitioner has had an effect on the collaborative environment, and subsequently on each project's development.

4.2.1 *Symbiosis* with Maria Kasapidou

The adoption of collaborative approaches in my practice coincided with my earliest use of GRT. A common approach in sound design is to induce alterations in the generated sounds by modulating various processing parameters on software synthesisers and digital signal processing (DSP) modules (or plugins) through using low frequency modulators (LFO), envelope generators (EG), and step sequencers, as well as the manual modulations caused by physical movements on MIDI controllers' tactile controls – sliders, potentiometers, buttons – with a typical example of my earliest equipment displayed in figure 4.1. With this approach in mind, the use of movement data interpreted through accelerometers could be utilised as a further source of modulation. I first began exploring this approach during my collaborations with Kendrick and Kasapidou by using a pair of Nintendo Wii Remotes (or Wiimotes).

Kendrick at the time was resident artist at the University of Salford, with her practice focusing on responding to music with live drawing on floor-mounted paper canvases, a format and motivation we also employed with Kasapidou in our later collaboration. The Wiimotes were attached on the artists' forearms, with each sensor's four continuous data streams assigned to several DSP parameters, resulting in modulations according to their movements. These experimentations were pointing towards the existence of a feedback loop between the two collaborating disciplines, where drawing in response to sonic environment would cause variations of the sound and thus providing motivation for further drawing. This feedback system became the project's conceptual basis, one whose exploration persevered throughout the different developed iterations of the performance.

From the perspective of my discipline, using movement data as a modulation source made for a significantly distinct sonic outcome when compared to using the aforementioned traditional approaches of LFOs, EGs, or step sequencers, with the achieved articulations operating beyond usual music rules determined by tempo and rhythm divisions. In further exploring this aspect, I trialled this approach with musician Alex Alexandrou, who contrastingly to Kasapidou's limited practical experience in music and knowledge of sonic-arts performance canons, is an experienced performer and composer of a broad spectrum of electronic genres. As a result, whereas Kasapidou's effect on the sound was inadvertent, or in other words a by-product of movements while drawing, Alexandrou's operation was akin to performing a music instrument, reflected in sonic articulations that were conducted with the intention of manipulating sound in specific ways, which in turn rendered the drawing as the by product of the process (see figure 4.2a & 4.2b).

The other aspect to emerge from this experiment was that having a musician acting as the drawing artist meant that the project's focus shifted to a single discipline and expressive medium. While previously drawing was the catalyst facilitating the feedback loop between the two performers and their respective mediums, it now had become simply a visual aid within a predominantly sonic-driven performance. Furthermore, Kasapidou's creative contributions towards the collaboration concentrated on her discipline, by providing both practical and theoretical knowledge of drawing and live visual art, as opposed to Alexandrou who was more keen to discuss the sound generating processes and provide suggestions on developing the audio processes. While his contributions were welcome and made for a pleasant exchange, that collaboration was closer to the negotiations of collaborative music-making. Contrastingly, the process with Kasapidou was more open to us trialling different suggestions and wider ideas,

rather than debating the finer details of operating the tools and methods in creating our respective mediums.

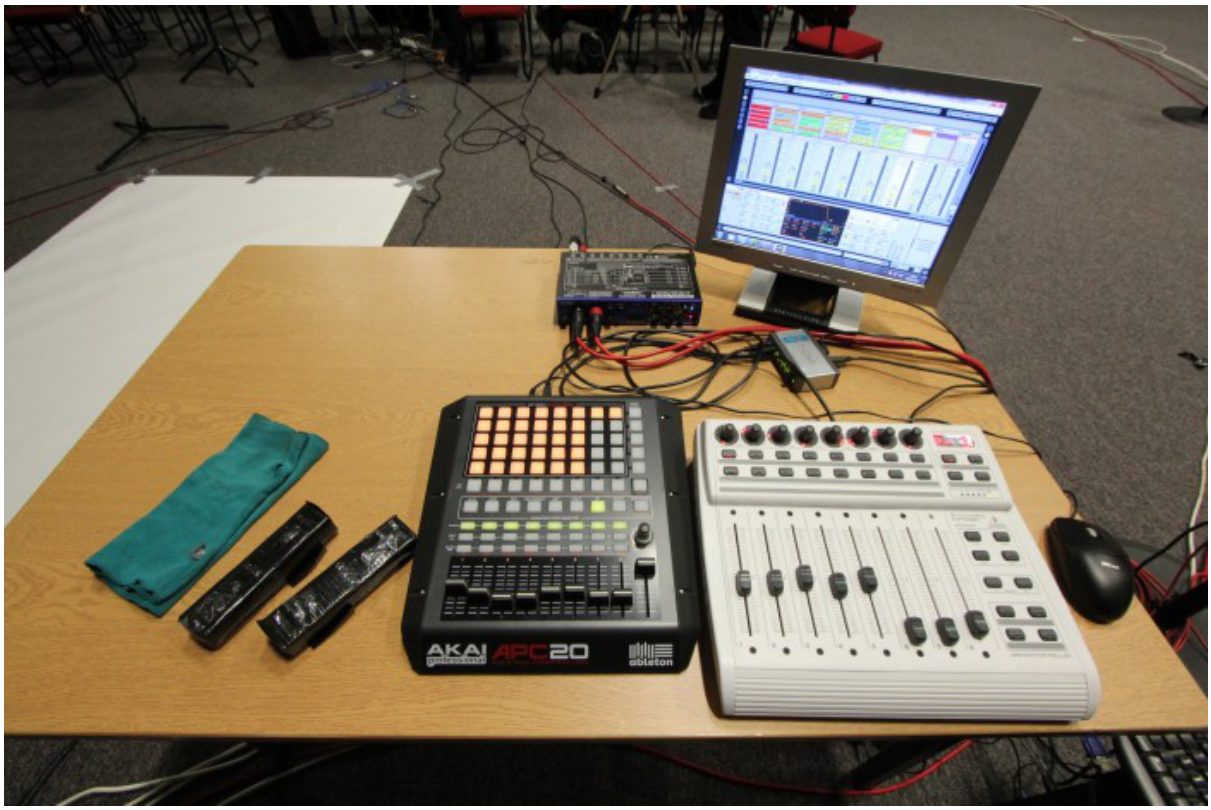


Figure 4.1 - Equipment used for *Symbiosis* (2011)

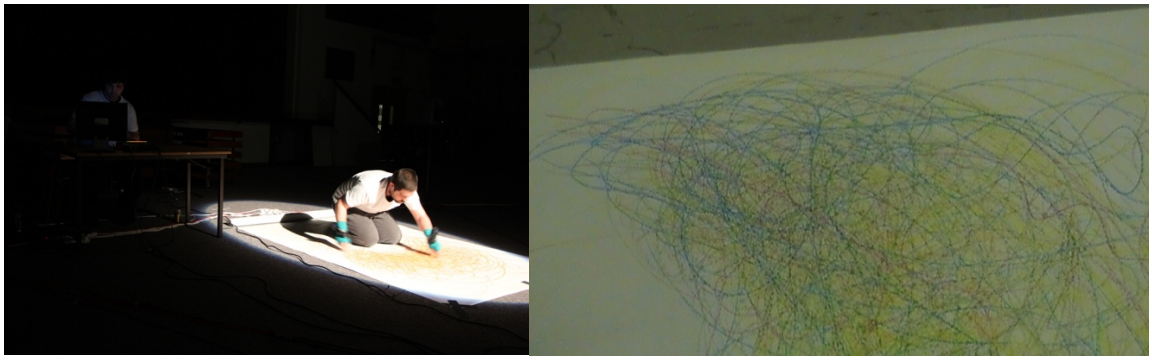


Figure 4.2a (left) & 4.2b (right) – Alexandrou performing Symbiosis (4.2a) & resulting drawing (4.2b)

Reflecting on the collaborative development of *Symbiosis* thus far in relation to theories emerging from my literary research, the latter point on discussions with Kasapidou acknowledging our mutual lack of knowledge of each others' disciplines relates to Amy Edmondson's notion of 'situational humility'. According to Edmondson (2017), this mode of interaction emerges when individuals of 'narrow specialization' work together towards a

common goal, and in realising their lack of expertise in completing a project involving several fields of knowledge, become 'empathetic and curious' in receiving advice from their collaborators and 'work across expertise boundaries' (Klotz 2017). Within the context of our collaboration, the motivation of developing a creative outcome requiring knowledge beyond our own disciplines generated a confidence in introducing and appropriating our disciplinary contributions, as well as a tacit understanding of each other's necessity towards the completion of the creative outcome. Secondly, finding myself enthralled with the new working approach gave light to what Moran & John-Steiner (2004, pp. 17-19) describe as the 'intrinsic motivations of interdisciplinary collaboration'. At the same time, the 'extrinsic' motivations manifested through opportunities to present my work within contexts beyond the discipline of music. One such opportunity was Emergency 2013, an annual festival of performance art organised by Manchester-based organisation Word of Warning. This opportunity would not had materialised if *Symbiosis* was a music-focused performance, as was implied by the festival's artistic director. Performing at Emergency led me to meet performance artist Frances Kay, with whom I went on to form a collaboration lasting the majority of my Practice Research, and which resulted in some of its most significant findings and contributions. This revealed a further benefit of interdisciplinary collaboration, and arguably a further 'extrinsic motivation', where interdisciplinary practice is means of reaching not only new audiences, but also opportunities to form collaborations with new practitioners and new disciplines.

4.2.2 *Alpha* with Frances Kay and Shona Roberts

At the time, Kay's practice focused on solo works exploring notions of 'endurance, duration, pain, and their effect on the body and mind' (France Kay n.d.). Experiencing her work *Scaffold*[25] at Emergency, I found her unhurried and deliberate movements across a 10 feet tall structure (see figure 4.3) particularly engaging as a durational performance, while at the same time considering the possibilities of a collaboration involving augmenting the work with interactive sound elements. Kay also expressed interest in my performance at Emergency, and after I explained my system and some of the ways it could be used in the context of her work, she was keen to form a collaboration. My aim was to use the wearable system for sound modulation, as with the previous iteration of *Symbiosis*, but instead of affecting recordings,

[25] https://franceskayart.wordpress.com/scaffold/

apply them on the structure's surface-borne sounds captured through contact microphones. From this initial plan, we began workshops experimenting with contact microphones (or piezos) attached to different objects in lieu of a full scaffold. While trying various placements on objects such as chairs and desks, Kay trialled using the piezos taped in her palms. This resulted in a new approach, where the performer not only modulates the sounds I initiate, be that recordings or synthesisers, but also generate additional sounds through her movements, a concept we decided to explore ahead of the initial scaffold project. From the perspective of my practice, this new approach with Kay presented an exciting opportunity to develop *Symbiosis* with a practitioner who uses movement as their predominant expressive medium. While Kasapidou's movements were the by-product of her drawing actions, with Kay we had the option of also planning movements designed for specific effects on the sound. Reflecting on the trajectory of my Practice Research, this was the point when I began exploring the different modes of interaction between system and performer, which eventually led to a significant contribution of this thesis, as detailed in chapter three.

Figure 4.3 – Scaffold by Frances Kay at Emergency 2013

In line with my research aims, namely the application of the symbiotic concept with my practice, my first area of focus for this collaboration was using the sentiments evoked by each type of symbiotic relationship as concepts for designing the aesthetics of the two mediums, as well as the narrative expressed through their interaction. This approach was influenced by choreographer and contemporary dancer Shona Roberts, who supported the development of *Symbiosis*. Being already a personal friend, I initially asked Roberts to perform with me for an event Kay was unable to attend (see figure 4.4). Despite the limited time for getting accustomed with the system, I felt confident due to knowing Roberts' aptitude in performance involving music. Following our first performance, while I was keen to work further with Roberts, an ongoing collaboration would have been difficult to fit with her existing work schedule. As such, we would periodically rehearse for specific performances, while Kay remained the principle collaborator in the development workshops of *Symbiosis*. However, the experience of observing the outcomes of trialling new approaches with each performer proved to be productive. The conclusions from that experience were that firstly, the output of the system was significantly different to that produced by Kay, and secondly, Roberts' greater experience of choreographing to music meant that her response to the produced sounds was based more on the emotions these evoked in her, rather than Kay's approach which was based on predetermined narratives guiding her improvisations. Roberts used terms such as 'relaxing, aggressive, engulfing' and so on, in describing her corresponding emotions to each sound, and subsequently how these informed her performance. This approach prompted me to identify my own subjective associations with emotions evoked by the lexicographical definition of each type of symbiotic relationship, a task I also explored with Kay. Together, we listed terms for each symbiotic type; mutualism was represented by buoyancy, unity, and harmony, commensalism by apathy, disassociation, and ambiguity, and parasitism by aversion, competition, and discord.

Further developing this idea with Kay, we decided to arrange our performance over three sections, each dedicated to a different symbiotic type. In the mutualistic section, the performer would engage in specific choreographies designed to create sounds complementary to the other sonic elements, thus evoking a sense of harmony. For the commensalistic section, the live generated sounds, such as short percussive and tonal material, were distinct to the atonal sustained drones making up the arrangement, thus creating an ambiguous connection between the two different sets of sounds. Finally, the movements during parasitism were designed as to interrupt sounds through controlling signal distortion and degradation DSPs. In turn, my role was to control the arrangement by triggering each section's both fixed sonic

elements and different interaction systems, as well as mix the sound sources together. Although I retained some control over generated sounds that were not attached to the interaction system, I had no control over the latter's processing other than adjusting the volume of each channel's input and output (respectively, signal from the piezos going into a processing channel and its post-processing outcome).

Figure 4.4 – *Symbiosis* with Shona Roberts at Anatomy 2014

On reflection, a number of resonances by John Cage's ideas emerge from these initial collaborations with Kay, such as Cage's approach in disciplinary interaction with dancer, where the two disciplines are brought together for the first time within the context of a performance (Cage, Kirby & Schechner 1965, p. 59). Similarly, *Symbiosis* relied on structured improvisation, with the performers free to express according to each section's parameters, and besides any specific predetermined action during each section, with our preparation based on workshops for each section, rather than rehearsing a determined performance. Furthermore, Cage describes the 'crudeness and roughness' of some of his multimedia performances during the early 'happenings', an aspect that was 'partly intentional…and partly the inevitable result of extremely limited finances' (Kirby 1966, p. 11). Rather than an explicit application, our appropriation of this notion emerged organically in my collaboration with Kay, with roughness

being an evident aesthetic in our work, as well as a result of our resources at the time; Wii Remotes and microphone cables were attached by duct tape directly onto the performer's limbs in an intentionally rough fashion, complementing Kay's outfit of white bandages wrapped over fitting dark overalls (see figure 4.5). This approach was also fuelled by Matthew Smith's distinction between approaches in interdisciplinary performance employed at Wagner's Festpielhaus in Bayreuth and London's Crystal Palace. While the former approach, dubbed *iconic gesamtkunstwerk*, concealed all mechanical apparatus used in the performance away from the audience's view, no such effort was made in the latter's *crystalline gesamtkunstwerk*, instead being a 'form that exposes and celebrates the outwards signs of mechanical production' (Smith 2007, p. 3). As such, baring all apparatus visible was our means of turning audience's attention to the means by which the two performers are connected.

Figure 4.5 – *Symbiosis* with Frances Kay at Gesamtkunstwerk 2015

4.2.3 Further iterations of *Symbiosis* with Kay

By early 2015 my collaboration with Kay had led us to perform *Symbiosis* at several events. It was around that time that we began developing new works as means of exploring new methods of expression in sound design, choreography, and narrative, from my perspective as researcher, towards investigating further applications of the symbiotic concept. Having decided on the new works employing the same gestural system and symbiotic concept as our first performance, we

concluded that any subsequent works would essentially form iterations of *Symbiosis*, and would be appropriate to maintain the same title for our shared creative output. One consideration behind this approach was that presenting our collaborative practice under a particular name could form an effective branding endeavour. Furthermore, from my researcher's perspective, coalescing a particular approach under a single project – that of two practitioners developing a stage performance involving the expressive mediums of sound and movement – would allow me to employ an iterative approach where reflections on the findings emerging from each work were used as basis for subsequent iterations. As such, *Symbiosis* became an ongoing project I treated as an experimental platform on which to trial different approaches of activating the symbiotic concept. As to avoid confusion between the different iterations, I used internal titles for each work, beginning with retroactively naming our first work as *Alpha*.

The next research focus I aimed to explore was whether a single symbiotic type could be used as conceptual basis for an entire performance, as opposed to *Alpha* featuring all three. My motivation to pursue this approach emerged from the work going into developing *Scaffold#4* (see video 01), which was the initial idea spurring my collaboration with Kay. As mentioned in the previous section, this work was based on Kay's performance *Scaffold*, and involved capturing the vibrations caused by the performer's movements on the structure through the use of piezos (see figures 4.6 & 4.7). As with *Alpha*, the sounds would then be modulated according to the movement data from the Wiimotes attached on the performer. The difference of *Scaffold#4* in comparison with *Alpha* was that while in the latter Kay operated the system with the explicit intention of creating sound, in this case the movements remained focused on exploring the structure in an interpretive manner, as with the narrative Kay developed for the original work *Scaffold*. In reflection, a mode of commensalism emerged through this collaborative work, with the discipline of performance art making up *Scaffold* becoming the host on which the discipline of music/sonic-art could be attached and develop without affecting its host.

Figure 4.6 – *Scaffold#4* with Frances Kay at Metanast 2014

Figure 4.7 – *Scaffold#4* equipment (piezos attached on scaffold and Wiimotes worn by Kay)

Identifying the emergence of a single symbiotic type in the development of *Scaffold#4*, combined with our further work in developing *Commensalism* (see figure 4.8) (video 02), a further performance exploring the namesake symbiotic type, motivated me to reflect on my collaborative approach. So far I had concentrated on utilising movement as a way of designing sounds, where the performer is used as a source of modulation, in addition to the LFO, EG, and step sequencer devices. This approach can be related to Cage placing Cunningham, an

accomplished dancer and choreographer, as a conductor-cum-metronome keeping time for the performing musicians (Fetterman 1999, p. 124). Furthermore, my previous embodiment of symbiotic types was limited to the sound design and the juxtaposition of interactive and fixed sounds. As such, while the choreography was collaboratively designed to affect sound in specific manners, I applied less consideration to the effects of sound on its collaborating discipline and practitioner. Reflecting back on Roberts' comments regarding my sound design emotionally affecting her choreography, I realised that her performance had almost no effect on the way I developed my part of the work, other than using the data interpreted from her movement. Also realising that I was still maintaining this approach in my work with Kay so far, I placed further focus on reciprocating the ways sound influenced the performer by allowing the notions embodied in the choreography to set the basis on which I developed each performance's sound design. In other words, the new focus concentrated on the interaction **between** performance art/movement and music/sound, rather than the previous approach of designing sound **through** movement.

This newly adopted motivation towards a closer interrogation of the way disciplines, expressive mediums, and practitioners affect each other resulted in reconsidering the previous mode of disciplinary interaction employed in my collaborative work thus far. While I previously maintained that *Alpha* was developed through an interdisciplinary collaboration with Kay, on reflection, my approach of enriching my discipline with performance art suggested a multidisciplinary approach, where music was the principle discipline seeking support and diversification by performance art. In fact, it was in the new approach that interdisciplinarity could be activated, where the reciprocal influence between the interacting disciplines resulted in an outcome exceeding the sum of its parts[26]. In describing the contribution of this finding[27], this mode adaption led me to relate this experience to the way symbioses mutate in nature. As discussed in chapter 2 [2.2.2], environmental and external factors may cause a symbiotic relationship to change type, and consequently alter the fitness outcome for each partner. In the context of my collaboration with Kay, adapting our mode of disciplinary interaction showcased that such modes of operation are not fixed, and quite like

[26] The traits of the different modes of disciplinary interaction are detailed in section 2.3.3

[27] I must stress that the transition from multidisciplinary to interdisciplinary mode of collaboration between Kay and I is presented neither as an aspect of improvement in our work, nor as a preferred mode of interaction. It is simply a different mode, and as seen later in this chapter, multidisciplinary approaches continued to be employed in further collaborations.

symbioses, are susceptible to change. On reflection, the identification of this aspect was a significant milestone in relating the symbiotic concept to collaborative polydisciplinary practice. While interdisciplinarity between Kay and I was activated only in the stage of manifestation, with the other stages remaining multidisciplinary, at the time my focus on closer integration and understanding between the disciplines proved to be a useful endeavour towards sharing disciplinary knowledge between my collaborators and I.

Having explored the symbiotic type of commensalism in *Commensalism* and *Scaffold#4*, my next aim was to investigate parasitism. At that stage of my research, interpreting this symbiotic type within the collaborative process presented ethical issues due to its negative lexicological connotations. As such, at that time I focused my investigation of parasitism solely through the aesthetics of the work's observable elements, aesthetics and narrative. In *Parasitism* (video 03) we experimented with a novel interaction approach, aiming to create a subtler connection between movement and sound. Omitting the Wiimotes, the performer's only manner of interaction was through stimulating the piezos which were attached in metallic cylinders, (see figure 4.9). This approach drew from our earlier experiments of placing piezos on different objects, before deciding to attach them directly to Kay's palms. In this case, the objects provided a conceptual basis for the work. Taping the cylinders on Kay's extremities, the foreign objects became the parasites hindering her movements. Kay developed a narrative around this notion, consisting of repeated attempts to unsuccessfully rise from the floor, as can be seen on video 01 during 1:13, 1:34, 2:33, etc.

Figure 4.8 – Studio session of *Commensalism* with Frances Kay

A further new approach employed in the development of *Parasitism* concerned the appropriation of material from previous works; my earliest medium of artistic expression was the manipulation of music recordings etched on vinyl records (Moriaty 2018, p. 2). The majority of those records were tracks of EDM, an area of music encompassing several genres, whose output and development has been significantly influenced by the appropriation of material, aesthetics, and methodologies from previous genres, such as the manipulation of recorded music through sampling. Being previously content with using the work of others as starting points for my work, my current practice is exploring the reuse of past material from my own corpus of work. This approach was further influenced by that of John Cage, who advocated treating 'past literature as material rather than as art', and adding 'I would not present things from the past, but I would approach them as materials available to something else which we were going to do now' (Cage, Kirby & Schechner 1965, p. 53). Similarly, Leigh Landy and Evelyn Jamieson appropriated past material in their collaborative work *A special case/2: Recycling*, suggesting that:

> The point of recycling in our work is to allow access through previous knowledge. This idea is by no means new. Composers, choreographers and other artists have often either quoted their predecessors of contemporaries (with the occasional case of plagiarism) or even themselves.
>
> (Landy & Jamieson 2000, pp. 8-9)

Figure 4.9 – *Parasitism* with Frances Kay (studio)

In treating our past work as the starting point for *Parasitism*, I used elements from my solo work *Unsound Connections* (Moriaty, 2016), consisting of crude feedback tones, an approach resulting in rather aggressive and dissonant sound design, which further adhered to the aforementioned notions allocated to the symbiotic type of parasitism. In obscuring the relationship between movement and sound, I designed the processing system as to randomly delay the microphone signal in a range between 500-4000ms. This randomisation was achieved by using an LFO on random waveform, with its rate and depth parameters modulated by envelope generators reacting to the input. Kay appropriated her outfit from *Scaffold* (see figure 4.3), made of muslin gauze bandages wrapped around her otherwise bare body, referring to the imagery commonly featured in art of the middle ages depicting crucifixion. In turn, the movement design for *Parasitism* was inspired/appropriated from her work *Here* (see figure 4.10), where Kay attaches herself with cling film to fixed structures, e.g. crowd barriers of staircase banisters, and performs a disentanglement ritual, 'an escape from her bounds', over the duration of the performance.

Figure 4.10 – *Here* by Frances Kay at Manifold 2014

With appropriation of past material investigated in Parasitism, we also applied this approach in a further work based on commensalism, internally designated as *Yellowed-out*

Beats (see figure 4.11). Quite like our approach to *Scaffold#4*, the work used another work by Kay as its starting point, the latter based around a physical-theatre choreography set to the song *Yellow Flicker Beat* by Lorde. In a further similarity with *Scaffold#4*, Kay's performance was an exact recreation of her solo work, albeit with the difference of listening to the song on headphones, as to allow for my additional sound design to be performed over the venue's soundsystem. As with our previous works, the sound generation system relied on DSP modulations mapped to the Wiimotes' data streams, with the processed sounds extracted from the song used in Kay's original work. My analytical reflection at that time suggested that the notion of commensalism in *Yellowed-out Beats* was focused on one work affecting the other without being itself affected; Kay's original work remained largely unchanged, while it provided sonic, visual, and performative material for the developed *Yellowed-out Beats*. However, through the findings emerging from developing the iteration *Kitty*, described later in this section, I have since redefined commensalistic collaboration, as presented in chapter three.

Figure 4.11 – *Yellowed-out Beats* with Frances Kay at Marie Antoinette 2016

The development of the four aforementioned iterations, *Scaffold#4*, *Commensalism*, *Parasitism*, and *Yellowed-out Beats*, served as experiments towards trialling new approaches in system interaction and applications of the symbiotic concept, with relatively few public

presentations. Through combining the findings emerging from each experiment as well as elements of sound, movement, and visual aids, we developed the next major iteration of *Symbiosis*, *Beta* (video 04). As with the previous approach, the system included several DSP channels, with their parameters modulated by the movement data. As with the previous iterations, the channels processed signals from both the piezos as well as fixed media recordings. During this development we trialled a new gesture recognition device, the Source Audio Hot Hand, which while it presented several benefits over the Wiimotes – smaller size of wearable units and more detailed gesture settings – issues such as unreliable software and short battery life prompted us to continue using the simpler yet reliable Wiimotes. In regards to the arrangement, unlike *Alpha* where we dedicated specific sections to each symbiotic type, *Beta* presented a more ambiguous connection between sound and movement throughout its duration, in an attempt to implement the concept of adaptability between different types of symbiotic relationships. As a result of the aforementioned closer integration between our disciplines through discussing the process by which we create our respective parts, Kay and I had gained an intimate awareness of each other's parts, and were able to anticipate our partner's potential actions during the improvised performance. Our on-stage interaction had now developed into non-verbal system of communication based on performed gestures from Kay's perspective, and in the way I introduce new sounds for her performance. Together we devised a set of rules for the duration of our performance:

- **Input activity meters of a piezo indicates performer is interacting with that mic/hand**
- **Signal of corresponding piezo is fed into a channel**
- **Output activity meters of corresponding channel indicate sound is generated**
- **Output of corresponding channel is raised, and sound is heard**

At that point Kay is aware of which sound is active, and the possibilities of its manipulation through her movements. However, unlike *Alpha* where she would have to assume a choreographed set of actions, she is now given an active role in sound selection:

- **If performer wishes to perform with particular sound, continue engaging**
- **If performer is unwilling to perform with particular sound, disengage and proceed with other actions**

Choices were also available for my performance; if Kay indicated willingness to perform with the sound I initiated, my choices would be to either perform alterations in the input level, thus

producing tonal variations in the output, or allow the performer to engage with the sound as it is. In the case Kay indicated unwillingness to perform with a particular sound, my options were to either feed the piezos' signal to another channel, thus initiating a different sound, or persist with my original selection by increasing the input level. After a certain threshold, the increased gain of the microphone amplifier would induce a feedback loop between piezos and venue soundsystem[28], causing the sound to be heard regardless of Kay's actions. Further to that selection process, the performance's dynamics variations were also improvised, either by myself via altering the levels, or by Kay varying the vigour of engaging the piezos; from each perspective, providing a prompt for the other performer to either follow or deviate from our suggested dynamics.

By the middle of 2015, *Beta* had been presented several times within various setting as both live performances and video installations. From the collected audience response, the approach of ambiguous connection between sound and movement seemed to resonate well. Quite like our aim in *Parasitism*, the work could be perceived as a performance of sound and movement, rather than one where physical performer controls sound, as was the explicit aim of *Alpha*. Such a reaction was documented by Fluid Radio's Nathan Thomas who reviewed our performance at Vivid works during Supersonic Festival 2015:

> Contact mics and gaming controllers strapped to Kay's palms and forearms generated signals that were fed through Moriarty's (sic) laptop and electronics rig. Moving within a small square taped out on the floor, Kay's movements were slow and supple, tentative at first but becoming more agitated in response to the rising volume of the audio. The swooshes and scratches produced by the contact mics were clearly discernible, but I was less clear what influence the gaming controllers were having on the sound, which I took as a good thing — there are few things more tedious than a tech demo in which the relationship between gesture and effect is fixed and obvious, but this performance never felt like that.
>
> (Thomas 2015)

[28] While traditionally such an action holds the potential to cause significant damage to both equipment and people's hearing, the level of the electroacoustic feedback was controlled through the use of brickwall compressors and appropriate gain staging during soundcheck.

At the same time, academic reviewers were less keen on this approach, suggesting that 'the correlation/ inter-relationship between movement and music and computational systems is unclear', and further commenting on 'the cables which tether the performer to the audio processing system and the visual appearance of the ubiquitous 'laptop on a table with a pile of wires' detract a little from the impact'[29]. While my understanding of this response is that it relates to subjective issues, especially the latter comment on the work's rough aesthetics, its suggestions on the interaction design proved useful, and were adopted in later iterations of *Symbiosis*, as detailed in 4.2.5.

Beyond the findings concerning the performance practice, significant contributions emerged with regard to my research into polydisciplinary collaboration. By applying the notion of adaptation to the performative elements, I began examining how this can be translated within the wider context of collaborating practitioners expressing through sound and movement, an investigation which led me to identify interactions during a performance and during the development of a work as distinct yet interdependent elements of interaction between collaborating practitioners, and also as it further emerged, as distinct stages of the collaborative process. In gaining further insight into how these interactions affect the collaborative process, I felt that it was important to explore the existing concepts and approaches with other collaborators. By combining the findings emerging from my work with Kay and Roberts towards the developing collaborative framework, applying this within new collaborations would allow me to observe how the existing approaches are received by practitioners who are unfamiliar with my research, the necessary adaptations for these to complement the new collaborative process, and what new approaches emerge from these adaptations.

4.2.4 *Mutualism* & *Merlin* with Ana Berkenhoff

The first of my new collaborations took place with sound artist and actor Ana Berkenhoff. Meeting at River Side Studios in London during an event where we were both performing solo sound works, we discussed our wider practices and suggested developing a performance exploiting my interactive system. My aim for this collaboration was to investigate the symbiotic type of mutualism. In my discussions with Berkenhoff, I outlined the concepts of

[29] Combined reviews of submission to International Conference on Movement Computing 2017, received via email, 6 April 2017.

my research, without however revealing specific details of my theoretical findings so far, an approach taken as to avoid biasing the outcome of the collaboration. The concept of mutualism was discussed in the context of interaction between our expressive mediums, an idea which Berkenhoff welcomed. In outlining the project brief, we aimed to use Berkenhoff's voice as the main sonic material, with her arm movements providing modulations, as with my previous work. Although Berkenhoff is also a composer and sonic artist, she was keen to concentrate on expressing solely through movement and voice, while leaving me to have more influence in creating the sound design and interactive processing system. However, we also agreed on letting each other into our respective processes, allowing us to provide suggestions in the development of our individual parts. On reflection, the aspect of mutual involvement in both disciplines by both practitioners is crucial towards activating mutualism in the collaborative process. While previous efforts concentrated on relating the symbiotic concept to the outcome of the work through aesthetics and modes of interactions, the findings which emerged from my collaboration with Berkenhoff showcased the activation of symbiotic traits within the process of developing a work, as explored below.

My collaboration with Berkenhoff resulted in two iterations of *Symbiosis*; *Mutualism* (video 05) and *Merlin* (audio 01). The former was performed in December 2015 during a two-day festival in Salford, and was developed over two days ahead of the performance (see figure 4.12). Our aim was to design the system as to allow the performer to manipulate her voice through arm gestures. As with my previous approach, I created several processing channels with DSP parameters mapped to the Wiimotes data streams. Similarly, my operation concerned distributing the voice signal into the different channels. Considering the brief amount of time at our disposal, we decided on an improvisatory performance based on Berkenhoff exploring the system, not unlike Kay's previous approach. However, considering the former's experience in using and creating sound generating systems, Berkenhoff was keen to understand the processes making up each channel, and the specific parameters affected by her movements. As a result, Berkenhoff's performance showcased a more detailed control of the system in comparison to Kay[30], further facilitated by the finer control in altering the tonality and dynamics of her voice. We exploited this level of control as means of progressing through the arrangement, with each section aimed to rise in intensity by both Berkenhoff's increased level

[30] This comment is not in relation to comparing the quality of outcome between the two performers, but rather on the control of dynamics while operating the system.

of voice, consisting of improvised vocalisations, and by mixing more of the processed signals together, with a point of saturation signalling the end of each section, prompting us to reduce dynamics and restart the process in the next section. This approach provided unclear framing for the sections, leading me to add a further rhythmical synthesiser part. By retaining control of the part's perceived intensity through manually modulating its low-pass filter's cutoff frequency, I was able to signify the end of each section in a clear manner, thus ensuring Berkenhoff was better aware of the arrangement's progression.

Figure 4.12 – *Mutualism* with Ana Berkenhoff at Sonic Visionaries 2015

A further finding which emerged from *Mutualism*[31] was the reconsideration of the previously conceived interaction modes. My earlier assertion was that the mutualistic mode of interaction concerned the performance of choreographed movements intended towards generating specific sounds (see 4.2.2). However, my approach in *Mutualism* allowed the performer full liberty to control the system towards creating sounds of their discretion. The difference of understanding the system's processes between Kay and Berkenhoff allowed the latter to operate the system

[31] It should be said that findings leading to this reconsideration also emerged from my work with Roberts on the iteration *Bound*, discussed in 4.2.6.

akin to a music instrument; whereas Kay concentrated on creating sounds through an exploratory approach, Berkenhoff was aware of how each movement would affect sound. With this in mind, I reconsidered the previous mode of mutualism instead as parasitism, with the new mutualistic mode assigning the performer a greater degree of expressive liberty while operating the system. This reflection led me to a further significant finding towards the interpretation of the biological notion of symbiosis in the context of collaborative practice. The typology of symbiosis is determined according to the effects of the host's fitness outcome, with harm suggesting a parasitic relationship. As mentioned in the previous section, applying such a notion in the context of collaborative practice presents ethical issues. However, a trait evident in my work with other practitioners is the varying level of liberty when expressing through our respective mediums. As well as the liberty allowed through improvisations, both performers were often required to execute certain actions at specific moments in order to achieve a predetermined outcome in the performance. Therefore, the varying level of expressive liberty allocated to each performer according to a particular mode of interaction represented the varying level of fitness outcome experienced by a host according to the type of symbiotic relationship it is engaged in with its partner.

This finding led me to reconsider the modes of interaction which emerged in my previous works. For example, while in *Parasitism* the work suggested a parasitic mode, in reality Kay maintained full liberty to express through her medium (within the confines of the work's narrative), suggesting a mutualistic approach. However, since that system was designed as to obscure the connection between performer actions and resulting sound, those actions were not performed with the intention of creating sound, but served purely the performer's expression. This approach was further reflected in my earlier work with Kasapidou, where her actions intended to create the drawing, and with Kay's performance in *Scaffold#4*, aimed towards exploring the structure while not paying particular attention to the generated sounds. In relation to the notion of sound as a by-product, which emerged during my work with Kasapidou, the performer's expression was acting independently to its effects on the partnering discipline. In other words, while movement was not affected by sound, the expression of sound was enriched as a result of the movement. As such, this conclusion led me to interpret this mode of interaction as the symbiotic type of commensalism, a relationship where the symbiont extracts benefit without affecting its host. As mentioned in chapter three, this mode of operation alleviates the need for the performer to understand the system's function, as with the approach employed by Kasapidou and Kay during the two aforementioned works. In contrast, Berkenhoff's thorough knowledge of the system in *Mutualism* pointed towards a conscious and

intentional influence on sound by the performer. Moreover, Berkenhoff's improvised operation of the system lacked any restrictions with regard to the range of her expression during the performance, thus relating this mode of interaction to the type of mutualism. Expressive restrictions are in place when the performer is required to perform choreographed movements with the intention of achieving a specific sonic result. Consequently, according to the interpretation of the biological notion of fitness outcome to the creative notion of expressive liberty, instructed choreographies relate to a parasitic mode of interaction.

Further to the emergent findings regarding the activation of the symbiotic concept in relation to the modes of interaction between the expressive mediums of sound and movement, my collaboration with Berkenhoff shed light on the different modes of interaction between practitioners and disciplines. In March 2016 we began the development of our second work, internally designated as *Merlin*, ahead of the Moving Minds exhibition at Glyndwr University. Our intention was to use a system similar to the one used in our previous work, while developing a scripted narrative that could be expressed through Berkenhoff's performance. Having worked on our individual parts away from each other, our first attempt in combining sound and movement left us unsatisfied in its outcome. After discussing potential directions in which we could develop the work, I realised that we were together contributing to both involved disciplines through not only mere feedback and suggestions, but substantial and detailed input on how our partner's expressive medium should develop. It is worth pointing out, however, that these exchanges were quite animated, and concluded through debate, negotiations, and even bargaining. For example, Berkenhoff insisted on removing the previously used synthesiser part and constructing entirely new rhythmical elements. While I was quite keen to maintain that particular part, I responded by suggesting a radical alteration of the script by changing its performance to a staccato style of quarter notes duration for each recited syllable. Berkenhoff was insistent on wanting to retain the freeform voice performance. However, in exploring that combination we identified an interesting result, thus mutually agreeing on heeding each other's particular suggestions. Similar exchanges were repeated with other elements of the work, with some suggestions unsuccessfully debated, until we developed the work to a satisfactory outcome.

On reflection, the working relationship between Berkenhoff and I was significantly different to that with my previous collaborator. With Kay, our exchange of information was limited to feedback on our partner's parts, as well as discussing the practical aspects of our work, e.g. arrangement and duration of sections, outfit fixing for the Wiimotes and piezos, etc. Furthermore, while I often had input into the choreography by highlighting specific movements

in relation to the sounds they generated, this was seldom reciprocated by suggestions for my sound design. While some tentative steps towards a higher level of integration took place during the development of *Beta*, as mentioned in the previous section, these were limited to developing a system for on-stage communication and behaviour. The intention of exploring a higher level of integration in the development of the work's material was realised in my second collaboration with Berkenhoff. Despite the tensions during the development of *Merlin* (see figure 4.13), with the debates on how the work should develop often heated, our personal interactions remained cordial and pleasant. In contrast, the lack of diverging views on the work's development meant there were few disputes in the working environment with Kay. However, tensions would often manifest in our personal interactions, ranging from disagreements on time of meetings and travel arrangements due to conflicting schedules, snaps of aggression borne out of misunderstandings, and prolonged periods of estrangement leading up to a performance. Despite these tensions, there was enough motivation from both partners to continue performing together. Looking back at my collaboration with Kay, especially during its later stages, it was the 'extrinsic motivations' (Moran & John-Steiner 2004 p. 15-17) which held the collaboration together until its dissolution in early 2017.

Figure 4.13 – *Merlin* with Ana Berkenhoff at Moving Minds 2016

Reflecting on the difference between the social interactions with Kay and Berkenhoff, I considered some of the factors contributing to this higher integration. One such consideration was that unlike Kay, Berkenhoff's experience in music-making meant that she possessed the language to have a direct input in my process. It could be said that in my work with Kay, 'situational humility' (see 4.2.1) had turned into what can be described as 'situational diffidence', caused by both her hesitation in contributing towards a discipline she lacked expertise in, as well as the absence of any substantial motivation for her to contribute to the music-making process from me.

4.2.5 *Kitty* with Ali Matthews

Following the performance of *Merlin* in March 2016, soon after I became acquainted with musician, singer, and actor Ali Matthews, a colleague who is a lecturer in performance at the University of Salford. In my initial contact with Matthews I suggested developing a work involving gesture control and live voice processing, similar to the approach in my last work with Berkenhoff, with the aim of performing at an event I was curating with the Metanast collective. The event featured performances by Sophia Loizou, Hugs Bison, and KET Project, whose work contained influences from EDM as well as featuring visuals. Having also significant parts of my past practice based in EDM, I aimed for the new work to incorporate such aesthetics in the sound design. Furthermore, I invited VJ and visual artist Sean Clarke to develop a visual performance to complement the performance with Matthews. On a practical level, Clarke's involvement was a means of better integrating the work with the event's audiovisual programme. However, from my researcher's perspective, working on a project with more than one practitioner, each expressing through different disciplines, meant that I had the opportunity to explore a multifaceted collaboration, and investigate the notion of parallel symbioses which I had recently discovered through my academic research.

In the initial discussions I described to Matthews my symbiotic framework, in its form at the time, as she was already aware of my research from having attended a presentation I delivered. In describing the mutualistic approach, which I aimed to also explore in this work, Matthews seemed keen on jointly developing both disciplines. At that point, we agreed on working on our respective parts ahead of our first workshop. For the performance, we discussed on using a text that could be recited in a regular rhythm, akin to Berkenhoff's performance in *Merlin*. Matthews, having formal musical training, asked I write her part in traditional notation,

a type of work of which I have limited knowledge. Having sent an outline of the voice rhythm, Matthews responded with uncertainty as to whether she could perform the illustrated pitch, to which I suggested that she was at liberty to modify the notation as to fit the text as well as her preferred way of performance. For my part, I aimed to write a piece, rather than a sound design, loosely based on the EDM subgenre of Breakbeat. Unlike the sonic elements in my previous works, this piece was constructed in regular rhythm, and contained pronounced percussive elements, a mid-high frequency "lead" synthesiser part, synthesised bass part with subharmonic frequencies, with the spectral and dynamic balance between the different elements mixed in a fashion typical of the genre I was referencing. Beyond those elements, comprising the performance's fixed sounds, the remaining system resembled my previous approach, with three channels intended on processing Matthews' voice, and certain DSP parameters mapped on the Wiimotes data streams (see figure 4.14).

In joining our respective parts together during the first workshop, Matthews used a text based on a 1950's song by Kitty Kallen, from which the work's internally designated name derived. In developing the performance format, Matthews was to recite the text into a microphone, while controlling the processing with her arm movements. The arrangement followed a traditional pop music format, of ABABCAB, where Matthews would recite the text at a regular rhythm during the A sections, while I recorded her voice and played it back on the B sections. In designing the movement, we decided on an approach where Matthews would hold her arms relatively still during the A sections, and become more animated during the B sections, so her movements would affect the recorded voice. However, in contrast with the previous work with Berkenhoff, the recorded voice was used only as material for the processing system, whose output turned the speech to unintelligible synthetic tones. The C section concerned a subdued part of the composition, with the louder low frequency elements omitted, while both live and recorded voice were processed into a crescendo, akin to the well-known EDM build-up and drop approaches, before leading into a final A section and the end of the performance (video 06).

Figure 4.14 – *Kitty* with Ali Matthews at Metanast 2016

With regard to the mode of collaboration, while as mentioned I initially aimed for a mutualistic process to be activated during this work, the available time prior to the performance – just two two-hour sessions – made difficult any substantive exchange of views and debates as to how the work should develop. Although Matthews initially agreed on having an active involvement within the development, as with the mutualistic approach, by the second workshop I could sense a degree of disaffection towards the work from her, providing little input into the composition and the way the system reacted to her movements. At the time, I did not address this directly, and concentrated on going over the choreography and voice processing, deciding to complete the composition according to my initial aims. On reflection, I considered whether the initially planned mutualistic collaboration had adapted, and attempted to identify the adapted mode. Despite these concerns, the collaboration progressed without tensions, and while there was little exchange between our respective material, (other than me pointing out movements towards operating the processing system), we both managed to complete and join our contributing parts within a unified work. In considering whether a commensalistic mode could be identified, I was unsure of which discipline and expressive mediums were at liberty and which were being restricted. Indeed, both sound and performance were developed without constraints, with only emergent direction that of requiring a specific choreography from Matthews as to activate the voice processing. As such, at the time I concluded that this

collaboration concerned a commensalistic approach, with the restrictions placed by the medium of sound used as a stimulus on which to develop the performance.

On the visual element of *Kitty* developed by Clarke, my initial aim was that our interaction would also be of a commensalistic mode. Early on, I provided Clarke with a set of practical requirements for his visual performance, such as the duration of the work, screen and space size, and style of sound and music. He suggested making an image generating system responding to live sound input. Agreeing with that approach, I also queried whether his performance could include camera input processing, as to create a connection between sound and visuals with both Matthews' voice and image being processed live. Further to this first discussion, there was almost no further interaction between Clarke and I on developing our respective parts. With this in mind, I have been considering whether this joint work can be identified as commensalistic. It could be said that Clarke's part used elements of my and Matthews' parts, whilst ours remained unchanged. However, as it emerged later through further research on commensalistic symbioses, such relationships are defined when the symbiont extracts increased fitness outcome, while the host experiences insignificant change. The nuance of this definition lies in the latter point of the host experiencing insignificant change, rather than no change at all, as for example the effects of barnacles on their host whale; while the mammal is not harmed, negative effects such as skin irritations and hydrodynamic drag will be experienced (see 2.1.2). In the context of creative practice, this minimal change on the host discipline as a result of polydisciplinary collaboration is reflected in developing *Scaffold4* from Kay's original *Scaffold*. Her performance for *Scaffold#4* involved wearing the Wiimotes, hence creating a physical consideration for her performance when compared to the original work. Furthermore, although Kay was to replicate her performance of *Scaffold* during our joint work, being aware of the sound generating system exerted subconscious influence on her performance. This is evident in her adapting movement whenever approaching the piezos placed on the structure (as seen in video 01 at 2:00). In *Scaffold#4*, the discipline of performance art acted as the host on which the discipline of sonic art could develop. And while the host remained largely unaffected, the slight yet evident change confirmed the activation of a commensalistic mode of interaction. With this in mind, I further reflected on my work with Clarke. His performance drew visual and sonic material from my work, without however exerting any influence on Matthews or I, neither during the development nor the presentation stages. According to my definition of collaboration, as presented in chapter three, collaborators must have influence on each other and their respective material. As such, considering there was

no evident influence of the visual material on the jointly developed sound and performance, I conclude that the interaction with Clarke does not constitute a collaboration.

In contrast, my work with Matthews showcased evident influence on each other's material, with gesture system influencing choreography, and voice making up a significant part of the composition's sound design. Reflecting on the outcome of *Kitty*, while the performance was of adequate quality in terms of the sonic and performative elements, there was a significant disparity between the aesthetics of the performance and the sound design, with the voice often feeling subdued and alien to the particular style of music. In discussing this with Matthews, I asked her views on the outcome, and also her thoughts on her level of input in the development, and whether there was anything holding her back from having more input. Responding to this, she agreed on my views about the resulting work, and mentioned that in her collaborations she is usually more involved in the development process, not being averse to putting forward suggestions that may end up to disagreements, 'which can often be quite bitter' (Matthews, personal interview, 12 September 2016). However, with regard to our work, she felt 'in service of the idea' within the collaboration, not due to any resistance on my part, as I had made clear my willingness to co-develop this performance, but rather from not possessing 'knowledge or the appropriate language of interactive electronic music' as to contribute meaningful suggestions. Furthermore, Matthews stated that she felt unclear on her role; 'What was my contribution? Was it the voice, the movement, or the lyrical content? At certain points, I just didn't know what was the purpose of the work' (ibid). This uncertainty was compounded by not having enough time to become accustomed with the interactive system, suggesting that she would have preferred to learn its operation akin to using a music instrument, by making 'precise and intentional manipulations on my voice'. Asking for a description of her process with other collaborators, Matthews mentioned that 'good familiarity helps' in overcoming arguments, and it is important to 'develop a shorthand between the two artists' (ibid), as means of quickly and clearly communicating. Although examining the social mechanisms through which familiarity is developed between individuals during professional or personal engagement is beyond the scope of this research, it remains a subject that has often concerned creative practice by scholars and practitioners alike:

> As people work together, the interaction can provide them with a mutually satisfying experience akin to friendship and love… motivation focuses on the connection with the other person; it is not limited to the goal.
>
> (Moran & John-Steiner 2004, p. 18)

In other words, the motivation towards being actively involved within a collaboration often stems from the desire to work with a specific person, and less towards achieving a specific outcome. Furthermore, while the authors suggest that 'not all collaborators need to be friends to produce great works' (ibid, p.20), they also state that trust borne out of 'respect for another person's different perspective… often develops into friendships, which may explain why friends tend to collaborate better' (ibid, p.21). Ultimately, and in agreement with Matthews' thoughts on familiarity, the authors conclude that trust 'moderates conflict, turning destructive tension into constructive controversy... Without trust, tension becomes an impassable chasm so that true collaboration cannot emerge' (ibid). Examining this aspect in relation with my collaboration with Matthews, our interaction was restricted to just three sessions each lasting between one to two hours, an initial discussion followed by two workshops, which arguably was not enough time in which to develop trust through familiarity. In contrast, my work with Berkenhoff, while also brief, included social interactions such as sharing dinner and discussing subjects beyond our work, something which allowed us to become more familiar with each other's personalities, rather than just our practices. And in reflection, it was through the social process of finding more about each other's personalities that we developed the 'shorthand' mentioned by Matthews, facilitating us to be outspoken and bold during our creative exchanges.

In collecting the findings from developing *Kitty*, the most significant of these concerns the challenges presented from the simultaneous interaction of social and collaborative environments during a collaboration. As mentioned, 'collaboration involves an intricate blending of skills, temperaments, effort and sometimes personalities to realise a shared vision' (ibid, p. 11). Therefore, skills are but a small part of effective collaboration, whereas personal characteristics come into further focus. This consideration led to a further realisation in relation to the symbiotic concept; while I was preoccupied to identify and sometimes forcefully activate a particular symbiotic mode of collaboration, I placed less consideration on initiating the collaborative process itself. In biological terms, not all interspecific interactions will lead to symbiotic relationships, even if two organisms' traits are complementary. Interpreting this within the context of creative collaboration, while the completion of a work involving distinct disciplines requires a mixture of skills, turning this mixture into a successful collaboration is more reliant on the involved practitioners' motivation towards working together. The findings presented in this section point towards personal familiarity being a facilitating factor towards achieving motivation, without however being the most crucial aspect, as showcased in my work

with Berkenhoff. In relation to the aforementioned biological traits, I conclude that complementary dispositions and characters between practitioners is a crucial aspect in creating synergy, and ultimately an effective collaboration. It is important to stress, however, that lack of tension is not a trait of such synergies, as it emerged from my collaboration following *Kitty*, as presented in a paper (Moriaty 2018, p. 13) discussing my conclusions on conflict and the ways it affects both social and creative interactions during a collaboration.

4.2.6 *Bound* and *Zero* with Shona Roberts

Having previously mentioned the work I conducted with contemporary dancer and choreographer Shona Roberts during the development of *Alpha*, I discussed how at the time her role was limited to supporting the performances of *Symbiosis* whenever Kay was not available due to other commitments. Despite that limited role, distinct from Kay's developmental input, my work with Roberts resulted in mutual influence in not only the respective material we developed for performances, but also in enriching our wider practices. From my perspective, Roberts' discipline was distinct to those of my other collaborators, whose practices fall within the wider field of performance art. With dance being a historically established artistic discipline, quite like music, I had the opportunity to be part of and investigate an interaction between disciplines which have a long and fruitful collaborative record. With Roberts' professional activities focusing on performing at commercial events internationally, such as open air festivals, theatre, and circus performance, collaborating in my projects allowed her to explore interactive technologies, as well as performing to vastly different scores than the popular music usually employed in her professional work. Furthermore, Roberts and I had been personal friends for some years before we began working together, as opposed to the other practitioners I met within the context of my practice.

All aforementioned factors made for particularly productive and enjoyable engagements whenever Roberts supported my previous project, leading us to eventually develop new performances in the context of the *Symbiosis* iterative cycle. Work on the first of those iterations took place in February 2016, internally designated as *Bound*. At that stage in my research, I was concerned with interpreting the biological notion of parasitism within creative collaborative practice, which, as mentioned in previous sections, presented ethical implications due to the conveyed negative lexicological connotations of harm and conflict. In reflection, Roberts was the ideal practitioner to collaborate with towards this investigation,

firstly owing to Roberts being accustomed to having her creative output directed by other practitioners, such as choreographers, filmmakers, and stage directors, and secondly due to us being close friends, which allowed me further liberty in communicating my ideas and project needs towards conducting my research.

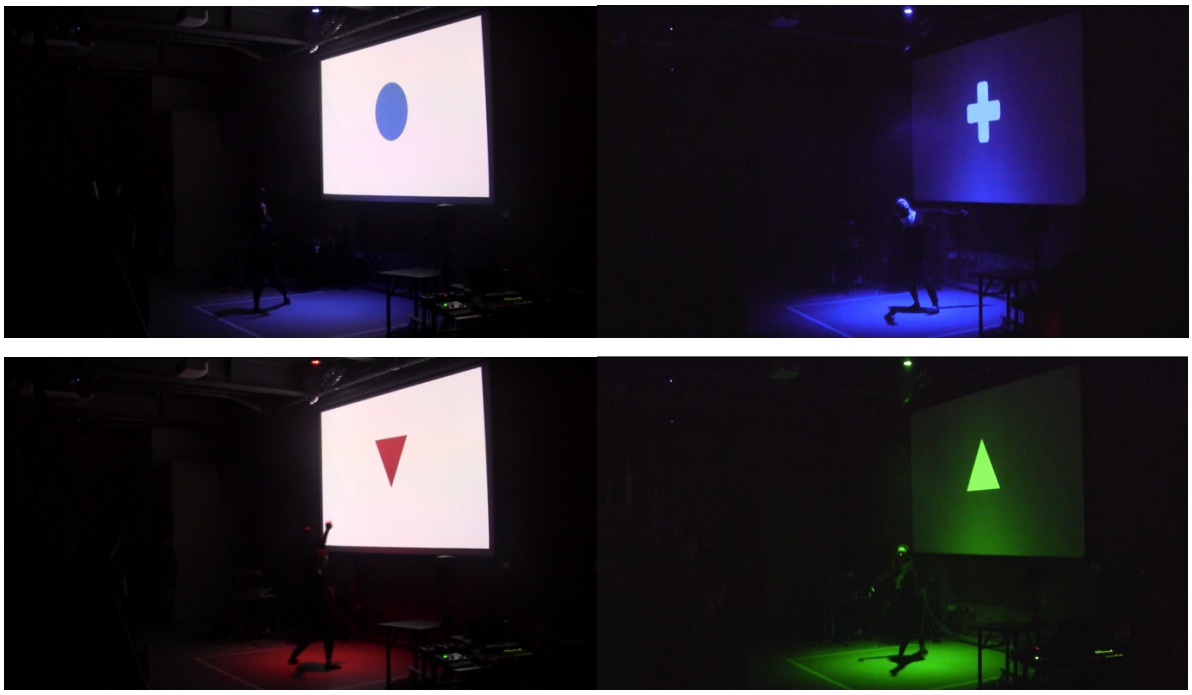
My previous attempt in activating parasitic notions with Kay in *Parasitism* concerned the work's aesthetics (see 4.2.2). In *Bound* (video 07), the aim was to interpret the notion of parasitism within the interaction between the involved disciplines. Inspiration for such an interaction design came from the symbiosis between parasitoid wasps and their host spiders. The relationship is initiated when an adult wasp lays one of its eggs beneath the spider's skin (Leung & Poulin 2008, p. 110). Following this, the larva begins to take control of the spider's function, turning the host into what is described a 'zombielike slave' (Palermo 2015), driving it to take actions that benefit the parasite's development, often against the host's welfare. Interpreting this in the context of interaction design, a parasitoid system would have to communicate one practitioner's instructions to the other with the intention of controlling the former's expressive medium. In other words, and in relation to my work, the system should be able to influence Roberts' choreography during the performance by instructing her to perform movements aimed to generate specific sounds. Considering that the means of on-stage communication between performers we had so far employed were our expressive mediums, sound and movement, any additional channels of communication would have to be delivered through a different medium, as to not interfere with our respective material.

The solution we explored was to project simple visuals as cues representing specific movements. Since the interaction took place through the performer's arms, where the Wiimotes were attached, the cues took the form of shapes signifying the location of the arms for the duration of each instruction, with upwards and downwards pointing triangles, instructing that arms should be below or above shoulder-height respectively, cross instructing shoulder-height, and circle instructing the performer to maintain constant movement. Furthermore, the shapes' different colours represented the movement's speed and intensity, with blue, green, and red making a scale from least to most intense movement (see figures 4.15a-d). In developing a way for Roberts to interpret these instructions during her performance, we used an interplay similar to the one Kay and I devised for *Beta* (see 4.2.3). For example, by projecting a blue downwards triangle, the performer's forearms have to point upwards (with the triangle's base edges representing hands), while maintaining a slow movement. These values are meant to be interpreted gradually and as average means, as to allow the performer to incorporate them within the choreography, rather than maintain a single position. Furthermore, the performer

maintained a privilege of vetoing instructions by performing actions contrasting a given instruction, as a both an extension of the interplay, prompting a move to a different instruction, and a measure of safeguarding the performer from any potentially perilous combinations of instructions. Having decided on the interplay, we conducted two workshops were we trialled the system, with the performance consisting of improvisations on both mediums. The sound design was made of interactive processing channels derived from previous works of mine, albeit with the Wiimotes' x-axis value (vertical orientation) mapped to pronounced elements, such as the frequency of the modulated filter, as heard in video 07 (0:49 to 0:51), and the gate-open probability for the percussive tone (2:10).

The findings which emerged from *Bound*, in combination with those from my work with Berkenhoff, were instrumental in defining the modes of performance interaction in relation to the types of symbiotic relationships. We paid less attention to developing our material in favour of trialling the parasitic interplay, which in reflection suggests a project focused more on research rather than practice. Nevertheless, with this being the first work to be developed solely between Roberts and I, we used this experience as a reference point towards our later collaborations. A further noteworthy aspect from this collaboration was the lack of tension in both interpersonal and collaborative environments. Previously, tensions manifested in both negative manners, as quarrels with Kay and alienation with Matthews, as well as positive, as the cordial yet heated exchanges with Berkenhoff. However, *Bound* was developed without any such tension on either interactions.

A year after our work with Roberts on *Bound*, we began work on our second collaboration, *Zero*. From the findings emerging from the aforementioned collaborations, as well as others I engaged in during that interim period, I made considerable progress towards developing my collaborative framework. Through this research I identified three consecutive stages in the collaborative process, conception, development, and manifestation, each at liberty of employing a distinct mode of symbiotic interaction (see 3.2).



Figures 4.15a-d – *Bound* with Shona Roberts at Metanast 2016 & sequence of projected instructions

With the framework functioning as both a procedural set of precepts and strategies used by collaborators towards developing new works, as well as an analytical tool towards examining completed works, I applied this knowledge by reflecting on my previous collaborations. The first consideration to emerge was that my efforts of activating the symbiotic concept in those works focused on the interactions between expressive mediums, an area concerning the stage of manifestation. Having already conducted both research and practice in identifying emergent symbiotic traits in the other two stages through the development of *Vi-We-Nous* (4.3) and *anti:lepse* (4.4), I then aimed to test the framework by activating it within a new project. In setting out the parameters by which I could effectively investigate the current development of my framework, I considered that while this examination should be conducted through a new work, maintaining precedents to my previous work would facilitate an effective comparison between new and existing findings. As such, I decided to pursue a further iteration of *Symbiosis* in collaboration with Roberts, an idea she was fortunately keen on realising. From my researcher's perspective, this approach would allow me to derive findings from both process and outcome, as well as compare them with those emerging from our previous collaborations. In this section, I concentrate on examining the process, with the work's outcome detailed in chapter five.

Starting with the final iteration of Symbiosis, I began with developing the project brief ahead of our first workshops, an approach demonstrating a parasitic stage of conception. My

aims for *Zero* were to address the knowledge and feedback which emerged from developing and performing *Alpha* and *Beta*. As mentioned earlier, obscuring the relationship between movement and sound received mixed reactions during the presentations of *Beta,* as did the 'rough aesthetics' Kay and I employed at the time (see 4.2.3). On addressing the latter point, I limited the interaction interface to the Wiimotes only, as with the previous approach in *Bound*. While also eliminating the visual aspects of the cables, I considered that Roberts' movement style was less inclined towards surface exploration, as was the case with Kay's performance, thus having less effect through the use of wearable piezos. On the former point of ambiguous relationship between expressive mediums, I decided to assign each section with a different mode of interaction, similarly to the approach taken in *Alpha*, with the difference however of implementing an evident adaptation between modes within each section. This approach is means of allowing observers to establish a relationship between sound and movement, before the mode adaptation obscures that relationship, as well as a conceptual reference to the challenges of categorising biological symbioses which are prone to adaptation. This focus on adaptation between modes facilitated me to examine whether determinacy of material is mode-dependent, or in other words, the level by which the outcome can be predicted and directed according to each mode of interaction. This aspect emerged during my work in *Vi-We-Nous*, as described in the following section (4.3), where the desired outcome needed to be controlled and determined to a high level of precision through a parasitic mode of interaction. As such, the examination of this aspect in *Zero* concerned the level of determinacy that can be achieved from the two modes, mutualistic and commensalistic, with the findings from the work detailed in the following chapter, and the conclusions presenting in chapter three (see 3.2). Finally, I also implemented the previously used appropriation of past material. In which case, *Zero* (video 08) used both sonic material and the development methodology from a work I had recently developed with percussionist Alexander Pepelasis, *Krotala*, which I will now describe before going into further detail on my work with Roberts.

Krotala featured a combination of fixed recordings and processing of live percussion, with the latter's manipulation affected by Pepelasis' arm movements, as with my previous approaches. The work's development was informed by a further notion of Cage where, in some of his work with dancers, the only shared attribute between music and dance was that of time, with materials of the two mediums brought together for the first time within the context of a performance (Cage, Kirby & Schechner 1965, p. 59). In regards to my research, this approach would further investigate a commensalistic performance, albeit in this case made of a single

discipline[32]. Contrastingly to Cage however, who welcomed a high level of indeterminacy in the aforementioned works by allowing freedom in the performer's actions within each section, or as he described these 'compartments' (ibid, p. 62), Pepelasis decided on creating a score for his percussive parts as a way of providing a determined set of actions during the performance (figure 4.16), something which he preferred over a free improvisation due to his background as concert percussionist. I further provided an arrangement for his score, marking out the intended dynamics and rhythm of each section, values which we assigned to the notions of intensity (dynamics) and density (number of played notes per beat). During the workshops we concentrated on Pepelasis' parts and the live processing influenced by his movements, as a way of him becoming accustomed to the potential sonic possibilities of his performance through the processing system. I then composed the remaining sonic material making up the work, much of it incorporating recordings of Pepelasis' parts captured during our workshops. And quite like Cage's approach, the two material, fixed media and live percussion and processing, were for the first time combined during the work's performance at the Sounds Like This Festival at the Leeds College of Music. On reflection, I considered whether the commensalistic interaction employed during its manifestation was also activated during the development stage. While both practitioners created their respective parts independently, Pepelasis' score was influenced by my arrangement, as was his performance with the motion-controlled processing system. My sound design was also influenced by Pepelasis' material, which could suggest a mutualistic interaction. However, that later influence is sourced from the material rather than the practitioner, or in other words, it was an **opportunity for exploitation** I seized and utilised towards developing my material, rather than a limitation placed due to any of my collaborator's creative decisions. This was a further significant finding towards developing the framework, by defining the parameters by which balance of creative control and direction of influence is determined within a collaborative environment. With this mind, I concluded that the development stage of *Krotala* concerned a commensalistic mode of interaction[33].

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[32] In previous chapters, I addressed the subject of whether polydisciplinarity manifests within a collaboration featuring practitioners of significantly distinct culture, methods, and equipment, albeit operating under the wider context of a disciplinary field, as is the case in my work with Pepelasis. See 2.2.1 for more details.

[33] In discussing this conclusion further, I compared the development stage of my collaboration with Pepelasis with the parasitic development which emerged while working with Teresia Björk on *Vi-We-Nous*, described in the following section (4.3).

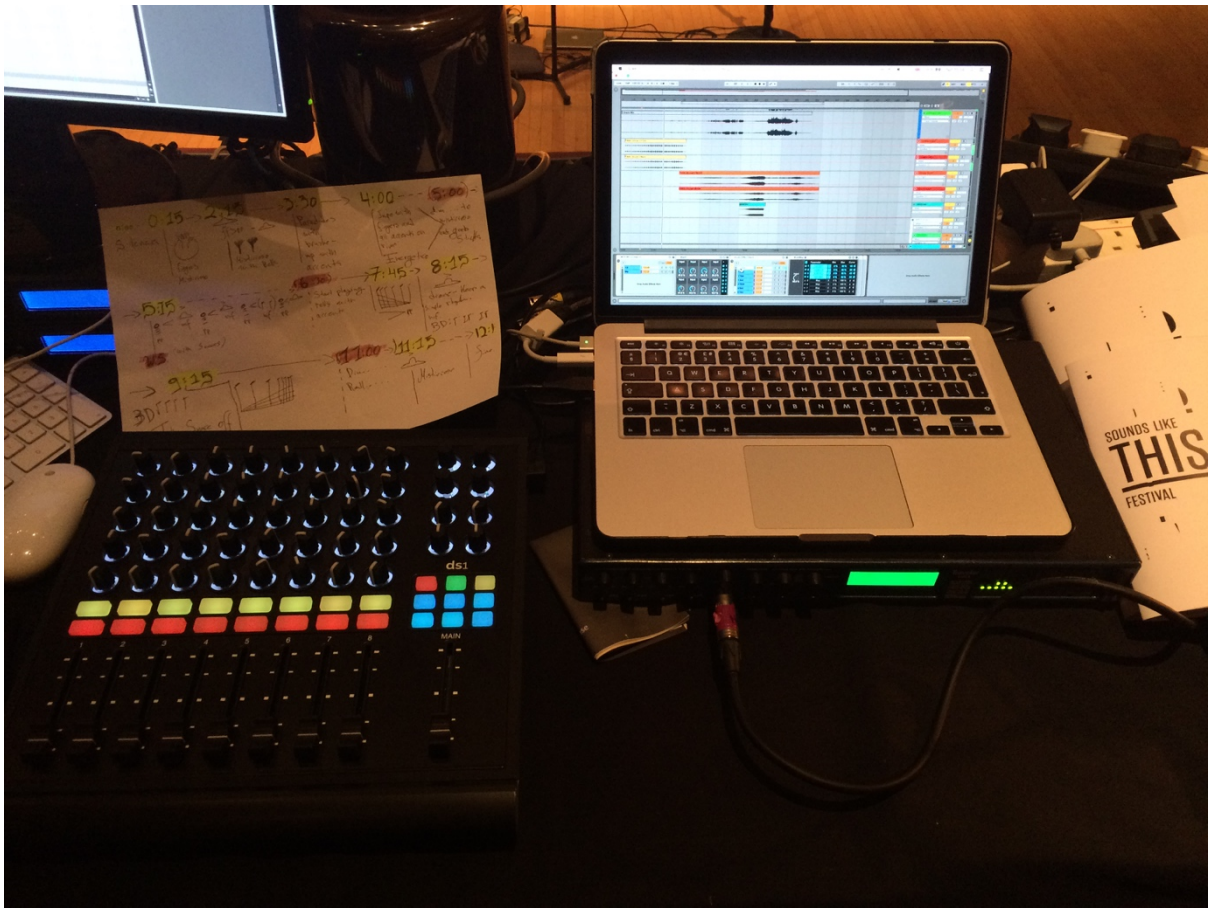

Figure 4.16 – *Krotala* equipment and score, Sounds Like THIS Festival 2017

In using the process and material of *Krotala* as the basis for *Zero*, my workshops with Roberts concentrated on working with the previous work's interactive sounds, albeit modified as to accommodate the lack of live percussion and greater range of motions. These were arranged over three sections in which the performer engaging in the different modes of interaction. In achieving this, I essentially 'trained' Roberts in operating the system, with more focus on the mutualistic and parasitic sections, being the two modes requiring the performer to knowingly shape sound through their movements. In describing our interactions during the development stage, beyond my initial direction in conveying the project aims and training Roberts in operating the system, we both remained at liberty of developing our respective disciplines within the defined arrangement. And while we maintained active roles in providing feedback on each other's material, I was tacitly assigned with the responsibility of creative decision making, as in my previous work with Pepelasis. While this suggests a commensalistic approach, I have been reflecting whether elements of mutualistic interaction also emerged in the development of *Zero*. An example of this occurred when Roberts asked for distinct sounds to be used as cues in the transition between sections. While I was at liberty to develop these

sounds, these had to respond to Roberts' requirements of being easily perceived over the other sounds making up the work's sonic material, thus placing a limitation on the development and expression of my material. This was in contrast with *Krotala*, where we solved the same issue by Pepelasis placing a timer on his percussion rig, which we synchronised with the initiation of the fixed-media arrangement. Such a solution was obviously impossible to implement with a dancer, resulting in the aforementioned limitation. It could be argued that adding the cue sounds was a practical problem solved through adjusting the work's creative material, and which perhaps could have been overcome with Roberts becoming further accustomed to the arrangement, had we had more time in our disposal. Nevertheless, this adaptation of commensalistic to mutualistic mode during the development stage hinted towards the efficacy of allowing the mode to adapt according to the emerging needs of a project. And as mentioned in chapter three, emergent adaptations in the mode of a collaboration largely occur during the stage of development, as discussed in chapter three (see 3.2.2).

From the above observations, the most significant finding to emerge from the development of *Zero* is the need for adaptability between modes of collaboration as and when the emerging work necessitates these. While this adaptation takes place in the collaborative environment, this work provided further insight into the social interactions between collaborators. As mentioned earlier, my final work with Kay was *Yellowed-out Beats*, developed in late 2016, with the collaboration eventually coming to a conclusive end a few months later after Kay explicitly expressed that she was not willing to continue working with me. While this was far from unexpected, considering the previous social tensions between us, the dissolution of this collaboration had a significant effect on me. On reflection, I experienced the loss of a shared identity (Moran & John-Steiner 2004, p. 15). On practical terms, losing Kay's partnership meant that I was bereft of a significant portion of my live performance repertoire, much of it necessitating her performance input. On a personal level, the ending of our collaboration brought about feelings of dejection and culpability towards the failure of our symbiosis.

Nevertheless, such sentimentalisms proved to be transient, largely alleviated through new findings emerging from my research's central concept, symbiosis. As mentioned, I often felt that my collaboration with Kay was dependent on its extrinsic motivations (see 4.2.4). This relates to organisms' benefit transactions, which without metabolic complementarity are

susceptible to dissolution[34]. As such, the outcome with Kay was a precarious collaboration which came to an end once the levels of extrinsic motivation reduced. In contrast, my collaboration with Roberts was based on intrinsic motivation. This conclusion emerged from investigating a viewpoint that is perhaps cynical; considering that Roberts' artistic practice concentrates on commercial activities such as theatre productions, open-air festivals, and circus performances, what is her motivation for committing time and energy towards a project existing on a fringe niche of artistic practice such as *Symbiosis*?

In describing her practice, Roberts' most common approaches involve either receiving directions on specific movements by choreographers, or developing a choreography according to the requirements set by a client. Being accustomed to such approaches, I asked her about the level of input she had on my discipline during our earliest collaborations:

> I think I would trust your expertise on that, I am definitely not a musician! ...I would give you feedback about (how) what you were doing made me feel, but I never wanted to direct you, as I thought that was more your thing.
>
> (Roberts, personal interview, 19 June 2018)

I then asked if the approaches in her practice contributed to not having much input in my discipline, and also whether she ever felt that she wanted to have more input:

> That's an interesting question. I'm so disciplined at being told what to do I guess (laughs)! And it was your project that you were getting me in on, so I was very respectful of that… you did ask me sometimes, and I was like 'oh it makes me feels like that', so going back to what we said before.
>
> (Roberts, personal interview)

Roberts then described the differences between the process involved in our collaboration and that of her other work, the latter involving in most cases developing presentations which are 'heavily choreographed' through a process of 'tweaking it, polishing it, drilling it, making it perfect'. Being accustomed to that approach, Roberts suggests that as her career progressed she

[34] For the biological notion, see 2.1.2. For my interpretation in creative collaboration, see 3.1.2

became more interested in exploring improvised choreography. And as she mentioned, this was one of her main motivation for working with me, as well as the limitations placed through the different apparatus making up the interaction interface:

> it was massively restricting my movement the wires… But that made it really interesting for me, and I quite enjoyed that restriction, because it meant that I was creating improvisational dance that was unique to those restrictions... A lot of time when you do improvised dance, you just keep coming up with the same things, the things you like doing, or the things that look good on you, ones that your body is trained well to do. When we do improvisation we do look into concepts with similar restrictions within structured improvisations. So it's interesting that it (our work) marries up with the tools that we use in structured improvisations.
>
> (Roberts, personal interview)

This eagerness on allowing our work to emerge through spontaneity also came up while discussing my level of input on her discipline, which focused on demonstrating the system's operation, and also the timeframe of presenting work after only conducting workshops, rather than strict rehearsals:

> I remember earlier on was an element of asking you 'what does this do?'… I was more bothered by that at first as I wanted to control what I was doing. But later on, after working on it for a while, there was an element of letting go and going with it, and seeing what happens spontaneously… the time we had to put out pieces, sometimes it was so tight. These different elements we had to play with it was such a quick process, from studio to audience. But in a way, I kind of love it for that. We both have to think quick on our feet, there's an element of spontaneity that is part of the work for me. In a way, it would be odd to spend a long time on it in a studio, and really know those structures through and through… Instead, I've got these different elements of it that I've got to remember on stage. It's quite exciting, I liked it!
>
> (Roberts, personal interview)

This discussion goes to answer the earlier question on Roberts' motivations. While *Symbiosis* presented few extrinsic benefits in comparison to her professional activities, the project allowed her to experience an approach which allowed a greater degree of freedom in her

expression while also imposing a set of playful restrictions. As such, Roberts' intrinsic motivations concerned an opportunity to exploit new methods, aesthetics, and tools towards enriching her expressive medium. And since my medium also becomes enriched from interacting with Roberts', a relation emerges between the creative and biological notions of reciprocal exchange and motivation towards engaging in a collaboration and symbiosis respectively.

Zero was presented during the Noisefloor Festival at Staffordshire University in April 2017. In July 2018 I was invited to perform the work at the Creative Fuse Conference in Newcastle. With Roberts not being able to attend, I asked another collaborator to perform the work, dancer, choreographer, and multimedia artist Lucie Lee, which whom I had previously developed another project. As opposed to the approaches in my previous work, based on improvisation and interplay between performers, the material for *Zero* are organised over a determined arrangement for the interaction modes during each of the sections, also including precise movements towards generating specific modulations during the final section (this is further detailed in chapter five). As such, Lee needed to both develop a choreography according to each section's requirements, as well as learn the final section's choreography. From the perspective of my discipline, revisiting the performance system after a year from its last use prompted to make alterations in regards to the ways I utilised the movement data within the arrangement. These adjustments, however, concentrated at optimising the system – reduction in processing demands, logical arrangement of control mappings on my MIDI controllers, balance between sonic elements, etc. – rather than aiming for new creative expression through generating additional material.

Having previously determined that my work with Sean Clarke in *Kitty* did not constitute a collaboration, I also concluded that collaborative traits were not evident in this engagement with Lee. Identified as tension, emergence, and complementarity (Moran & John-Steiner 2004, p. 12), emergence lacked due to the clear outcome that was expected, akin to a recreation of the developed work. For the same reasons, with Lee aiming to develop a choreography as to fit the work, she made no suggestions on altering the existing material, thus avoiding any tension in the collaborative environment. Furthermore, my definition of collaboration in relation to the symbiotic trait of persistence requires collaborators to be engaged throughout the collaborative process. Considering that Lee's role was to embody the completed work within her developed material, akin to an instrumentalist interpreting a jazz standard, her involvement was outside the collaborative process.

In contrast, 'situational humility' was entirely absent in my work with Berkenhoff, something which however made for a positive environment, with us both expressing a mutual willingness to discuss and develop both disciplines together. In discussing Kay's lack of input towards my process, she firstly stated that 'one, I never felt strongly against any sound elements that you were coming up with, and also I felt that I didn't have the necessary knowledge to discuss sound with you' (Kay, personal interview, 22 November 2016). Another aspect was Kay's level of confidence at the start of our collaboration on *Alpha*, as she stated:

> While you felt confident to suggest particular positions for specific moments in the performance, even though your knowledge on movement disciplines was not so strong, I never felt confident enough to ask for a specific sonic element.
>
> (Kay, personal interview)

Indeed, my lack of knowledge was also something 'we had to overcome early in the collaboration', with Kay having to explain 'the differences between my disciplines, physical theatre, performance art, dance… and also what could be expected of me and my movements' (ibid). Seeing that I was both inquisitive about her practices as well as open to learn and have any erroneous assumptions corrected, during our later engagement Kay stated that she felt more confident:

> I felt as if I came into a pre-existing project that wasn't mine, and I had to agree with the direction you were steering the project in… But in most recent works (e.g. Yellowed-out Beats), I felt more actively engaged… I could make decisions on the visual elements, outfits, props, etc. At first I felt like I had to ask permission to include something in a performance. After realising that you were bringing almost no resistance to these elements, I was more confident to direct the visual elements almost alone… Now, I certainly feel more confident in asking for a specific sound, or alteration in the score. That's more to do with being more familiar with Manoli the person, rather than having more knowledge on music. That's also to do with growing as a person, developing as an artist, and having more confidence in my own work.
>
> (Kay, personal interview)

From the above I understand that for Kay to be more willing to contribute, she needed evidence that those contributions would not be challenged. Beyond the aspect of confidence, a

further consideration with regard to the different experience in each collaboration is the manner in which I communicated my project aims to my collaborators. For example, in describing the previous iterations of *Symbiosis*, in my discussion with Berkenhoff we both talked about 'making a new piece' based on my system, whereas with Kay we discussed about her 'performing' in the piece. While at the time I considered the two expressions to carry the same meaning, and I certainly intended for both collaborations to concern the joint development of new works, on reflection I appreciate that the slight difference between those two statements can be perceived differently, and thus contribute to a different understanding by each practitioner. This highlighted the importance of clear and explicit communication of one's intentions and aims ahead of a collaboration.

As a conclusion from comparing the findings from my collaborations with Berkenhoff and Kay, while with Kay I placed considerable effort and consideration in creating a closer integration between our processes, thus activating a mutualistic collaboration, mutualism emerged effortlessly in my work with Berkenhoff. Having discussed several areas which can contribute towards a closer integration, in reflection I posit that such effort can in many ways be counterproductive towards creating an effective collaborative environment. Higher integration is a distinct mode of interaction, and as discussed earlier, higher integration does not equate to a **better** collaboration, a point I perhaps overlooked at the time, partly due to my focus on investigating particular areas of the symbiotic concept. Quite like types of symbioses in nature are determined by the biological characteristics of the engaged organisms, and considering that most mutualism began as parasitic interactions (Paracer & Ahmadjian 2000, p. 7), those that are observed today are the result of prolonged evolutionary processes where the organisms' genes adapted as to extract benefit from the relationship. However, serendipitous mutualisms may also occur when species' traits are complementary. In the context of my practice, my collaboration with Berkenhoff was such a serendipitous partnership, where the combination of our traits – 'skills, temperaments, effort and… personalities' (Moran & John-Steiner 2004, p. 18) – was such as to facilitate an integrated mutualistic collaboration. In the case of my work with Kay, where despite that my efforts for closer integration seldom materialised, the most effective mode to support our traits would have been a commensalistic collaboration.

As a further point from the above conclusion, while my process with Berkenhoff was more integrated than the one with Kay, *Beta* presented a much higher level of performers integration than that of *Mutualism* and *Merlin*, as evident from the elaborate system of communication Kay and I developed. This realisation pointed out an independence between

the stages of process and outcome, with each stage conducted through different modes of interaction. This motivated me to develop the framework as to allow for distinct modes of interaction to be activated in each different stage, which ultimately resulted in the three stage framework presented earlier in chapter three.

4.3 *Vi-We-Nous* with Teresia Björk

My collaboration with Teresia Björk on *Vi-We-Nous* was a departure from my usual practice at the time, insofar that I maintained the sole control over sound manipulation, as opposed to exploiting movements through an interactive interface made of GRT and/or microphones. While this provided a useful context for my practice, the most significant findings to emerge were crucial in developing the theoretical contributions of my Practice Research, and, as I present in this section, the trajectory by which the work developed resulted in a major shift in the focus of investigating the symbiotic concept within polydisciplinary collaboration.

I was initially invited in early 2016 by Thomas Bjelkeborn to present *Symbiosis* at an event he was curating in Fylkingen, Stockholm. Since neither Kay nor Roberts were available to perform with me during those dates, I asked Bjelkeborn to suggest a local practitioner who might be interested in performing with me. Björk responded to that call, and after I explained my work, she seemed keen to work together. Soon after, Björk began describing a different piece she wanted to develop, based on research she had conducted on the life and work of Swedish artist Siri Derkert. As well as finding this subject interesting, I was also intrigued by her gestures and performance using objects and surfaces on her previous work *Without Name*[35]. I communicated how my interactive system could be used within a similar performance, a possibility Björk suggested that she was keen to explore. As such, my intrinsic motivations for engaging in this collaboration concerned a well-researched and defined concept, a performer whose previous work resonated with me, and my collaborator's willingness to work with the elements of my practice which I consider important. Furthermore, it is worth also mentioning my extrinsic motivations. As a practitioner, *Vi-We-Nous* was programmed for a series of performances in Beijing and Stockholm, thus being a significant professional opportunity[36].

[35] See http://www.teresiabjork.com/video/ & https://vimeo.com/99060169

[36] More details on the programming and partners for *Vi-We-Nous* can be seen in my blog published by the University of Salford, see appendix II

And from the perspective of my research, I was motivated by the prospect of investigating a collaboration whose concept was defined by my partner, as opposed to my previous collaborations where I acted as the instigating practitioner.

Development for the work began in the week prior to the event at Fylkingen, where we aimed to prepare a performance lasting twenty-five minutes, ahead of planning for the full length performance that was expected for the later events. From our previous discussions, Björk had provided a conceptual framework based on Derkert's experiences at certain stages of her life, to which I was to respond by embodying those stimuli within the sound design. Having prepared several examples of sound design in advance, our first workshop focused on auditioning the examples and Björk pointing out which she preferred on using, who was also willing to express modifications she wanted. I found this process particularly pleasing, as it contrasted the experience during my previous collaborations thus far, where performers would have little input in the way I developed my discipline (with one exception being my work with Berkenhoff, see 4.2.4). Björk also wished to incorporate recordings of her voice in the sound design, something I was also keen to explore conduct as a way of expanding my previous work with live vocals. With this work taking place over the first two days, it was not until the final workshop that Björk began to reveal her choreography. It was then that I found the opportunity to start making suggestions on using an interactive interface. However, Björk was reluctant to using such technology, especially in the available timeframe prior to the performance. Although I was initially disappointed at not using interactive elements, I found her position reasonable, as I also had to respect a performer's prerogative on not using methods which interfere with their material, more so ones that require attachment on their body. As such, I agreed to concentrate solely on composing and performing the score. The decision to adapt my practice according to the collaboration's requirements proved to be a crucial aspect in my investigation of the symbiotic concept, and facilitated the emergence of some of the most important findings of my Practice Research, as I present next.

Following the performance in Fylkingen, I returned to Stockholm to develop the remaining sections. During that time, Björk's requirement for the score were becoming more prescriptive, asking for significantly different material than those developed during our first workshops. This is evident in the final outcome; whereas the sonic material making up the first sections (video 9, 0:00 - 19:30) are composed out of processed feedback tones – derived from the compositional approaches I was exploring at the time through my solo work *Unsound Connections* (Moriaty 2016) – the following sections are composed from material sourced from commercial libraries, such as prepared rhythmical and melodic loops, found sounds, and foley

effects, as to achieve the sonic outcome defined by my collaborator. A further contrast to my earlier practice was Björk's requirement for the material to be organised over an arrangement of particularly precise timings. This led me to develop a performance combining both fixed-media and live generated sounds, where I trained myself in performing the latter's modulations according to the arrangement[37], as opposed to my previous approaches in improvisation. I will return on this subject later in this section.

Reflecting on the process of developing *Vi-We-Nous* in relation to my research, I first examined my role. Since the work did not make use of interactive technologies, an element in which I had based my previous investigation of the symbiotic concept, I was limited in the manners I could create my material, a limitation that was further compounded by my collaborator's prescriptive direction. At the same time, I had practically no input in the development of the choreography or visual elements, such as outfits, light design, and scenery, which made me consider my experience in relation to that of Matthews' during our work on *Kitty*, where she felt unable to make contributions on my sound design due to lacking the 'knowledge or the appropriate language' (see 4.2.5). While I can appreciate how Matthews' restrictions resulted in lack of motivation towards the work, my overall experience of such an approach was not a negative one, neither at the time nor on reflection; in regards to my level of input, I acknowledged my lack of experience with Björk's discipline, and was willing to not pose any restrictions in the development of her material. Furthermore, despite the restrictions set on my material, the selection available to Björk was limited to the options presented through my output. I compared this relationship with that between composers and instrument players, traditionally concerning the latter performing material created by the composer. In contrast, my collaborator was advising the development of my material, while I maintained control over the interpretation of that advice according to my methods in composition and performance. In other words, Björk **exploited** my skills in sound design towards creating her creative vision, and my abilities in performing those sounds within an arrangement she defined.

Examining this relationship according to my framework, while our engagement began through a commensalistic mode, where the instigating practitioner provides a conceptual stimulus on which the subsequent material is developed, the mode adapted into parasitic, with the instigating practitioner now directing the development of both expressive mediums. Contextualising this approach according to the symbiotic concept, my collaborator exploited

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[37] See appendix II for the performance score of *Vi-We-Nous*

the resources I made available to the project, composition and performance, towards complementing her creative expression through my discipline and medium. It was this experience which prompted me to interpret the biological notion of fitness outcome to the range of expression allotted to a practitioner by the parameters of a collaboration, in regards to both developing their material and contributing to their partnering discipline. As parasitic symbioses concern the hosts' reduction of fitness outcome according to its symbiont's exploitation, parasitic collaborations concern the directed practitioner's reduced range of expression according to the limits defined by the instigating practitioner. This interpretation of the biological notions of **harm** and **benefit** into the creative notions of **restriction** and **liberty** was a important development in my Practice Research, and went to broaden the focus of its contributions. As mentioned previously, the investigation leading to these findings resulted from not using interactive technologies in *Vi-We-Nous*, thus allowing me to concentrate on a different area of interaction; while my earlier research examined symbiosis in relation to the interaction between **disciplines** and **expressive mediums**, the investigation now focused on the interaction between **practitioners**. As a result, while previously the framework's activation was specific to my work – performances featuring sound and movement interacting through technological means – the new investigation expanded its application to practices beyond those using disciplines, tools, and expressive mediums employed in my practice.

One of those broader applications concerned the identification of distinct stages within the collaborative process, which can relate to a broad range of polydisciplinary practices. As presented in chapter three (see 3.2.1), my framework arranges creative collaboration over three successive stage, conception, development, and manifestation. While other researchers identify more than three stages (Tuckman 1965) (Landy & Jamieson 2000) (Farrell, 2001), as also discussed in previous chapters (see 2.3.4 and 3.2.1), my arrangement over three stages was motivated from the process experienced during the making of *Vi-We-Nous*. With Björk initially presenting me with a detailed structure for the envisioned work, any of my inputs towards the concept during our subsequent workshops were countered by referring me to the previously presented structure, thus suggesting a separation between the actions that went into developing the structure and those through which our material emerged. Furthermore, the material's development continued until they were deemed to satisfy the structure, with the following actions focusing on combining the material within a coherent presentation. Following that, any changes we applied on the material related to practicalities and quality control adjustment, rather that additional creative expressions, which again demonstrates an activity distinct from our previous one. In summarising each distinct set of actions, the first relates to establishing a

conceptual basis and allocating practitioner's roles, followed by the development of the material according to the boundaries set during the previous stage, and concluding with the curation and organisation of the emerging material within a discernible outcome.

Significant differences emerge from comparing the process of *Vi-We-Nous* to that of my previous work. While in the former each stage resisted input from the following phase, the process of developing the several iterations of *Symbiosis* concerned a feedback loop between each stage, with the concepts influenced by the material emerging during the development stage, and the final outcome affected by reflecting on the feedback deriving from each performance towards informing our improvisations in future presentations.

Björk's working approach, however, has had an effect on the way I planned some of my subsequent works, as seen in the way *Zero* resisted significant changes following its first presentation (see 4.2.6). On further reflection, I considered whether the different practice backgrounds between Björk and I could be responsible for our respective approaches; while mine is influenced by the culture and practices of improvised music, experimental sonic arts, and electroacoustic composition, as well as my academic research and previous engagement with EDM, Björk received classical dance training and developed her choreography skills at conservatories such as Balettakademien and the Royal Swedish Ballet School. This consideration also emerged during my later discussions with Roberts – who is also a classically trained dancer – where she described feeling 'a massive sense of freedom' in our collaboration, as opposed to the determined approaches she commonly employs in her practice, be that heavily choreographed outcomes in commercial work, or strict direction under a choreographer in contemporary dance (Roberts, personal interview). Comparing Björk's and Roberts' process with the one I previously utilised, the most obvious difference concerns the level of determinacy within our outputs. In previous sections, I discussed the ways my earlier work with Kay was informed by John Cage's thoughts on indeterminacy (see 4.2.2), which he defined as 'the ability of a piece to be performed in substantial different ways' (Pritchett 1993, p. 108). Reflecting on the experience of working with Björk in creating a determined outcome, I considered which aspects of my earlier work could be deemed as indeterminate. This could be said of the sounds generated and modulated by the performer's movements, and further arrangement through my actions in response to the performance. However, the nature of those sounds – timbre, spectral content, envelope shape, duration, etc. – were determined in the composition stage, as was the range of the performer's possible modulations. As such, the indeterminate aspect is reduced to 'with respect to its performance' (Cage 1961, p. 36), rather than employing aleatory processes during its composition (Lloyd 2016, p. 11), an area which

Cage explored extensively in his music and writings[38]. Returning to *Vi-We-Nous*, I conclude that the motivation behind creating a determined outcome can be sourced on the work's intended series of presentations. As such, repeatability and consistency between performances was an important factor for Björk, something which from my perspective necessitated for additional preparation prior to performing at each different venue, as to maintain a consistent reproduction of the score between each space's particular acoustics and sound system. As such, this aspect presented a further restriction on my discipline as a result of the work's nature and requirements as defined by the instigating practitioner, thus further demonstrating the parasitic nature of our collaboration.

So far I discussed the several findings to emerge from my collaboration with Björk: interaction between practitioners, interpretation of benefit/harm to liberty/restriction, stages of collaborative process, and determinacy in outcome. The final subject to emerge was that of tension and conflict between collaborators. As mentioned earlier, I previously experienced this aspect in both positive and negative manners during my collaborations with Berkenhoff and Kay respectively (see 4.2.4). In the process of creating *Vi-We-Nous*, however, tension appeared in both interactions. Considering the parasitic nature this collaboration, since Björk retained the majority of control in creative decisions, that should suggest a lack of conflicting views in relation to the work's development, thus alleviating any potential tensions. Such was the case in my collaborative interactions with Kay, where our shared aesthetics and purpose during developing *Symbiosis* provided a safety barrier blocking our personal tensions from seeping within our work. As a result of intense and prolonged personal antagonism between Björk and I, such a barrier failed to materialise during our collaboration, resulting in a challenging and often dispiriting experience. Having touched upon this experience in my latest conference paper (Moriaty 2018), a detailed account of our exchanges would not provide any useful conclusions in regards to my research; however, one particular instance of conflict allowed for a significant realisation.

[38] The investigation of indeterminacy was prompted by my practice's approach in improvisation, and emerged as a distinct aspect in each mode of interaction. While it remains a useful tool for collaborators in selecting appropriate modes of interaction for the manifestation stage, as detailed in chapter three (see 3.2), a thorough investigation of indeterminacy in creative practice is beyond the scope of this thesis. This subject has been extensively discussed by practitioners and researchers, such as in John Cage's writings (see 'indeterminacy' - Cage 1961, pp. 35-40), and more recently as one of the central investigations in Emma Lloyd's thesis (Lloyd 2016).

Early on in the development stage, Björk asked for brief segment of popular electronic music with regular and pronounced rhythm. My initial composition – loosely based on the Psychedelic Trance subgenre of EDM – found my collaborator in agreeance, and we went on to use the segment throughout the development stage. However, following our final rehearsal, Björk asked me to replace it with a new composition. With our first performance the following day, and appropriate work spaces inaccessible, I explained that carrying out that task with any measure of success would be difficult, if not impossible. Despite my protest, Björk insistence on implementing that alteration was delivered as an ultimatum in her usual by then bold and abrupt fashion, leading me to acquiesce to her demands. Having spent most of the that night composing the new segment[39] in my hotel room, these tensions were further compounded the following day when I asked my collaborator to audition and approve the new segment, to which she replied that it was not necessary. On reflection, there was a lack of 'situational humility': rather than finding a solution collectively, the instigating practitioner did not acknowledge the limits of her practice knowledge – in which case, electronic music production – and placed a requirement without considering the implications on the practitioner assigned with carrying it out.

Naturally, at the time I abhorred that experience as thoroughly unpleasant. However, examining that particular request in the context of the **work** rather than the **collaboration**, it was only on reflection that I acknowledged the success of my collaborator's creative decision. Indeed, the initial segment presented significant disparities with the rest of the score, and could have potentially posed a distraction at a crucial point in the performance. As such, I considered the reasons behind my initial resistance.

Having earlier presented the thought of Moran and John-Steiner on collaborators turning conflict into a creative tool through trust (see 4.2.5), the authors further contextualise that element of trust:

> Trust consist of respect for another person's different perspective, an expectation of good will, and confidence in the other's ability to contribute to the common purpose... Without trust, tension becomes an impassable chasm so that true collaboration cannot emerge, and the participants are left with conflict and unrealised dreams.
>
> (Moran & John-Steiner 2004, p. 21)

[39] The segment in question can be heard in video 09, 25:00 – 26:24

From my perspective, lack of trust was an effect of what I perceived as my collaborator's domineering approach towards me, which extended beyond directing my creative material and into coaching aspects of my personal life. Moran and John-Steiner address this issue by suggesting:

> Collaborators can provide difficult criticism to their partners without being perceived as controlling… control of the project came from the integrity of the project itself – an intrinsic motivator.
>
> (Moran & John-Steiner 2004, p. 18)

On reflection, I can now appreciate that Björk's intrusiveness may have been well-meaning. Nevertheless, the social tensions at the time impeded me from such rational thinking. With my intrinsic motivation towards the collaboration reduced, I was resistant against additional efforts, such as the aforementioned last-minute alteration.

As with the overall investigation in my Practice Research, knowledge from studies on symbiotic relationships provides useful context. In symbioses, it is often that one of the parties will perform actions which are seemingly counterproductive to extracting benefit, as seen in the behaviour of clownfish, who protect their host sea anemone by aggressively attacking approaching fish (see 2.1.2). Rather than a purely altruistic behaviour, the clownfish recognises the long-term benefits of the symbiosis, and is therefore willing to risk short-term peril in exchange of maintaining its relationship. In the context of creative collaboration, a cynical viewpoint could be that one's ego drives them to impose their ideas on their collaborator. However, a more optimistic suggestion is that artists and creative practitioners invest significant time in devising their ideas, and long to see them realised and appreciated by audiences and partners alike. And if these are unconstructively scrutinised and rejected, this longing can result in resentment. Of course, it may be almost impossible to possess foresight on whether incorporating an idea may be beneficial or detrimental to the work. Rather, diplomacy and debate skills will largely decide which ideas become realised within mutualistic collaborations. This aspect is diffused in parasitic collaboration, where creative control is apportioned to the instigating practitioner, both as privilege and responsibility. However, as mentioned in Moran and John-Steiner's thoughts, the privilege of creative direction is attached to the responsibility of cultivating 'a safe space to hear criticism… (and) receive encouragement when work is not going well' (Moran & John-Steiner 2004, p. 16). The responsibility of the instigating practitioner is further contextualised by Helen Storey:

> there can be no high argument of who is more important than the other. Whether you are the instigator of the project or not, there has to be a levelling of personality that goes on. There has to be an authentic acceptance of this fact, because you both decide to be equal in it… If you are instigating a collaboration, you have to be prepared to open up and to truly take that other person into account, and not become prescriptive to them. And that is where the risk is, because they can come up with something that you don't like.
>
> (Miell & Littleton 2004, pp. 47-48)

In my efforts to further investigate hierarchy and conflicting views in collaboration, I brought up this subject during my interviews with other practitioners. I first asked musician and media artist Marinos Koutsomichalis his thoughts on being directed within a collaboration, to which he replied that he is often open to 'lose control and serve' (Koutsomichalis, personal interview, April 24 2018) during a collaboration:

> It is the freedom of not being yourself… You can temporarily become dominated by the other party, and in the context of certain collaborations it may or may not work out… I won't be depressed if I just temporarily follow a project. I am able to put my ego aside for a bit.
>
> (Koutsomichalis, personal interview)

I then asked whether he has encountered a case where he acquiesced to a creative decision he was not happy with at the time, but in reflection it was beneficial for the final outcome:

> And vice versa, in many many situations my idea was largely the wrong thing to do (laughs)... I mean, I have a strong ego, and humans are complex beings. It could be that I insist on something, an idea, because I think this idea is really good. But that's on a superficial level. What's true could be that my psychology is such, and my personality traits are such that I am becoming kind of obsessed with that particular idea. Or it could be a hunger that I project towards the other and I hide in the ideal, or maybe I try to exert power on him or her. All of these we don't understand, but from a psychoanalytical perspective it plays a part in how we behave and who we are. I mean, there is a line, there are always limits. But it's not always clear to me whether an idea is good, or whether

> someone is trying to project that idea for an ulterior reason, either knowingly or subconsciously.
>
> (Koutsomichalis, personal interview)

Indeed, Koutsomichalis' point on the subconscious exertion of power over your partner in the guise of creative decisions seems a possibility which may have occurred in my work with Björk. However, as with my earlier statement, it could have also been an earnest desire of seeing her creative vision realised through my material. I then asked whether Koutsomichalis believes that instigating roles should be fluid, with the balance of creative control assigned dynamically during a collaboration:

> It depends on the context, on the person… If I feel that the context is appropriate I can lose myself in them, or even try to exert power on other people, or let them take all the responsibility on themselves.
>
> (Koutsomichalis, personal interview)

This relates to the context-dependent nature of symbioses, with the type of relationship between two specific organisms being susceptible to mutation according to environmental factors. In the context of creative collaboration, those environmental factors relate to the dispositions and character traits of each practitioner, and which largely determine which mode of collaboration is possible, and furthermore most effective.

Koutsomichalis then added a further comment on the efforts going in to maintaining a collaboration:

> some collaborations are very exhausting psychologically. Human are quite complicated, sometimes you work with other people and you feel they drain all your resources and your stamina. But then it could be that in situations like that the results are very interesting, and the kind of artworks that you get in the end deserve these situations.
>
> (Koutsomichalis, personal interview)

As with the earlier comment, this sentiment is evident in my efforts towards creating *Vi-We-Nous* – which at the time I considered to be my most mature composition – since the quality of the final outcome demonstrated that the stressful and draining environment during its

development was a worthy endeavour. It was this conclusion which led me to identify the work itself as the highest priority within a collaboration, as discussed in chapter three (see 3.4), which relates to the aforementioned example of the clownfish and sea anemone symbiosis. In receiving temporary **harm**, the motivation of the clownfish is not focused on providing **benefit** to its partner, but to itself exploit benefit from a prolonged relationship. Similarly, practitioners' motivation in setting temporary **restrictions** on their expression is not focused on allowing **liberties** to their collaborator, but instead to liberate the work from the barriers emerging from the complexity of social interactions.

I then discussed this subject with composer Alan Williams, whose work and academic research has championed collaboration among composers. In discussing his work with the BBC Philharmonic, he mentioned that while the traditional role of the composer suggests 'a complete control over the artistic outcome' (Williams, personal interview, 7 June 2018), he values contributions from other performers and conductors, since they 'know what will work' (ibid) in relation to their instruments and score respectively. He then offered his views on the need for practitioners to place the work ahead of any motivation for personal expression:

> [practitioners] should have the humility to realise when someone has more or better insight and have something to offer. In terms of collaboration, and I have experienced this flipping between leadership and following roles, you have to have the skill of leaving your ego at the door… and if your behaviour or the interaction with the other collaborator is damaging the work, you have to stop, you have to reconsider, you have to step back, you have to abandon your ego and say 'right, what do we really need to achieve here?'
>
> (Williams, personal interview)

In relation to the conflict I described during my collaboration with Björk, the answer to Williams' rhetorical question is that we needed to achieve a transition between two significantly different sections of the score. The initial EDM-influenced segment would have been unsuccessful in the context of the existing score, largely comprised of abstract sound design. With the last-minute alteration making for a coherent transition, the final result justified both Björk's creative decision, and my effort in following her direction.

Collaborating with Björk in *Vi-We-Nous* has been an invaluable experience on several levels: it contributed some of the most significant findings of my Practice Research, it presented a significant professional opportunity, and it matured me as a practitioner and as a

person. I should mention that despite the aforementioned tensions, my social relationship with Björk remains cordial to this day. Following discussions, she made clear that her behaviour was never intended as disrespectful, but rather a result of her learned working methods and the intensity of creativity. My overall conclusion is that Björk is an incredibly dedicated practitioner, whose direction intended to bring out the best out of my material, even at the cost of a harmonious social relationship at the time. John-Steiner acknowledges intensity as 'essential to creative work', adding that 'Trust is central to collaboration, particularly among dyadic partners. But it cannot be taken for granted. It needs nourishing' (John-Steiner 2000, p. 83). This aspect fuelled the final finding to emerge from my collaboration with Björk, that is identifying the **collaborative** and **social** environments as distinct yet interdependent areas of interaction (see 3.1.2), and their interpretation with the **ecological** and **evolutionary** scales through which symbioses are investigated (see 2.1.5). While creative partnerships start with collaborative interactions, it is the social interactions which mature and evolve the relationship. And quite like evolutionary adaptations allow symbioses to persist against adverse environmental factors, it is through nourishing trust that practitioners facilitate synergy and protect their collaboration from incompatible personal traits.

These findings on the role of social interactions between collaboration were further investigated and activated during my work with Emma Lloyd, described in the next section.

4.4 *anti:lepse* with Emma Lloyd

As mentioned earlier, my collaboration with Kay on *Yellowed-out Beats* (see 4.2.3) aimed to provide further insight into activating the symbiotic type of commensalism within both process and outcome, and supplemented the initial findings to emerge from the previous work *Commensalism*, where the type was examined only as a mode of interaction between our mediums. Following the performance of *Yellowed-out Beats* in October 2016, I intended on repeating this supplementary process on parasitism through activating the mode throughout all three stages of the collaborative process. In achieving this, I was to alone define the work's aims and parameters during the conception stage, direct the performer in realising those aims during the stage of development, and present a work where the relationship between sound and movement embodies the notion of parasitism.

My approach during the conception stage was influenced from that employed by Björk, who set out the aims for *Vi-We-Nous* according to the resources I was making available to our

collaboration, as described in the previous section. With intending on developing the new work with Kay, as part of our ongoing collaboration, the brief was established by taking into account my collaborator's abilities and medium. However, in contrast to Björk's aforementioned approach, I also aimed to incorporate the themes Kay was exploring through her practice at the time, namely 'endurance, duration, pain, and their effect on the body and mind' (Kay n.d.). As a way of preserving a connection with the precedent work, *Parasitism* (see 4.2.3), the new work would again use feedback tones as its principle sonic material, while also maintain the previously employed visual aesthetics. Keeping in mind that those elements derived from Kay's *Scaffold*, I examined her work as a further source of influence towards setting out the brief for the new project. As such, exploiting her work served as further means of activating the notion of parasitism, as well as the previously employed appropriation/recycling of past material (Cage, Kirby & Schechner 1965, p. 53) (Landy & Jamieson 2000, pp. 8-9).

In examining the documentation of *Scaffold*, I concentrated on a photograph depicting Kay with her arms stretched in between the structure (see figure 4.17), which, in her own words, was a way of portraying the role of 'women in religion through a visual aesthetic' (Kay n.d.). That image became the prompt through which all aforementioned elements – aesthetics, themes, sonic interface – could be combined in a coherent manner. Wearing piezos and Wiimotes on her forearms, the performer stands between two speakers set at shoulder-height, as for the piezos to face the speakers when the performer raises her arms. This would complete an electroacoustic feedback loop, thus generating sound for as long as that position is maintained. As such, the expression of sound would be reliant on the restriction of movement, therefore activating the mode of parasitism in the interaction between mediums. With further research on the themes and concepts I aimed to explore – such as the imagery to emerge from the West's military involvement in the Middle East, and feminist theories on the female form and woman's perceived role in society[40] – , by early 2017 I had completed the work's brief, and was then in a position to begin discussing it with Kay as to progress from the stage of conception to that of development. However, before I had a chance of doing so, it was then that Kay expressed unwillingness to continue our collaboration. As well as the personal effects caused by this dissolution, as mentioned previously (see 4.2.6), this was a major setback in

[40] See appendix II (*anti:lepse* notes, p. 1) for more details on the work's conceptual basis. While this was eventually collectively constructed between Lloyd and I, the central concepts derived from my initial research.

realising the new project. And since it was planned specifically with Kay's practice and thematic exploration in mind, my initial inclination was to abandon it.

Shortly after these developments, I had a discussion with Emma Lloyd, a fellow musician and researcher whose thesis investigated collaboration and indeterminacy through a practice focusing on classical and contemporary works for violin. As well as being a close personal friend, it was always my intention to discuss and compare findings on our common research topic. Our discussion initially focused on her work *[kiss]*, written by composer Matthew Sergeant specifically for Lloyd. Being a 'performance/installation lasting 3-5 hours' (Sergeant 2014) where the performer navigates through an indeterminate graphic score, Lloyd explored the effects of a durational challenge on her body and mind, and 'how that challenges comes out in the performance' (Lloyd, personal interview, 20 June 2018). Connections between *[kiss]* and the aforementioned project I had planned for Kay began to emerge from this discussion. In describing my idea to Lloyd, and seeing an obvious interest from her part, I suggested we develop the work together, to which she responded positively.

This collaboration presented several peculiarities in comparison with my previous engagements. While Lloyd's expertise in collaborative practice was an obvious asset, her discipline concerned the wider field of music, which in principle implied that this work would fall outside the context of polydisciplinary collaboration. However, as discussed with my collaborator at the time, a practitioner's disciplinary subject is activated during praxis rather than in precedence. Of course, the limits of one's creative contributions are defined by their knowledge and experience, as for example my aforementioned reluctance towards having input on Björk's choreography during our collaboration.

Figure 4.17 – *Scaffold* by Frances Kay, 'crucifix' pose

At the same time, I considered that placing a practitioner in an unfamiliar creative role may potentially yield unexpected outcomes, as mentioned previously by Roberts, who expanded her improvisatory vocabulary as a result of the limitations imposed by the equipment used in our work (see 4.2.6). A further precedent of such an approach is the collaboration between John Cage and Merce Cunningham on *Concert For Piano and Orchestra*, where the latter acted as conductor (Fetterman 1999, p. 123). When asked his reasons behind placing an acclaimed dancer and choreographer in the role of conductor, Cage replied 'he was available. I knew **he could do it**' (Cage 1986, in Fetterman 1999, p. 124). With this in mind, and considering Lloyd's willingness and availability, as well as her experience of and interest in exploring

durational challenges on body and mind, I was confident that her role in this project was appropriate; I knew **she could do it**.

Embarking on this project with Lloyd led me to reconsider my initial aim of examining only parasitism. As well as our long-standing friendship providing an intrinsic motivation for employing a reciprocal mode of interaction, her expertise in collaboration was a further incentive for me to embrace all and any input she was willing to commit, and allow the project to change accordingly. During an interview conducted almost a year after our collaboration, I asked Lloyd to reflect on her understanding of our roles:

> One of the earliest discussions we had was me asking what you really wanted here… And you said you wanted to be a collaboration in sort of equal terms, and you wanted my input in that way. Although we had our roles within that, I felt that it was pretty even.
>
> (Lloyd, personal interview, 19 February 2018)

I then asked her views on whether any significant changes took place, compared with the idea I initially presented:

> I think it did change over the course of quite a few conversations and the workshop time we had on it. I mean, not entirely, but I think it sort of grew into exploring certain different avenues simultaneously. You had a basic idea of what you wanted to do, and it came from this idea of how a collaboration could be parasitic. And then because of the way we started talking about it there were other areas of interest that I had in the project that I think we managed to bring into it.
>
> (Lloyd, personal interview)

Indeed, even before our first workshop we began highlighting the existing aspects we were mutually interested in exploring, as well as any new avenues Lloyd wished to explore. One such avenue concerned the use of sensory deprivation, which we implemented by blocking vision through a blindfold, and reducing hearing through in-ear monitors broadcasting only the feedback tone, rather than the processed sonic outcome. This aspect was introduced as means of both extending the performer's meditative state during the performance – an element already explored by Lloyd in *[kiss]* – as well as developing an unorthodox manner of influencing a

performer's actions during the performance[41]. It was through reflecting on this change that led us to collectively established the work's title as *anti:lepse*, from the transliteration of the Greek word *αντίληψη*. While translated as 'perception, understanding, awareness' (Word Reference, n.d), the term is synthesised from the prefix *αντί*, meaning 'against', and *λήψη*, meaning 'reception'. As such, we considered the notion 'against reception' to effectively conveys the performer's experience. A further aspect to emerge during our workshops relates to the length of the performance, which was initially planned as a durational installation, akin to Kay's 3-6 hours-long *Scaffold* and Lloyd's 3-5 hour-long *[kiss]*. The body stance required to generate sound (see figure 4.18) had an obvious effect on her body, with muscle contractions appearing as early as seven minutes after maintaining that position. Despite the discomfort, this aspect was desirable by both partners, as it made for an extrovert representation of the performer's internal struggle while operating the instrument's anti-ergonomic design. As such, in order to safeguard the performer's wellbeing, we decided to change the work's format to a performance lasting 20 minutes.

Figure 4.18 – *anti:lepse* with Emma Lloyd, studio, interrupter feedback position

[41] See appendix II, (*anti:lepse* notes, p. 1) for more details on the principles directing the performer's movement and interaction with the system.

While some of the changes emerged through practical explorations of the system during workshops, the majority were conceived during our planning discussions. In relation to the symbiotic modes activated during the first stage, Lloyd, to whom I explained the framework, suggested our interaction was more related to a commensalistic mode (Lloyd, personal interview). On reflection, I considered whether the aforementioned changes and collective decision-making pointed towards a mutualistic conception stage. However, these changes concerned the accommodation of my collaborator's practical issues and creative contributions. As such, despite the modifications and augmentations of the initial idea, the overall concept I devised persisted. Therefore, suggesting a commensalistic conception. Following this, the collective decision-making persisted in the development stage, thus demonstrating a mutualistic mode of interaction. In setting our aims for the outcome, we had to consider the practical limitations facing our collaboration. With Lloyd residing in France at the time, conducting working sessions with the same frequency I had during my work with Kay was impractical. As such, we used the limited time we could both commit to the project towards developing a demonstration video (see video 10), with the intention of then seeking appropriate sponsorship as to enable us to commit sufficient time in fully realising the work. Despite our best efforts, such support is yet to materialise, and thus the work lacks a conclusive outcome. Regardless, the process through which we developed the proof-of-concept video provided crucial insight towards my Practice Research investigation. On reflection, Lloyd was the only practitioner – other than Kay – I could have asked to collaborate with me on *anti:lepse*. Considering the work's intrepid concept and challenging requirements for the performer, my collaborator had to be someone I was particularly familiar with, and to whom I felt comfortable and confident in discussing my ideas. Lloyd agreed on this point, stating 'I would have been very very careful about who I would work with on a project like that as well' (Lloyd, personal interview). She further clarified that beyond protecting her physical wellbeing, a collaborator for this project must have been one who would accept the limits she would set herself for the performance, 'and for that to not be taken as a sort of front' (ibid), a point reflecting Koutsomichalis' earlier thoughts in regards to a subconscious exertion of power over one's collaborators (see 4.3.4). Lloyd further expanded on this subject:

> I know that if I say to you that 'that's the line, I won't do that' then you'll know it's not because I am trying to be difficult. And I also trust you that you wouldn't try to push me into anything that I was uncomfortable with doing.
>
> (Lloyd, personal interview)

This demonstrates how familiarity can facilitate transparent exchanges between collaborators. Considering the ambiguous communication that was evident during the developed of *Vi-We-Nous* (see 4.3), my collaboration with Lloyd was facilitated by our pre-existing social bond, and allowed us to feel comfortable in clearly communicating our ideas and concerns. In asking about her previous social interactions with other collaborators, Lloyd described having experienced working with both new and familiar practitioners. However, the common trait between both experiences is the strong social bonds developed during the collaboration, stating that she would 'start working with people that we have some mutual interests socially before we actually start working together' (Lloyd, personal interview). From further discussing this subject, what emerged was the importance of the social interactions between collaborators, and they ways it assists a project's progression:

> I think the best way for me has always been that social time which surrounds the working time, where we just sit and bounce ideas, and say 'well, this is the thing about this, this concerns me, this is one of the things I am worried about'. And it's not important to resolve it at that time, it's important to just talk about things, and then go away and come back and say 'I was thinking about that'. We did a lot of that, we had conversations like that and couple of days later you would come back and say 'Actually, I was thinking about what you said'. I think that was really productive.
>
> (Lloyd, personal interview)

I consider the above statement to be an apt demonstration of the **interconnected** nature between **social** and **collaborative** environments, and how **solutions** to problems or disagreements often occur **outside** the working environment through the collaborator's individual reflection. In asking Lloyd her view on conflict and tension between collaborators, she stated aversion in using those terms for describing the exchange of ideas and disagreements which naturally emerge during collaboration. Her response demonstrates the crucial role of diverging views among collaborators:

> in my experience with other collaborations we obviously have different ideas about something, and we would argue things out, and we may not necessarily agree in one sitting. But then we can go away and have a think about it, and the fact that someone challenged what you were thinking about before, is a very good way of refining your

> ideas. And also for getting rid of some of the ones that aren't going to work, at least in that particular collaboration.
>
> (Lloyd, personal interview)

She then added a point which on reflection provided a significant insight towards my investigation of the symbiotic concept:

> that decision process is why every collaboration is unique. Because we are going to come up with something together, you and me, that's going to be completely different that what I would come up with someone else, and indeed with what I come up with on my own. It's not just my ideas and your ideas together. These ideas which we come up together **are formed**, **are shaped**, **are refined** [emphasis added] because of what the other person has said to you, because of the way they have challenged the ideas.
>
> (Lloyd, personal interview)

Indeed, this statement appropriately encapsulates the intention of the mutualistic mode of collaboration, and to an extent also reflects the corresponding symbiotic type. As mentioned in chapter two (see 2.1.3), organisms' evolutionary adaptations are influenced by their **sustained exposure** on each other's **traits** and through a **selection** process reliant on 'conflict management' (Douglas 2010, p. vii). It is through this process that the evolutionary trend towards mutualism emerges. In the context of creative collaboration, practitioners' ideas are **'formed, shaped, refined'** through their **sustained interactions.** And as Lloyd points out, the outcome to emerge from these exchanges is **unique** to each collaboration, akin to how evolutionary traits are **specific** to each persistent interspecies relationship.

Another point emerged from my reflective discussion with Lloyd; further elaborating on her previous statement on refining ideas through mutual challenging, she brings up the subject of competition between collaborators as being counterproductive:

> it's about letting your own ideas to mature and change, and you reflect on things, rather than being like 'Right, I think that, and you think that, who's going to win?'. I mean, yes, for me, you can do that, but that's not the interesting thing about collaborating.
>
> (Lloyd, personal interview)

Examining competition in relation to the biological phenomenon, conflict in mutualisms manifests as 'cheating' (see 2.1.4), with organisms motivated to extract additional benefits temporarily performing actions that compromise an otherwise reciprocal relationship. And as mentioned, this is an important biological trait in partner selection (Douglas 2010, p. vii), and in influencing the emergence of evolutionary adaptations leading to more stable mutualistic symbioses. However, in the context of creative collaboration, such competition proves counterproductive, regardless of employed mode of interaction. If a creative contribution is ignored, unconstructively scrutinised, or imposed without regard to the context of the work, this will inadvertently lead to disappointment and resentment from the perspective of that contributor (see 4.3.4), and ultimately reduce their motivation towards the work and the collaboration. This disparity between **biological** and **creative** notions of competition served that the **limitations** of **relating** the **symbiotic phenomenon** into a **collaborative framework** emerged. Of course, as presented in chapter three (see 3.1.2), this realisation was neither unexpected, nor suggested a fundamental flaw with employing symbiosis as the central concept of my investigation. Rather, it pointed out the limitations in attempting a literal **translation** between the two fields of knowledge, and as such prompted me to focus on the **interpretation** of patterns between the **biological** and **creative** systems of **interaction**.

I then asked Lloyd her view on the differences between collaboration and other types of joint work, with her reply referring back to collaboration's trait of uniqueness:

> it comes back to what we said about if there was a different person the final product would be different. If that person had an influence on it, then they are to some extent a collaborator. I mean, there are some fuzzy areas. If you are going for some technical advice, for example, it all depends if that technical advice could have been obtained from somewhere else or from a book or another person.
>
> (Lloyd, personal interview)

This statement by Lloyd relates to my earlier conclusion on **direct** and **active** participation of practitioners in the creative aspects of their joint work, from which the notion of **irreplaceability** emerged as a defining trait of collaboration (see 2.3.2). It is worth pointing out that this position is based on Howard Becker's observation in regards to support personnel being interchangeable in the creative process (Becker 1982, p. 78), which relates to Lloyd's suggestion of 'fuzzy areas' between creative and technological contributions towards a project.

This aspect is particularly pertinent to practices where technology plays a crucial role in facilitating the practitioner's creative expressions.

In summarising the findings to emerge from *anti:lepse*, even though the collaboration demonstrated further connections between biological phenomenon and creative practice, at the same time it pointed out the concept's limitations. Furthermore, the collaboration with Lloyd highlighted the significance of tension in collaboration, and the way in which strong social bonds allow a transparent exchange of diverging views in the collaborative environment, and their subsequent resolution during social exchanges, thus again relating to Moran and John-Steiner's theory of trust between collaborators 'turning destructive tension into constructive controversy' (Moran & John-Steiner 2004, p. 21). In addition, Lloyd's expertise in collaboration provide further evidence towards the uniqueness of collaborative endeavours; akin to organisms' evolutionary traits being unique adaptions resulting from their interaction with their symbiotic partners, the manner in which each practitioner exploits their partner's resources results in outcomes specific to their discipline, tools, aesthetics, and furthermore to their motivation towards the work, and disposition of relationship with their collaborator. It is here where the notion of irreplaceability emerges again (see 2.3.1); although the initial parasitic conception took into account Kay's practice traits, the joint development with Lloyd resulted in a work which indeed bares the latter practitioner's specific traits[42]. The final finding to emerge underlined the fluidity of disciplinary engagement in relation to extra-disciplinary inclination. If Lloyd's discipline were to be deducted solely from her experience with stringed instruments, that would leave a narrow field of practice that could be exploited within a collaboration. However, as the process of *anti:lepse* demonstrated, Lloyd's exploration of mental and corporeal challenge proved crucial in using her body as an expressive medium, thus facilitating a disciplinary adaption from music to performance art.

[42] As mentioned in chapter two when I first articulated the notion of irreplaceability, it would be impossible to precisely anticipate an outcome of polydisciplinary collaboration. My conclusion on the final outcome of *anti:lepse* being distinct to what would have been developed with Kay is reached from my personal knowledge of each practitioner's traits, which of course is presented with certain reservation in its accuracy.

Chapter 5

Outcome – *Zero*

Zero is a live performance realised through the interaction and collaboration between the expressive mediums of sound and physical movement. Through a set of commercial motion sensors, performers improvise within a feedback loop where sound and motion are continuously influencing one another. The performance aims to highlight the emergent properties of interdisciplinary interaction in reference to the biological phenomenon of symbiosis, with the interaction modes utilised in the performance mutating from mutualistic to parasitic, with the balance of expressive liberty modulating between the mediums of sound and movement and their respective practitioners. The resulting live work combines the mediums not as distinct artistic expressions complementing each other, but as an amalgamation of disciplines within an obligate interdependent system.

(Programme notes)

5.1 Introduction

As mentioned in the previous chapter (see 4.2.6), *Zero* was the result of my collaboration with contemporary dancer Shona Roberts, which was then further performed with Lucie Lee. Created as a live stage performance involving the disciplines of music and dance, it aims to present a feedback loop between practitioners, disciplines, and expressive mediums. Starting with sounds contained in Ableton Live, its extrovert reproduction influences the performer's movements, whose wearable motions sensors – in which case a pair of Wiimotes – influence sound, thus completing the feedback loop. The sounds making up the composition consist of devices generating and modulating sound according to the performer's movements, as well as a set of pre-recorded sustained drones.

The work is structured as to feature the three modes of symbiotic interaction, each activated during as many sections over its arrangement; starting with mutualism (video 11[43], 0:00 – 3:50), moving onto commensalism (ibid, 3:50 – 9:30), and concluding with parasitism. Each of these modes is characterised by a predefined interplay motivating and instructing both performers' actions, as is described next.

5.2 Symbiotic modes

5.2.1 Mutualism

As with the mutualistic mode of interaction, the performer is aware of the system's function during, and can anticipate the resulting modulations their movement will exert on the sonic environment. Wearing a Wiimote one each forearm, the data path between the sensors' continuous control (CC) messages and corresponding sound device parameter goes through two maxforlive control devices, Map 8 and Multimap (Max for Live Essentials pack), with the CC mapped to Map 8's dials, and each dial mapped to a single instance of Multimap. It is Multimap which is mapped to the sound devices' parameters, and ultimately provide audible

[43] While the initial development of the work discussed in chapter four is presented through video 08, the following discussion concerns the material presented in video 11, performed with Lucie Lee. All mentioned times from hereon relate to video 11.

modulations. This approach allows for various controls and alterations to be performed to the way data are affecting sound, as is explained in the following sections.

The main interactive sound during the mutualistic section is generated by a feedback delay (Amazing Noises Dedalus Delay), with its parameters mapped to the Wiimotes' eight CC values, these being X axis (vertical position), Y axis (roll), Z axis (yaw), and acceleration. In this case, the X axis of both devices (horizontal orientation) is assigned to the delay's two filters, low pass and high pass for left and right arm respectively.

The performer is free to improvise throughout the section, knowing that pointing any of arm downwards or upwards will cause the generated sound to reduce in volume (due to the removal of frequencies caused by the filters). The remaining functions, such as tonal manipulation, grain size and frequency, although receiving modulations from the Wiimotes, are not under the explicit direction of the performer, but inadvertently exploit her movements in a relationship akin to commensalism.

The musician's role during this section is to adjust the range by which each CC of the Wiimotes affects the mapped parameters. Performing adjustments on the Map 8 and Multimap instances, in which case the Mutlimap's minimum and maximum range values. As a result, the musician is able to adjust the performer's expressive range, starting with the movement modulations restricted to creating a specific sound design during the first phase of the mutualistic section, and allowing further control later on, thus deviating from a determined sonic outcome.

The results section sees the performer focusing on upper body movements during the early phase of the section, before beginning to move across the stage later, once greater range of gestural expression is granted. The interaction is described as 'structured improvisation', with the performer being able to anticipate specific sounds from their movements (learned during rehearsals), without these however being organised to a precise choreography.

The cue for the transition into the next section is the distinct percussive sounds starting at 3:50.

5.2.2 Commensalism

In contrast to the mutualistic mode (as well as the parasitic, as I explain next), during the commensalistic section the performer is not aware of their movements' effect on the generated sound. This is the result of a matrix system between the mapped parameters, with the musician

able to perform live re-mappings of the relationship between movement data and sonic modulation parameters.

The sound generation is based on a series of granulators (Audiority Grainspace) processing recordings of synthesised percussive patterns, with the Wiimotes' CC mapped to the granulators' parameters such as start-end of input sample, pitch and tone variations, saturation, grain size and frequency, and reverberation. However, in contrast with the previous section where the mappings are fixed, in this case the continuous messages and DSP parameters are interrupted by a matrix built from a combination of Map 8 and Multimap devices. The performer's instruction is to use the produced sound towards conducting a free improvisation for the duration of the section, while trying to ignore the relation between the movements and sound modulation, since that will be subject to change by the musician's actions. The only cognisant interaction of the performer occurs after 8:19, where patterns of kickdrum and snare sounds are triggered through engaging with each Wiimotes' acceleration values, respectively left (kickdrum) and right (snare). Once the performer is aware that the two sounds have become available, they can implement these within their improvisation, while continuing to inadvertently modulate parameters in the other sounds.

The outcome results in an ambiguous connection between movement and sound. While the performer is unware of that connection, the expressive medium of sound exploits the modulations provided by the movements, thus enriching its gestural vocabulary. The transition cue for the next section is the distinct arpeggio synthesiser sound starting at 9:28.

5.2.3 Parasitism

The parasitic section presents the highest level of control from the performer, while at the same time posing the highest level of restriction on their movements. The Wiimotes' CCs are mapped to a synthesiser (Ableton Analog) generating a fixed arpeggio pattern, with the left arm controlling the synthesiser's low pass filter cutoff frequency on the X axis and envelope attack duration on the Y axis (rotation), while the right arm controls reverb depth and delay feedback on X and Y axis respectively.

The choreography is constructed towards achieving a determined sonic outcome. Starting from a static standing position facing the audience and both arms pointing downwards, the performer begins a slow extension of the right arm from pointing downwards to upwards over the performer's shoulder. The movement modulates the reverb depth, from the lowest

value (sett at 10% wet-dry ratio) to its highest (50%). Once the highest value has been reached, the performer moves the left arms downwards in a similar speed as the first movement, and simultaneously pivots the right arm upwards at the same speed, thus increasing the synthesiser's low pass cutoff frequency. Once both arms have reached the same position parallel to the ground, the performer is instructed to swiftly 'punch' with their right arm, thus triggering the kickdrum pattern, and bring both arms pointing downwards, before repeating the same sequence of movements again. Once the second sequence is completed, the performer is instructed to 'punch' with both arms and then move away from the initial static position. At that point (video 11, 11:24), they are free to improvise their movements, as with the commensalistic section.

Prior to that point, the musician's instructions concern only observing the performer's choreography and modulating another instance of Ableton Analog which complements the interactive instance. Following the completed 'static' cycles and once the performer begins their improvisation, the musician stops the Wiimotes' modulation on the mapped parameters, and assumes control of these. This is again made possible through the Map 8 and Multimap devices, where both minimum and maximum values of each CC are mapped on a single physical dial (Multimap), and a single button mapped to Map 8's mute function which regulating the passage of information between Wiimote CC and Multimap parameter. The musician assumes control over the performer's functions for approximately a minute, before the latter returns to the initial position, and repeats the initial arms sequence, albeit allowed to move across the stage this time. Control of parameters is returned to the performer, before being interrupted again at the end of the second sequence.

Zero concludes with a short section of commensalistic interaction (starts 13:18), where the performer's movements influence a pair of granulators (New Sonic Arts Granite) processing two percussive samples, or 'breaks', better known by producers and listeners alike as the 'Amen break' and 'Hot Pants'. As with the previous section, the performer is unware of the effect their movements exert on the newly-introduced sounds, and is instructed to perform an improvised sequence, with its intensity influenced by the overall level of sound made of the combined elements, which begins to fade until silence to the end of the piece.

Chapter 6

Conclusion

Having presented my collaborative process in chapter four, and its theoretical and practical outcomes in chapter three and chapter five respectively, the final chapter concludes this thesis by summarising my findings. I firstly revisit the research questions, and provide answers through reiterating the previously presented arguments. I then state and evaluate the contributions to emerge from my research, followed by a discussion on the limitation of the conceptual debate and practice approach, and how these can inform further research directions. The chapter, and indeed thesis, concludes with a personal commentary on the perils of organising and understanding human behaviour according to biological metaphors, and how these dangers can be alleviated through a perspective informed by symbiotic relationships.

6.1 Research questions revisited

The initial research of the biological phenomenon of symbiosis aimed to explore any possible connections between the manners in which animals organise within interspecific relationships and the ways practitioners complement, interweave, and fuse their distinct disciplinary traits. It was through this investigation that the first research question emerged:

Q.1: What parallels can be drawn between the interactions of organisms engaged in symbiotic relationships and those between practitioners engaged in polydisciplinary collaboration?

Chapter two went to answer this question. Knowledge from the field of biology demonstrated that symbioses manifest not only in different types of interaction between organisms, but also in varied levels of integration between distinct species. The latter variation in integration was associated with the level of integration between disciplines that takes place during each modes of polydisciplinarity, as discussed in 2.2.4. Similarly, the different types of symbiosis were related to the modes of collaboration proposed by Hayden and Windsor (2007); with fitness outcome being the qualifier by which symbioses are identified as mutualistic, commensalistic, or parasitic, fitness outcome is interpreted as the level of creative control within collaboration, with the symbiotic types respectively assigned to collaborative, interactive, and directive modes. More to modes of interaction and levels of integration, the ecological and evolutionary scales by which symbioses are examined represent the collaborative and social environments where practitioners engage with one another during joint work, and the ways social interaction have a direct effect in the outcomes of collaboration. Finally, the biological distinction between genotype and phenotype where used as a metaphor in describing the often hidden inner processes of a collaboration and the publicly presented manifestations of its outcomes.

With the connections between symbiosis and polydisciplinary collaboration, the outcome from the second question combined the theoretical findings with those to emerge from my collaborative practice, and organised these within a framework for polydisciplinary collaboration:

Q.2: How can the core traits of symbiosis be interpreted into a framework for polydisciplinary collaboration in performance practice?

Following the identification of the elements making up both symbiotic relationships and polydisciplinary collaborations in chapter three, these were presented over a common syntax as to further demonstrate the previously discussed connections between the biological and creative systems of interaction (see 3.1.1). It was there that the biological roles of host and symbiont were interpreted into those of instigator and directee, with the level of their respective input determined according to the mode of collaboration. The subsequent framework defined nine strategies, describing the actions practitioners implements during each stage of a collaborative process – conception, development, and manifestation (see 3.1.3) – with the first stage concerning the theoretical and conceptual starting point of a collaborative endeavour, followed by the phase of developing the material making up the work, and concluding with the organisation of those within a completed creative outcome.

It is through examining the stage of manifestation that the final research question emerged:

Q.3: How can the interpreted symbiotic traits inform a model of interaction between sound and movement through gesture recognition technologies (GRT)?

Whilst the first question addressed issues related to all types of creative collaboration, and the second question further focused to collaborations in performance practice, the third question concerns the tools and methodologies specific to my practice. The vast majority of the works developed during my collaborations (see chapter four) involved systems allowing interaction between the expressive mediums of sound and movement, constructed through the use of commercially available motion sensors and software suites. The level of influence exerted by each practitioner on their collaborator was dictated by the mode of interaction, as with the established interpretation of fitness outcome into range of expression. Activating this in practice, the *Zero* iteration of *Symbiosis* developed with Shona Roberts included all three modes of interaction, with the physical performer's operation of the system resulting in material of varied determinacy and level of freedom in improvisation. The collaborative process of *Zero* was described in 4.2.6, with the system facilitating the interaction and its principles of operation presented in chapter five.

6.2 Stating and evaluating the contributions

The contributions of this Practice Research consist of two practice-led outcomes: the adaptive framework for polydisciplinary collaboration, and the process by which thirteen different works were developed alongside six collaborators.

In discussing the body of work developed for this research, I must first state that collaboration is certainly not a straight and narrow practice approach; it is beset with perils, tensions, complexities, often insurmountable. Considering these challenges, the resulting volume of works that my collaborators and I carried through, and diversity of settings these were presented in, demonstrates the strengths and potential of the adaptive approach. Notwithstanding this personal evaluation, the value of the presented practice focuses on its process. Chapter four provides a transparent account of how these works were developed, including all wrong turns, unsuccessful experiments, and personal erosions that we encountered on the way, alike with our victories, fruitful avenues, and evidence of novel approaches in espousing the mediums of sound and movement within performance practice. It is through perusing our process that practitioners may find both inspiration and caution towards developing their own joint endeavours.

Beyond the practical process, the emergent theories first define three fundamental collaborative traits – joint authorship, irreplaceability, and complete cognition –, thus granting practitioners a greater understanding of what collaboration necessitates, beyond the aspects shared with other types of joint endeavours. The framework then provides practitioners and researchers a tool towards organising both practical and analytical applications. Practitioners are able to engage in collaboration under an adaptive approach; rather than the risk of presupposing a singular path, the symbiotic concept presents an unconventional starting point, with an intrinsic flexibility to adapt modes according to the emerging requirements of each project and partnership as these run their course of development. Similarly, researchers examining collaborative endeavours are able to qualify the engagement of the involved practitioners, be that through observing the 'phenotypical' outcomes of their case studies, or further investigating the 'genotype' by which those outcomes were developed via either concurrent witnessing or second hand accounts.

The framework's potential for analysis is evaluated through the examination of three collaborative endeavours I conducted, as presented in chapter three. In regards to evaluating its practical applications, evidence emerged through observing the activation of the framework

in the work of my postgraduate students at the University of Salford, as well as a cohort of local practitioners during a commissioning programme I facilitated as part of the 2017 edition of the Manchester Science Festival[44]. In both instances, participants were presented with the framework prior to engaging in new collaborations in theatre practice and sonic arts respectively. The most pertinent finding to emerge is that the framework has become **independent** of its biological concept; although the practitioners were aware of the types of symbiosis and their subsequent interpretation into strategies and precepts for collaboration, the biological nomenclature and its associated functions were not considered as part of the engagements. Instead, the framework served as an initial stimulus from which practitioners were able to develop their own understanding of polydisciplinary collaboration, without my own subjective conclusions being imposed on their work. This was a particularly positive outcome, as it not only alleviated concerns on whether the biological elements may obscure the framework's purpose, but more importantly, it sets the foundation towards a new approach in understanding human organisation through metaphors borne of animal behaviour, an area of philosophical debate which in the past has led humanity to act against nature's evolutionary trend, as I discuss later in this chapter.

6.3 Limitations and future directions

In chapter one, I set the delimited field within which this research was conducted (see 1.3.2). As a result of those initial restrictions, as well as the subsequent development of my research, a number of limitations emerged in the contributions. Here, I address these, and discuss how those limitations pave the way for future areas of research.

The first set of limitations focuses on the dyadic partnerships of my collaborative. Although to a certain extent this was the result of the serendipitous opportunities I encountered as part of my professional practice, my resistance to engage with larger teams of collaborators was further motivated by the nature of symbiosis, or more precisely, the manner in which I examined the biological phenomenon as part of this research. While symbioses often involve more than two organisms, and indeed more than two species, the relationship types are defined

[44] The 'Symbiotic Synergies' commissions programme was funded by the University of Salford's Make the Difference start-up award, and invited participants to develop and present works through collaboration with practitioners of different disciplines. More details on the participants, and outcomes are available at https://metanast.wordpress.com/past-events/oct2017/

according to the effects experienced by the host and its symbiont, a system which by definition assumes just two individuals. As a result, the practical applications of the framework were not trialled within team environments, thus making the efficacy of its adaptive approach inconclusive in cases where the engagement concerns more than two voices, more than two creative visions, and more than two disciplines. Further to the latter point, my presented practice involved collaboration with disciplines from the wider field of performing arts. This is in contrast with much of the examined case studies: the collectives shinkansen and Medea Electronique, the team which developed *Variations V* (see 2.3.2), as well as those comprising Stratofyzika and danceroom Spectroscopy, and the science-arts collaboration between Donnarumma and Caramiaux in *Corpus Nil* (see 3.3). Considering the conceptual basis of the framework, symbioses are susceptible to mutations when new partners are introduced, with the fitness outcome experienced by each individual according to the specific traits of the new partner, as seen in the parallel symbioses between hermit crabs, cnidarians, and burrowing sea worms (Douglas 2000, pp. 6-8). As such, parallel collaborations involving more than two practitioners and two disciplines may also be increasingly susceptible to the existing difficulties of collaborative practice, thus presenting an important area of trial for the next step of my research.

In planning such approaches in future collaborations, I also feel it is important to include practitioners whose skill sets is grounded in technology. With technology-facilitated performance practice rapidly emerging as a distinct discipline, certain technological fields are becoming almost traditionally associated in its development, such as Human-Computer Interaction (HCI), User Interface (UI) and User Experience (UX) design, and Gesture Recognition Technologies (GRT). Having iterated early on that this research aims to explore the potential of consumer tools in facilitating interaction between sound and movement, the next step of this project would benefit from support by the aforementioned technological disciplines, with will not only aim to discover new findings on collaborative process, but also bring its outcomes in line with current developments in media arts. The possibilities that lie in exploring technological augmentations of our collaborative endeavours hold the potential to alleviate a further challenge evident in the practice outcomes, that is the visibility and perception of the symbiotic concept through practice-based evidence. While the involved practitioners are aware of the findings which emerged from the conceptual debate between polydisciplinary collaboration and interspecies relationships, these principles are less visible from an audience/observer perspective, and indeed understanding these necessitates viewers to become informed through the works' associated theoretical basis. Augmenting these principles

with new technologies, as well as additional expressive mediums such as visualisations and somatosensory feedback, will allow the works to 'speak' for themselves, and become independent of its accompanying theoretical standings, akin to the way the framework became independent of its biological concept.

Beyond the practical limitations discussed above, further challenges appeared in the theoretical debate between knowledge sourced from biology and that borne of creative practice. Arguably, this issue is expected when attempting to conduct a subjective interpretation of objective scientific facts. As a result, the manner in which I conducted this interpretation leaves certain conclusions open to debate. An example of that is my use of phenotype and genotype; while I posit that both of these interpreted areas – respectively the inner working of a collaborative engagement, and its presented manifestation – are equally susceptible to adaptation according to the involved partners' actions, the natural operation differs substantially. Adaptation of the phenotype due to changing environmental factors are often ignored by the genotype, thus not inherited through genetic transfer, with organisms observed to 'possess traits that neither of its parents have' (Miko 2008, p. 140). A further limitation concerns the framework's understanding due to the employed nomenclature. Although I already addressed the subject of language in chapter three and contextualised the intended definitions of the terms used in the framework (see 3.1.2), describing a collaborator as a parasite and their contributions as exploitative holds a level of negative connotations. However, as I discussed earlier in this section, the evaluation provided evidence that once the framework is activated in practice, it becomes independent of its biological concept, and thusly avoiding the issues raised by the negative definitions of its associated language.

Despite the suggested solution against the latter limitation of language, the issues raised by the used terminology extend beyond semantics, and indeed raises legitimate concerns when articulating collaborative engagements, and moreover all types of social organisation.

6.4 Final thoughts: a warning from the past, and a way forward

As demonstrated through this research project, using traits of animal behaviour as metaphors towards understanding and organising human engagements can be a productive approach. However, in advocating similar endeavours to future researchers and practitioners, I must also point out the inherent dangers that lie in such methodologies.

In the context of human history, it is only recently that we acknowledged our animal roots through discovering the phenomenon of evolution. Although Darwin's theory ultimately succeeded in putting to rest theological arguments towards humans' superiority over nature, correlating animal behaviour with that of humans produces counterproductive outcomes: from Spencer's Social Darwinism (see 2.1.3), to the employment of eugenics in stirring up nationalism and rationalising the Nazi atrocities during the second world war. Nowadays, with the scientific community conscious of such perils, we observe a similarly counterproductive backlash; any attempts of understanding human behaviour through observing our genetically programmed inclinations towards negative or destructive actions can be conflated with justification of those. An example of this comes from the criticisms aimed towards Edward Wilson after publishing his work on social organisation of animals in *Sociobiology: The New Synthesis* (Wilson 1975). Soon after its publication, a faction of academics criticised Wilson's arguments on how certain human behaviours stems from our evolutionary 'baggage' of survival through antagonism. In later editions of the book, Wilson summarises the argument of his critics:

> If genes prescribe human nature… then it follows that ineradicable differences in personality and ability also might exist. Such a possibility cannot be tolerated. …because it tilts thinking into a slippery slope down which humankind easily descends to racism, sexism, class oppression, colonialism, and – perhaps worst of all – capitalism!
>
> (Wilson 1975, p. vi)

As discussed in chapter two, animals' motivation in forming cooperative engagements is fuelled from the simple transaction of receiving more than what they provide. Wilson is cognisant that humans' sense of morality allows us to overcome this problematic transaction.

> No serious scholar would think that human behaviour is controlled the way animal instinct is, without the intervention of culture… genomics biases mental development but cannot abolish culture.
>
> (Wilson 1975, p. vi)

What can be deducted from both Wilson's arguments and those of his critics, is that principles of animal behaviour can be useful towards developing positive systems of human organisation

only if these are examined through our understanding of culture and morality. The most powerful contribution to human organisation that can be deducted from the phenomenon of symbiosis is that diverse interactions breed enduring benefits. Through patience and appreciation of nature's evolutionary trend, today's parasitic partners will evolve into mutualistic benefactors. To borrow and paraphrase Rene Dubos' quote which opens this thesis, starting from the initial notion that 'symbioses are the ultimate examples of success through collaboration', this research provides evidence that 'collaboration is the ultimate example of success through symbiosis'.

In the context of collaborative endeavours, I subscribe to Vera John-Steiner's position that 'by joining with others we accept the gift of confidence, and through interdependence we achieve competence and connection' (John-Steiner 2000, p. 204). Personally, following this research and almost ten years of rigorous and reflective collaborative practice, I see polydisciplinary collaboration in creative practice as more than simply a working approach. For me, it is foremost a political statement against the antagonism of the arts world; we, individuals of different backgrounds, cultures, and dispositions, mesh our specific traits within symbiotic relationships in order to overcome limitations, and achieve a shared goal: creating art that it is neither me, nor you. It is us; an interdependent outcome which we alone could not achieve.

References

Appendix I – media files

Video 01 – *Scaffold#4*
Video 02 – *Commensalism*
Video 03 – *Parasitism*
Video 04 – *Beta*
Video 05 – *Mutualism*
Video 06 – *Kitty*
Video 07 – *Bound*
Video 08 – *Zero* with Shona Roberts
Video 09 – *Vi-We-Nous*
Video 10 – *anti:lepse*
Video 11 – *Zero* with Lucie
Video 12 – *Zero* demonstration

Audio 01 – *Merlin* interview and excerpts

Appendix II

Interviews

Drymonitis, A. (2018, March 19)
Goodhead, I. (2017, December 12)
Hyde, J. (2017, March 7)
Kay, F. (2016, November 22)
Koutsomichalis, M. (2018, April 24)
Leone, A. (2018, February 19)
Lloyd, E.J. (2018, June 20)
Matthews, A. (2016, September 12)
Roberts, S. (2018, June 19)
Thomas, L.M. (2017, July 12)
Williams, A. (2018, June 7)

Additional material

Vi-We-Nous blog
Vi-We-Nous performance score
anti:lepse proposal

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