

**FINDING PRĀṆA:  
DIGITAL AND PERFORMATIVE  
EXPERIMENTS IN SEARCH OF A  
TECHNOLOGY OF THE SELF**

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DIGITAL AND PERFORMATIVE  
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TECHNOLOGY OF THE SELF**

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# Abstract

In this practice-based research yogic breath techniques are integrated into biofeedback art. The yogic concept of *prāṇa* (life-breath) and its related philosophy and practices underpin the research. In addition, the yogic practices and philosophy of breath are contemplated within respiratory philosophy and Foucault's (1988) observation of 'care of the self' and his wider concept of 'technologies of the self'. The yogic breath in this research is explored via three artistic fields: 1) performance art, 2) embodied audio interaction with bio-signals, and 3) sound art. Through a performance in each field the physical, mental, ethical and philosophical dimensions of breath are traced.

Informed by these ideas and an initial fieldtrip to the Kaivalyadhama Yoga Institute, the ambition of this practice-based research is to 'find' *prāṇa*-as-technology for utility in biofeedback art practice as directed by two questions: (1) How can artistic research be integrated with breath practices? (2) What does this integration contribute to our understanding of *prāṇa*?

The research is undertaken through a practice-based reflective methodology (Sullivan, 2005) conducted through a 'self-laboratorium' (Varela, 1999) which produced three performance works that each integrated a different breathing practice and artistic field to find *prāṇa*: (1) *Hawk* uses an *āsana* (posture) practice in a performance art work; (2) *Finding Prāṇa* employs neuro-imaging technology (fNIRS) to sonify and visualise real-time brain-state data during a live *prāṇāyāma* (breath controlling) performance; (3) *Public Address System* is a sound art performance of an ensemble breath meditation in an architectural resonant space. Collectively across three distinct artistic fields a contribution to biofeedback art is made.

Through using breath practices within the field of biofeedback art the contribution of this research has: (1) developed a practice that integrates breathing practice within performance; (2) which necessitates the acknowledgement of two 'technological mainframes' – the technology of machines and algorithms and the technology of the breath itself; (3) the creation of unique sound and visual system applied to fNIRS technology as a way to explore the changing hemodynamic response during *prāṇāyāma* practice; (4) the introduction of a 'technology of breath' as a 'listening technology' (5) the consideration of breath intrinsic to our wider technological thinking, designing and making.

The outputs of the research are: a documentary film of the initial fieldtrip to Kaivalyadhama Yoga Institute; Three biofeedback performance works *Hawk*, *Finding Prāṇa* and *Public Address System*; and *The Taxonomy* which is developed for the research to trace the development of, and also write with and about, the three performance works. Each performance has been 'published' beyond the PhD. *Hawk* at The Cistern, Bòlit Centre for Contemporary Art, Spain; *Finding Prāṇa* in *Ubiquity: The Journal of Pervasive Media*; and *Public Address System* at BALTIC Centre for Contemporary Art, UK.

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# List of Accompanying Material

The performance documentation and films listed here can be viewed on the accompanying USB datastick.

1) **Hawk** – Psycho-physical performance.

Performed at *FLARE 1: Beyond Body*, Gallery North, Newcastle Upon Tyne.

February 2015.

2) **Finding Prāṇa** – A biofeedback artwork.

Performed at *ISEA 2017*, Auditorium of the Botanical Gardens, Manizales, Colombia.

June 2017.

3) **Public Address System** – Architectural sound installation by the Bhramari

Ensemble. Part of *Pas Moi*. Performed at Broadacre House, Market Street, Newcastle upon Tyne. November 2016.

4) **Finding Prāṇa** – Documentary film (20 mins).

Screened at: Association for Medical Humanities, *Dangerous Currents: Risk and Regulation at the Interface of Medicine and the Arts*, Dartington Hall, Devon.

June 2015.

*Inhabit*, Neon Arts, Moothall Gallery, Hexham.

February 2016.

5) **Interview** with Prof. Ranjit Bhogal Scientific Research Director at Kaivalyadhama.

6) **FLARE talk** with Dr. Magdalen Górska ‘Breathing Matters: Feminist Intersectional Politics’.

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*Finding Prāṇa*, is not only an academic endeavour but a personal project that began in 2000 after stumbling into an ashtanga yoga class in Goa, India. I have learnt so much from the teachers, body workers, friends and my own students that I have met along the way.

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Finally, I have to thank my friends Darren and Fiona and my love Julie Crawshaw. Thank you for all your support.

# Declaration

I declare that the work contained in this thesis has not been submitted for any other award. I also confirm this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the Faculty Ethics Committee on 31<sup>st</sup> January 2015.

I declare the word count of this thesis is 50,907 words

Name: Helen Collard

Signature:

Date:

# Glossary

**Āsana** – Sanskrit term which in yoga is often translated as posture or pose.

**Ashtanga Yoga** – A specific *āsana* and vinyasa based practice. In which each breath has a corresponding movement. A system practiced through memorising a series of postures. (See appendix 1 for further information).

**Autopoiesis** – (from Greek, αὐτο- (auto-), meaning 'self', and ποίησις (poiesis), meaning 'to make' refers to a system capable of reproducing and maintaining itself. The original definition can be found in (Maturana and Varela, 1973, *Autopoiesis and Cognition: The Realisation of the Living*).

**Being and Becoming** – I use broad overarching definitions of the terms being and becoming. Being is the existence of a thing. Anything that exists has being. Becoming is the possibility of change in a thing that has being.

**Cerebral Blood Flow (CBF)** – The blood supply to the brain in a given period of time.

**Dialogic** – A communication. Bahktin, (1981) Lipari (2014) suggest that all dialogic communicative acts have resonance and traces of their future, past and present relations. Which can be a simultaneous lived interplay of the spoken and the not spoken, listened and not listened.

**Entrainment** – Often unconscious synchronisation of organic movement such as gesture and heart rate to an external rhythm.

**Embodiment** – A sentient lived body and its interactive processes, such as perception and cultural acquisition are made through the senses.

**Ethopoiesis** – Foucauldian term defined as the making or “agent of the transformation of truth into ethos” (Foucault, 1994, p.209).

**fNIRS** – A neuroimaging technology that uses near infrared spectroscopy technology. An optic capability that can detect changing levels of oxygenated and deoxygenated haemoglobin in the brain, otherwise known as the haemodynamic response or cerebral blood flow (CBF).

**Intermediality** – A way of understanding the relations between two or more media, such as performance and images and or the transgression of boundaries and associations between them.

**Intersubjectivity** – The psychological relation between people, objects, constructs and meanings. The space of shared or cross boundary understanding.

**Intimate** – Derived from Latin *intimus* "innermost," from *intus* "within."

**Mind, consciousness and awareness** – I use these terms in an overarching and inclusive way. Contained within their meaning is not only focused awareness (or full waking consciousness), but also simple sensibility or sentience.

**Nāḍī** – Energy channels within the yogic body through which the movement of *prāṇa* or vital forces flows (Eliade, 2009, p.36).

**Prāṇa** – Not only the physiological breath, or the mechanistic-materialistic process of gas exchange in respiration, but also air. Prāṇa is life-breath and considered the vital or energising principle that has an essential connection to our physical, mental, ethical and philosophical capacities.

**Prāṇāyāma**– Seated yogic breath exercises. In the yogic body, *prāṇāyāma* is used to control the flow of *prāṇa*.

**Post-lineage yoga** – A subculture of yoga practice (Wildcroft, 2019) in which yoga teachers and practitioners who have either rejected or have been ostracised from their

lineage of study use peer-to-peer networks to develop and evolve yoga practice with others.

**Self** – See Definition of Terms p.35

**Speculative fabulation** – (Haraway, 2016). A method used in thinking, writing and research to make, reconfigure, re-situate, combine and cross between perceived boundaries and relationships. A process that can combine science, facts, fable, experience and imagination.

**Soma** – the lived or sentient body. Focuses on the bodily dimension of feeling, perceiving and creating objects and processes of aesthetic experience.

**Somaaesthetics** – embodied philosophy means giving “real body to thought” demonstrating one’s philosophy through one’s own bodily example, expressing it through one’s manner of living. (Shusterman, 2012, p.4)

**Soul** - The human soul includes our intellect, emotions, fears, passions, and creativity. The self is the soul, while the body is a mechanism a physical representative in the world (Encyclopædia Britannica. 2010).

**Subtle Body** – See Yogic Body

**Sympoeisis** – Collectively producing systems that do not have self defined spatial or temporal boundaries (Beth Dempster, 1998, Haraway, 2016, p.61).

**Taxonomy** – A system for naming, organising and ordering things.

**Technology** – See Definition of Terms p.35

**Transdisciplinary** – A research method that crosses disciplinary boundaries to create a holistic approach.

**Visiting** – A method of thinking; to move the mind to somewhere else (Arendt, 1982). In

the act of *visiting*, we are training the mind to go somewhere other and else, we are enabled to compare judgements and therefore put ourselves in the position of somebody else.

**Yoga** – A routine deploying self-conscious and somatically aware ritualised movement incorporating physical postures (*āsana*), breath control (*prāṇāyāma*), meditation and practices of concentration and withdrawal. The practices operate within a multitude of diverse subcultures and beliefs. Derived and blended with a diverse set of relationships to the mythologies and ontologies of the Indian sub-continent (Wildcroft, 2019).

**Yogic Body** – Unlike the anatomical body of modern science, the make-up or features of the yogic body change according to the yogic texts or metaphysical conventions of particular branches of yoga. For some texts the goal is the destruction of the body, rather than its preservation. In this thesis the yogic body is the schematic comprised of a complex system of energy channels known as *Nāḍī s* (see Fig.12) through which the movement of *prāṇa* or vital forces flows. (Eliade, 2009, p.36).

**Zoe** – Greek (ζωή), meaning life or existence.

# **Chapter 1**

## **Introducing the Research**

## Chapter 1 Introducing the Research

### 1.1 Background

#### 1.1.1 Summary of the Research

This practice-based research project draws on the philosophy of yoga, and the conventions of biofeedback and performance art to build an experiential understanding of the concept of *prāṇa* (or ‘life-breath’). Informed by an initial fieldtrip to the Kaivalyadhama Yoga Institute the research practice is developed through a self-laboratorium that realised three biofeedback performative experiments. This research makes a distinct contribution to the field of biofeedback and performance through an embodied practice that utilises and traces breath to experience *prāṇa*.

The experimental performance art practice that is developed in this research takes primary direction from the practices of yoga and is then informed by a field of artists that are clustered via a commitment to the body in four specific ways: (1) artists working with bio-signals and scores in embodied audio-visual interaction; (2) performance artists working with the mind/body as a material; (3) artists working with sound, vibration and listening; (4) artist working with air or breath as material. The research also produces a written taxonomy as a way to develop and write with and about the research process; that draws on additional sources that traverse disciplinary boundaries across art practice, philosophy and other disciplines as arising from the bodily experience of doing the experiments.

The three experiment-works produced are: (1) *Hawk* – a solo performance of embodied practice at Gallery North (February 2015); (2) *Finding Prāṇa* – an integrated solo performance of embodied practice and fNIRS neuroimaging technology at the International Symposium of Electronic Arts (June 2017) and (3) *Public Address System* – an embodied ensemble performance at Broadacre House (November 2016). Each of these works were produced from the PhD practice developed for this research; and each of these works have subsequently been published beyond the PhD project at the Bòlit Centre for Contemporary Art, Spain (August, 2018) BALTIC Centre for Contemporary Art, UK (May 2018) and published in *Ubiquity: The Journal of Pervasive Media*, (Collard and Jackson, 2016).

In biofeedback art practice it is usual to find artists developing technology to trace the biological body. This project's contribution is to configure technology differently. At the outset, this research necessitates the acknowledgement of two technological mainframes: firstly, the technology of machines and algorithms; and secondly the technology of the body itself. From here the contribution of the project is to suggest that building a 'technological interface' is one way to assess the body's technology, but the 'interface' can also be found to be breath itself. 'Finding' *prāṇa* does not only cultivate and explore the breath mind connection through technology, but also how we can connect to a technology built within and how this technology has the potential to connect and network outwardly.

### 1.1.2 Personal Practice

I began yoga<sup>13</sup> nineteen years ago under the ashtanga tradition. Through this practice I was introduced to the concept of breath as *prāṇa*. I committed myself to a primary teacher within this tradition and for many years this provided me with a structured framework which enabled me to focus, learn and commit to a daily practice. However, the strong attention to posture (*āsana*) in this practice did not fulfil my interest in the other elements or limbs of yoga. I became increasingly drawn to the role of the breath and specifically *prāṇāyāma* and meditation. I moved outside of ashtanga to further understand yogic breath practices from other traditions and lineages or fusion thereof. I now consider my practice "post lineage" (Wildcroft, 2018). Theodora Wildcroft defines post lineage as "a lineage of ideas and inspirations, of sharing in community and fellowship rather than careful reproduction from guru to student" (Wildyoga, 2019). Appendix 1 provides further background regarding ashtanga and post lineage yoga.

Religious scholar Beckerlegge (2000) has located that this approach of integrating, sharing, and making community is not a new approach in yoga at all. Beckerlegge describes it as an integral but untold part of the yoga tradition. Moreover, this location of

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<sup>13</sup> Around the world millions of practitioners engage in a multitude of practices that they call 'yoga'. Yoga is a term that covers an enormously rich and diverse history of practice and philosophy (Wildcroft, 2018, p.13). Yoga according to Whicher (1998) is a complex and comprehensive philosophy of transcendental consciousness that crystallised into a school of thought out of South Asia sometime between 150 BCE and 500 CE (p.42). Through Newcombe (2013) yoga is the product of a multiplicity of encounters between India and the rest of the world. Yoga can be: a mental and physical practice for health; a metaphysical system describing the universe; a practice of ritual or devotion (Newcombe, 2013, p.72), "or a system of ethics and other social practices for righteous living" (Wildcroft, 2018, p.13).

integrated approaches is strongly supported by the recent publication of *Roots of Yoga* (Mallinson and Singleton, 2017). In this key text an analysis of historical pre-modern source texts is made to make sense of an immensely diverse literature concerning the earliest foundations of yoga. This book joins an increasing literature (Singleton, 2010, Goldberg, 2016) that reveal the roots of yoga as a transnational practice that is “diverse, fragmented and heavily blended.” Furthermore, it demonstrates the extent in which “contemporary yoga is a continuation with, and departure from, its historical antecedents” (Wildcroft, 2017). In yoga the method of taking a practice, combining it with others, adapting and adjusting is a key apparatus of the evolution of yoga’s present and future but also throughout its past. My own yoga practice is now strongly influenced and maintained via this blended approach. The forum FLARE created for dissemination of this research with two other PhD researchers which will be discussed later also combined and interlinked embodied and performance art practices in this way.

### 1.1.3 *Prāṇa*: Energising Principle

In the philosophies and methods of yoga, *prāṇa* is considered the vital or energising principle, encapsulated in one Sanskrit word meaning the two English words breath and life. *Prāṇa* derives from the compound of two Sanskrit roots, *pra* and *na*, the prefix *pra* meaning constant and the suffix *na* meaning movement. *Prāṇa* is taken to mean the constant motion of air, breath and life. In key classical yoga texts such as the *Yoga Sutras of Patanjali*<sup>14</sup> and the *Hatha Yoga Pradipika*<sup>15</sup>, the advocacy of strict somatic rituals for self-cultivation often begin with breath (*prāṇa*). These yogic practices are concerned with the volition or the raising awareness of breath (*prāṇa*) through methods and embodied techniques such as yoga postures (*āsana*) and through breath control (*prāṇāyāma*). Breathing is something that can happen without any serious consideration. Eleven thousand litres of air are consumed each day (Kumar, Abbas, & Aster, 2014) happening without any mind put to it, almost in spite of oneself. But, in yoga, control, awareness and volition are applied to the breath, and it is through this conscious observation and

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<sup>14</sup> *The Yoga Sutras of Patanjali* were compiled prior to 400 CE by Sage Patanjali, taking materials about yoga from older traditions. The book contains 196 Indian sutras or aphorisms.

<sup>15</sup> *Hatha Yoga Pradipika* is a manual on hatha yoga written in the fifteenth century by Svāmīrama. The text introduces *āsana*, *prāṇāyāma*, *śat karma*, *mudra* and *bandha* as a system of physical purification to prepare the body for meditation and the awakening of the vital energies of *prāṇas*, *chakras* and *kundalini*. The book is one of three classic texts on hatha yoga, alongside the *Shiva Samhita* and the *Gheranda Samhita*.

regulation of breath in yogic practices that the locus for human transformation and self-realisation is thought to be found. In this respect, *prāṇa* and these embodied practices are thought to be the fundamental basis for human consciousness.

#### **1.1.4 Artistic Practice – Background to the Research: Culture Lab**

During my MRes at Culture Lab, Newcastle University, breath as a material emerged as a source of inquiry in my art practice. I made work that used sensors to extract data from breath, and through this data made creative sonifications visualisations and interactions via the use of digital technology. In *Breath Drawings* (2009) I used the coding software Processing<sup>16</sup> to create a screen-based drawing system that reacted upon the intensity and length of the user's breath. During this time, I also made *Pneuma* (2010) an interactive installation. The interaction in this installation required a user to exchange their breath through a hookah pipe in order for a ghost-like apparition of a yogi to appear in a darkened room. The ghost-like apparition was achieved through electronics, MaxMSP<sup>17</sup> and an old Victorian illusion called Pepper's Ghost<sup>18</sup>. The yogi's movements, temperature and breath were conveyed sonically via MaxMSP code, a wireless Arduino, an accelerometer, a temperature sensor and radio microphones. Layered over the generative sound (created by the yogi's movement and body data), the user by blowing into the hookah pipe triggered the soul music track 'Please, Please, Please,' sang with intense emotion by James Brown and The Magic Flames (1958). The song sits at the very beginnings of soul music, a mixture of sacred gospel and the profanity of the blues. The longer the user breathed into the pipe the longer the song played.

*Pneuma* was made as an interactive installation that set out to explore sonically and visually some of the ideas and properties I was beginning to experience within my breath practices. Specifically, what I was focusing on was the necessity of breath for interchange between the individual and their physical environment, the breath as a bridge, and as

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<sup>16</sup> Processing is an open-source graphical library and integrated development environment (IDE) built for the electronic and media arts and design communities. Processing uses the Java language.

<sup>17</sup> MaxMSP is a graphical, flow-based programming language made by Cycling 74.

<sup>18</sup> Pepper's Ghost is an illusion technique named after English scientist John Henry Pepper who demonstrated the effect in 1862. Examples of the illusion are found in old carnival sideshows such as the Girl-to-Gorilla trick.

conveyance between thought, action and emotion. In this MRes research, digital technology was utilised in order to explore through a visual and sonic medium, sensor data extracted from breath, specifically during yogic breath practices. This research explored how digital technology can enable us to feel connected to others, be it human or machine, and how interchanges with and through the digital realm can seem magical and otherworldly. Following the making of *Breath Drawings* (2009) and *Pneuma* (2010) I began this PhD research project with the aim to progress and expand the complexity and communication of these concepts.

### **1.1.5 Kaivalyadhama Yoga Institute**

This PhD research began with a four-week period of field work (2015) at Kaivalyadhama Yoga Institute in Lonavla, India. My core interest was in the institute's application of multiple disciplines of enquiry in order to investigate the dimensions and notions of *prāṇa*. The Institute develops philosophical, scientific and therapeutic research and education through a yogic health centre, science laboratories, a philosophical and literature department, an ashram, and yoga college. The scientific laboratories at Kaivalyadhama investigate the quantitative psycho-physiological and neurological effects of yoga and has published a quarterly journal, the *Yoga Mimamsa* since 1928. I became aware of Kaivalyadhama through my yoga practice, since the institute has an international reputation for teaching *prāṇāyāma* at its college and health centre. However, what really became pivotal to this research was the institute's interdisciplinary approach of combining psychological, literary, spiritual *and* scientific approaches towards the practices of yoga and specifically the notion of *prāṇa*.

Therefore, the purpose of the fieldwork became a personal engagement and immersion in the Institute's understanding of the yogic concept of *prāṇa*, and an exploration of the Institute's interdisciplinary approach to *prāṇa* in its application of both a yogic and an anatomical schematic to the mind/body. This fieldwork provided an initial framing opportunity through a variety of lenses and was foundational in my understanding and development of *prāṇa* throughout the research.

During the embedded<sup>19</sup> field research at Kaivalyadhama I kept field notes and took part in yoga classes, *poojas* (prayer rituals), therapy sessions, studied experiments and interviewed key practitioners and scientists at the centre including the scientific research director Prof. R.S. Bhogal. Methods of documentary filmmaking were used to make the film *Finding Prāṇa*, 2015 (20 mins) during my stay. The film (see USB #2) is a collage of sounds, interviews and images that explores the schematics through which the centre operates. It includes a sound recording of an evening *Pooja*, visual footage of yoga practices at the yogic hospital and health centre, and documentation of the centre's research environment including the research laboratory's museum of scientific and technological instruments made and collected over its ninety-year history. This film was screened at the Annual conference of the Association of Medical Humanities, Dartington Hall, (June, 2015) and at Neon Arts exhibition, *Inhabit* at Moot Hall, Hexham (February, 2017). Interview footage with the centre's scientific research director Prof. R.S. Bhogal is also available in the attached documentation (see USB #5).

Kaivalyadhama is located in the small hill station of Lonavala, Maharashtra, India. It was established by Swami Kunalayananda in 1924, who combined the yogic teachings from his teacher the yoga ascetic Sri Madhavadas (1798-1921) with his own interest in scientific research. Kunalayananda's ambition at Kaivalyadhama was to "bring together science and spirituality by coordinating the spiritual aspects of yoga with science" (Alter, 2004, p.83). Yoga scholar, Joseph Alter describes the key to understanding Kunalayananda's work at its base and foundations are the application of the universal principles and laws found in classical yogic literature. This foundation was then coupled with objective science to empirically prove these yogic principles. Science was deployed by Kunalayananda as the "handmaiden of spirituality and orthodox philosophy" through which he could "reveal the basic Universal Truth manifest in yoga by demystifying it through science" (Alter, 2004, p.83). The challenge of investigating across two different ontological systems of "trying to make science conform to spirituality was the driving force" behind Kunalayananda's creativity and innovation (p.83). This approach informed my own artistic aims. Through the deployment of scientific and digital technology I too was working to manifest some

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<sup>19</sup> Embedded, by which I mean I was resident at the Institute. I slept and ate there. I attended both the yogic hospital and the yoga colleges programmes. This included classes on asana, meditation and kriya (cleansing practices).

aspect of the yogic principle of *prāṇa* and its breath practice via the translation of data into the sound work *Finding Prāṇa*.

In his unorthodox and interdisciplinary investigation, Kuvalayananda's first recognised finding was the *Madhavdasa Vacuum* (Alter, 2004, p.84). This discovery, identified a drop in internal pressure, and a vacuum in the large intestines during the breath practice of *nauli*<sup>20</sup>. As Alter pinpoints, Kuvalayananda's discovery was significant for a particular reason:

“What made this a ‘completely new’ discovery was not so much reflected in the data as such, as in the way in which a specific methodology of science made it possible for two different kinds of ‘data’ to manifest themselves in the same space at the same time as a consequence of the same kind of action a kind of empirical harmonic chord created by the simultaneous intonation of science and spirituality” (p.84).

Kuvalayananda had shown that experimenting with “the way in which physiological changes could be linked to the underlying theory of yogic physiology, rather than to a theory of functional biology and structural anatomy” (p.91) could provide findings and insight in a scientific domain. Kuvalayananda's approach was therefore a form of mimetic empiricism in which, in order to materialise *prāṇa*, he measured oxygen (p.91). Later Kuvalayananda and others would conduct experiments on brain waves, pulse rates and blood pressure (Brosse, 1946, Paranjpe, 2012) to try to discover the subtle flow of *prāṇa* as it was encoded in these gross body functions.

One of the earliest examples, is the work of French cardiologist Brosse (1946). Brosse studied a yogi at Kaivalyadhama through electrocardiographic and pneumographic recordings whilst in an underground burial known as Bhugarbha Samadhi (yogis would use underground burial, often conducted as a public feat, in which the yogi would stay underground over many days). At Kaivalyadhama, they built their own underground burial chamber in a laboratory which is documented in my film *Finding Prāṇa* (2015). The

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<sup>20</sup> The practice of *nauli* involves drawing up the diaphragm whilst rotating the recti abdominals.

chamber was built in order to set controls for their experiments investigating this yogic practice. The findings of Brosse concluded, that the yogi was an “incontestable master” of bodily functions such as blood circulation and metabolism rate. She stated that the yogi could put his body “in a state of slowed-up life comparable to that of a hibernating animal” (Brosse, 1946, p.82; Paranjpe, 2012). In one particular test, the data suggested that the heart was being voluntarily controlled to the point of cessation for several seconds. Many other similar observations and recordings were made, notably by Bhole and Karambelkar (1967) who also reported the participant voluntarily controlling the heart to a point of cessation over a period of time during underground burial (Bhole, Karambelkar and Vinekar, 1967; Paranjpe, 2012).

During my interview with Prof. Bhogal (Collard, 2015). I asked about the reported yogic phenomena of voluntarily stopping the heart. His opinion and analysis of the data was that the pulse of the yogi’s heart was dramatically weakened and slowed (venous return was retarded) but the heart was still, however minimally beating. In his opinion it was the inadequacy of the technology to capture the subtlety of the practice and the reduced heartbeat that resulted in many of these reports of the heart completely stopping. Technology was clearly instrumental in establishing and demonstrating breath, body, mind phenomenon; not only as a tool of scientific and repeatable proof but also perhaps with certain limitations to capture these phenomena.

During my time at Kaivalyadhama, I was keen to investigate the past technologies and experiments the scientific research lab employed. I also wanted to know which technology and findings were now at the forefront of their research and how this could be applied or influence my own application of technology and breath in artworks. What were Kaivalyadhama’s recent experiments and technology telling us now? However, the most significant discovery at Kaivalydhama during this fieldwork came about through literature read in the Kaivalydhama library, and through experiencing practices, poojas and conversations about the concept of sound and vibration as an integral part of yoga practice. Pooja’s at Kaivalaydhama had been conducted in the same small room, almost every night since 1926. I attended, and sat in the very small living room of the current Swami (the Institute’s spiritual director) Swami Maheshananda. The room has remained almost completely unchanged since the first Swami Kuvalayananda lived there. Unaware of the meaning of the prayers I felt the pooja’s and the conch shell sounds resonant off the walls,

and when I awoke the next morning I could still feel the vibration and resonance in my chest. As my research continued these connections between sound, vibration and breath became a prominent point of focus. Through the conversations I had with Prof. Bhogal and through reading of experiments documented in the *Yoga Mimamsa* archive (as illustrated in Fig. 1 & Fig. 2). Both the potential and also the limitations of machine technology to capture yogic phenomena was keenly brought into focus by Kaivalyadhama's transdisciplinary approach.



Fig. 1 “An experimental set up for scientifically studying pressure changes in yogic practices”  
Kaivalyadhama, Lonvala, 1975. Image © Kaivalyadhama Scientific Research Department.



Fig. 2 “Swami Kavalayananda observing an experiment on oxygen consumption during yogic practice.” 1984. Image © Kaivalyadhama Scientific Research Department. Lonavla, India.

## 1.2 Background to the Research Context

“At magic hour,  
when the sun has gone but the light has not,  
armies of flying foxes unhinge themselves  
from the Banyan trees in the old graveyard  
and drift across the city like smoke.  
When the bats leave, the crows come home.  
Not all the din of their homecoming fills the silence  
left by the sparrows that have gone missing,  
and the old-white-backed vultures,  
custodians of the dead for more than a hundred million years,  
that have been wiped out.  
The vultures died of diclofenac poisoning.  
Diclofenac, cow aspirin, given to cattle as a muscle relaxant  
to ease pain and increase the production of milk,  
works like nerve gas on white-backed vultures.  
Each chemically relaxed milk-producing cow or buffalo  
that died became poisoned vulture-bait.  
As cattle turned into better dairy machines,  
as the city ate more ice cream,  
butterscotch-crunch, nutty-buddy and chocolate-chip,  
as it drank more mango milkshake,  
vultures’ necks began to droop as though they were tired  
and simply couldn’t stay awake.  
Silver beards of saliva dripped from their beaks,  
and one by one they tumbled off their branches dead.  
Not many noticed the passing of the friendly old birds.  
There was so much else to look forward to.”

Arundhati Roy

(The Ministry of Utmost Happiness, 2017, p.5)

Arundhati Roy opens her novel in *l'heure bleue* the twilight hour and just as day is meeting night, magical realism dissolves to reveal an immediate exposition on industrial pollution. Vultures, the scavengers, those that clean up the dead, are dying. We are forewarned of our actions and of the closure of our connection to the interdependent, looping, and cyclical nature of things, and also alerted to the perils of a human vision where our actions and connections are un-thought of. Roy's prose is a timely reflection of our epoch and situation within the sixth mass extinction (Ceballos et al, 2015, p.19) and a split sensibility we often now have to inhabit in order to effectively conduct our daily lives.

### **1.2.1 The Technological Mainframe**

Within the current situation of the sixth mass extinction (Ceballos et al, 2015, p.19) I present two perceptions of technology, each can be thought of as a 'technological mainframe'. This discussion is used to situate some thoughts, behaviours and shifting relationships and connections to technology in this research. Much like the work at Kaivalyadhama, in which science and technology is used to explore the science of yoga, this discussion is offered to explore differing locations of technology both within, outside of, or upon the body. Two differing technological mainframes are discussed, broadly and in a wider context before I begin to narrow and outline the specific relationships and interactions of technology and the body in this research.

In this, the sixth mass extinction, systems and algorithms, in our work, health, military, and political systems attune and accelerate our habits and movements. The timeframes of many of these systems such as the spread of information on social media and those of the financial market operate far beyond the scope and speed of our own human response time. Not only that, but in the instance of the financial market it is a system working in timeframes that are also humanly irreversible (Johnson et al., 2013, p1). Machine decisions, such as these, are also not simply a quicker version of our own existing behaviour. Physicist Neil Johnson calls these decisions "machine ecologies" in order to highlight that these machine decisions generate a completely new behavioural regime. Furthermore, Johnson argues there is an "emerging ecology of competitive machines" that has an "intriguing correlation with the onset of the system-wide financial collapse in 2008" (Johnson et. al., 2013, 1). These decisions or "ultrafast extreme events" have the ability to conduct a financial trade in 740 nanoseconds (or 740 billionth of a

second) (Conway, 2014). A highly competitive race ensues to shave a nanosecond of a financial trade time in order to trade at the speed of light (Johnson et. al., 2013, p.1). In comparison, the human response time, such as the ability to notice a potential danger and then react to it, is approximately one very long second (Liukkonen, 2009). Whilst ecological concerns are undergoing a critical acceleration is it of consequence that technological behaviours without human syncopation now run our social, financial and natural order? Might it be that we are caught in a dictatorial arrhythmia of a technological mainframe that maintains us? Might we be skipping essential human rhythms and decisions?

Conversely, the second technological mainframe I would now like to consider is through a discovery made by Nobel Prize winners for Physiology or Medicine 2017, (Hall, Rosbach, and Young, 2017). This research showed that plants, animals, and humans adapt and entrain their biological rhythm so that it is synchronised with the Earth's revolutions (The Nobel Assembly at Karolinska Institute, 2017). Hall, Rosbach, and Young (2017), established that most of our cells have a mechanistic oscillation, a figurative clock, that provides constant feedback related to the revolution of the earth. We each, have a circuit on a molecular level making interconnected loops as a method of bodily to worldly synchronisation. This synchronisation or entrainment to the earth attunes our physiological, psychological, circadian and seasonal rhythms. The findings of Hall, Rosbach, and Young in application has profound influence on how we think about sleep, shift work and many other factors that disrupt our natural rhythms. Their findings provide a thought vantage that opens my own thinking beyond a technological system of machines and algorithms to other possibilities of what might constitute a technological mainframe or system.

Hall, Rosbach and Young (2017) connect the body on a cellular level outward to the environment it lives within; it demonstrates a connection to the revolution of the planet. And through Roy, and the demise of the white backed vulture we are notified of the consequences in forgetting our direct connection to others within that environment. But as technological, corporate and political systems amplify and accelerate in order to corporatise the air we breathe, the animals we eat, and the water we drink, we may no longer continue to understand *how* we are interconnected. We may no longer connect “eggs to hens, milk to cows, food to forests, water to rivers, air to life and the earth to

human existence” (Roy, 2016, p.150). In the sixth mass extinction we must remember and re-constitute ways to prioritise interconnection. If we fail to do so, our natural resources of earth, water, forest, and air may no longer continue to exist in conditions that support the human.

The background to this research is living within an epoch – the sixth mass extinction in which it is overtly evident that we are disconnected from our environment. However, *prāṇa* is, a concept that continues to recognise that we are connected, that breath is connected to the body, the mind, to air and to life itself. Maintaining the physical, mental, ethical and philosophical connections of *prāṇa* to the natural resource of air is a reminder of our interconnectedness. Through the initial fieldwork at Kaivalydhama this research starts by tracing *prāṇa*. It is examined through the coalescence of two technological mainframes or systems, through the machines and neuroimaging technology of fNIRS and *prāṇa* as a technology in and of itself.

### 1.3 Aims, Objectives and Research Questions

The research aims are:

1. Develop a practice that draws on the conventions of yoga, biofeedback and performance art in order to build an experiential understanding of the concept of *prāṇa*.
2. To engage breath as a tool for performance and thereby raise the importance of breath and breathing as a life force and a medium for art production.

The research objectives are:

1. Through examination and experimentation with breath explore how the interconnection of *prāṇa* connects self and others.
2. Develop a mode of writing that conveys and articulates the subjective experience of investigating *prāṇa* through an artistic practice.

The research questions guiding the research are:

1. How can artistic research be integrated with breath practices?
2. What does this integration contribute to our understanding of *prāṇa*?

## 1.4 Definitions of Terms

Prāṇa, technology and self are key terms in this thesis, definitions are briefly outlined below in order to provide both the specific and broader meaning that each term occupies within this research.

### Prāṇa

Prāṇa is more than just the physiological breath, or the mechanistic-materialistic process of gas exchange in respiration. Prāṇa as life-breath is mentioned from the beginning of India's literary record (Mallinson & Singleton, 2017). Prāṇa is considered the vital or energising principle that has an essential connection to our physical, mental, ethical and philosophical capacities.

### Technology

In this research the word technology<sup>21</sup> is used and defined in two different ways which has been outlined in terms of technological mainframes in the previous discussion.

Firstly, I refer to technology in its most common sense, as “machinery and/or equipment that has been developed from the application of scientific knowledge” (Oxford English Dictionary, 2019). This is used quite specifically, often in reference to the making of the biofeedback performance *Finding Prāṇa*, in which I refer to the fNIRS hardware I use in tandem with a computer and its related coding as technology. Comparatively, it is also used when I discuss artists that are using tools, devices, machinery or computing in their artworks.

However, the main use and my overarching definition of technology has a much broader and pervasive inference whereby technology is not solely a human tool or artefact. I draw on philosopher John Gray, and biologists Lynn Margulis and Dorion Sagan in order to more fully outline this definition. Gray (2003) states “technology is not a human artefact: is as old as life on Earth” (p.15). In this short statement, Gray orientates our technological thinking to an origin of pre-human time, here we have to consider that technology cannot solely be equipment, machinery, artefact or tool made by the human. In this definition

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<sup>21</sup> Early 17th century from Greek tekhnologia ‘systematic treatment’.

technology exists in what we might term as its opposite or other – nature, the natural. Furthermore, Margulis and Sagan (1997) describe technology not only throughout nature but within the human body, that we ourselves are technological devices and that it is a condition and inescapable part of our living. Margulis and Sagan's evolutionary work on microbial lifeforms demonstrates that we have been developed by the earliest bacterial communities as a method of genetic survival, which they propose is a form of technology:

“There is evidence to show that we are recombined from powerful bacterial communities with a multibillion-year-old history. We are part of an intricate network that comes from the original bacterial takeover of the Earth. Our powers of intelligence and technology do not belong specifically to us but to all life [...]. Intelligence and technology, incubated by humankind, are really the property of the microcosm” (Margulis and Sagan, 1997, p.36).

Technology in this context is not solely artificial and conversely the body is not solely natural. Many of our favourite technological inventions were preceded by our bacterial symbionts, bioluminescence preceded electric lights by 2000 million years, birds took to the skies long before aeroplanes, and long before Roman galleys rowed the Mediterranean, protists *Sticholoch* propelled the same water with microtubular oars (Margulis, Sagan 1997, p.152). Technology can also be seen through other natural lenses such as the patterns and forms of organisation that animals use. Biologist Brian J Ford uses an example of leaf-cutter ants as an example of insect technology working within the natural world:

“The industry undertaken by some leaf-cutter ants is close to farming. They excavate large underground nests which the colony inhabits. Workers go out foraging for leaves which they cut with their jaws and bring back to the nest. These leaves are sent to grow colonies of fungi, enzymes form which they can digest the cellulose cell walls of the leaves and render them suitable for eating by the colony [...] the garden is vital for the ant's survival; without the continuous farming and feeding of the fungal colonies, the ant colony is doomed. These ants are indulging in an agricultural enterprise which they systematically maintain” (Ford, 1999, p.98).

Margulis and Sagan's definition and the example of leaf cutter ants as a technology

becomes useful to understanding the concept of technology applied to this research, in which *prāṇa* is considered a technology under this wider definition. Through tracing the interior and exterior cycle of breath in artworks, questions when breath is inside and an inner experience and when it is outside and an external point. Where are the boundaries of self, other and the common drawn if *prāṇa*'s technology traverses these boundaries? Margulis and Sagan's definition is used in order to render the word technology outside of the human made tool, machine, or artefact. Technology here is considered as a dynamic or system by which the lived body is engaged, distributed and networked.

### **Embodiment**

Embodied yoga practices are a central medium within my artistic practice. My concepts are sourced and evolved outwardly from this medium. All three pieces within this research begin with an embodied process derived from yoga practice. I use the term embodiment and draw on Merleau-Ponty to distinguish between the "objective body, which is the body regarded as a physiological entity, and the phenomenal body, which is not just some body, some particular physiological entity, but my (or your) body as I (or you) experience it" (Audi, 1999. p.258). More specifically in this thesis I identify embodiment most closely with Shusterman (2012) and his use of somaesthetics. Shusterman similarly to Ponty describes "the sentient lived body rather than merely a physical body" (p.5). However, he also offers a nuanced insight into the living and philosophy of embodied practices. Shusterman's somaaesthetics acknowledges that embodied practices have: 1) different subject positions within different cultures and positions also differ within the same culture; 2) can be a means to not only describe our culturally shaped forms but also as a means to improving them; and 3) to put into effect these improvements, practical exercises of somatic or embodied training must be included within the discourse rather than be a mere philosophical written or read debate (Shusterman, 2012, p.4). Shusterman informed by pragmatist William James uses somaesthetics as the idea of a philosophy as an embodied art of living. Embodiment through Shusterman's terms is a "meaningful aspect of philosophical practice because it is an essential aspect of life...[philosophy] could and should be practised with one's own body rather than being confined to 'the life of the mind' (p.141). Through Shusterman and his term somaesthetics embodied practice can therefore be seen as a vehicle for "political issues of justice, freedom and liberal democracy" (Shusterman, 2012, p.141).

## Self

It is through embodiment and the experiments conducted in the self-laboratory, that I am focused on the body most of us take to be this separate thing: the self, or the me. Firstly, I use self in a specific way to denote an individual human being – as above, a body with agency, a mind and actions. This is used particularly when referencing Foucault's "Technology of the Self." I will expand on Foucault's term further on in this discussion, but before that I will outline a second and expanded definition of self. We mostly view our embodied selves as separate from other bodies, this is essential for us to operate in our daily lives. We create a narrative of the 'me' what I do, what I think what I feel. But as Margulis and Sagan demonstrate the self or 'me', is actually found to be composed entirely of non-self-elements:

"Our DNA is derived in an unbroken sequence from the same molecules in the earliest cells that formed at the edges of the first, warm, shallow oceans. Our bodies, like those of all life, preserve the environment of an earlier Earth. We coexist with present-day microbes and harbour remnants of others, symbiotically subsumed within our cells. In this way, the microcosm lives on in us and we in it. Some people may find this notion disturbing, unsettling. Besides popping the overblown balloon that is our assumption of human sovereignty over the rest of nature, it challenges our ideas of individuality, of uniqueness and independence. It even violates our view of ourselves as discrete physical beings separated from the rest of nature" (Margulis and Sagan, 1997, p. 34-35).

The self, is constantly in exchange with air and microscopic life, since for every one human cell in a human body there is one micro-organism in us generously sharing their genetic capabilities (Sender, Fuchs, and Milo, 2016), Margulis and Sagan's work has developed post-humanist feminist thinking and philosophers such as Haraway (2016) to propose that the interdependence and entanglements of a living self is intimately made with others. We continually ingest and infect other environments, other bodies. Such a view of our bodily, environmental, and spiritual interdependence has long been central to

the Yogic philosophy of self or *Atman*<sup>22</sup> The yogic doctrine of atman (universal self) or the Buddhist doctrine of no-self (in which the practices of questioning traditional elements of the self (or narrative of the self – I am this, I do that) lead to a self identifying primarily with a much larger whole. The self identifying to a wider whole – the universe, this is the self as atman.

### **Foucault’s Technology of the Self**

‘Technologies of the self’ are the various “operations on their own bodies and souls, thoughts, conduct, and way of being, that people make either by themselves or with the help of others in order to transform themselves to reach a state of happiness, purity, wisdom, perfection, or immortality” (Foucault 1988, p.18). Foucault argues that technologies of the self are instrumental in activating and cultivating a relationship and ethos to the self, and that this cultivation of self is a means of activism and advocacy. Two concepts, ‘*askesis*’ (forms of self-training) and ‘care of the self’ (forms of self-care) underpin Foucault’s theory of ‘technology of the self’ (Foucault, 1988, p.31). *Epimeleia heautou*, or the care of the self is described by Foucault as the “concerning of oneself with oneself” (Foucault, 1988, p. 21). It is a formulation of the constitution of the self or subject, and a philosophical precept adopted throughout Classical Greek societies, including Platonic, Socratic, Epicurean, and Cynic philosophical practices and culture. Strikingly analogous to yoga philosophy and practices, the care of the self, prescribed a variety of practices and codes such as meditation, acts of endurance, rites of purification and retreat in order to establish how to be with the self. These embodied practices of care of the self, have a deliberate aim of cultivating some kind of relationship of oneself to oneself, and a relationship between self and truth (p.34).

The relationship of truth to self is an essential distinction for Foucault, it suggests that there is a hidden self or inner nature or essence that has been “concealed, alienated, or imprisoned in and by mechanisms of repression” (Foucault, 1997, p.282). The process, within technologies of the self is to develop, transform and liberate the ‘true’ self from its

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<sup>22</sup> Atman is a central concern in all of the Upanishads. Its earliest use is found in the Rig Veda (RV X.97.11) Upanishad and ‘Know your Atman’ is a focus (Raju, 1985 pp.35-36). The Upanishad texts state that every self is not the body, nor the mind, or the ego, but atman. “Atman means both ‘soul’ or ‘self’ the essential being of all creatures” (Easwaren, 2001, pp.38-39).

bondage or repression.

### **Askesis**

The concept of askesis a concept and tradition of the Athenian Stoics<sup>23</sup> who flourished around 100 BCE to 200 C. was a term used to describe the physical manifestation or practice of one's ethos. A training between two poles of *gymnasia* – a training of oneself – and *meletē* meaning meditation, according to the Latin translation *meditatio*. These were more imaginary experiences to train one's thoughts. Practices were diverse, but primarily non-intellectual, a matter of exercise for body and soul, a self-formation. Askesis is identified by Foucault as both a mind-set and a practice. It is not simply an attitude or a way to fulfil particular desires, like the completion of a regular exercise regime or eating five a day. It is a posing of a set of questions such as, what is the self and how do I take care of it? through this cultivation the self becomes a material to be formed and fabricated. Consequently, just taking care of the *body* does not necessarily mean we take care of the self. The care of the self through askesis, as Foucault identifies is a principle of the soul:

“The self is not clothing, tools, or possessions. It is to be found in the principle, which uses these tools, a principle not of the body but of the soul. You have to worry about your soul – that is the principle activity of caring for yourself. The care of the self is the care of the activity and not the care of the soul-as-substance” (Foucault, 1988, p.25).

In Foucault's *Technology of the Self*, care of the self is the “practice of thinking as opposed to knowing.” Even when a practice of care of the self has a strong mental or intellectual focus, “it is still a matter of exercise rather than a form of knowing or knowledge.” This formation of the self occurs through “a concrete ethical substance” (McGushin, 2007, p.18) with a precise end (*telos*) to be achieved: an ethos. Complimentary to this discussion Shusterman (2012) and his work on somaesthetics adds further insight into Foucault's *Technology of the Self*. Shusterman, much like yogic practices argues that self-knowledge is not easily acquired because our perceptual habits and interests are constantly directed to focus on our purposes and goals in the outside exterior world. However, by foregrounding

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<sup>23</sup> The stoics also had a concept like *prāṇa* that solidified breath, life and soul - *pneuma*. *Pneuma* was considered to be instrumental in formulating the Christian idea of the Holy Spirit (Connor 1999).

the body Shusterman claims we can improve our understanding of our background functioning. Shusterman states: “if probing into the background somatic self demands discipline and effort, then such askesis aptly embodies one of philosophy’s oldest and most crucial aims – the quest for self knowledge” (2012, p.17).

The self is a “subject capable of knowing the truth” (McGushin, 2007, p.192) attained through the poetics of the self. *Technology of the Self* is the conscious fabrication in which the self uses techne, craft or art in order to work on a precise end or outcome. McGushin attaches the concept of etho-poetics to this work of Foucault. It is developed from the ancient Greek idea of *poesis* in which we utilise agency and find orientation:

“It is this notion of poiesis that I have in mind when I call Foucault’s work etho-poetic. It is poetic in the sense that it is a mode of fabrication; it is etho-poetic insofar as it is an art of self-fashioning of fashioning or developing an ethos - loosely speaking, a character or self, and more specifically a centre of action, and orientation in the world” (McGushin, 2007, p.18).

Care of the self as a philosophy and practice has dominated many cultures over many centuries. It was thought that in order to realise or formulate the now much better known Delphic principle ‘know yourself’ (*gnothi sauton*) (Foucault, 1988, p.19) we must first constitute caring for ourselves. In *Technologies of the Self*, Foucault suggests that our present philosophical situation starts to take form, at the moment when this ancient philosophical precept of care became eclipsed by the modern scientific project of knowledge. This was a moment when the secondary ‘know yourself’ leap-frogged the primacy of ‘care of the self’. The question of subjectivity and truth was turned upside down, arranged in a different order, and we became absorbed by the modern imperative of ‘know yourself’. The obligation to know oneself founded on a prior commitment to take ‘care of the self’ was relegated. And ‘know yourself’ became the new foundation. Foucault establishes the primacy and importance of ‘care of the self’. *Technology of the Self* is a working, and a fabrication, an etho-poiesis, through embodied practices which can implement agency, advocacy and politics within the self. *Technology of the Self* and the concept of ‘care of the self’ became an additional lens to view and explore yoga principles. Firstly because of the similarity of the types and prescription of practices; and secondly because their askesis or practice is seen as a form of knowledge. And lastly, and most

importantly Foucault makes a connection to the cultivating of self beyond habitual or concealed thinking “instilled by mechanisms of repression” as a liberation or politic.

## 1.5 Artistic Field

### 1.5.1 Introduction

This thesis contributes to the field of embodied audio-visual interaction and specifically performance with bio-signal interfaces. This field is illustrated via the practice of artists such as Atau Tanaka and Marco Donnarumma, in which the performer’s body and related bio-signals are essentially developed as a musical instrument. Tanaka is known for his work with a variety of bio-signal interfaces to create sensor-based musical instruments for performance and exhibition. His work became prominent through his performance *Kagami* with *BioMuse*<sup>24</sup> a neural interface/biocontroller that allows the performer to create music with muscular and neural activity. Tanaka’s work with Biomuse is expanded through Sensorband, an ensemble formed in 1993 with Zbigniew Karkowski and Edwin van der Heide. Each ensemble member plays a sensor-based gestural controller that uses the body’s ultrasound, infrared, or bioelectrical signals to produce computer music (Bongers, 1998).

Similarly, Donnarumma uses and also makes his own wearable biosensors –Xth Sense. Much like Tanaka, Donnarumma’s hardware and coding amplifies and analyses a player’s muscle sounds with which he renders a sonic mapping for his performances. In *Body Series* (2010-2014) the work focused on creating a fused experience of sound and movement through straining muscle, bones and blood, amplified and composed in real time from the body of the moving performer but also from passive spectators. *Hypo Chrysol* (2013) is an immersive multichannel sound and video which is made via the amplification of muscle strain in the performer’s arms whilst hauling 50kg concrete blocks. In this field “the body is rendered in a dynamic of coadaptation between performer and instrument in different configurations of body and technology” (Tanaka and Donnarumma, 2018). This field provides an exploration of the coupling of human and technological ‘bodies’ at the

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<sup>24</sup> A biomusical interface created by Hugh Lusted and Ben Knapp of BioControl Systems. It was developed at Stanford University in conjunction with the Medical School and the Electrical Engineering Department. Tanaka was in fact the first musician to be commissioned to work with the interface.

physiological level to offer new and explorative means to extend and find alternative modes of both performative and sonic expression.

This research is a contribution to the field of embodied audio-visual interaction, it is a contribution that is made through the configuration of a physiological body and a bio-signal interface. Distinctively, the body I am configuring is set within an embodied practice that utilises *prāṇa*. As such this is now not solely a physiological or bio-signal process that is traced. My contribution within this field of research is to privilege the experiential elements of a breath practice; a practice that has physiological signals but is also used to locate the mental, ethical and philosophical dimensions.

### **1.5.2 Definitions and Role of the Practice**

As such the art practice that is developed in this research takes primary direction from the practices of yoga and is then informed by a field of artists that are clustered via a commitment to the body in a set of four specific ways. Through these fields I locate the research into the wider field of biofeedback art more generally.

#### **1) Artists working with bio-signals and scores in embodied audio-visual interaction**

The artists I cite in this field are working in embodied audio-visual interaction and specifically performance with bio-signal interfaces; primarily within the field of biofeedback. I reference artists' work that explores questions of the body's connection to the mind, or the use of the mind to control or cultivate a body or self. This area of work was largely pioneered in the 1960s and 70s and I concentrate on touchstone artists such as Alvin Lucier, David Rosenboom and Nina Sobell, who re-appropriated medical and scientific tools and created some of the very first biofeedback artworks. During this time a leap of thinking occurred, in that, the mind could now voluntarily control what were previously thought of as involuntary physiological phenomenon. Through these artworks I look to explore through physiological data, sonification and/or visualisation, some aspect or link to the artist-performer's mind. By examining biofeedback artworks, I identify how artists use technology to engage our thinking about the links and potentials of the human self and how body and mind coalesce. I then discuss the second wave of biofeedback work focusing on contemporary artists Janine Antoni, Lisa Park and composer Eduardo Reck

Miranda to further reflect on the split and union of a mind/body paradigm.

## **2) Performance artists working with mind/body as material**

I locate performance artists using the body and mind as a material in which limits and possibilities are tested. Two performances of physical and mental endurance from artists Tehching Hsieh, and Marina Abramović and Ulay, are outlined in order to identify performance art as a location for acts of self-fashioning and self-cultivation. These performance acts inform the practice of this research. The performances are discussed to explore performance art as a medium of self-fabrication, agency and resistance that implicitly connects the mind/body paradigm. I indicate that the practices of yoga are related to and connected to these kind of performance acts.

## **3) Artists working with Sound, Vibration and Listening**

I locate artists working with sound and vibration as a means to explore both inwardly and outwardly the embodiment and realm of listening. I explore the work of Pauline Oliveros and her process of deep listening as a practice used in her artworks to cultivate a listener's awareness of both interior and exterior sound and spaces alongside Alice Coltrane and her work with jazz improvisation as a form of listening. I also draw on the interactive artwork of Yoshimasa Kato and Yuichi Ito and their interactive sculpture *White Lives on Speaker* to explore themes of vibration within arts practice. The artworks here connect vibration and listening to the practices, motivations and intentions of yoga.

## **4) Artists working with Air or Breath as a Material**

A brief survey of artworks from Sabrina Raf, Rafael Lozano-Hemmer and Scott Snibbe present breath as a material or information and also as an interaction. Whilst through the work of Yves Klein and Marcel Duchamp and their use of air, notions of the void, of immateriality, emptiness and spirituality are explored.

These four categories or fields provide the context and definition of artistic practice within this research. In this introductory chapter I have introduced the principle of *prāṇa* alongside both my yoga and art practice background in order to contextualise the transdisciplinary approach I have undertaken in this research. I have also described the fieldwork undertaken at the Kaivalyadhama Yoga Institute and some of the historical work conducted in order to provide an understanding of the Institute's innovative approach to

*prāṇa* and its investigation. This fieldwork provided this research with a set of lenses that combined psychological, philosophical, spiritual and scientific approaches. The institute's simultaneous modelling of a yogic *and* an anatomical schematic to the mind/body and the principle of *prāṇa* provided a leading method and focus at the beginning of this research. The second section provided a broad overview discussion of notions of technology, followed by the specific conceptual framework of this research through its aims, objectives and questions. The broad overview began with Arundhati Roy's prose, where I utilised this writing as an example of our ecological interdependence and interconnection in the framework of the sixth mass extinction. I present two perceptions of technology within this epoch. Each can be thought of as a 'technological mainframe'. This discussion is used to highlight my own thoughts and shifting relationships to technology. Firstly, global machine systems beyond human syncopation I show to be performed *out* of and beyond timescales of the human body, such as the financial trading system. Secondly, a biological system, operating on a cellular level *within* the body that interconnects us to our global environment and the daily revolution of the earth (Hall, Rosbach, and Young, 2017). This broad contextual discussion is offered to show my own differing or shifting locations and impetus across the body and machine-based technology. The discussion and the relationship between technology and the body is a key research focus. Lastly, in this section, the key terms used within the research – *prāṇa*, technology, embodiment, self, and technology of the self are outlined and defined.

In the final section of this chapter I provide a summary of the artistic fields in which the research resides. This research is transdisciplinary and references a wide selection of artists from a diverse set of disciplines and practices. I provide four categories in order to more easily navigate the wide range of contexts and mediums of artistic practice within this research: 1) artists working with bio-signals and scores in embodied audio-visual interaction, 2) artists in performance art using the mind/body as a material in which the limits and possibilities of those materials are tested, 3) artists working with sound and vibration as a means to explore both inwardly and outwardly the embodiment and realm of listening, and lastly 4) artists working with air or breath as a material.

However, as I explain in the next chapter these artists and their artworks are cited throughout the whole of the thesis. The artists and their work are not reviewed or consolidated within a single chapter or within these categories, but instead each artist plays

a role to relate or contextualise specific elements of the research throughout the thesis

# **Chapter 2**

## **Methodology**

## Chapter 2 Methodology

### 2.1 Methodology of the Practice Based Research

#### 2.1.1 Sullivan Reflective Practice

The methodology of this research is underpinned by yogic philosophy and practices. The research is conducted through a transdisciplinary arts practice studying *prāṇa*. It is practice-based research. The research-practice does not exist as a priori of the research, but is constructed for the purposes of *doing* the research. This research employs a practice-led methodology and reflective practice approach supported by Sullivan's Framework of Visual Arts Research (Sullivan, 2005). The process is iterative and relational, within a cycle of reflective enquiry that informs modifications as appropriate. It is transdisciplinary research across art practice and yoga practice, and it reflects Sullivan's observation of the "desire by artists and others to explore spaces and places in ways that disrupt assumed boundaries [and] a desire to move beyond discipline boundaries and into areas of inquiry that interact and intersect and require new ways to conceptualise forms and structures" (p.152).

Specifically, the research methodology is located within Sullivan's *making in systems* (2005, p.154); where "art making is a system like practice because it exists within a broad set of private and public relationships" (p.154). Furthermore, my research methodology crucially relates to Sullivan's concept of *making in dynamic systems* in which system elements are constantly interacting, influencing and being changed by their surroundings. Dynamic systems are transformative since as Sullivan states they occur "as a consequence of continual interactions among the elements in a system and among features of an environment things change" (p.154). In *dynamic systems* there is feedback both from the surroundings and the elements of the system and this exchange produces "effects that are new and different. These outcomes are more than merely a 'sum of the parts' because from these transactions new phenomena are realised" (p.154). This is described by Sullivan as *emergence* in which new features arise from "an interaction that is independent of any of the parts themselves." In addition, and as cited by Sullivan (2005, p.154), key to the dynamic systems outlined by Gell-Mann (2003), Eve, Horsefall & Lee, (1997), Coveney & Highfield, (1995) is the interactive nature of the artistic components and the processes

having a nonlinear character. This practice is a contemporary art example of Sullivan's understanding of what artists do in research. It is led by "investigating the potential for knowledge creation that exists *between* theory and practice, and *beyond assumed discipline boundaries*." Sullivan states that "through this kind of artistic research process, artists pursue issues and ideas that have personal and public relevance" (Sullivan, 2005, p.152). Reflective enquiry and making within a dynamic system underpin the research methodology. In this research, the system elements of breath practices, performance, and digital technology interact, influence and transform each other into new and different performances. It is not only the practice elements of these system elements that interact but theoretical aspects influence the direction and focus of the exchanges generated. These kind of reflective interactions and iterations produce new configurations and insights and it is here in these investigations that the work and the knowledge creation in this research arise.

### **2.1.2 The Self Laboratorium**

The concept of *prāṇa* within the yogic body is the focus of this research. Much like Kaivalyadhama's research approach I am investigating breath beyond its anatomical aspects to encompass psychological, spiritual, poetic, and ethical aspects; however, this research is done through performance and biofeedback artworks and *within the confines of my own body*. Therefore, within this research, a methodology that philosopher and neuroscientist Francisco J. Varela coins 'the portable' or 'self-laboratorium' (1999) is also used. Described by Varela the portable or self-laboratorium is understood through the topography of a scientific researcher but is based inwardly to the subjective experience:

"Establishing a discipline of research in science is bound to the invention of a topographical place (the laboratory) which provides the perspective for a set of procedures or gestures (the methods, the experiments). Once these two poles are articulated in their specificity, a new discipline of knowledge can be born. The last in line in the West was the invention of experimental psychology at the turn of the century. Let us now inverse this description, and point it inwards, as it were. Human beings in their embedded, situated life, the fact constitute a topographical place (the body, the self) where procedures and gestures can be carried to explore

directly human experience itself (the quest). As in other laboratoria, the procedures followed shape and bring forth the content of what can and will become manifest” (Varela, 1999, n.p).

Varela (1999) offers various examples of self-laboratoriums, seen in Eastern traditions of human wisdom such as Buddhism, Taoism and Hinduism and also Western schools of thought and practice that arose in Europe at the turn of the 20<sup>th</sup> century citing Freud’s development of psychoanalysis, the Wurzburg School of Introspectionism and Husserl and Merleau-Ponty’s phenomenology. Varela identifies these traditions and schools as approaches to the portable or self-laboratory and describes the intention of the self-laboratorium as the location for human transformation and discovery.

This research is based within a self-laboratorium. The topographical place, or laboratory is through my own body and the procedures and gestures of yogic breath practices through biofeedback and performance artworks are carried out to explore the human experience. These procedures and gestures (methods and experiments) within the self-laboratorium shape and manifest the content of this research.

As discussed in Chapter 1, there are aspects within the self-laboratorium I associate with two Ancient Greek concepts of *askesis* (forms of self-training), and *care of the self*, discussed in Michel Foucault’s 1982 seminar *Technology of the Self* (Foucault, 1988, p.31). Both concepts offer support in understanding how yogic breath practices are connected with the development and understanding of self. Like yoga practices, the practices of *askesis* and *care of the self* also came with a variety of concepts, techniques and codes, rites of purification, and techniques and models for mediation, endurance and retreat. For example, hard sporting trials in the gymnasias, sexual abstinence or fasting were part of these methods and techniques to “test the individual with regard to the external world” (p.37). These embodied practices and rituals were valued as a process in order to develop mental, bodily, poetic and ethical awareness.

### **2.1.3 Auto Ethnography**

Within this reflective methodological framework, the subjective experiential body is leading and driving the research.

“The living body/subjective self of the researcher is recognised as a salient part of the research process, and sociohistorical implications of the researcher are reflected upon “to study the social world from the perspective of the interacting individual” (Denzin, 1997, p. xv).

A diary was kept throughout the research during my daily practices and the experiential qualities of the practices informed the performances. Some of the autoethnographic writing, diary entries and notes I made during this research are found in appendix 2. Through breath practices of yoga, I explore the situatedness of self. The research in these terms is also then autoethnographic. Leading this research is the privileging of my own embodiment, emotion, self-consciousness and introspection, which aligns to autoethnography: a methodology which calls on the “subjective body as a site of scholarly awareness and corporeal literacy” (Spry, 2001, p.706). Moreover, autoethnographic research based in performance, fine art and communication studies situate the socio-political body as a site of meaning making (Spry, 2001; Alexander, 2000; Bauman, 1986; Dailey, 1998; Fine, 1984; Pelias, 1999). Furthermore, Douglas and Carless (2013) outlines that autoethnographic methodologies through an exploration of the subjective and personal provide the opportunity to learn about “the general – the social, cultural and political” (p.84). Similarly, Spry (2001) defines autoethnography as a methodology that makes us “acutely conscious of how we ‘I witness’ our own reality constructions” and it is through these self-reflections and cultural refractions of identity that we can come to interpret our wider culture. (Spry, 2001, p.706). This research is focused on the subjective body, privileging embodiment, emotion, self-consciousness and introspection via yogic practices in performance artworks. It is through the process of autoethnographic methodology that this research connects a reflexive art/yoga practice to the cultural, political and social.

Owing to the fact that the research is derived from the experiential or the autoethnography of breath and a body; the sources and references I use do not necessarily align to the boundaries of the academic discipline of the thesis, which, broadly in this thesis are performance, biofeedback art, embodiment in audio/visual interaction and yoga. However, the references and connections that arise are highly specific to a living life – a self. Therefore, the sources and references are sourced from a diverse number of disciplines including literature, biology and philosophy. It is the specificity of the writer-artist of this

thesis, specifically a subjective body and voice (albeit situated, partial and incomplete), rather than the academic field or discipline that locates, contains and drives the research content and the writing of it.

## **2.2 Method: Experiments in the Self Laboratorium**

This research in the self-laboratorium is an attention on the subjective body. My methods are located in the subjective body moving across disciplines, in which I am often working across classifications and discipline boundaries. This research is operating within *the spaces between* disciplines. It is a hybrid transdisciplinary practice both composed and moving across and outside of the categories' and disciplines of performance, biofeedback, embodied audio/visual interaction and yoga studies. However, the practice in the self-laboratorium is consolidated by a set of methods which can broadly be broken down into four areas: 1) a performance art practice, 2) a yoga practice and its theoretical underpinnings, 3) the use of technology and digital media, and 4) a performance practice that is inclusive of participation in its making.

### **2.2.1 Hawk**

Gallery North, Newcastle, UK (February 12<sup>th</sup> 2015).

Subsequently performed at The Cistern, Bòlit Centre of Contemporary Art, Girona, Spain. (August 2018).

- Performance of embodied practice.

*Hawk* takes place on a piece of black carpet 2m long x 80cm wide. I wear black leggings and a custom-made falconer's hood of black, kid leather. The hood covers my head apart from my mouth. A leather strap attaches around my neck, and the hood is tightened with a leather drawstring. This is a psycho-physical<sup>25</sup> performance of a yoga practice. Each breath has a corresponding movement. I make an audible sound with each breath entering and leaving. The breath's sound is created through a slight constriction in the throat.

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<sup>25</sup> I use the term psycho-physical to traverse mind-body dualism. One origin of the term is thought to come from German physicist, philosopher and mystic Gustav Theodor Fechner who describes it as the sharing of physical and psychological qualities. I use it in this practice to describe a relationship between the internal (psychic) and the external (physical) worlds.

# Methodology

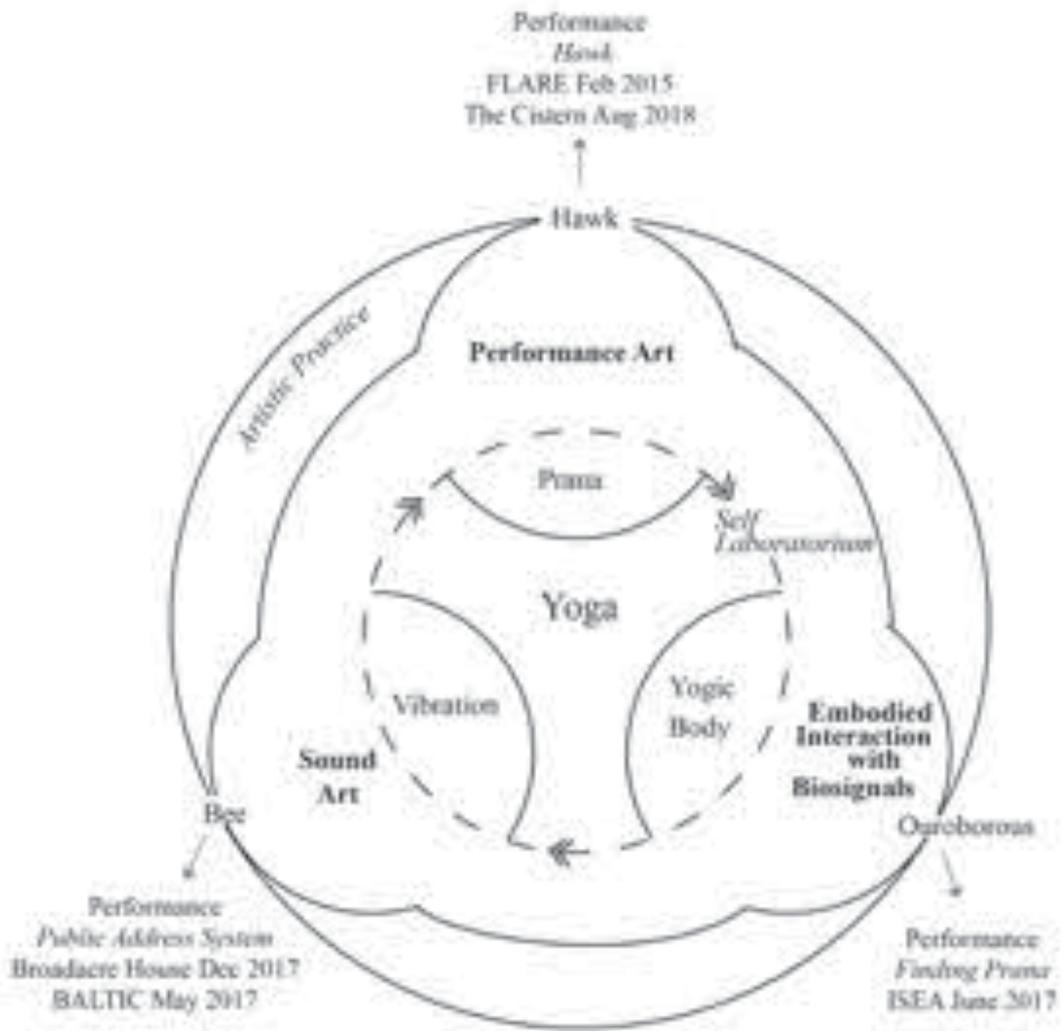


Fig. 2.b Methodology Ven. Helen Collard 2019.

### **2.2.2 Finding Prāṇa**

ISEA (International Symposium of Electronic Arts) Botanical Auditorium, Manizales, Colombia (June 16<sup>th</sup> 2017).

- Performance of the integration of two different systems: science and embodied practice.
- Scientific instrument fNIRS integrated into a creative sound and lighting system.
- Digital and computational processes to render cerebral blood flow data into sonic and visual experience.

My second performance entitled, *Finding Prāṇa* identified breathing practices as a form of biofeedback and aimed to explore breath practices through the application of cerebral blood flow science and fNIRS technology. The realisation of this project involved an extensive development of prototyping for a creative sound and lighting system which was built using MaxMSP software, Oxysoft software, ASCII writer protocol and fNIRS medical hardware to create a performance that could correlate, sonify and visualise my *prāṇāyāma* practice through the use of fNIRS data.

### **2.2.3 Public Address System**

*Public Address System*, Broadacre House, Newcastle, UK (December 7<sup>th</sup> 2016).

Subsequently performed at BAL TIC Centre for Contemporary Art, Newcastle, UK (May 2018).

- Performance of embodied practice.
- Ensemble – participatory.
- Sound and architecture.
- Broadcast.

Over a residency period of eight weeks, and through a programme of workshops, an ensemble of fifty people was formed to perform *Public Address System*. This performance comprised of ensemble members performing the breath practice of *bhrāmarī* in the architectural space of a resonant six-storey concrete stairwell. The sound of the performance was captured by microphones placed throughout the stairwell, the mix was amplified out the building into public space in real-time via a PA system.

#### **2.2.4 FLARE Symposiums**

FLARE (Forum for Living Art Research and Education).

- FLARE 1: Beyond Body programme (8<sup>th</sup> - 12<sup>th</sup> February 2015).
- FLARE 2: In/visible programme (14<sup>th</sup> May 2015).
- FLARE 3: Sync-down, Co-Arise, Listen-In (3<sup>rd</sup> - 5<sup>th</sup> May 2017).

In addition, this research, or self-laboratorium, was expanded through a process of working with other artists' research and practice. FLARE was instigated by performance artist Dr. Sandra Johnston (Northumbria University), who convened discussions between myself and two other PhD researchers: performance artist Denys Blacker and dancer Harriet Plewis. These conversations made apparent a shared practice and theoretical underpinning across our research. Through these conversations, FLARE (Forum for Living Art, Research and Education) was set up and emerged as an international network of artists and scholars exploring concerns of the interrelatedness of performance, technology, and embodied practices. Each symposium was curated and consisted of performances, workshops, talks, screenings and daily practices with invited guest artists, academics and public contributions. Appendices 5-7 show the full programmes and details of the FLARE symposia.

#### **2.3 *The Taxonomy***

Chapters three, four and five of this thesis present a taxonomy which is comprised of six components – three *elements* and three *animalia*. The components have a distinct role in the methodology as a way of tracking the movement of the practice in-the-making. Fig. 3 illustrates the taxonomy followed with a key. *The Taxonomy* is constructed and formulated to demonstrate the artistic and thinking processes and their evolution which occurred within the practice-based research in which the element of prana moves through the yogic body into vibration. Each of these three elements (prana, the yogic body and vibration) has a related animalia that represents and becomes a means to discuss the theory and practice that emanated from these three elements.

# Taxonomic Components of the THESIS

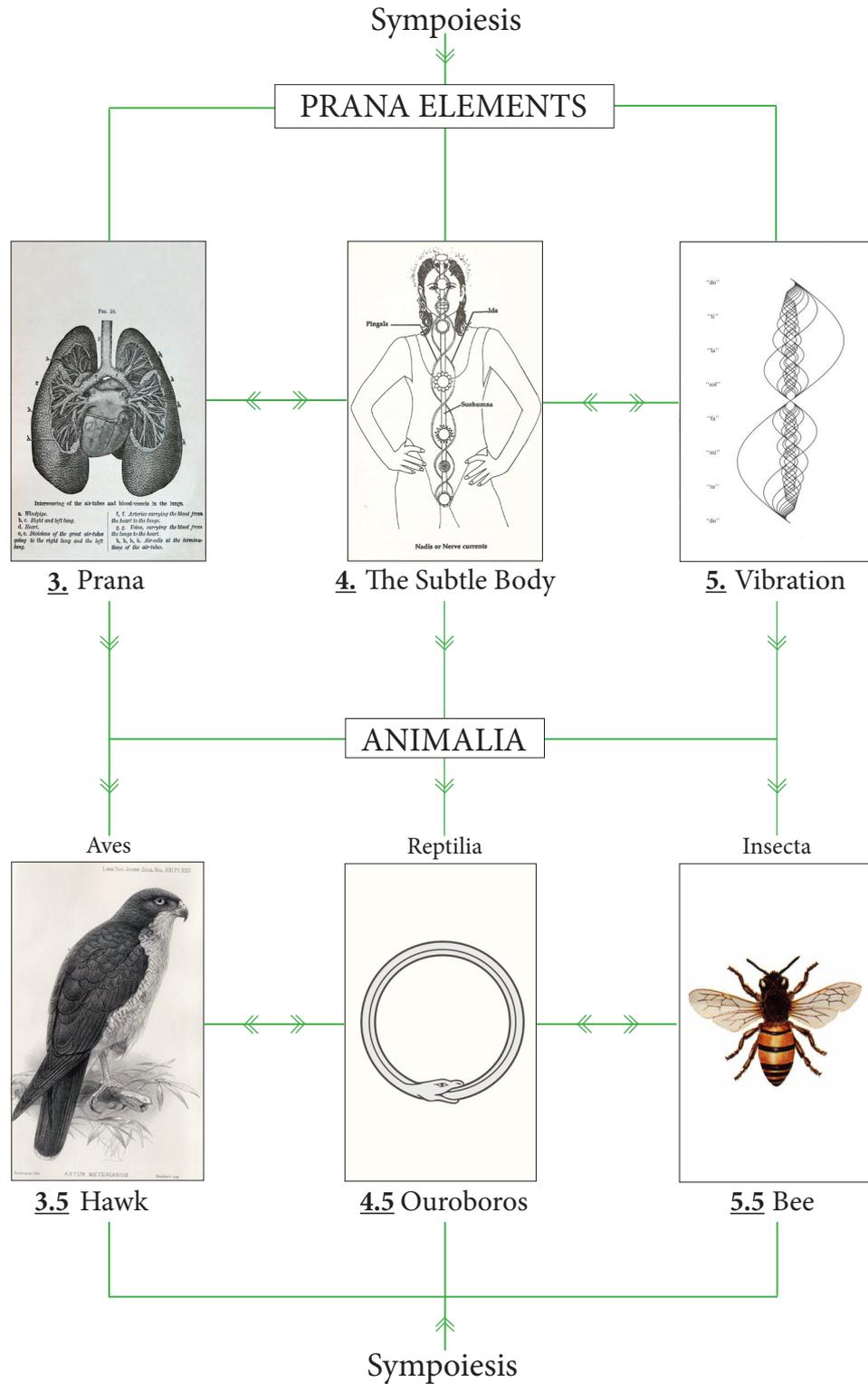


Fig. 3 *The Taxonomy*. 2019.

### 2.3.1 KEY: Schematic of *The Taxonomy*

#### **Taxonomic Components: Elements**

1) **Prāṇa:** *The Taxonomy* begins with the primary philosophical concept of *prāṇa* underpinning this research; which is a Sanskrit word that conjoins breath, air and life into one.

2) **The yogic body:** *prāṇa* is then introduced into the second element of *The Taxonomy*, the yogic body.

3) **Vibration:** is the third element, and thought to be an effect of *prāṇa* within the yogic body.

I have linked together the taxonomic elements (*prāṇa*, the yogic body and vibration) in this way in order to illustrate and map the emergence of a technology. Each of the three elements are interconnected, and used within the practice of yoga to attain self-realisation. I use them here, in an art practice as a Foucauldian *Technology of the Self* (Foucault, 1988) in order to cultivate and fabricate a self or ethos.

#### **Taxonomic Components: Animalia**

Each of the above elements (*prāṇa*, the yogic body and vibration) has a corresponding animalia and a derived piece of artwork.

1) Prāṇa contains the animal and the performance artwork *Hawk* (a bird), a psycho-physical performance, that uses breath practice as a form of self-fabrication.

2) The yogic body contains the animal ouroboros (a mythical looping snake). This animal represents breath as a biofeedback system and the making of *Finding Prāṇa*, a biofeedback performance that utilises neuroimaging technology to sonify and visualise a yogic seated breathing practice known as *prāṇāyāma*.

3) Lastly, vibration contains the animal bee and the artwork *Public Address System*, Which is an ensemble performance and sound meditation in an architectural space exploring embodied breath, sound, and its return.

### 2.3.2 Mapping the Research Movement

In exploring the particular value of artistic research in relation to qualitative and quantitative methods and disciplines, Bolt (2016, p.140) suggests that the work of art is not just the performance or event – which in this case is *Hawk*, *Finding Prāṇa* and *Public Address System*. Instead the work “is the effect of the work in the material, affective and discursive domains” (Bolt, 2016, p.140). So how can the artist-as-researcher explicate what has taken place – *beyond* ‘the work’ as manifest in the performances?

In this research I introduce the practice that created the performances by following Bolt’s own suggestion, of finding ‘ways to map the movement in conceptions, understandings, methodologies, material practice, affect and sensorial experience that arises in and through the research experience’ (Bolt, 2016, p.141). This ‘mapping’ is found in *The Taxonomy* which has a distinct role in the methodology as a way of tracking the movement of the practice in-the-making (that realises the ‘performance acts’). As *performative* the text is an “iterative and citational practice that brings in to being that which it names” (Bolt 2016, p.134). In this case it brings in to being *the practice itself*. In this regard the research practice is both found *in* and is born *of* *The Taxonomy* which is illustrated in Fig.3.

The configuration and interplay between each of the taxonomic elements can be seen to draw on Donna Haraway’s method of *speculative fabulation* (2016). Haraway describes speculative fabulation as a method used in her thinking, writing and research to make, move, reconfigure, re-situate, combine and cross between perceived boundaries and relationships. In this process Haraway is combining science, facts, fable, experience and imagination (p.12). *The Taxonomy* operates as a speculative fabulation. It too is comprised of practice, fact, fable, experience and imagination and it is an approach that crosses boundaries to perform a subjective thinking body in this research.

If as Bolt suggests the performative paradigm of artistic research is to realise its potential as a new performative research paradigm that is *distinct from established modes of research*, it is important to avoid conventional default to established fields of research. With this in mind the text does not follow established paradigms set by social science research for example, but instead forges an iterative story that is both shaped by the body’s experience of the performance acts, and forms them in turn.

### 2.3.3 How Artists Perform in *The Taxonomy*

The artists and their respective fields have been clustered together in the previous chapter in order to readily understand the context of the artistic practice in this research. However, within the thesis, the artists and their contexts are *not* drawn together into disciplines or as a whole within a specific review chapter. Instead the artists are interspersed and configured with each pertinent taxonomic element. The artists and their work are performative and citational. My performances are applied to and fabulated to specific components within *The Taxonomy*. As suggested by Bolt this device is an approach that more fully enables the research experience. Each artist or performance, or piece of artwork are citational. They are used to conspire and intersect with the unfolding of each taxonomic element and its narrative. Artists intersect with yoga practices, theory, science, fable, experience and imagination. They are woven within the text and contribute to the speculative fabulation of the taxonomic text.

### 2.3.4 Taxonomic Component Elements & Animalia

How the three elements and three animals were fabulated together and used to represent each artwork and their influences came about progressively and iteratively as the practice-based processes evolved. The following discussion illuminates some of the processes I encountered during the research and specifically the embodied practices from which these taxonomic components developed. This discussion is supported by Haraway's (2016) idea of fabulation and her notions of *making with* (or embodying the other). I draw on processes in yoga practice and Hannah Arendt's (1982) model of *visiting* in order to further contextualise the Elements and Animalia that have come to make up the components of *The Taxonomy*.

Much like in fable, the use of elements and animals in art and yoga practice offers a space and exploration of symbolic, moral and spiritual spaces. The elements and animalia used in this taxonomy similarly work as daemon<sup>26</sup> (Pullman, 2015) or message. Our co-evolution and companionship with animals, is depicted by our earliest ancestors on cave walls. Therefore, to think that animals first entered the "human imagination as meat, leather or

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<sup>26</sup> Daemons are the external physical manifestation of a person's 'inner-self' that takes the form of an animal. Featured in Philip Pullman's epic trilogy of fantasy novels *His Dark Materials*.

horn is to project a 19th century attitude backwards across the millennia. Animals first entered the imagination as messengers and promises” (Berger, 2009, p.12). Many practices within yoga are constructed from observing animals and are used to conjure or assimilate aspects of that energy or form. Posture practice, for example cultivates the practice of making shapes or taking specific qualities of an animal, or other-worldly creature or deity. The animal, creature or deities shape, energies and qualities are trialled and tested out within a human body and mind. A posture such as *Bakasana*, for example, explores the movements and sensibilities of a crane taking flight. Whereas *Supta Kurmasana* evokes a tortoise withdrawing into its shell.

The efforts of all yoga techniques are acts of experiencing other to human. Yoga scholar Mircea Eliade surmises “All of the yogic techniques invite one and the same gesture – to do exactly the opposite of what human nature forces one to do [...] to react against the ‘normal’, ‘secular’, and finally ‘human inclination’” (Eliade, 2009, p.96). Similarly, Duchamp, described art as a device “with which to break mental and emotional habits and to discourage the projection of the one’s self as absolute” (McEvelley, 1997, p.201). These techniques, like *The Taxonomy*, are a method of human deconstruction; they provide the self with another form to make questions against. They are seen similarly in practices using Tantric visualizations. Sanskrit scholar Sthaneshwar Timalsina characterises Tantric visualization as a practice with the ability to enable the subversion of the human and its “underlying cultural and linguistic presuppositions and frameworks” (Timalsina, 2012, p.57). These human techniques of deconstruction also then become a co-process of reconstruction as a new and changing mental space occurs (p.57). *The Taxonomy’s* elements and animalia are comparable in this way to Tantric visualizations in the sourcing of energetic otherness, in ‘present-ing’ a mental remapping, and wiring of the self.

Through these techniques of alterity, we move, we conjure presence or like-ness, *and make with* (Haraway, 2016). I am suggesting that when present-ing into the place of something other in this fabulated taxonomy, there is a potential to radically alter our viewpoint. *The Taxonomy* is a systematic treatment that enables me to think through and with the work emerging from the self laboratory. To further examine this kind of thinking and also to offer traction and contextualisation of the thinking which has developed in this research and its consequent fabulated taxonomy, I outline Hannah Arendt’s concept of ‘visiting’. Arendt’s concept of visiting was a method of thinking; to move the mind to somewhere

else. Visiting therefore is not the kind of thinking we associate with disciplinary knowledge or science justified by repeatable evidence, and it is also not so much the ciphering of truth or belief, or decisions concerning right or wrong. It also is not a thinking that can satisfy a process for assessing information and argument (Haraway, 2016). Although this was all very important to Arendt, what really mattered in her conception of ‘going visiting’ was to think with Kant’s “enlarged mentality” (Villa, 2000, p.159). In the act of *visiting*, we are training the mind to go somewhere other and else, we are enabled to compare “our judgement with the possible rather than the actual judgement of others” (Kant, 2014, p.40) and therefore put ourselves in the position of somebody else. Or, as I am suggesting through the configuration of the elements of this taxonomy – *prāṇa*, the yogic body, and vibration and their connected animalia – hawk, ouroborous and bee. It is a kind of representative thinking made possible by the exercising of the imagination. Visiting enables one to entangle, and make particular, individual acts of judgement and to have response-ability (Haraway, 2016). This thesis is structured in a taxonomy of components and classified into elements and animalia to take us visiting. It is a form of mapping and sourcing of energetic otherness, much like those discussed earlier in yoga and Tantric practice (Timalsina, 2012). *The Taxonomy* is devised in order to make fully present the relationships, thinking and places that evolved through yoga in an art practice.

### **2.3.5 Taxonomic Interaction – Sympoiesis**

As *The Taxonomy* Fig.3 indicates sympoiesis can be thought of as a network that connects each of the taxonomic components. I use this term to reflect the kind of interactions that happen between the taxonomic components. Haraway derived the term sympoiesis from the work of biologist Margulis whose development of symbiogenetic evolution theory<sup>27</sup> suggests that: "Life did not take over the globe by combat, but by networking" (Margulis and Sagan, 1997, p.29). Symbiogenetic evolution is always about co-evolution. Similar to the conceptual framework of Deleuze and Guattari’s rhizome (Deleuze and Guattari, 2004, p.23) the taxonomic components are interwoven, interdependent, and in a co-evolving process. Haraway describes sympoiesis as “enfolding autopoiesis – generatively unfurling and extending it” (Haraway, 2016, p.65). In Haraway’s definition sympoiesis is the action

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<sup>27</sup> Symbiogenesis is an evolution theory that begins to trouble neo-Darwinian evolution as conflict and competition as the driver of change. It questions the fight for survival through its work on the unseen role co-operation plays; seen most clearly in the light of infection, pollination, or think of kissing, or possibly through our developing relationship with technology.

and recognition that nothing can really make itself on its own. Sympoiesis is used in *The Taxonomy* to evidence and demonstrate this kind of working. Breath or *prāṇa* is a sympoietic state. The boundaries of inside and outside, self and other interpenetrate. Through air/breath we inhabit and assimilate one another.

### **2.3.6 Taxonomic Summary**

Through this thesis, I develop each taxonomic component, to create a text that interweaves interdisciplinary ideas from yoga philosophy, performance, biofeedback, sound art, psychology and ethics. I begin, in Chapter 3 with the first taxonomic strand *prāṇa* and my performance of *Hawk*. I discuss the element of *prāṇa* in yogic practice and philosophy hand in hand with more recent western thinking from Irigaray (1999, 2005) and the respiratory philosophers Škof (2018), Berndtson (2018), and Morley (2018). The relationship between air and art follows; considering air as both a material and also as a motif to denote the immaterial in art practice. Lastly, I discuss my performance of *Hawk*, and its use of *prāṇa*. The performance of *Hawk* is considered in relationship to Foucault's care of the self and Audre Lorde's self-care as a means of feedback to enable activism and advocacy.

In Chapter 4, the second taxonomic strand of the yogic body and ouroborous are discussed. The use of *prāṇa* in the element of the yogic body is explored as a biofeedback system. I review artists working with biofeedback technology and mind/body practices. Specifically, the seminal biofeedback performances in the 1960s by artists such as Lucier and Rosenboom and more recent artists in this field such as Janine Antoni. My own biofeedback performance *Finding Prāṇa* is discussed through both the lens of the yogic body in order to contextualise the *prāṇāyāma* practice, and an anatomical lens in order to contextualise the use of neuroimaging technology (fNIRS). I then discuss the data and scoring process of the fNIRS data in order to perform a live sonification and visualisation of the changing cerebral blood flow (CBF) during my *prāṇāyāma* practice.

In the final taxonomic strand vibration and bee in Chapter 5, I explore the embodiment of vibration, sound and listening and how as embodied beings we are participants in a vibrating, connecting technological world. Sound and vibration are investigated through

the work of Lipari (2014), Oliveros (2010), and Nancy (2007) and my own ensemble performance piece *Public Address System*.

### \*\*\* Summary

Supported by Sullivan's Framework of Visual Arts Research (Sullivan, 2005) in these introductory chapters I have outlined the practice-led and reflective practice methodology I use. This methodology process is iterative and relational, and sits specifically within Sullivan's *making in systems*. This reflective practice methodology is designed via Varela's portable or self-laboratorium. The laboratory is my own body/self, through which I explore *prāṇa* in an iterative and reflective process. I employ Sullivan's (2005) reflective enquiry to my yoga and art practice as well to related theory and artists' approaches within the four fields of artistic research outlined as: 1) artists working with bio-signals and scores in embodied audio-visual interaction, 2) artists in performance art using the mind/body as a material 3) artists working with sound and vibration as a means to explore both inwardly and outwardly the embodiment and realm of listening, and lastly 4) artists working with air or breath as a material. The experiments made within the self-laboratorium integrate breath practices and technology into performance. Through Sullivan's *making in systems* I have paired or embedded specific yogic breath practices into specific performance processes. Each pairing has developed iteratively and each pairing has been concluded as a performance artwork. The focus within these experiments is autoethnographic in which the privileging of my own embodiment, emotion, self-consciousness and introspection is primary. Finally, in order to adequately map this reflective methodology and research experience (Bolt, 2016) I described my use of the role of a *performative* taxonomy. *The Taxonomy* and each of its elements is then summarised in order to prepare the reader for a performative text in which the mapping of the practice in-the-making in the following three chapters can be followed.

**The next three Chapters (three, four and five) present *The Taxonomy*.**

### **3. Taxonomic Element – *Prāṇa***

## Chapter 3: Element: Prāṇa

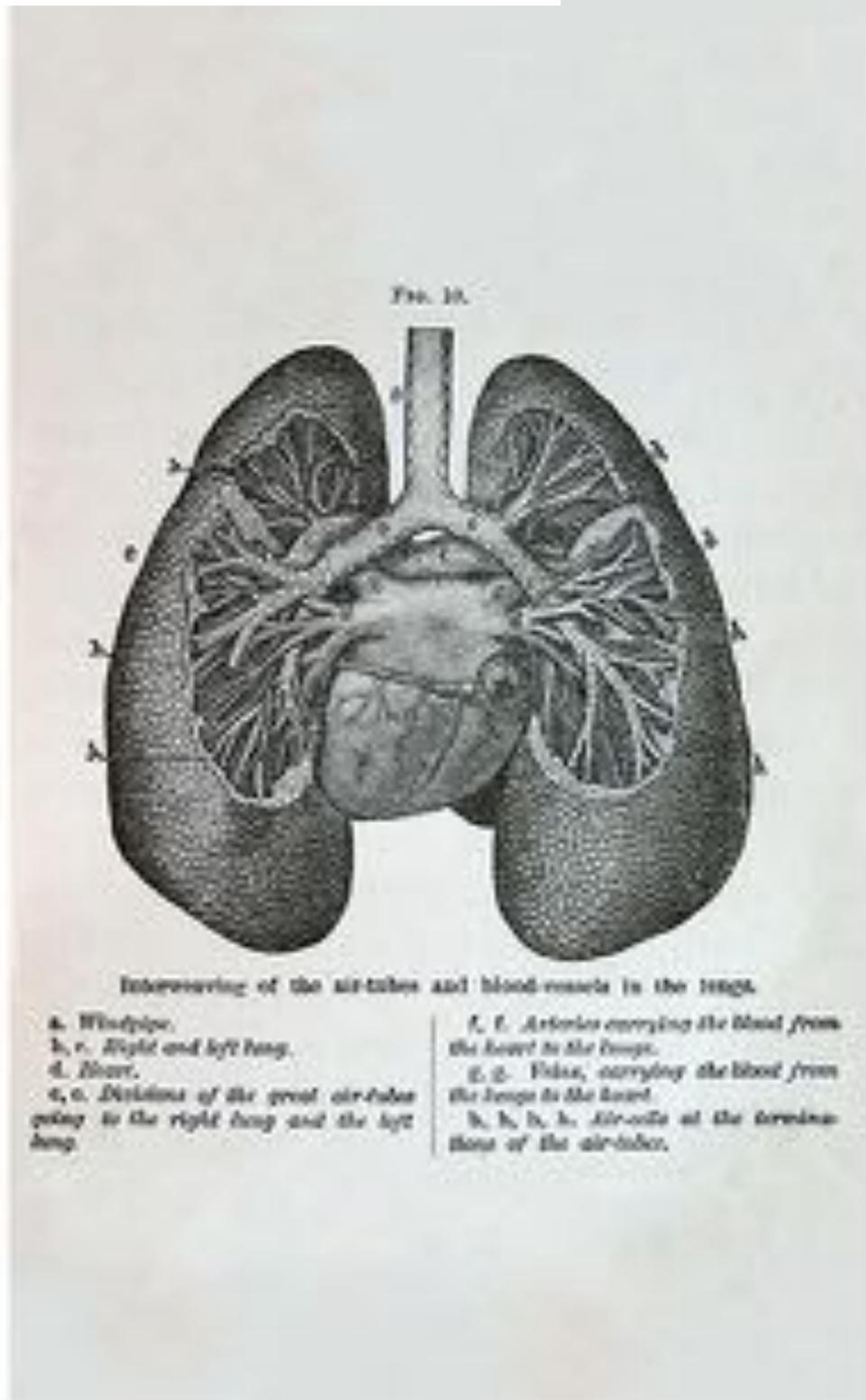


Fig. 4 Lungs and Heart. Image © Encyclopaedia of Medicine, Guelph World Publishing Company, p. 160.

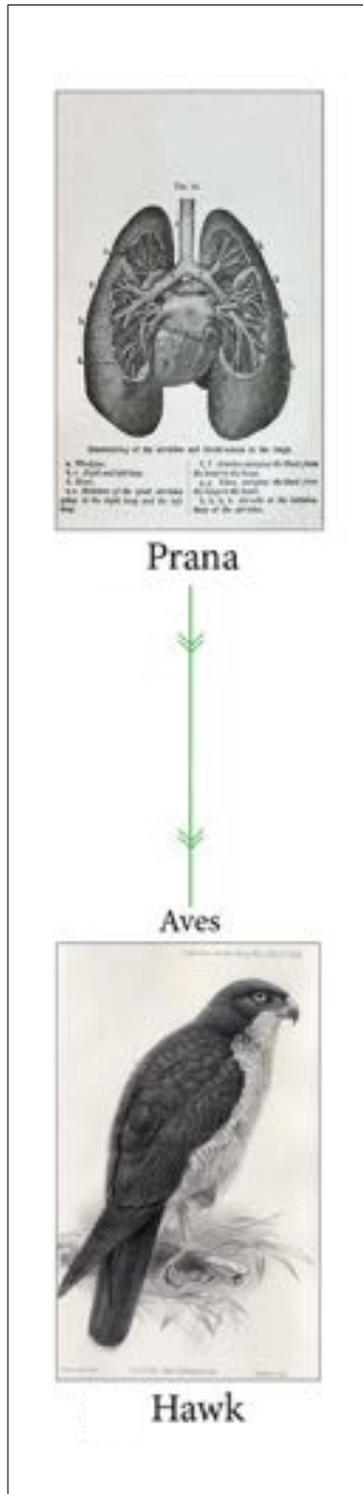


Fig. 5 Prāṇa & Hawk Strand.  
©Encyclopaedia of Medicine.

This chapter identifies and discusses the properties of breath through *prāṇa*<sup>28</sup>. It is the primary philosophical element informing this art practice. In the first section of this taxonomic strand, *prāṇa* is contextualised in yogic practice and philosophy and additionally with phenomenological respiratory philosophers (Irigaray, Ditrich, Škof and Berndtson) and feminist thinking (Lorde, Górska, and Ahmed). In order to enhance this discussion through practice, I then consider air used as an allegory or desire for the immaterial in artworks and also artists use of air as a material and semiotic in artworks. In section 3.5 the element of *prāṇa* is then fabulated through its related animal. Here I discuss my first psycho-physical performance *Hawk* which draws on my own yoga posture (*āsana*) practice. In this taxonomic strand the element of *prāṇa* is fabulated with a hawk (and its flight) – a bird being aerial and operating both of, and in air. Furthermore, the hawk enables a discussion of the elements of training and outward withdrawal required in this performance and as a foundation of yoga practice. This self-training (or askesis) is discussed through the lens of Foucault’s Technology of the Self. Through this lens, I frame *prāṇa* as a form of technology, a technology of self. But first I discuss the properties of the element of *prāṇa* from where these practices and this performance originate.

<sup>28</sup> Prāṇa – is further subdivided into five energetic components, the *prāṇa* vayus or winds. The vayus of *prāṇa* are *prāṇa*, apana, samana, udana, vyana. Each has a distinct energetic quality, including specific functions and flow within the body.

### 3.1 Element Definition: *Prāṇa*

“We don’t speak of the air between our body and a nearby tree, but rather the empty space between us. It’s empty. Just an absence of stuff, without feeling or meaning. A void” (Abram, 2018, p.264).

It is easy to miss the invisible, but air is our most radical need. Our entire life is encompassed between our very first inhale and that final expelled exhale. The presence of breath is the material presence of time in our body. We are of air. We are embodied by air. Breath is a conduit for being, and as each breath physiologically accumulates it is a conduit for our dying. Breathing brings what was outside in; infusing through the lungs, through the veins, circulated in the blood, organs and cells. And breathing also takes us out, our essence exhaled into exteriority, externalised into the atmosphere; then taken in by someone else, or something else, somewhere else. In this continuous exchange, breathing expands the conceptual boundaries of the body, the self, and our beyond, where the horizon of embodiment is no longer contained behind the membrane of skin. Our breath is contagious, infecting, a communion with the “immense lung” (Merleau-Ponty, 2002, p.246) outside of us.

The ancient Indian tantra<sup>29</sup> and yoga text the *Upanishads*<sup>30</sup> position the meditation on breath as “one of the vehicles for reaching (or returning to) that state without movement and differentiation” (Ditrich, 2018, p. 100). Furthermore, expounded in the commentaries in the *Vedic* texts *prāṇa* interlinks us between micro- and macrocosms (Aitareya Āranyaka 2.1.6). “Speech is united with breath, breath with the wind, the wind with all the gods, all the gods with the heavenly abode, and the heavenly abode with *brahman*” (Aitareya Aranyaka 3.1.6). *Prāṇa* in this text is an agent that animates the body and links it through speech to the entire cosmos. Ditrich (2018) argues that already in these ancient texts the “dynamic structural model of the cosmos in its multiple interrelations to the human body indicates a perception of the embodied individual that is not viewed as an independent entity but rather as a relational, interlinked, dynamic system or process” (p.100). This

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<sup>29</sup> The Hindu Tantras total ninety-two scriptures however; tantra has been practised across Asia and part of Asian history since 500CE (White, 2000) A method to expand the mind and liberate the dormant potential energy, and its principles form the basis of all yogic practices.

<sup>30</sup> Gavin Flood (1996) dates the Yoga Upanishads to the 100 BCE to 300 CE period.

model is repeatedly reflected in many Indian religious and philosophical traditions and also through other terms used to denote “air”, “spirit” “wind “cosmic breath” such as *lil, aer, pneuma, ruah, spiritus, anima, qi, ki, sila, and mana* (Škof, 2018, p.57).

More often though, our awareness of the body is to separate the “outer” body – that which is in contact with the external world from the “inner” body – that which we carry around within ourselves. Phenomenologist and yoga practitioner James Morley (2018) describes this separation as:

“Tending to an alienation that we habitually experience in relation to our bodies. The objects of external sense become the focus of our experience, so that we tend to privilege that aspect of our body that is accessible to the external observer perspective. We think of ourselves in terms of our mirror images observable from an external point of view. Correspondingly, our perception is alienated from the sentient mass of our bodies, which is relegated to the margins of our ordinary experience” (p.118).

Furthermore, Morley suggests that breath practices, integral to yoga, prevail against this alienation. The conscious breath offers a concrete experience of the “body as a *relation* between inside and outside. To breathe is to pull air into ourselves and to rhythmically release outward something of ourselves” (p.118). The simple and ubiquitous experience of breathing, is brought into attention and application by yoga practice and the concept of *prāṇa*.

A key objective of yoga is a cultivation of the self, encapsulated in Patanjali’s aphorism written in the *Yoga Sutra*: “Citta Vritti Nirodhana: Yoga is the removal of the fluctuations of the mind” (Raganathan, 2008, p.1-2). Yoga’s purpose is to circumnavigate the usual alienation, habits and illusions our minds create and to experience beyond that mind. In yoga, through practices that attend to the conscious process of controlling and attending to the breath, it is thought we can not only connect to the mind, but go beyond the *citta* (the desiring mind). In this consequent gap or stopping of the desiring mind, we find an opportunity to restructure the alienating and habitual thoughts and patterns and have the opportunity to cultivate knowledge of the self or *atman*. In yogic philosophy and its practice, breathing is not just a thoughtless bodily function, separate from the mind.

Yogi and author Theos Bernard is probably best known for his autobiographical accounts of yoga and his extreme breath experimentation (including the story of Bernard cutting his frenulum in order to free his tongue to block his throat for a *prāṇāyāma* practice<sup>31</sup>). In the following excerpt from a diary written in the 1930s Bernard connects the mind to the senses and the breath to control the mind. Bernard states that:

“Mind is master of the senses and breath is master of the mind [...] every mental state has a corresponding respiration [...] Consider the mental act of listening to catch a faint and indistinct sound; breathing is suspended. It is impossible to listen while breathing deep and full [...] Every action of concentration means so much suspension. Breath determines the pressure behind all emotions, activities and circulation; it has to do with feelings, life, senses. Its influence is far greater than we ever suspect” (Bernard, 2007, p.74).

In a moment of shock, we fight to inhale a breath, in moments of wonder we might take an explosive gasp, or in fear or excitement the breath rapidly quickens. In this way, we begin to see a connection between how breath and our state of mind are linked. Within Bernard’s statement, we recognise this relationship between breath and the mind but also the potential of what it might mean if we control the breath, might we control or influence the mind through conscious breath?

Artist Holly Herndon through her sonic artwork *Breathe* (2012) explores these connotations of the breath. *Breathe* is a three-minute soundtrack that both traces and abstracts the human breath through a chain of real-time MaxMSP digital processes. Through both sound capture and processing of human breath, Herndon’s work takes the listener between emotional resonances we intimately know from a human sigh into witch-like glitches and computational distortions. Some are so familiar and humane, they haunt; others, so processed they soar ahead and scream in an otherworldly way. Through digitally processing a breath Herndon serves to heighten our awareness of emotions contained within it. It is a sonic communication in which each breathe creates a ‘feltness,’ and we hear a self and a reflection. Through Herndon’s digital manipulation, we are connected but

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<sup>31</sup> This story has been doubted as it would make speech incredibly difficult without the tongue being attached to the frenulum.

also disconnected to breath, its senses and mind. To further the implications of a connected breath in this research, the next section considers the influential work of philosopher Luce Irigaray and the current wave of thinking within phenomenological respiratory philosophy. This work examines all phenomena and all philosophical questions within the atmospheres of breathing (Carel, 2018).

### **3.2 Respiratory Philosophy**

Irigaray (2002) locates the very first autonomous gesture of the lived human experience as breath. She reminds us that in the mother's uterus we take oxygen through blood, we are dependent and yet to be born. In order to be born, it requires a first breath of air (p.81). Air is our vital first food and Irigaray (1999) attempts to redirect the western philosophical framework, from the act of *thought* to the atmosphere of *air* – as the condition for life, action and thinking. Irigaray argues that thinking is born in air, but “air does not show itself. As such, it escapes appearing as (a) being. It allows itself to be forgotten” (p.5). Consequently, Irigaray describes the current western philosophical framework as a philosophy of forgetting in which our unawareness to the dimension of air is the single most important factor in our forgetting of being.

In Irigarayan terms it marks the forgetting of exteriority, the forgetting of an infinite and the abundance and the nourishment of air within and beyond ourselves. In this forgetting, breath is solely a physiological process, and breath within this dimension becomes insulated and cut away from exteriority. Irigaray describes disconnection as the “vital breath” disengaged from the “spiritual breath” (Irigaray, 2005, p.77). The breath is separated from the nourishment of something both essentially within and beyond ourselves. Breath is no longer interdependent, we are no longer tied and tethered outward. The vital breath that enlivens and inspires us becomes only physiological and the spiritual breath is something un-bodily, unconnected, partitioned into an incorporeal spirit, totally “independent from the course of nature” (Berndtson, 2010, p.282). Irigaray states that to forget this, naturally tethered outward dimension of air, of the vital and spiritual breath existing in tandem is a “cessation of becoming” (Irigaray, 2005, p.8). And is most essentially a forgetting of being.

Respiratory philosophers Leonard Škof and Petri Berndtson (2018) expose René Descartes well known writing in *Meditations on First Philosophy* as an example of Irigaray's forgetting of air. Descartes begins his *Third Meditation* thus:

“I will now close my eyes, I will stop my ears, I will turn away my senses from their objects, I will even efface from my consciousness all the images of corporeal things; or at least, because this can hardly be accomplished, I will consider them as empty and false; and thus, holding converse only with myself, and closely examining my nature, I will endeavour to obtain by degrees a more intimate and familiar knowledge of myself. I am a thinking (conscious) thing, that is, a being who doubts, affirms, denies, knows a few objects, and is ignorant of many, [who loves, hates], wills, refuses, who imagines likewise, and perceives; for, as I before remarked, although the things which I perceive or imagine are perhaps nothing at all apart from me [and in themselves], I am nevertheless assured that those modes of consciousness which I call perceptions and imaginations, in as far only as they are modes of consciousness, exist in me. And in the little I have said I think I have summed up all that I really know, or at least all that up to this time I was aware I knew” (Descartes, 1698).

Descartes intent is to look deep into his self, his path to a greater awareness of self-knowledge involves the removal or withdrawal from the world of the senses, to look deeply inward, removing distractions from the outside world in order to gain an unobstructed self-viewing. However, as Škof and Berndtson stress Descartes either did not close or block all of his senses i.e. blocking his nostrils from smell and closing his mouth from taste, *or* he did not describe the exact experience and is being untruthful. If Descartes had closed all his senses (including his nostrils and mouth), then the retelling of this experience would also have included a description of the discomfort and anxiety he would have experienced, from no longer being able to draw a breath. Škof and Berndtson's conception of self in Descartes text *is* also separate from the world, however this self is “an anxious self that has a constant urge to reconnect with our original way of being as breathing-in-the-world” (2018, p.xiii). Škof and Berndtson exemplify through this example Irigaray's forgetting of air. Irigaray argues that within the western philosophical tradition the forgetting of breathing is almost universal (Irigaray, 2002, p.77). In addition, the standing of dualism and all of its dangers has been made possible as a paradigm of

modern philosophy through this almost universal forgetting. Moreover, Škof and Berndtson argue that: “modern philosophy’s dualism is impossible if the starting principle of philosophising is the experience of breathing, as breathing perpetually intertwines the self, the body and the world” (2018, xiii).

Breathing may be something that happens without awareness a whole lifetime. Done in spite of oneself, an unconscious automatic process without any attention. However, the foundation of Irigaray’s, Škof and Berndtson’s respiratory philosophy much like the principles of breathing practices is to breath consciously. Respiratory philosophy through these thinkers means that whatever we look at, “we must be conscious of the atmospheres of breathing and strive to see our subject within it” (Škof and Berndtson, 2018, p.xvi). Through this new way of viewing the world, all the questions of life *and* philosophy become *respiratory questions of philosophy* and as Škof and Berndtson demonstrate if Descartes had remembered breathing, his passage quoted earlier from his *Third Meditation* would present a completely different retelling.

The consequences of being conscious to the atmospheres of breathing and searching to see the subject within it, are creating thinking that has political, intersectional and environmental justice implications. Górska (2016) through her discussion of the cultural processes of breath in black lung disease, panic attacks and phone sex work offers a politicised approach to breath and embodiment. In her proposal, breathing human bodies are conceptualised as “agential actors of intersectional societal power relations” (p.31) in which the struggle “for breath and for breathable lives are matters of differential forms of political practices” (p.172). The vulnerabilities, resistance and political power struggles of breath and breathable lives are contemplated in the very first words of Górska’s monograph: “I can’t breathe.” These were the last words of Eric Garner, a last vocalised breath of a struggle for existence before he died within a racist system which enabled a police officer to choke-hold him to death before due process and law. Górska demonstrates how, for some, the access to air is restricted, manipulated, and politicised. Viewed through Górska’s lens, breath and its embodiment are agential phenomena. Through this detailing, implications of power dynamics for both social and environmental justice are raised. See USB material #6 FLARE Keynote with Magdalena Górska. This discussion will be expanded further through the feminist work of Lorde and Ahmed later in the chapter. The yogic practices and the concept of *prāṇa* I use in this research are intended to develop

attention and awareness to the breath to explore the body as a *relation* between inside and outside. The modern western philosophies I have used in support of this thinking is not an attempt to impose a western framework over an established non-western tradition, rather it is intended as support to further enhance an understanding of the yogic dimensions of *prāṇa*.

### **3.3 Air and Art: The Immaterial Void**

If philosophers Irigaray (2002) Škof and Berndtson (2018) are right that air is the medium in which we operate then it is unsurprising that air has long been a subject within art practice. Artworks have often examined air's materiality, both its absence and objectification. To demonstrate air and breath's relationship to art, I survey a sample of artists working with air as both a void and conversely as a material of communication and information.

*Air de Paris* (1918) by artist Marcel Duchamp started as an ordinary glass phial in a Parisian Chemists. The phial was emptied of its contents, and then began a new life as a ready-made artwork. The phial's contents, although arbitrary, were classified by Duchamp as *Paris Air*, making the phial and its invisible contents distinctive. English scholar Steve Connor (2007, p.2) offers an insight into Duchamp's phial in which, it should not so much be viewed as a ready-made "but as a ready-to-hand emblem of unmaking." Connor proposes that *Air de Paris* represents an inaugural symbol of conceptual art's desire to think beyond the reverence for and preoccupation with the object. *Air de Paris* proposes "the idea of not being there and, by extension, art's capacity to summon and sustain this condition of the not-all-there, the next-to-nothing" (p.2). Connor connects Duchamp's phial of Parisian air with "arts desire to have done with objects" he extends his proposal further in that no object embodies this desire more than air.

"Air has a privileged relation to the struggle of art with, or rather its striving to find ways of doing without, objects. More and more, and most conspicuously in art of the conceptual tradition, art must refuse to be reduced to or mistaken for the objects which it has traditionally been called upon to call into being. For over a century art has struggled against the idolatry or enchantment of objects, preferring processes, especially processes of vanishing, decomposition or evaporation to the precipitation

of forms. Air has often been the carrier of this immaterialism [...] In fact, air has become a kind of allegory of art, or of its allergy to objects” (Connor, 2007, p.2).

Connor makes air an allegory for art’s immaterial desires. If it wasn’t for the phial, the air’s perhaps illusory container, air would escape and become coalesced into something else. Air’s “being is flight, flight from itself, the rushing out of essence into exteriority” (Connor, 2007, p.3). Furthermore, this coalescence of air, mirrors art’s aspiration. Art’s desire for expansion: to be infinite and not to belong in a place or particular range, but able to assume and propagate itself and permeate into everything. Connor identifies a relationship between nothingness and air in the work of Yves Klein, air here is explicitly expressed as empty space (2007, p.4). In *Void* (1976), Klein leaps off a building abandoning himself into empty space, a showman defying gravity, launching into the immaterial. In *Void Room* (1961), an empty white-walled room, Klein, presents the idea of an invisible presence. He described the room as being filled with an immaterial presence of “pure pictorial sensibility” (McEvelley, 1982, p.26). Klein denies us the role of the visible object in art and instead offers a potential to engage in other communicative possibilities. In both these works Klein presents a making in which the immaterial becomes materialised. This kind of materialisation of air or specifically *prāṇa* informs this research.

### **3.4 Air and Art: The Material and Semiotic**

Conversely, and more recently, we see artworks in which air has materiality. Air is a space bustling with information, where microscopic forms communicate and non-living particles contribute to our macro-atmosphere. Air is abundant with life.

A survey of these artworks that present air or breath as material or information are discussed in writer Monika Bakke’s extensive essay collection *Going Aerial* (2006), where each author’s contribution offers an analysis of air, which is proposed to be a biosemiotic material used to communicate and circulate information. In *Translator II: Grower* (2004) by artist Sabrina Raaf, the carbon dioxide in air is transcoded. A small robot navigates the periphery of a room and draws shafts of green grass on the walls. Each blade’s height is drawn in response to the level of carbon dioxide monitored in real-time within the room. In this biometric portrait the act of breathing renders information about the human condition as a larger macro-environmental condition.

There has also been a focus in many artworks of representing air displaced into objects, perhaps in homage to Piero Manzoni's deflated remnant of a red balloon in his piece *Artists Breath* (1960). The exhibition *Thin Skin* (2002) curated by Barbara Clausen and Carin Kuoni, focused on artworks using air in balloons and inflatable material objects. This was a show exploring bodies as permeable and sensing; however, perhaps most famously, and also simply, the exchange of breath is captured by Marina Abramović and Ulay in the performance *Breathing In, Breathing Out* (1977). This piece radically acknowledges breath's materiality. It challenges each performer's very being through the removal of volition concerning the control of one's own air. Cigarette filters in each of their nostrils prevents any new intake of air, and Abramović and Ulay's two mouths are clamped around each other. One breath is repeatedly shared back and forth between a melding of two people's being. A rhythm between the bodies has to be found to achieve each intake and outtake. The sound of their breath is amplified, its information delivered to the audience via microphones on the performers' chests. The performance lasts nineteen minutes, by which time carbon dioxide has filled their lungs and they can no longer go on. It is a dance, of one breath moved between two minds, two bodies. It is a simple and clear back-and-forth of how to sustain the self and the other. It is both endangering and toxic, through its exclusion of any other air yet is also life sustaining (to a minimal point) through the inclusion of an interdependent other.

The toxicity of air in Abramovic and Ulay's piece is played out more widely in Rafael Lozano-Hemmer's interactive installation *Vicious Circular Breathing* (2013), in which the visitor becomes a part of, and complicit with, a mechanical system that processes and accumulates their breath. The breath is collected through a process of sixty-one automated brown paper bags that inflate and deflate via motorised bellows. The visitor enters the system through a hermetically sealed glass room and breathes in air that has only been exhaled by previous visitors, and they then breathe out their own contribution. Each visitor's complicity in the process accumulates and progressively makes the air more toxic. The visitor's participation and agency is in some ways detrimental to future visitors. At some point it will possibly become inoperable. In an interview (Lozano-Hemmer, 2015) Lozano-Hemmer's making of this work is attributed to hearing the CEO of Nestle speaking about the right to clean water as not a given right. Lozano-Hemmer's response was to make *Vicious Circular Breathing* as a reflection of his idea of the commons, and

that the air, the water, and the earth we share can become not only polluted but can be systematised for uncommon gain and private interest.

The use of technology and feedback to explore the materiality of breath is also embedded within *Blow Up* (2005) one of three pieces in artist Scott Snibe's *Breath Series*. In this installation, visitors blow into a small tabletop device with twelve fans. Each of the small table-top fans are synchronised to a huge wall of twelve industrial fans. When visitors blow into the small table-top device, they receive the pattern of their breath magnified and scaled up into a full-body experience by the wall of industrial fans. In this installation Snibe exploits how breath's immateriality can often only be identified through translation. Such as the sight of the chest rising and falling, or the sound we make when we gasp or sneeze, or through recording and amplification. In *Blow Up*, Snibe extends breath's legibility and also invites us to traverse the constant border slippage between our own breath, common air, and its translocation.

Bakke states "air as the most ancient means of communication" (Bakke, 2011, p.2) evident long before the introduction of humans into the Earth's ecosystems. Bakke conveys air as a space of both human and non-human existence. It is packed with molecular messages and signals indicating "desires, warnings, and survival instructions [...] by plants and animals [...] air is a habitat in its own right" (p.3) where we converge together, and "never breathe alone" (p.6). Bakke's connections reflect the yogic philosophy of *prāṇa*, where breathe and air contain signals, messages and knowledge.

*Breath Cultures* (1999) by Sabrina Raaf is an exploration of human breath as a composition of microscopic non-humans living within us, in our nasal and oral cavities. In this art project, the flora (bacteria and fungus) contained in each participant's breath were captured on a petri dish and given the growth nutrient agar. As each participant's oral flora grew and changed over the course of the exhibition, Raaf captured the unique visual development of microscopic life-forms usually invisible in an individual breath. Through this example, Bakke presents air as "a space where species meet" presenting challenges to our notion of a singularity in our "ontological hygiene" (Graham, 2002, p.11) and a compelling insight that we must accept that being oneself means being not only human. Bakke argues that the *zoe*, or non-human life is interconnected to human life and that the "human body is a transspecies environment" (Bakke, 2006, p.3). This connection across

bodily borders and species is represented through the elemental and animal motifs used in *The Taxonomy* in this research. Through Bakke an awareness to the multi-species, multi-elemental use of air is developed, in which we are a community of interdependent air users. Furthermore, our health depends on the relations we have within a multi-species, multi-elemental community. As Bakke outlines, the question of how we breathe is not only a pragmatic concern but also an ontological and ethical question. In the next section I consider how my own embodied breath practices through artworks connect to the *zoe* and represent a method of self-fabrication. I consider biofeedback within breath and argue that a technology is at work which could be considered a process in political resistance and a form of social and cultural activism.

## ***3.5 Hawk***

(Psycho-physical Performance)

### 3.5 Animalia – Hawk



Fig. 6 Hawk. Image ©Linnean Society Journal Zoology, Vol 13, p.22.



Fig. 7 Performance, *Hawk*, Helen Collard. Photo: Ko-Le Chen, 2015.

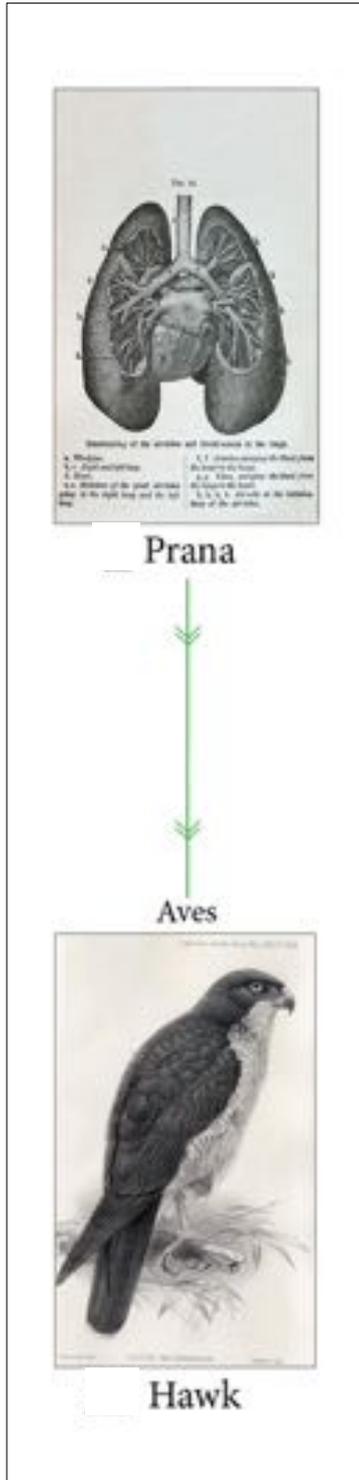


Fig. 5 Prāṇa & Hawk Strand.  
©Encyclopaedia of Medicine

*Hawk* (2015) is a performance art work I performed at Gallery North, Newcastle. This performance was part of a night of performances at *FLARE1: Beyond Body*, a five-day artist’s research event, in which artists from performance and media art backgrounds explored aspects of communication and interaction within the processes of mind-body practices.

Through the following section I explore my embodied experience of *prāṇa* during the performance *Hawk*. The performance is then contextualised theoretically in terms of Foucault’s 1982 seminar *Technology of the Self*, in which his concepts of *askesis* (self-training), and ‘care of the self’ have already been discussed. These concepts in relation to the performance of *Hawk* are then expanded through the work of Audre Lorde and Sara Ahmed in order to locate self-care as a means of activism. Furthermore, I relate concepts of self-care and *askesis* to art practice and political resistance through *Time Clock Piece* (1981), an endurance performance work by artist Tching Hseih. Through these discussions, I propose that the body and our being can be technological and feminist; in which, the re-cognising of breath is a form of feedback, self-fabrication and activism.

### 3.6 Animalia Definition: Hawk

“To cultivate life comes down to preserving and educating breathing, the origin of an autonomous existence, but also of the soul, understood in its original sense, as living” (Irigaray, 2005, p.8).



Fig. 8 *Hawk Stills*.  
Photo: Ko-Le Chen, 2015.

The animal in this taxonomic strand is a Hawk. As I describe in Chapter 2, *Hawk* is a performance of an intense physical *āsana* yoga practice. The performance is conducted on a 2m long x 80cm wide black carpet. I set performance parameters – firstly, I wear a falconer’s hood, specifically designed for the performance so that much like Descartes in *Third Meditation* my visual sense is completely withdrawn. Secondly, I must listen to the breath, each breath guides a movement. My naked chest rises and falls, visually representing and making each sound. I am intentionally exposing the flesh that encases my ribcage and lungs allowing the audience to see how each invisible breath effects and changes my external anatomy and energy. In this performance I am in training – in askesis, both the trainer and trained, observer and observed. Exposing an inward practice publicly. The performance lasted for an hour. It was in a university gallery space. A small audience attended consisting of artists, educators, scholars and bodyworkers.

### **3.6.1 Grief is a Thing with Feathers**

The performance of *Hawk* also contained other elements, it was autobiographical and built and imagined through a reading of Helen Macdonald’s *H is for Hawk* (2015). The book is both a memoir that unravels Macdonald’s grief after the sudden death of her father, and a detailed falconer’s diary that documents Macdonald’s process of training a goshawk during her mourning. Macdonald’s loss and healing is psychologically enveloped within each element of her year-long plan to develop a human-hawk relationship. It is a piece of writing that chronicles the process of training one of the wildest and untameable birds of prey to work and hunt with her.

“In my grief-stricken state I saw in the hawk all the things I wanted to be: she was self-possessed, solitary, murderous, free from human hurts. I didn’t want to feel those things, so I let myself feel them at a distance through identifying with her. But of course she was just a bird: I’d projected all those attributions onto her. Towards the end [...] I realised my mistake, saw that she was not a mirror of me but resolutely inhuman, and that was a turning point. My time living with a wild animal taught me how you feel more human once you have known, even in your imagination, what it is like to be not. It’s so important to recognise that the world is not full of things like you — and learn, too, to love that this is so”  
(Macdonald, 2014).



Fig. 9 Hawk's Hood. Photo: Ko-Le Chen, 2015.

I suggest, from Macdonald's reflections, that this process could be seen as an experience of Hannah Arendt's proposition of visiting. This leads me to explain my own performance in parallel with Macdonald's account of training. Her grieving and healing process was entwined in the relationship with her hawk, which strongly resonated with my own processes of grief. Following the death of my father in 2008, my 'hawk' (my healing and training) had been directed through an intensive, rigorous and daily training through yoga, which I also detailed in a diary. On reading Macdonald's book, associations and parallels became apparent between the training Macdonald was doing with her hawk and the training I had done with a yoga practice; that similarly, consumed and sustained me during that time.

### **3.6.2 Hooding a Hawk**

To train a hawk, a hood is essential to withdraw its visual senses. Hooding a hawk is the very first process in its training and no further training can be accomplished before this is achieved. The use of a hood in Macdonald's goshawk's training symbolically highlighted a parallel in yoga practice where one disconnects one mind to let another in: a process of withdrawal inward. In yoga posture practice focus points, are used to minimize visual stimulation, so as to calm the mind away from its usual distractions. The hooding of a hawk became a metaphor to visually express what I was doing with the control of sight and the audible sound of breath in a yoga practice to create a state of inwardness. This expression of inwardness became the basis for the performance. A human hood (Fig. 9) was made with costumier Naomi Jo Daley using black kid leather. The intention of this performance was to integrate breath practices into artistic research, to 'find' *prāṇa* through an artistic performance practice.

### **3.6.3 The Flight of a Hawk**

“An exploration of the ethical world is an aerial voyage that yields to the poet[ic] constellations of being [...] The imagined being and the ethical being are much more interrelated than intellectual psychology believes, since it is always ready to take images for allegories. The imagination, more than reason, is a unifying force in the human soul” (Bachelard, 1988, p.152).

I want to invoke a field of energy; to resonate with and amongst the audience and space.

It is a performance of control and letting go. The wild and the trained presents and absconds, as the body and breath physically and socially move across time. What resides in the gallery space here is a dividing line of my interior experience and the exterior manifestations of what the audience read or perceive. Might the line dissolve as spaces cross? Do they instinctively understand the sounds of this breath? I decide to do postures that I find hardest, but which open me up emotionally. I start digging deep into postures, peeling off outer layers to connect within. In *parsva dhanurasana*, my breath changes rapidly, the soothing, moving sound of an oceanic breath turns to a crumpled whimper, almost to crying. This could now feel like my own self-indulgence and pity. I use the breath to get back out, to not cave in deeper to the release. I could have gone down there, held the posture a little longer, excavated deep emotion; it often comes, especially in these extreme back-bends. But I don't, here. I close my mouth and breathe, a strong, long, resonant breath. I focus in on its rhythm and push back out. To train this hawk I really must watch it like a hawk. To materialise this process into art I must manifest it in a social sphere. It has to implicate and find others. Drawn together, on the breath we now share, in its sound, and the rise and fall between us. I offer a look within a breath, on a mind, its habits and projections. The audience, after the performance, asked about the sound of the breath, whether it was electronically amplified. Some were surprised that it was just breath as it sounds. I am suggesting that through the performance of *Hawk* it becomes possible to see a form of the fashioning of being, a working on self, an askesis, in which we can consider the perceptual boundaries of the human body and mind as unfixed and cultivatable.

### **3.7 Theching Hseih and *Time Clock Piece***

This notion of self-fashioning can be further explored in the performance work of artist *Theching Hseih*. Through Hseih's use of the performative body in performance art, a fabrication of subjectivity and also resistance is revealed. *Time Clock Piece* (1981) is one of five year-long durational performances that artist Theching Hsieh made during the 1970s and 80s. Performed in Hseih's New York apartment, *Time Clock Piece* was an endurance performance of an exacting and extreme regime. Throughout the whole year, both day and night, each hour, a sound produced by Hseih's watch played through a loudspeaker. On this sound, wearing a worker's uniform Hseih was required to complete his hourly task, placing a time card in a clocking-in machine to be stamped and time

coded. As well as punching the worker's time clock, Hseih took a single frame of a 16mm film of himself, standing with the machine. The entire year's performance was condensed into a six-minute film of these hourly stills. These performance parameters meant that, over the entire year, Hseih's sleep both day and night could only ever be for a maximum of 60 minutes. His ability to leave the room for any longer than an hour was also curtailed. Hseih's performance placed his body and mind under extreme conditions and, similarly to ascetic practices, it produces what Georges Bataille called the *limit-experience*. This is a type of action or experience which in terms of its possibility and intensity borders on the edge of living. It can be a process where the "subject breaks away from itself" (Noys, 2000, p.3) to find or go beyond the limit of its being. The limit-experience is imposed through the disciplinary parameters constructed by Hseih. His own corporeality is pushed by a machinic order, with its own system of accounts and monitoring. It is a performance of a subjected body under a disciplinary order. But by doing this, Hseih brings the connection of embodiment and temporality directly into focus. While Hseih's body is kept to time by a machine, it is also directly questioning what time might be, as we directly witness the circadian rhythms of Hseih's body being constantly disrupted and reconditioned by another. This is specifically pertinent when we refer back to the 2017 Nobel prize winner's (Hall, Rosbach, and Young, 2017) discovery of cellular oscillation synchronisation as cited in the opening chapter of this thesis. It is a performance of self-preservation under a potentially damaging regime. The body and mind are in constant self-fabrication in order not to give up or even collapse.

Art writer Adrian Heathfield (2011) interprets Hseih's performance as 'intermedial,' in which a conversation moves between three distinct forms: the durational performance over a year, the photo as it cuts and freezes time, and the 6-minute film and its attempt to restore duration (but not the duration of the performance itself). The intermediality weaved through the piece offers a hybrid sense of time. It convenes "a mixed space of temporality" and also "a feeling of distemporality" where it is hard to situate a "no time to which this belongs" (Heathfield, 2011, 00:01:53). How could you capture Hseih's experience of a year? The impossibility of the task is rendered in Hseih's documentation. A sense of absence and loss resonate, a sense of the unrecovered is palpable. We as audience are left to oscillate between his presence and absence (Heathfield, 2011, 00:08:07). Hseih and the clock machine are fashioning the self. And we too cannot help but imagine what links between his body and mind must have to be made under these conditions. I want to

identify this thinking as the site of Hseih's art production and perhaps his and our own art of living. I say 'art of living' rather than just 'living', because of this fabrication of the life it lived. This is much like the formation of exercises of endurance found in practices of 'care of the self' and the durational practices in yoga. This is an askesis that cultivates and fabricates the self to exist within the extremities of psycho-physical conditions. Specifically, it brings to mind the principles of suffering that many activists make a practice of. It is an idea in which the capacity to endure suffering is used against the capacity to inflict suffering. For example, "We shall meet your physical force with soul force" (King, 1966). The victory for the soul is achieved through the capacity to endure the suffering inflicted, not inflicting it.

### **3.8 The Preservation of the Self**

In order to contextualise what I imagine is at work in Hseih's performance, as activated in askesis and to draw a conclusion concerning the significance of 'care of the self', I introduce writer and activist Audre Lorde and her often used quotation: "Caring for myself is not self-indulgence, it is self-preservation, and that is an act of political warfare" (Lorde, 1988, p.131). In this quote Lorde makes a precise political statement in defining the concept of self-care as a means of self-preservation. It is contextualised in a *A Burst of Light* (1988) with her 'fight' with liver cancer in which the invasion of cancer cells in her own body is aligned to racism. Through her metaphor, Lorde reflects racism's systemic diminution and entry into the physical body and mind. In her coupling of individual self-care with a self-preservation from this other, Lorde is making direct reference to orders and systems that make some lives less cared for, less preserved, exploited and under-protected. This coupling of Lorde's casts light into unlit corners where we can see that not all lives are lived within a sophisticated support structure. Self-care in these instances is an act of resistance; we become non-complicit. And it is a fashioning and movement of working out where else mattering could and should take place. Feminist scholar Sara Ahmed in her blogpost 'Selfcare as Warfare' (2014) makes the following observation:

"When a whole world is organised to promote your survival, from health to education, from the walls designed to keep your residence safe, from the paths that ease your travel, you do not have to become so inventive to survive. You do not have to be seen as the recipient of welfare because the world has promoted your

welfare. The benefits you receive are given as entitlements, perhaps even as birth rights” (Ahmed, 2014, p.25).

A life and its survival depends on what body you have, and where, and who you spend it with. My global location and white face has granted me privileges to wealth and social and cultural benefits; my gender and sexuality has also prevented my access and exclusion to some of these rights and privileges. Survival is generated at the level of social systems and orders in which, punishment and violence is meted out to some; status and resources to others. Some bodies are divided from themselves to support other more valued bodies. In *Willful Subjects* (2014), Ahmed ties the history of the individual as the one who does not have to divide himself to a patriarchal, colonial and capitalist history. Ahmed’s valued bodies get to remain whole and undivided, while others become the proverbial secretarial right-hand:

“He can be an individual, not divided into parts, because others become his parts: they become his arms, his feet, his hands, limbs that are intended to give support to his body. When a secretary becomes his right hand, his right hand is freed. Your labour as support for his freedom. This is how the question of support returns us to bodies, to how bodies are supported. Willful parts are those who are unwilling to provide this support. So how quickly those who resist their subordination are judged as being individualistic as well as willful. In refusing to support him, by becoming his parts, we have become self-willed; in refusing to care for him, we are judged as caring for ourselves, where this “for” is assumed as only and lonely” (Ahmed, 2014, 8:24).

As a black American and lesbian woman, Lorde advocated that radical invention has to be part of some people’s survival in order to avoid the denial of selfhood, and to survive at all. For others, like the individual in Ahmed’s model quoted above it is less needed. Each deck is rigged; hands are systemically loaded. But, the failures of these structural inequalities, and the unequal provision of services and opportunity are consistently dispersed and negated, attributed to the failure of the individual. In *The Cancer Journals*, Lorde (1997) identifies and critiques an individualistic paradigm in self-care. Specifically, she criticises the narrative of the ‘happiness’ phenomenon. Lorde argues this is an individualistic narrative and a form of individualised governance that diverts attention

away from the necessities of wider political action:

“looking on the bright side of things is a euphemism used for obscuring certain realities of life, the open consideration of which might prove threatening to the status quo [...] Let us seek ‘joy’ rather than real food and clean air and a saner future on a liveable earth! As if happiness alone can protect us from the results of profit-madness” (Lorde, 1997, p.76).

Furthermore, this individualistic paradigm in self-care and its consequent diversion to address the structural inequalities and provision of opportunity are explored by Han (2015). Han outlines a concept of the self and how it is cared for as an ‘achievement subject.’ He argues that in our current age, self is negated and lands solely with the responsibility of the individual to make a better life, to do better. Through this notion of the achievement subject Han describes how we are made to consider ourselves dynamic entrepreneurs of the self, where the operational mode is an ‘unlimited can-do’. The achievement subject has to generate an unending positivity, of unending possibilities. In addition, Han argues that this individualistic can-do self, is the attuned solution and tool to effectively and much more efficiently realise capitalism’s productivity. Anything is possible as long as we try, and often survival for the achievement subject, is to learn the ability to auto-exploit the self in excessive and compulsive structures of work, performance and productivity (Han, 2015, p.9).

### **3.9 Selfcare is Warfare**

My purpose and method of self-care within this research has evolved and is informed by Lorde and the practices of yoga. It is not a search for happiness as an isolated individual. It is to propose, to centre, a form of activism and agency of self in which to matter, and to discover how that is directly entangled with others. As surmised by Ahmed:

“Self-care is not about one’s own happiness. It is about finding ways to exist in a world that is diminishing [Self-care] can be an act of political warfare. In directing our care towards ourselves we are redirecting care away from its proper objects, we are not caring for those we are supposed to care for; “we are not caring for the bodies deemed worth caring about. And that is why in queer, feminist and anti-

racist work self-care is about the creation of community, fragile communities, assembled out of the experiences of being shattered. We reassemble ourselves through the ordinary, everyday and often painstaking work of looking after ourselves; looking after each other. This is why when we have to insist, I matter, we matter, we are transforming what matters. Women's lives matter; black lives matter; queer lives matter; disabled lives matter; trans lives matter; the poor; the elderly; the incarcerated, matter. For those who have to insist they matter to matter: selfcare is warfare" (Ahmed, 2014, 8:24).

Although its full historical context it is beyond the scope of this thesis, it is significant to connect Ahmed's advocacy of care of the self to the wider activism of Kunalayananda at Kaivalyadhama Yoga Institute. During my interview with the centre's scientific research director Prof. Ranjit Bhogal it became apparent that Kunalayananda's motivation clearly arose in political action and resistance. Specifically, in order to disengage British control over India, over Indian bodies, over Indian selves, and to reinstate Indian practices (see appendix 10 – Interview Transcript). Kunalayananda initially began the Kaivalyadhama centre as a politically active nationalist. His yoga teacher had extensively prepared him with self-care methods and practices, in order to activate both himself and others to press for freedom from colonial power. However, Kunalayananda's approach was unique. It adapted and utilised the political currency of scientific evidence in order to further the application and benefits of yoga, and consequently fulfil his political cause: to remove the British. Kunalayananda eventually "drifted away from nationalism into transnationalism," but this approach and legacy then "made a quintessentially Indian 'tradition' the basis for a global modernity rooted in the subtle body" (Alter, 2004, 78). The next chapter considers this element of the subtle body or as I term it in the next taxonomic strand the yogic body.

### \*\*\* Summary

Through *prāṇa*, the self has become fundamentally interdependent on another – air. It is an integral relationship with the non-human, the non-speaking world. Through the examination of *prāṇa* via yogic breath practices and philosophy I have argued a form of care of the self (Foucault, Lorde and Ahmed). Foucault has demonstrated that there is a technology at work or at play within the self through care of the self practices. Yoga and yogic philosophy and the respiratory philosophers have demonstrated that *prāṇa* connects us, it is a means to listen inwardly to the inner self (mind) and outer self (world

environment). Using an *āsana* practice, the performance of *Hawk* entwines *prāṇa* and the agency of care of the self, from these two ideas; I argue that *breath is a technology*.

## **4. Taxonomic Element – The Yogic Body**

## Chapter 4: Element – The Yogic Body

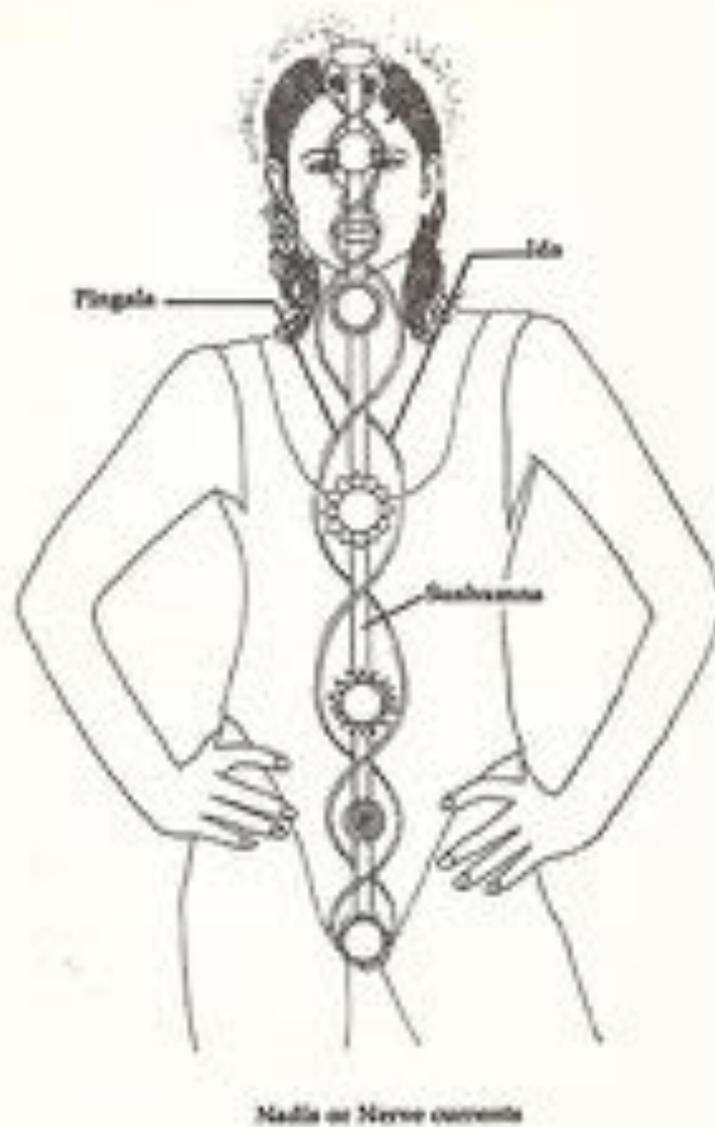


Fig. 10 The Yogic Body. Image © Guech Ly Lim, Octopus.net, 2017.

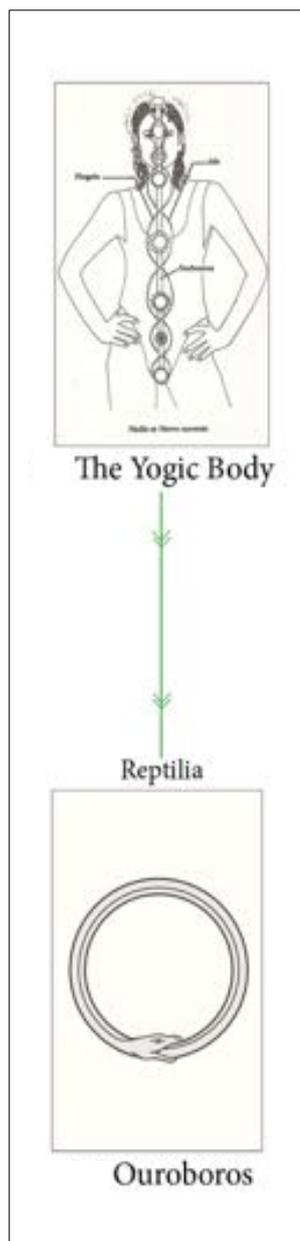


Fig. 11 Yogic Body & Ouroboros Strand.

In this chapter, I situate *prāṇa* in the element of the yogic body in order to explore *prāṇa* more fully as a biofeedback system. I discuss the yogic body as a schematic of energy channels (*Nāḍīs*) in which breath and its control activates vibration and feedback within the mind-body. The element of the yogic body is derived from yogic philosophy and practice and I present it as a schematic for *prāṇa* in the formulation and constitution of the self.

In section 3.5 the discussion of the element of the yogic body is fabulated with its taxonomic animalia ouroboros: the mythical looping snake. Ouroboros is cyclical, it represents the whole, in the integration and assimilation of opposites. The purpose of fabulating this animalia to this element is to symbolise and discuss my use of two different ontological systems working within my biofeedback artwork *Finding Prāṇa*. This artwork's processes and framework converge both as a yogic and an anatomical schematic through the use of neuroimaging technology (fNIRS) and sound to sonify my *prāṇāyāma* practice. In order to contextualise my use of these two different ontological schematics, I discuss other artists working with biofeedback technology and mind-body practices, particularly the seminal work in the 1960s by artists such as Alvin Lucier. I also discuss some relevant

biofeedback studies in scientific and clinical settings to further

contextualise the making and contribution of these artworks. Lastly in this chapter, I detail the sonification process used. This discussion concerns the utilisation of graphical scoring and the philosophical and artistic influences of the harp and music by Alice Coltrane aka Turiyasangitananda. Through this discussion I illuminate both the underpinnings of my sonification method and the role of breath, sound, and the machine as technologies for listening. But first, some further explanations and definitions of the yogic body and its application are provided.

#### 4.1 Element Definition: The Yogic Body

As I have discussed in Chapter 2, the element of *prāṇa* is a core tenet of yoga practice and philosophy and it is through connecting the body to the mind via *prāṇa* that the body in yoga can be thought of beyond its anatomical aspects. Eliade (2009) identifies the yogic body (or the psycho-spiritual body) beyond physiological functions and connects it to a supra entity in which it can be composed or layered on to various sonorous, architectonic, “cosmological or a mystico-physiological schematics” (p.98), for the purpose of self-realisation. The concept of the yogic body is identified by Indologist scholar David Gordon White (2011) to have evolved in the Tantras. The practitioner’s yogic body in the Tantra’s “became identified with the entire universe, such that all of the processes and transformations occurring to his body in the world were now described as occurring to a world inside his body” (p.14). White also locates evidence of the concept of the yogic body beginning before the Tantras in the Upanishads where it is a schematic comprised of a complex system of energy channels known as *nāḍīs*, (see Fig.12) through which the movement of *prāṇa* or vital forces flows (Eliade, 2009, p.36).

#### 4.2 Subtle Channels

In later hatha yoga texts and ascetic manuals, this *nāḍī* schematic references “the yogic body as a pneumatic system”, that has supporting systems such as hydraulic (body locks) and thermodynamic (heat generation) elements to direct and govern the flow of *prāṇa* within the yogic body (White, 2011, p.15). In the key hatha yoga texts, the *nāḍīs* and the practices of breath control are of primary importance. Practices to hold and control the breath in order to direct the flow of the vital force of *prāṇa* are thought to cause the yogic body to vibrate and to give the practitioner abilities and control over the physical realm. Furthermore, if a practitioner becomes adept at working these subtle channels, it is thought that the realisation of supernatural or beyond-physiological body powers (*siddhis*<sup>32</sup>) may be achievable (White, 2011, p.16). The three principle *nāḍīs* (Fig. 10) consist of the major *nāḍī suṣumṇā* and two secondary *nāḍī*, *idā* and *piṅgala* which are woven in a helix along the *suṣumṇā*. This schema with some variations, has become the predominant and basic model for the yogic body’s convection of *prāṇa*. The yogic body schema is often

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<sup>32</sup> *Siddhis* are spiritual, paranormal, supranatural, or magical powers and abilities, that are thought to be attained through spiritual advancement via the practices of yoga and meditation (White, 2012, p.34)

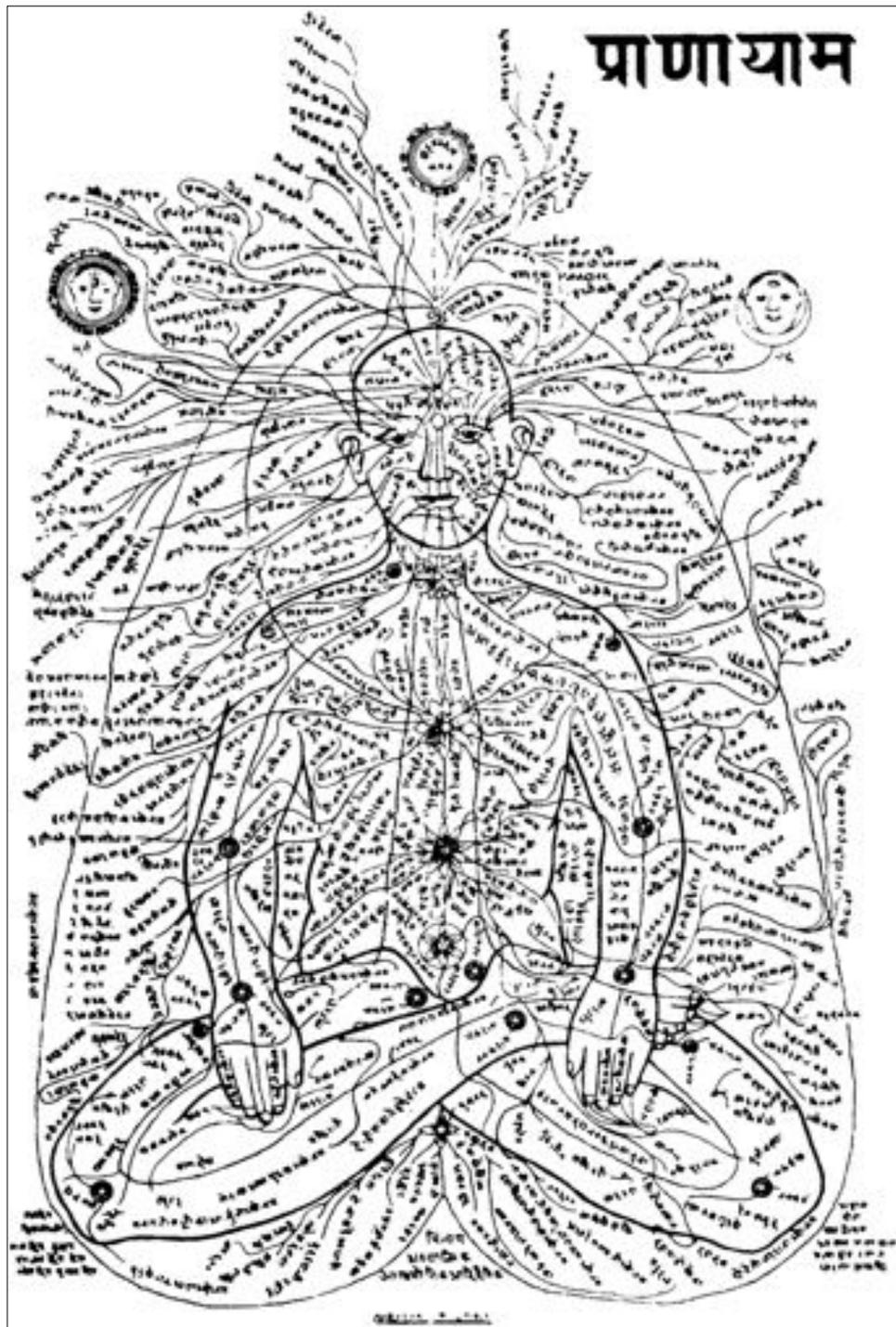


Fig. 12 72,000 Nāḍī Schematic. Image © Vishnu Saharanam, 2016.

described as in a parallel relation to the anatomical nervous system in which the spinal column refers to the major *nāḍī suṣumṇā* and the branching nervous system refers to the network of *nāḍīs*.

### 4.3 The Practice of *Prāṇāyāma*

In the yogic body, *prāṇāyāma* is used to control the flow of *prāṇa*. The word *prāṇāyāma* has two etymological meanings. It can be explained as a combination of two words *prāṇa* + *ayāma* and *prāṇa* + *yāma*. The word *ayāma* means ‘expanding the dimension’ and so in this first sense *prāṇāyāma* means expanding the dimension of *prāṇa*. The word *yāma* is defined as regulation, restraint or control, and this then refers to the regulation or restraint of *prāṇa*. In Pantajali’s Yoga Sutras, *prāṇāyāma* is “described as the controlled intake and outflow of breath in a firmly established posture” (Ranganathan, 2008, p. 201). *Prāṇāyāma* practice is based on three distinct stages of conscious respiration to activate the yogic body: inhalation (*pooraka*), retention (*kumbhaka*), and exhalation (*rechaka*). Through the manipulation, direction, and permutations of these three stages, different practices of *prāṇāyāma* are formed. Initially simple exercises to restrict the breath slightly, such as alternate nostril breathing, are practised to develop an awareness of the breath moving in and out of the body. Later, inhale and exhale ratios are introduced. Once this is accomplished, breath retention and suspension is then added to the *prāṇāyāma*. With regular practice the lengths of the retention and suspension of breath are gradually increased. The intention of the technique of *prāṇāyāma* is to bring the breath and mind together, and it is in this state, that the objects of the senses become diminished (Zysk, 1993, p.210). Through this diminishment, a superconsciousness condition (*turya*, *turīya*) can be experienced. In *turīya*, the practitioner’s soul (*ātman*) “is free to dwell with the universal spirit (*brahmān*)” (Zysk, 1993, p. 205).

### 4.4 Cessation and the Atemporal in the Yogic Body

In the yogic body the suspension of respiration via *prāṇāyāma* practice leads to the activation of *suṣumṇā* (Zysk, 1993, p. 210) and with this comes the arrest of thought and a consequent suspension of time (Nair, 2007, p.188). To further expand this key concept of breath cessation and its relationship to the mind and time, I would like to introduce an unverified tale, a fable, in which an experiment was conducted to test yoga practitioner

Swami Nadabrahmananda Saraswati's bold claim that, for extended periods of time, he could remain quite comfortable and relaxed without breathing.

The experiment was conducted at the Menninger Foundation, Kansas, USA, (Niranjananda, 2009, p.12) on an unknown date (thought to be around 1963-68). The conditions of the experiment involved three airtight chambers. The Swami was placed in one, and his whole body was also sealed in wax. As controls, a lighted candle was placed in the second, and a live monkey in the third. Electrodes were connected to the Swami's heart, brain and body and whilst the data was being monitored, the Swami played the tabla. The results of this experiment as reported included that:

“After three minutes the candle went out and after fifteen minutes the monkey fell unconscious, Swami Nadabrahmananda continued to play the tabla for forty minutes. During this period, he was not breathing [...] a coin was placed on the top of his shaved head, it bobbed up and down. When a microphone was placed against any part of his body, a loud consistent sound like that of a waterfall was heard” (p.13).

After the experiment, when asked about the sound of waterfalls, the Swami explained that the sound heard was the movement of *prāṇa*; and that as long as the *prāṇa* is active, even if a person stops breathing, they continue to live. The Menninger experiment is retold here to convey the essential component of *prāṇāyāma*; to find cessation. Patanjali's *Yoga Sutra* states that: “*Prāṇāyāma* is the pause in the movement of inhalation and exhalation” (Saraswati, 2009, p.5). The prime objective of yoga and *prāṇāyāma*, as mentioned earlier in Patanjali's aphorism, is the removal of the thoughts of the desiring mind. Through the practice of yoga, the cessation of the mind has been found in the control and stopping of the breath. In that pause or gap of breath, individual consciousness as a temporal experience is no longer ticking and we enter a timeless state. The cessation of time is in the cessation of mind, in the cessation of breath. Performing arts scholar Sreenath Nair (2007) expands on this concept, describing the practice of breath pausing as a stemming of the flow of the endless temporal identification and significance of the daily. The ‘gap’ that is created is a moment of atemporality that can take us into “a different perceptual modality”. We become neutral, in timeless space, existing “in zero velocity” (Nair, 2007, p.188). Cessation of breath through the lens of Patanjali's *Yoga Sutra* and Nair can be seen as an

atemporal, mind-altering act. Thereupon it can be said that, through the yogic body and the control of breath, we are perhaps equipped to control the mind.

The convergence of both the yogic body experienced through my own practice and the scientific data from the same anatomical body underpins my next piece of work *Finding Prāṇa*. This performance sonifies and visualises my *prāṇāyāma* practice through the changing data of cerebral blood flow.

## **4.5 Ouroborous**

(Biofeedback Sonification and Visualisation: *Finding Prāṇa*)

## 4.5 Animalia – Ouroborous

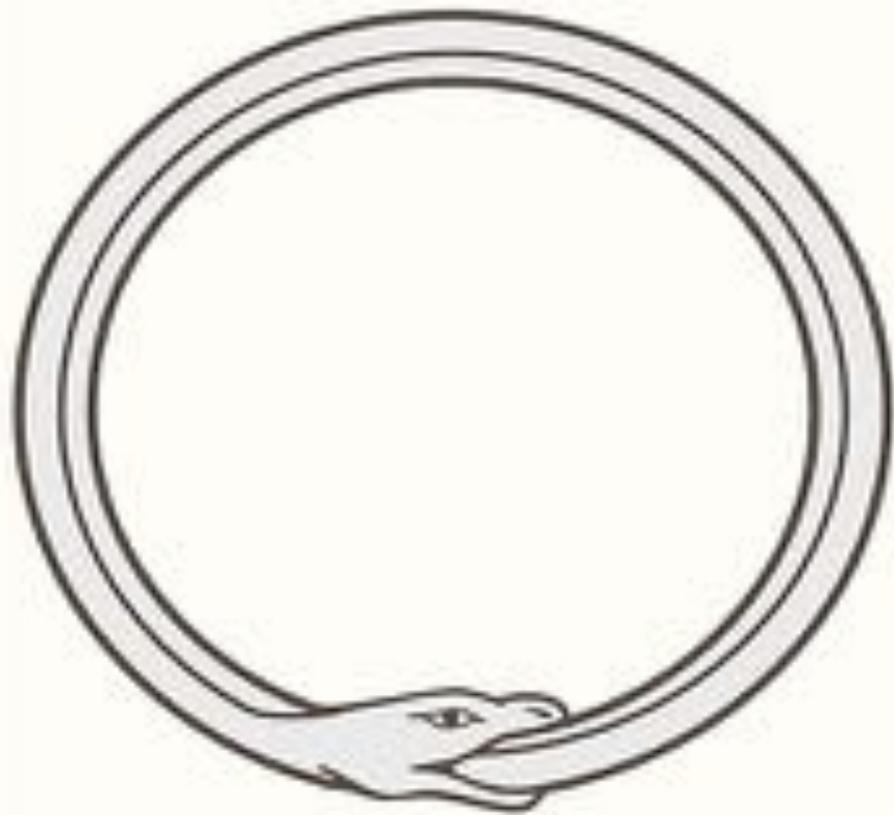


Fig. 13 Ouroborous. Image © Wikimedia Commons, Wikipedia.

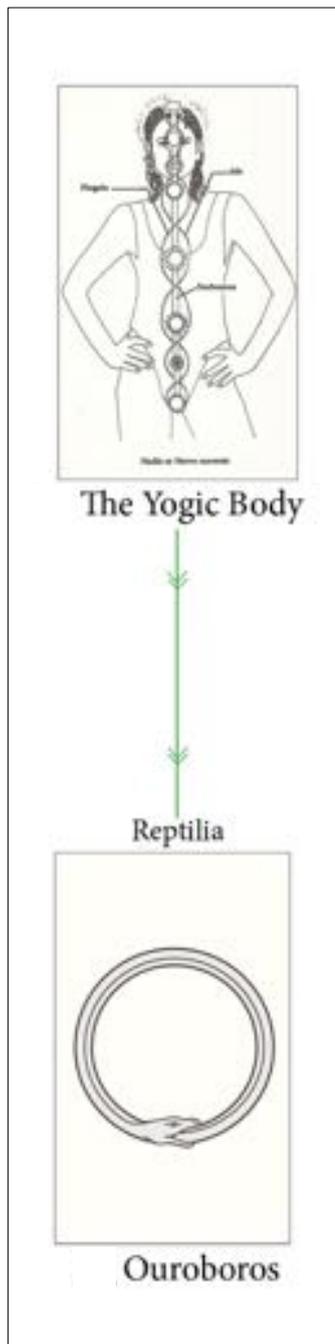


Fig.11  
Yogic Body & Ouroboros.

*Finding Prāṇa* (2015) is a biofeedback performance art work I performed at ISEA, (International Symposium of Electronic Arts) 2017 Botanical Auditorium, Manizlaes, Colombia. Through the following section entitled ‘Animalia Definition – Ouroborous’, I discuss the performance *Finding Prāṇa*. Through *Hawk* I have identified conscious breathing practices as a form of biofeedback. This second performance *Finding Prāṇa* I aimed to explore breath practices through the application of scientific technology to this process. This performance sonifies and visualises my own *prāṇāyāma* practice through the use of cerebral blood flow data and a bespoke-made biofeedback system. This process of re-appropriation of medical and scientific technology is contextualised in this chapter through the biofeedback systems that have been made and explored by artists and scientists throughout the last century. The systems are often approached through the examination of the anatomical body in the hope of discovering the mind/body connections discussed in Western, Eastern, and Yogic philosophies. In the 1960s artists Lucier and Rosenboom re-appropriated medical and scientific tools and created some of the very first biofeedback artworks. This work looked to connect physiological data, through sonification and/or visualisation, to a reading of, or control by, the performer’s mind. By examining various biofeedback artworks, I show how artist’s use of science and technology connect, or open a loop, in order to consider an undivided mind and body. In

the final part of this chapter I focus on the making of my own my own biofeedback artwork *Finding Prāṇa*. In this work, through the use of neuroimaging technology (fNIRS) I discuss my approaches to creating a sonification and visualisation of my *prāṇāyāma* practice. My attempt to find connections between ontologically different systems in which the possibility of the empirical and the experiential, the anatomical and the yogic body could become aligned in the same place, and at the same time are also discussed.

#### **4.6 Animalia Definition: Ouroborous**

For the Egyptian alchemist, Ouroborous is the snake that devours its own tail, a looping process of devouring and rebirthing in which ‘one is the all’. Ouroborous is the whole, in the integration and assimilation of the opposite: a liberation from the cycle of birth and death, from the beginning and end of time (Bekhrad, 2017). Through Ouroborous is a loop it is a symbol of the cyclical nature of things life into death, mind into body and inner into outer in which one might be the all. Ouroborous is an animalia placed within *The Taxonomy* as a motif of the ambitions of both the scientific and artistic communities and the hopes of biofeedback discoveries. Ouroborous represents the use of machine technology as a connecting circuitry to close and open the loop of the ontological differences between eastern mind/body concepts and western scientific approaches.

##### **4.6.1 Scientist to Mystic: Biofeedback and the West**

To discuss the artists that have informed my own biofeedback artwork practice, I introduce the background and discipline of biofeedback. In 1969, a diverse set of disciplines and, what at first might seem unrelated events converged, igniting a new interdisciplinary paradigm that came to be collectively known as biofeedback. One personal story of transformation and re-creation in this year (also evocative of Ouroborous) was at the general meeting of the Association for Humanistic Psychology. Here Harvard psychologist Dr Richard Alpert presented ‘The Transformation of a Man from Scientist to Mystic’ (Moss, 1998). In his presentation, Alpert chronicled the explorations and calculations he had made of his own consciousness in his own constructed self-laboratory, using psychedelic chemicals and later his use of mind/body practices. He detailed how these methods were a form of feedback and how these experiments had become instrumental in the beginning of his work as the renowned spiritual teacher Ram Dass (Moss, 1998). This was a notorious account amongst many being reported in the field of psychology where the unity of body and mind was becoming a prominent and contested focus. Both Gestalt and Reichian psychologists alongside earlier body therapy schools such as Feldenkrais and performance such as Artaud’s Theatre of Cruelty had introduced a variety of body/mind awareness forms and exercises. In the fields of psychology, neurophysiology, medicine and cybernetics there was a groundswell, of academic and scientific interest in the concept of self-regulation, feedback and systems theory. Publications such as Elmer and Alyce Green’s *Feedback Technique for Deep Relaxation* in

*Psychophysiology* (1969) and Charles Tart's compendium *Altered States of Consciousness* (Tart, 1969) all included discussions of feedback techniques. In the field of cybernetics, the conceptual parallel between the nervous system and an electronic machine was a focus of exploration, and in systems theory Ludwig Van Bertalanffy's *General Systems Theory and Psychiatry* (1969) also explored feedback concepts (Moss, 1998).

Furthermore, Neal Miller's 'visceral learning' experiments were heralded as a direct challenge to the entrenched view of the nervous system as two forever inflexible and divided parts. Miller's research conclusively showed that both animals and humans could learn to consciously control what were previously considered involuntary bodily functions such as heart rate, salivation and metabolic processes (Rosenboom, 1990, p.12). In 1969, an impetus could be discerned to understand consciousness and discover self-regulation phenomena through a diverse set of disciplines, and biofeedback became established as a model and technique that attempted to create a mind-body medicine (Moss, 1998). Elmer Green, an early biofeedback pioneer, defined biofeedback as follows:

“Every change in the physiological state is accompanied by an appropriate change in the mental-emotional state, conscious or unconscious, and conversely, every change in the mental-emotional state, conscious or unconscious, is accompanied by an appropriate change in the physiological state”

(Green, Green, and Walters, 1970, p. 3).

Clearly, I could draw parallels with Green's understanding of biofeedback and yogi Theos Bernard's earlier cited account of the breath and mind, but what interests me here is the scientific interest in the convergence of the psychological and physical. Was the body and mind now inter-related in the West, in a recursive loop? Like Ouroboros, like the mind/body practices of the East? The techniques of taking conscious control of the involuntary nervous system, and initiating self-regulation and feedback had in many ways been known by practicing yogis for centuries, as seen in the above discussion of *prāṇa* and also in the Kaivalyadhama centre's inquiry to understand this mind/body phenomenon scientifically.

The emergence of biofeedback as a movement should also be related back to a significant breakthrough in 1929 by German psychiatrist Hans Berger (Lutters and Koehler, 2016, p.2811) who provided the first detailed description and method in which electrical pulses emitted from the brain were recorded graphically by a new machine: the electroencephalograph or EEG. It was through Berger's discovery that ground-breaking propositions were being made in the 1930s about a now imminent possibility of being able to decipher the mind and brain. Berger found that, during an EEG recording and regardless of the complexity of the thousands of neurons in the cortex of the human brain, a person in a resting state would generate 10 regular oscillating lines per second, and that these regular lines would change at the precise moment of some form of mental activity (Miranda, 2014). Berger reported on this topic using the terms alpha and beta waves. Berger noted that the "rhythmic oscillations of the human brain consistently disappeared when the subject engaged in mental exercise (Lutters and Koehler, 2016, p.2811). In 1934 Edgar Adrian repeated Berger's experiments and took EEG into the auditory realm through the use of new amplification techniques (Adrian and Matthews, 1934). This initial amplification and sonification of internal signals excavated by technology was to inform many of the first pioneering biofeedback artworks of the 1960s and 70s. At this time, signal technology such as radio was now looking capable not only of connecting us outwardly across space and time to others, but also linking us inwards, providing technological insights into the transmissions of our own brain and perhaps the mind.

The work of American researchers Elmer and Alyce Green was at the forefront of the early biofeedback movement (Moss, 1998). Taking a transpersonal approach, the Greens believed that the voluntary control of physiology, or psycho-physiologic self-regulation, occurs through the regulation of the mind and through this control of the mind, doors open to transpersonal growth. The Greens (Green and Green, 1977) studied a renowned Indian yogi, Swami Rama, and the Dutch adept Jack Schwarz in order to investigate a variety of control skills applied to the involuntary nervous system. In one example, a hand-temperature experiment (Fig. 14) tested the Swami's claim that he could voluntarily control blood flow and increase the temperature of the left side of his right hand (the hypothenar eminence) several degrees above the right side of his right hand (thenar eminence). In this experiment, thermistors were applied to each side of the palm of the right hand and an electrocardiographic signal was also taken from between the right ear and the left wrist. During this experiment Swami Rama created a difference of 11°F

between the two thermistors, an increase of 9°F over the original temperature difference (Green and Green, 1977). In another experiment Swami Rama was shown to be able to control the heart, (Fig 15) both consciously slowing his heart and taking it into and out of atrial fibrillation. It was through the application of technology and machines to measure anatomical changes that the western scientists increasingly accepted that mind-body phenomena existed. Furthermore, in the description of the Greens' next experiment we can see how yogic philosophy, the yogic body and the siddhi of psycho-kinetic power can be seen to infiltrate the working hypotheses and paradigms of scientific endeavour followed by the Greens. The Swami told Elmer Green that he could demonstrate psychokinetic powers, which on two occasions were tested by Green in what he describes as a closely monitored situation. He reported that, on both occasions, while sitting five feet away and wearing a breathing mask to restrict any interfering air flow, the Swami moved a needle by ten degrees through no visible physical means (Green and Green, 1977). See Fig 16 & 17.

The Greens' biofeedback work not only tested the mind's connection to the body through its control of the autonomic nervous system but also investigated some of the much wilder claims of *siddhis*<sup>34</sup>, in which the practitioner uses the mind to influence or control elements of the external and physical realm.

Aside from the work on yoga adepts, biofeedback methods were used in the main to demonstrate that ordinary people could learn to voluntarily control physiological functions such as brainwaves, heart rate, blood pressure, muscle tension, temperature and blood flow in the skin that were previously considered involuntary. Biofeedback became applied in clinical settings to a range of medical and neuropsychiatry conditions including ADHA, depression and epilepsy (Rosenboom, 1990). Data and technology was applied to guide human beings not only to discover deeper control over their own physiology but also to consider a deeper awareness and control over their own consciousness. This involved the real-time machine monitoring of autonomic functions in order for the user or patient to become self-aware and to regulate their own physiology. The fundamental concepts of and distinction between the voluntary and involuntary nervous systems were rewritten. It was clear that the human body had agency or technology and my own research similarly aimed to integrate machines and instrumentation to demonstrate this human technology within yogic breath practices.

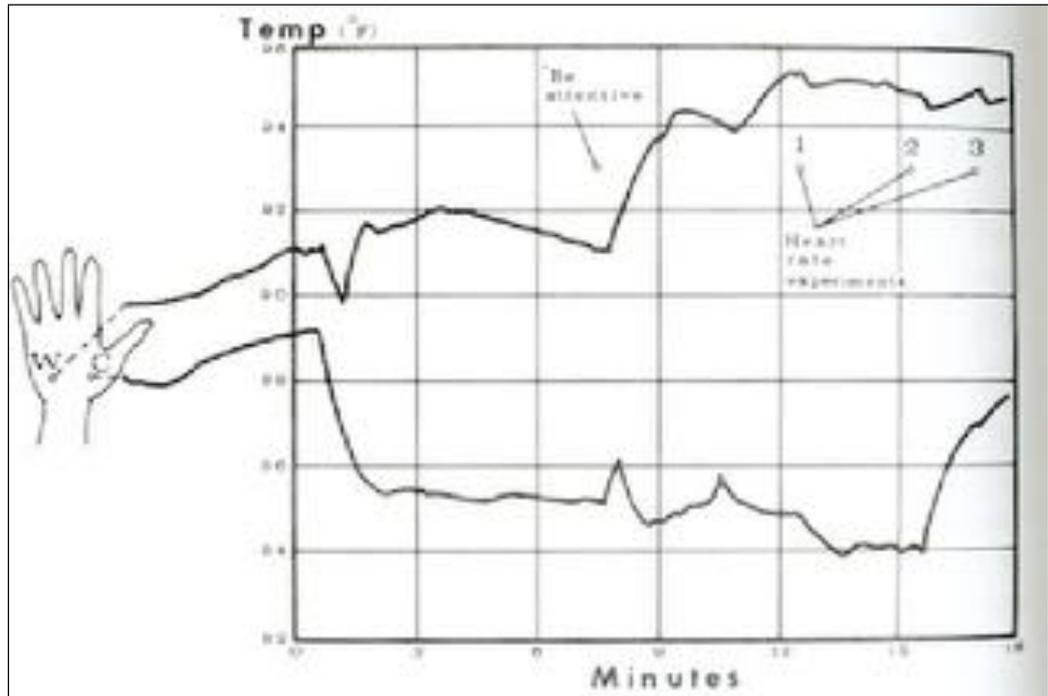


Fig. 14 Swami Rama's demonstration of voluntary control of blood flow in simultaneous warming and cooling of the hand. Image © Green and Green, p.198. 1977.

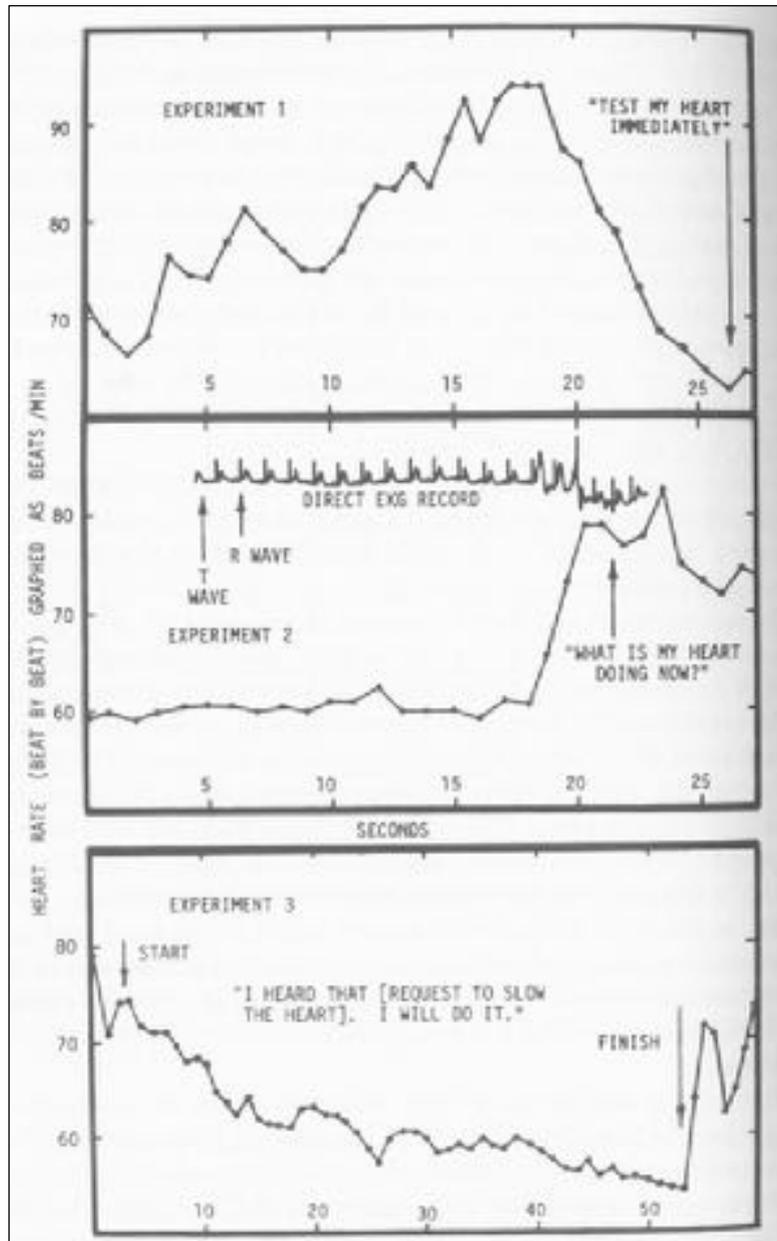


Fig. 15 Swami Rama's demonstration of voluntary heart control. The first two demonstrations were unexpected. The third 'experiment' was requested by Dale Walters over an intercom. Image © Green and Green p.199. 1977.

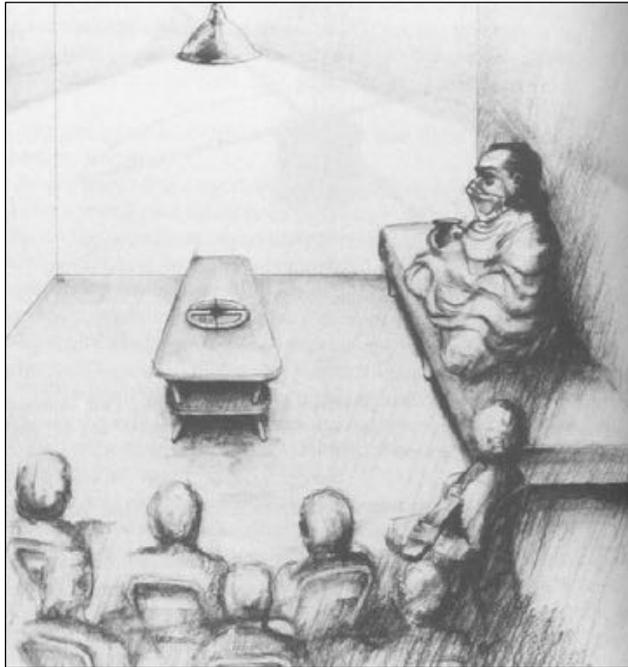


Fig. 16 Room arrangement of psychokinetic demonstration with Swami Rama. Image © Green and Green p.199. 1977.

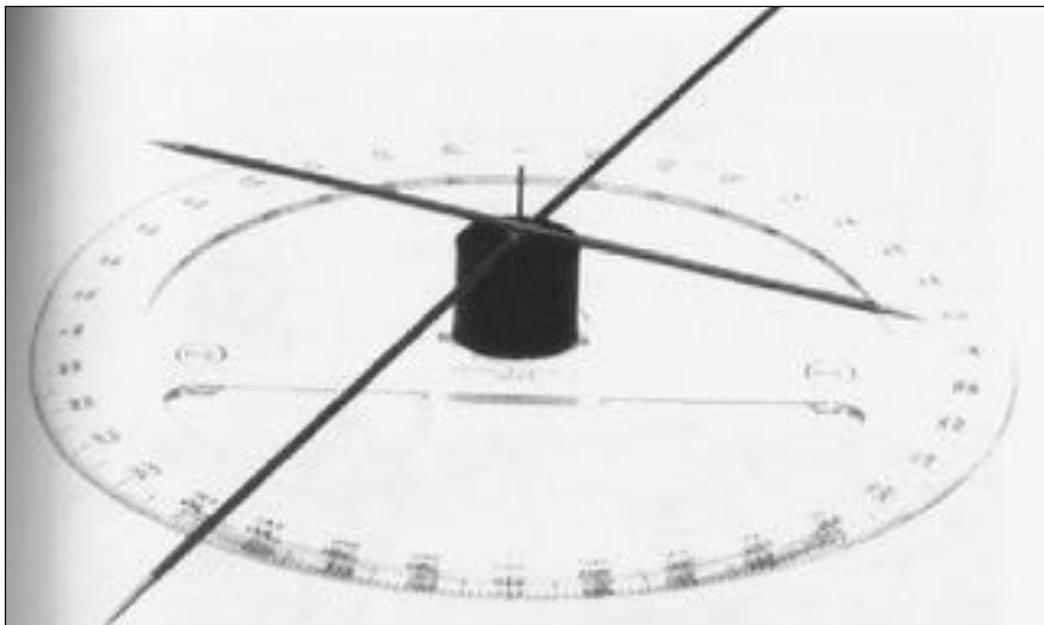


Fig. 17 Needle assembly for psychokinetic demonstration. Two aluminium knitting needles (14" and 7"). Image © Green and Green p.199. 1977.

### 3.6.2 Biofeedback and Sonification

In this section I place biofeedback and in particular its sonification in an artistic context and discuss how artists began re-appropriating medical and scientific instrumentation to make audible, and sometimes visible, gross and subtle changes in the human body controlled by the mind. In the 1960s, the interplay between art, science and technology became an emerging interdisciplinary paradigm through a generation of artists such as Rosenboom and Lucier who sought to make connections between the mind and body using biofeedback technologies to explore psychophysical phenomena and the potential to ‘recognise’ higher states of consciousness. Rosenboom wrote about the mood and possibilities of biofeedback artwork. It is interesting to note here that his thoughts were in many ways in tandem with Swami Kuvalayananda’s ambition to connect “the outer and inner spaces” (Kuvalayananda, 2018, online).

“Since the discovery of electrical pulsations arising from within the human brain, imaginative souls have speculated that through a direct connection of the brain to devices for sound production and visual display, internal realities would eventually be made externally, materially manifest” (Rosenboom, 1990, p.9).

It is clear from Rosenboom’s statement that the exploration and manifestation of the psycho-physical into audible and visual forms was an avenue of investigation for many artists working with biofeedback technology and instruments at this time. Experimental composer Alvin Lucier’s exploration of internal states rendered into physical external form was evident in *Music for Solo Performer* (1965). Furthermore, Kahn (2013) argues that this seminal work was realised through the collaborative input of a physicist with the Air Force Cambridge Research Laboratories, Edward Dewan. Whose “collegial suggestions” (Kahn, 2013, p. 85) also informed Lucier’s two other compositions *Whistlers* and *I am Sitting in a Room*. Kahn pinpoints this as an example of the technologies emanating from the militarised sciences of the Cold War, and particularly cybernetics, were a major influence on American experimentalism (Kahn, 2013, p.86). Alongside the impetus to use technology to explore the potential of mind-body connections, it should be noted that around the same time, research utilising technologies to control the human mind were also being implemented by the CIA through their 1950s mind control programme. For example, psychologist Dr Ewen Cameron’s research investigated the control and removal of the

inner drives of human subjects using electroconvulsive therapy (Curtis, 2002).

### **3.6.3 The Intimate Connection of Technology in Art: Alvin Lucier**

It was starting to become apparent from these early investigations with biofeedback that some form of intimacy and connection to the mind could happen through technology. In one of the first biofeedback artworks, an intimate connection to the artist's mind is explored by Alvin Lucier in *Music for Solo Performer* (1965). Lucier sits motionless, eyes closed, EEG electrodes attached to his head. The audience waits. When Lucier enters a state of 'non-doing', alpha waves (8-13Hz) are captured, and these cycles of alpha waves are amplified and routed, vibrating loudspeakers. By the suitable placing of speakers to a variety of drums, gongs, cymbals and objects the percussion objects become activated through a sympathetic vibration. The performer (Lucier) connects a particular vibration, an oscillating brain activity (between 8-13Hz), to a set of percussive instruments, and that vibration sets up a vibration through air to the body of someone in the audience. In Lucier's sonification, a circuit is made, in which the ability to exert control over the mind, has a consequent effect on what an audience can hear.

A circuit diagram (Fig 18.) which was part of the score for *Music for Solo Performer*, connects elements which are not usually regarded in the domain of technological, or 'in-series' or 'in-circuit' (Kahn, 2013, p.88). Lucier's brainwave oscillation is an energy force with perceptible and imperceptible states able to travel through acoustic, electronic, performance, physiological and neurological spaces (Kahn, 2013, p.88). It is Lucier's presence of mind, as a material force, that constitutes his role as performer and as an operator in the diagram and a component of the sound system. Lucier clarifies it thus:

“To release alpha, one has to attain a quasi-meditative state while at the same time monitoring its flow. One has to give up control to get it [...] I had to learn to give up performing to make the performance happen. By allowing alpha to flow naturally from mind to space without intermediate processing, it was possible to create a music without compositional manipulation or purposeful performance” (Siegmeister, Lucier and Lee, 1979, p.287).

To make this work happen, Lucier cannot be too willing as an operator, he has to consciously surrender to a state that allows him to become a technological component “of the music circuit” (Lutters and Koehler, 2016, p. 2812). Lucier has to relinquish any notion of a performance in the sense of him ‘doing’ something, to activate alpha waves he must fully surrender to a state of non-doing, he must be present but passive and non-active. Through his non-doing Lucier generates a component to flow within the circuit. Later in this chapter, I discuss my own work *Finding Prāṇa* in which, like Lucier as a performer, I have to use the breath to work ‘in-circuit’: as part of the technology.

On many levels *Music for Solo Performer* might justly be viewed as a soloist’s work, but there are also many other hidden working parts. In Straebel and Thoben’s (2014) paper “Alvin Lucier’s *Music for Solo Performer*: Experimental Music Beyond sonification” we are given an account of the authors’ participation in a 2012 performance of this piece with Alvin Lucier. Detailed attention is given to the performance of the work in which there are a string of decisions, accomplices, actions and technical devices intervening between data capture and sonic results. These elements are revealed as integral to the execution of this brain-wave performance. The paper highlights the roles of the assistant/s routing signals and the cuing of pre-recorded signals, and it is with this new knowledge that the notion of the soloist’s ‘non-doing’ communion might become somewhat more complex. Straebel and Thoben argue that a major decision made for *Music for Solo Performer* was to deliberately mask the many other operations needed to execute the piece, because the creation of an image of sonification or, as I suggest, the intimacy of a connection to Lucier’s mind was the most important element. Lucier’s explanation regarding the motivation for this piece of work in an interview with Robert Ashley for Ashley’s film *Music with Roots in the Aether* (1976) clarifies the significance of human intimacy:

“For a person to be having an EEG is a very touching situation and since we don’t have God anymore ... or have those things that even other cultures have, we have touching situations. EEG is a wonderful thing because you can find out things that you don’t know from external observation [...] I wasn’t really interested in biofeedback technology... what I cared about was the person sitting there without having to make a motion, yet, showing something ... that you cannot observe from outside, it’s a very intimate situation ... don’t you think?” (Ashley, 1976).



Fig. 18 Graphic score for *Music for Solo Performer*, Alvin Lucier. Image © Alvin Lucier; restoration by Pia van Gelder. From Alvin Lucier, "Music for Solo Performer", review 1972, London: Guildhall School of Music and Drama.

In *Music for Solo Performer*, Lucier makes an intimate<sup>33</sup> connection to the self, I use the term intimate as it is something found within – an internal or inward state. This intimate connection to the self is then shared between the self and an audience, interpreted via technology and sound. Lucier’s work presents the opportunity, or an apparent opportunity for the audience to connect to his inward state, to connect an inward state of another into their own. Furthermore, in Ashley’s interview Lucier states that: “I didn’t want to show mind control, discovery is what I like, not control” (Ashley, 1976). The work happens through many moving parts and players but, succinctly, an internal state is externalised. I make the assumption here that this is the way in which Lucier sees how a mind is discovered. It was this aspect of technological connection to an internal, experiential state that I intended to evoke in my own biofeedback artwork *Finding Prāṇa*.

Finally, I propose that Lucier’s *Music for Solo Performer* performance is not absolutely a solo performance in the performer’s brain alone. It is also a listening and an interaction. It works by integrating and assimilating a self into the landscape of electronics, an EEG, an assistant, a performance space, an artwork. *Music for Solo Performer* can be viewed in terms of the work of Alva Noë’s philosophical and scientific treaty *Out of Heads, Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness* (2009), which questions the cherished assumption that we are mainly or even solely our brain. In Noë’s book, the assumption that places consciousness within the boundaries of the brain quickly becomes refuted through scientific examinations of perception and biological case studies of consciousness and philosophy. The locus of consciousness described by Noë is more about the dynamic life of the whole. It is an “environmentally plugged-in person” (Noë, 2009, p.xiii) rather than being something that happens inside us, consciousness is something we do. The study of mind science, for Noë, must consolidate the whole, living being (Noë, 2009, p.15). Whereby a locus of consciousness is in the being and its dynamic:

“You are not your brain, you are a living being that is connected to an environment; you are embodied, and dynamically interacting with the world. We can’t explain consciousness in terms of the brain alone because consciousness doesn’t happen in the brain alone” (Noë, 2009, p.15).

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<sup>33</sup> Intimate – From Latin *intimus* meaning “innermost” taken from *intus* meaning from “within”.

For both Noë, and for Lucier in *Music for Solo Performer*, the phenomenon of consciousness is not something operating just inside of us, we are not locked in, prisoners inside of our own ideas, sensations, and subjectivity. Like Haraway's symposium (2016), consciousness is something world-involving, contagious. We do it dynamically. It is, and we are, environmentally, ecologically, plugged in to it.

#### **4.6.4 The Intimate Connection to Technology, Second Wave**

A second generation of work that followed EEG came with the discovery of a new interface and a new type of brain signal, the ERP (Event Related Potential)<sup>34</sup>. Through this, research in brain computer machine interaction (BCMI) pioneered a new connection across internal states to external expression was developed for motor-impaired users. In contrast to the continuous rhythms during EEG of alpha, beta and theta waves, ERP provides a "localised time-locked signal in response to stimulus" (Lutters and Koehler 2016, p.2813). With the increased availability of relatively inexpensive computers in the 1980s and the precision of ERP components that much more clearly reflect the activity of neural networks and the complexities of cognitive processes, ERP has become a widely used method to identify and delineate the psychological and neural processes involved in perception and cognition in neuroscience research.

A major contribution to the sonification of ERP came from Rosenboom (1976-79). In his piece *On Being Invisible*, the sonification of brainwaves in real-time was "instantaneously reshaped by the ERPs arising from the performer's brain." The ERP signal added a "mental control switch in which musical changes" could be manifested by "selectively attending to the auditory stimulus" (Lutters and Koehler 2016, p.2813). The majority of the early pioneers were sonifying the signal directly. Rosenboom was at the forefront of exploring the "hypothesis that it might be possible to detect certain aspects of our musical experience in the EEG signal" (Miranda, 2014, p.3). Rosenboom's push to initiate potentially useful information in the EEG to make music with was a key step in what became brain computer machine interaction (BCMI) research. This developing paradigm was not only in search of complex and meaningful control of data from the brain

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<sup>34</sup> In the 1930s Pauline and Hallowell Davis recorded the first known ERPs. During the 1960s, Grey Walter developed the application of ERPs. The ERP components are time-locked to the very moment stimulus begins (such as the presentation of an image or sound). Each ERP component reflects a brain activation connected with one or a combination of types of mental activity (Landa 2014).

(Rosenboom, 1990). It also became a search for a responsive interface to reflect a two-way interaction between human brain activity and sound (or sometimes images). In addition, like the early therapeutic biofeedback work of the 1960s and 70s, BCMI work can have considerable therapeutic benefits. Lucier and Dewan commented that EEG's potential lay in "the immobile if not paralysed human being who, by merely changing the states of visual attention, can activate a large configuration of communication equipment with what appears to be power from a spiritual realm" (Kahn, 2013, p. 90-91). This ability for humans to communicate without the need for the motor system was an important proposition for BCMI technology.

Composer Eduardo Reck Miranda, based at the Interdisciplinary Centre for Computer Music Research (ICCMR) at Plymouth University, UK, is a key proponent in developing the communication potential of BCMI. In London in 2014 a performance of *Activating Memory* was performed at the Royal Hospital for Neuro-disability. The composition was generated and played by eight performers. The directed brain signals via a EEG brain cap from four severely motor-impaired players (the BCMI quartet) provided a score in real-time for a string quartet to play. The composition begins by the BCMI player focusing on a choice among four flickering checked patterns on a screen. The patterns flicker at different speeds, and each pattern stimulates the visual part of the brain to create a "sympathetic electrical signal" (Miranda, 2014, p.25). The BCMI player has to learn to clear the mind or relax before refocusing on a chosen pattern. If the BCMI player gets both the clearing and focusing right, then the signal is picked up by the brain cap and sent to the computer. The pattern chosen by the BCMI player then sends a corresponding musical phrase to a screen for one of the string quartet, who then plays the musical phrase. Rather than transforming brain signals into sound, it seems the BCMI community has in the main explored the translation of brain signals into music, "thereby attempting to enhance the expressive abilities of artists and those with physical impairment" (Miranda, 2014, p.25). The identification of ERPs through technology enables internal states to be expressed externally, making internal states a form of communication.

#### **4.6.5 Art, Technology and Sympoiesis**

In this section I draw on artists that I identify as using technology to create sympoiesis, as human biofeedback connections that move from machines to other humans. Artist Nina

Sobell developed a piece of work entitled *Interactive Electroencephalographic Brainwave Drawing* (1974). This was a system which captured the portraits of pairs of participants' portraits via a live video feed onto a screen which they could watch. The brain activity of the participants was also captured by EEG oscilloscopes and layered onto the portrait (Fig.19). At times the participants' brainwave patterns merged, evidenced by a single irregular circle. Sobell considered it a visual expression of the pairs moving into synchronicity or entrainment (Carr, 2012, p. 228). In a further iteration of the installation in 1992, Sobell discovered that the participants could influence each other's brainwave states so that, in moments of rapport, the pairs' EEG produced matching shapes. Here we see the infection of the self to the other, and the use of EEG and its visualisation in Sobell's work provides visual feedback concerning our own state, but it is also as a means of connecting to others. In my own work, *Finding Prāṇa*, I was interested in developing this kind of interaction. The sonification of data was the intended means like Sobel's graphic to connect the audience to my internal state.

Over the last ten years the development of wearables and the reduced costs of both medical and consumer EEG headsets and software, such as those by Emotiv and NeuroSky, has generated a resurgence in biofeedback and particularly EEG artworks. To give a full contextual analysis of this work is beyond the scope of this thesis. But I discuss one artist here as her work lays the foundations for some of the problems I encountered in the making of my own piece of work. Lisa Park's *Eunoia II* (2014) was inspired by the 48 emotions outlined in Baruch Spinoza's book *Ethica* (1677). The three principle emotions being desire, joy and sorrow from which the other 45 are rooted from. I.E. "fear is a sorrow not constant, arising from the idea of something future or past about the issue of which we sometimes doubt" (Zabel, 2019). Park's motivation was to visualise and sonify, the unseen, to take the invisible energy and vibration of emotions witnessed within herself into a physical tangible realm for an audience. In this work Park sits surrounded by 48 aluminium plates containing water. Park is wearing an Emotiv EEG headset which Park has coupled its parameters (alpha, beta, delta, gamma, theta) to express four emotional states of excitement, engagement, meditation, and frustration, alongside cognitive activity and facial expressions such as a wink, a raised or furrowed eyebrow, a clenched jaw, or a smirk. The water plates are individually activated by each of these states by a vibrating speaker positioned underneath the plates. In comparison to Luciers's work, in which his

non-performance, his non-doing was an intrinsic part of the performance. Park is performing emotions within the piece. For this piece to work Park has to first train and tally the emotions or facial expressions that will activate the Emotiv's alpha, beta, delta, gamma, theta waves. It is a self-training dictated by the parameters and abilities of the technology rather than the abilities or range of her emotions. In this sense, the work bears a sense of confinement to the headset parameters and the expression of emotion. In my reading this work begins to indicate more about how willingly we adapt and connect ourselves to technology, even though our emotions are clearly beyond its technological algorithm. Park's work raises issues about the rendering of internal states and specifically the limits and parameters of technology to do this. This will be discussed later in the chapter in the context of my own biofeedback performance.

It appears clear from the very early beginnings of biofeedback artworks that an interplay and convergence between art (Lucier) and science (Dewan) has been a key process regarding the sonification of biosignals. Through the use of technology in human neurofeedback, a backdoor creaked open in the West to the notion of biofeedback connections and control. It is with that possibility and interconnection between the artistic, scientific, neurofeedback, computer science and sonification discourses at the turn of this century which have led to the pioneering BCMI's that now provide humans with the ability to use internal attention to make music. In the next section I expand on the notion of the loop-form of Ouroboros through consideration of our technological and human connection to the earth.

#### **4.6.6 Humans and Technology In-Circuit with the Earth**

“It isn't a sound idea, it's a control or energy idea”

(Lucier, cited by Kahn, 2013, p.83).

To widen the notion of loop forms, I utilise the idea of Ouroboros not only in terms of the previously mentioned biofeedback states with the use of technology, but also in the following discussion of signals, loops, and communication technology with the earth; and also the in-circuit state humans have with the earth. In *Earth Sound Earth Signal* Kahn identifies an 'in-circuit' principle where the earth is a return conductor, an idea which was

established as early as 1803. However, the earth's circuit has become best known through the work of Carl August von Steinheil, who applied it to telegraphy in 1883. Kahn relates how this discovery led to the understanding of radio in the 1920s and its in-circuit deployment of the ionosphere<sup>35</sup>, and the earth's use to "serve signal propagation in telecommunications" (Kahn, 2013, p.255). To paraphrase history of science and technology scholar Chen-Pang Yeang, the radio has always used the open space between the transmitter and the receiver, the air, and this space between these two points was an essential element of radio as a technology (p.255). So, we are perhaps more familiar with air as a technological circuit than first thought. Kahn expands this further and identifies the ionospheric loop in radio as a form of its own self-discovery, explaining that:

"... at a certain point [wireless] began to systemically incorporate ionospheric reflexivity for long-distance communication, thus bringing the ionosphere into a technological circuit. In fact, because wireless was used to empirically establish the existence of the ionosphere and to map its constitution and behaviour, it participated in the development of its own circuit [...] In this way ionospheric reflexivity was instrumentalised as part of long distance communication" (Kahn, 2013, p.256).

Although the earth as in-circuit was an economic choice, communications grew and the ground became over-populated with noise from earth currents and messages. In order to avoid noise in the loop a multiplexing or second line was installed which became known as the 'metallic circuit'. This was a closing of the circuit to the electromagnetic sounds of nature, interference noise, and cross-talk. The metallic circuit encased technological elements and left them to talk amongst themselves:

"An earth circuit was open to the sounds of the earth and to other, non-natural sounds, whereas a metallic circuit was closed into its own technological loop [...] For over a century and a half there have been large cycles in which the earth has been *in-series* or *in-circuit* with an open circuit or excluded by a closed metallic

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<sup>35</sup> The Ionosphere is the layer of the earth's atmosphere which contains a high concentration of ions and free electrons and is able to reflect radio waves. It lies above the mesosphere and extends from about 80 to 1,000 km above the earth's surface.

one. The manner in which the earth was put in circuit and taken out is constituent if forgotten part of communications history that can in turn, be observed as a strategy in music and the arts, and as an ecological allegory with programmatic implications” (Kahn, 2013, p.256).

I make reference here to the closed metallic loop, as this will be helpful during the discussion of my own work *Finding Prāṇa*. I parallel this in-circuit loop with the earth to develop the discussion of the human-earth in-circuit through the following discussion of *Slumber* (1994) Fig. 20. In this biofeedback art performance, artist Janine Antoni’s sleeping state as monitored via polysomnography literally dictates and regulates the patterns she makes in her waking day. Antoni lived in the gallery for 28 days both day and night, so *Slumber* becomes a work in which we watch Antoni’s own private laboratory unfold, in which she has become her own subject for circadian experimentation and immersion. During each night Antoni is connected to a polysomnography and the machine traces Antoni’s dream state through a recording of rapid eye movements (REM) happening in real-time and translated into graphical visual form by electronic circuits putting ink onto paper. During the day Antoni weaves the recorded patterns of each night’s dream-state on to the bed blanket she sleeps with in the gallery using a giant bespoke wooden hand loom. Her dream states are revealed by a machine recording her subconscious eye movements traced on paper. Then, later, when in a wakeful state, these are translated and embodied by a conscious hand labouring on a loom. Each night the machine’s automated scrawl is triggered by the activity of a sleeping mind. It is circadian and cyclical, where Ouroboros is working between the conscious and subconscious, the mind and the body. The 28 days represent the moon circling the earth, as the earth circles the sun, day and night weaved together in a blanket. Antoni is in-circuit with the revolutions of the earth through her connection to the physical environment and in her sleeping and waking is undeniably present in the weaving of her dreams. She is feeding back and graphically scoring her ecology in an oscillation and sympoiesis moving both within her own body and synchronised beyond the self. Ouroboros has provided a discussion of relevant literature and explored the key biofeedback artworks that have informed this research. I have also discussed the in-circuit or feedback loop of the earth and the concept of a closed metallic circuit. These discussions have provided the context and informed the artistic decisions in the making of, my own biofeedback art work, *Finding Prāṇa*, which I discuss next.



Fig. 19 *Interactive Electroencephalographic Brainwave Drawing*, Nina Sobell 1974.  
Image © Getty Publications 2008



Fig. 20 *Slumber*, Janine Antoni 1994. Image © [whitecubediaries.wordpress.com](http://whitecubediaries.wordpress.com)

#### **4.7 Finding Prāṇa: A Biofeedback Performance (fNIRS & Prāṇāyāma)**

I now follow this contextual background with a description of the work carried out in this research. This work applies fNIRS technology to record the cerebral blood flow, measured as changing levels of oxygenated and deoxygenated haemoglobin in the brain, whilst performing a sequence of *prāṇāyāma* exercises. The data is sonified and visualised in real-time allowing the audience to experience the effects of the *prāṇāyāma* on cerebral blood flow in an auditory and visual form.

##### **4.7.1 Connecting fNIRS (Near Infrared Spectroscopy)**

In order to develop an anatomical investigation into the effects of *prāṇāyāma* within the body, two pilot studies were conducted using functional Near Infrared Spectroscopy (fNIRS). Each pilot study was conducted in collaboration with Dr Philippa Jackson<sup>36</sup> at Northumbria University's Brain, Performance, and Nutrition Research Centre (BPNRC), Newcastle, in order to test the sensitivity of fNIRS to a *prāṇāyāma* practice. The proposition of fNIRS technology is its optic capability to detect changing levels of oxygenated and deoxygenated haemoglobin in the brain, otherwise known as the haemodynamic response or cerebral blood flow (CBF). Pilot studies were initiated to test if significant changes would occur during specific *prāṇāyāma* exercises. If significant changes were found, I planned to map the fNIRS data through Max software to produce a correlative score in sound. My first intention for the sonification of data would be to reflect both the physiological changes (the haemodynamic response) and the experiential felt aspects of a *prāṇāyāma* practice. fNIRS is a non-invasive optical imaging technique. I used a 2-channel Oxymon system (Artinis Medical Systems) in which a head-band is worn to monitor blood flow changes in the pre-frontal cortex of the brain. The technique exploits the fact that light in the near infrared spectrum easily passes through biological tissue such as the skull and can transmit photons (light particles) into arteries, veins, blood vessels and capillaries. The optical properties of haemoglobin differ depending on whether or not it has oxygen molecules attached, where oxy-Hb and deoxy-Hb absorb different amounts of light. Therefore, fNIRS is able to quantify levels of oxy-Hb and deoxy-Hb based on measuring the amount of light particles absorbed. For further explanation regarding fNIRS

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<sup>36</sup> Philippa Jackson is Associate Director of the BPNRC at Northumbria University. Her research investigates the effects of omega-3 fatty acids on cognitive function and cerebral blood flow. Philippa leads the fatty acid research group and is also principal and co-investigator for a number of industry funded projects with a focus on novel nutritional interventions.

technology and its applications in clinical settings and breath studies, see appendix 8.

#### 4.7.2 *Prāṇāyāma* Experiments

As the graph in Fig. 21 indicates the sequence consisted of: (1) *Naulī* (turning of the abdominal muscles) which is principally a cleansing exercise. (2) *Kaplabhati* (skull cleansing) in which the practitioner makes fast repetitive exhalations using the abdomen. This is also considered a cleansing practice and typically begins a practitioner's *prāṇāyāma* practice. (3) *Ujjayi* (victorious breath) practiced by breathing through the nose and narrowing the throat by partially closing the epiglottis. This *prāṇāyāma* heats the body and produces an audible sound similar to an ocean wave. (4) *Nāḍī Shodana* (channel or nerve cleansing) the practitioner alternates between left and right nostril breathing. (5) *Sitali* (cooling breath) the practitioner draws breath in through a curled tongue and breathes out through the nose. (6) *Bhrāmarī* (black bee) the practitioner makes an exhalation sound imitating the hum of a bee, whilst closing the ears off with the palms of the hands so that the sound is conducted within the skull. (7) *Savasana* (corpse posture) is practised at the end of a *prāṇāyāma* session. The practitioner lies down and returns to belly breathing. The *prāṇāyāmas* chosen for this first pilot study were practised in their simplest form without *kumbhaka* (breath suspension). However, retention is employed in the first form of *naulī*. Between each type of *prāṇāyāma*, three rounds of clearing breaths (regular seated breathing) were performed.

In the second pilot test, conducted over a 45-minute period, *prāṇāyāmas* that involved the retention and suspension of breath were included. Each *prāṇāyāma* was repeated for three rounds unless otherwise stated. The second sequence (Fig. 22) as the graph indicates consisted of: (1) Headstand; (2) *Balāsana* (child's pose); (3) *Rechaka Kumbhaka*, inhale, exhale, and suspend the breath; (4) *Pooraka Kumbhaka*, exhale, inhale, and hold the breath; (5) *Rechaka Pooraka Kumbhaka*, inhale hold, exhale suspend; (6) *Sama Vritti* (same action), nostril breathing: inhale right, exhale left, inhale left, exhale right, all with retention. (7) *Visama vritti* (irregular action), right nostril breathing with retention, left nostril breathing with retention; (8) *Bhastrika* (bellows breath), 60 rapid exhalations followed by slow inhalation and retention; (9) *Surya Bhedana* (sun piercing), nostril breathing: Inhale right, hold, exhale left; (10) *Chandra Bhedana* (moon piercing), nostril breathing: Inhale left, hold, exhale right; (11) *Sitali* (cooling breath), Inhale through a

curled tongue, hold, exhale through both nostrils; (12) *Savasana* (corpse posture), belly breathing. The observations and graphs from both pilot studies show that each *prāṇāyāma* was associated with a distinct cerebral blood flow response, demonstrating the sensitivity of the technique to *prāṇāyāma*. Further interpretations from Dr. Philippa Jackson can be found in appendix 8.6

#### **4.7.3 Finding Prāṇa System Architecture**

The results and interpretation of data from the pilot studies led to the conclusion that fNIRS is a viable proposition to begin to build a system that would sonify and elucidate cerebral blood flow changes during *prāṇāyāma* practice. To build this system, fNIRS data was taken from the Artinis recording and analysed by Oxysoft software. Each data sample consisted of 5 numbers: (1) sample number. (2) oxy-Hb – right hemisphere. (3) deoxy-Hb – right hemisphere. (4) oxy-Hb – left hemisphere. (5) deoxy-Hb – left hemisphere. Through the Ascii writer protocol, communicating through sockets the data was streamed in real-time via a TCP connection into the visual programming language Max. A clock and baseline change patch built in Max were used to interpret the raw values. The patch makes and applies a baseline adjustment of the raw data after a specified amount of baseline data collection for twenty minutes.

#### **4.7.4 Sonification Iterations**

A prototype sonification was built, mapping total oxy-Hb data to samples of natural sounds that I already had sourced in my sound library. This first iteration of the sonification was used as a method of testing the system specifically in terms of time lag and data loads rather than a consideration of what and how the sonification should sound. The sound samples were used as dummies until the sound of the sonification had been considered. Low levels of oxy-Hb triggered the production of underwater sound samples. Baseline levels triggered field recordings of ocean waves. As oxy-Hb levels rose electronic drones layered up into harmonies to sonically indicate the increase in oxy-Hb. When the total oxy-Hb level reached the highest point a drum sample of the famous Amen break<sup>37</sup> played. When total oxy-Hb levels bottomed out over a set period of time, such as when breathing in *savasana*, human speech samples discussing theories of what it is to be human or

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<sup>37</sup> Amen break – a four bar drum loop known as a cornerstone to hip-hop, jungle and drum & bass. The break featured on the soul track *Amen brother* was originally released in 1969 as the B-side to The Winston's 7" single *Colour Him Father*.

### fNIRS Pranayama 1: Pilot Sequence

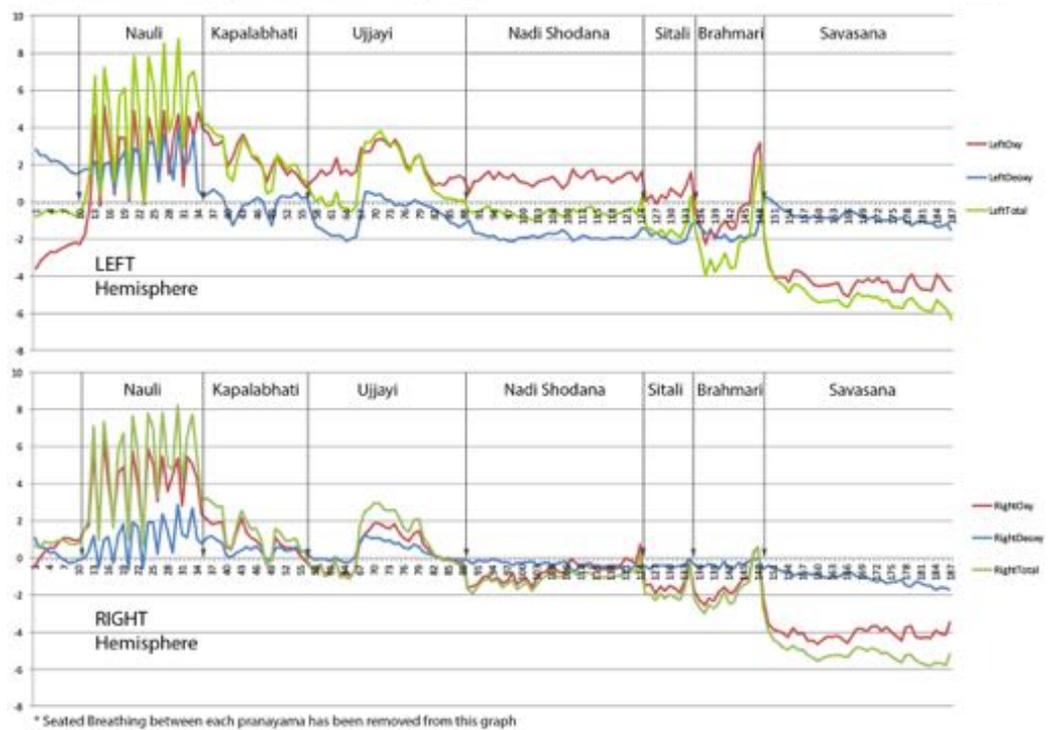


Fig. 21 fNIRS Results Pilot 1: *Prāṇāyāma* Sequence. Collard & Jackson, 2015.

## fNIRS Pranayama 2: Suspension Sequence

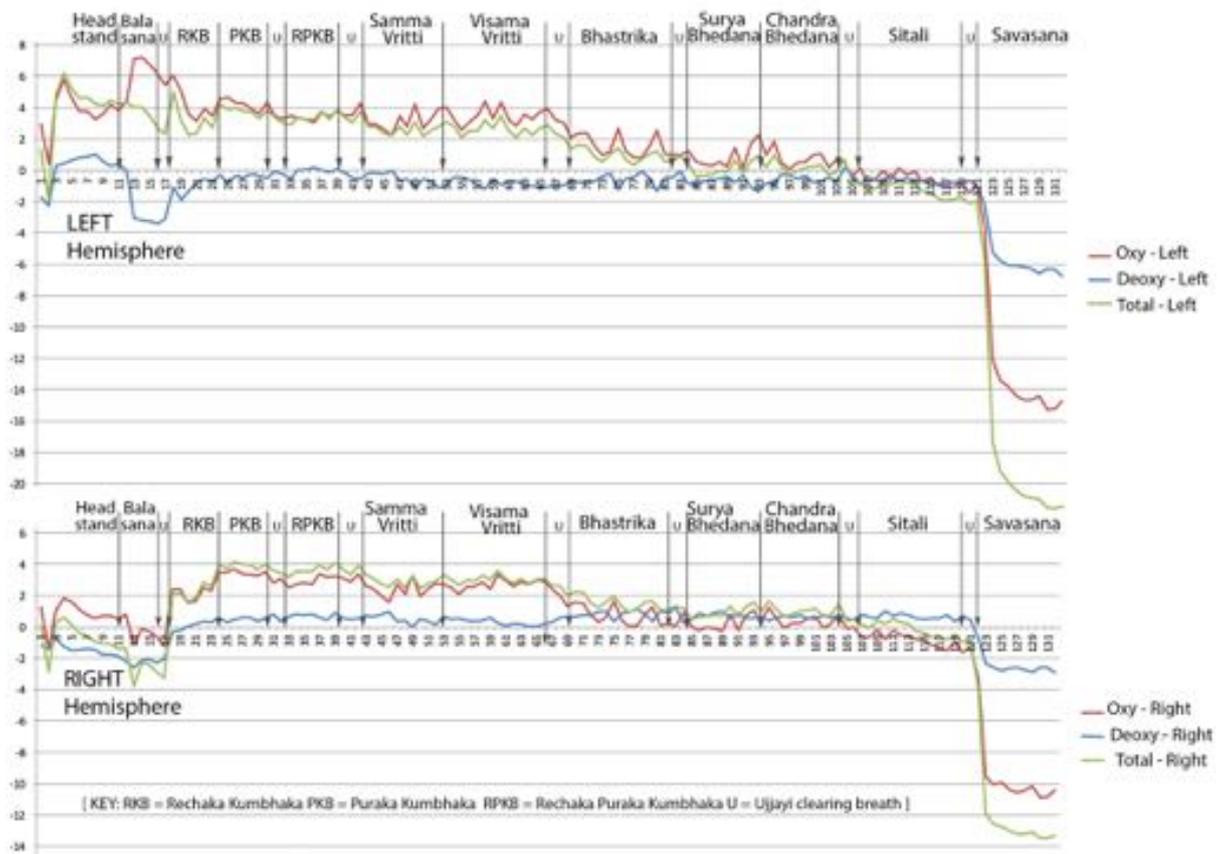


Fig. 22 fNIRS Results Pilot 2: *Prāṇāyāma* Sequence (retention) Collard & Jackson, 2015.

robotic were played. If total oxy-Hb levels continued to drop, another sample would play, creating a collage of voices. This first iteration sonically delineated the haemodynamic response in one data stream but lacked complexity. The sound transitions were over defined and were stylistically too broad to create any real feeling or atmosphere in the sonification. However, this version was very useful in establishing the test and build of the system and a real-time connection to the CBF and sound generation.

This research employs a practice-led methodology within a cycle of reflective enquiry that informs modifications as appropriate (Sullivan, 2005), therefore the process of building the system and creating a sonification was iterative and relational. The sound transitions in the first testing prototype were each stylistically very different which made transitions over defined. Through this reflection, the second sonification was designed to be generative. The second sonification iteration employed all Hb readings as input to control a synthesizer built in Max. The parameter choices of the synthesizer were intended to sonically reflect the ascending and descending levels of oxy-Hb and deoxy-Hb but also as a whole create a texture of sound that would create an aerial or air like atmosphere. The six data streams comprised three data sets for each hemisphere. Right hemisphere mapping consisted of: (1) total-Hb controlling the number of midi-notes played; (2) oxy-Hb controlling frequency width; and (3) deoxy-Hb controlling frequency range. Left hemisphere mapping consisted of: (1) left total-Hb controlling the range of a flanger; (2) oxy-Hb controlling the duration of the comb filter; (3) deoxy-Hb controlling the range of detuning on the comb filter. This second iteration resulted in a more complex and cohesive sound but did not clearly represent the physiological changes that were occurring. This could have been amended by changing the controls and parameters. However, through building these two test iterations, a disjunction between the representation of the *anatomical data and the experiential feeling of prāṇāyāma* had become apparent. I decided to approach this through a method of graphical scoring. I felt this method would be better in providing a structure within which to hold and converge both elements in the sonification process.

#### **4.7.5 Graphical Scores**

The intention of the sonification was not just to sonically represent the data, but to evoke in the audience, a representation of the practitioner's experience through sound. I began

looking at methods of graphical representations which might allow the correlation of cerebral blood flow data with the *prāṇāyāma* experience in order to then convey this to sound. In the tradition of avant-garde composition and graphical notation systems, this kind of devising allowed sound to be thought about and designed outside of the traditional 5-line stave system. This method of composition provided a structure to: firstly, notate the *prāṇāyāma* practice as a felt experience; secondly to correlate that experience to the corresponding CBF data; and finally through that merger to map that experience/data to a sonic score. This mapping and graphics exercise was a means to correlate the data and experience into sound, as a method to integrate breath practices with artistic research.

To do so I followed examples from John Cage and his many scores ranging from *Aria* (1958) and *10 Stones* (1989), to Kathleen St John's *Centipede*, (1978) Fig.23, and Susan Stenger's *Sound Strata* (2015) Fig. 24. These graphical scores go beyond the notion of a fixed or set performance, offering original graphic abstractions that provide new parameters about thinking of sound and encouraging a correlative sensibility to surface. Brian Eno's intention for his graphic scores *Ambient #1 Music for Airports* (1978) was to provide a means to convey a visual impression, rather than instructions for actually playing the music. This was a pertinent consideration for my work, as the breath was already set to specific patterns and had physical boundaries and parameters, but what I needed was a process of establishing a sonic landscape that the data could exist in. The visual scoring (Fig. 25 & 26) was a means to integrate the gross anatomical data with the yogic body experience in devising a sound experience.

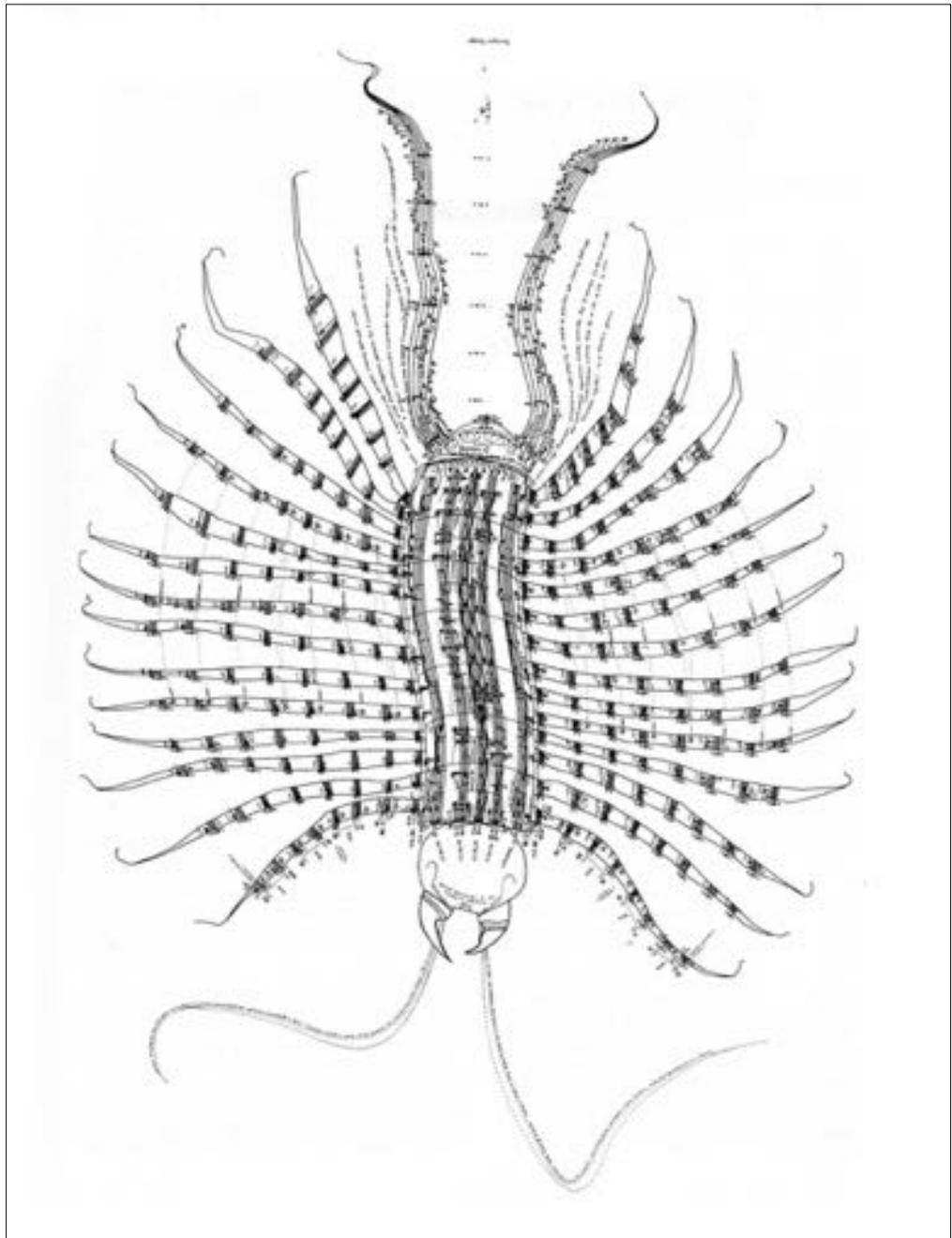


Fig. 23 *Centipede*, Kathleen St John, 1978.  
Image © Heresies magazine #10, "Women and Music", 1980.



Fig. 24 *Sound Strata of Coastal Northumberland*, Susan Stenger, 2014.  
Photo: Colin Davidson, © AV Festival, 2014.

How to score sound to time, as well as integrate the experiential aspects of time changes that I felt during my own *prāṇāyāma* practice was an important factor which underpinned the process of graphical scoring. In addition, as I have outlined previously, the notion of time, or more specifically the cessation of linear time has also been documented as an important consideration as one of the processes at play during *prāṇāyāma* practice (Nair, 2007). In traditional linear notation, time is implied through left to right visual association, which was the first aspect of time that I applied to the score. However, I also applied my own experiential aspects of time change during *prāṇāyāma*, to the score, that were used to inform and map sonic elements. The score was a graphic to depict two time dimensions. In the preliminary sketch Fig. 25 Score: *fNIRS prāṇāyāma*, the X axis represents traditional linear quantitative time which plots fNIRS data every 10<sup>th</sup> of a second. The Y axis represents the qualitative aspect of my *prāṇāyāma* practice. This is divided into three qualitative sensations which I identified during my *prāṇāyāma* practice – *space*, *intensity* and *rhythm*. These are components within a *prāṇāyāma* breath. Firstly, the breath in each *prāṇāyāma* is set by the *rhythm* of an inhale length and an exhale length. Secondly, the *space* between the transitional moment of an inhale to an exhale (and vis-versa) and thirdly the *intensity* of these transitional moments between an inhale and exhale is also modified and changed for each *prāṇāyāma* exercise. A *prāṇāyāma* includes all three of these aspects, whilst some maybe more focused in a particular area depending on the type of *prāṇāyāma*.

I began to think about *prāṇāyāma* across two time axes that can be represented in terms of the ancient Greek idea of time; and the two distinct versions of *chronos* as linear time and *Kairos*, which is more like a felt or qualitative aspect of the experiencing of time a “being in the moment” (Lipari 2014). In *Ethic, Kairos and Akroasis: An Essay on Time and Relation* Lipari expands on the qualities of *kairos* time, describing it as beyond “binary oppositions and the presumed spatial linear progressions of past, present and future” but works as “a relation to alterity that accomplishes temporality... [it is] a nonlinear way of synchronous listening” (Lipari, Alnott, 2014, p.79). The *kairos* or qualitative Y axis was split into three sections of space, intensity and rhythm. This axis enabled the exploration of the sensation or idea of *kairos time* during *prāṇāyāma*.

The three qualitative elements of *prāṇāyāma* with the quantitative data were applied to a first sketch Fig. 25 Score: *fNIRS prāṇāyāma*, I used cross-hatching to represent the amount

of emphasis to be applied to the three aspects of rhythm, intensity and space (*kairos* or Y axis). Each section was interpreted sonically, ie *space* sonically would provide a sense of spacious and expansive sound, the *intensity* section would be immediate, intense and present, and in the rhythm section it would plot sonically to a synchronous and meditative sound. For example, the suspension *prāṇāyāmas* (high oxyHb) with long transistions between an inhale and exhale became correlated with spacious sounds. As the oxyHb level moves down towards the baseline reading which is equated with normal breathing, the intensity of the composition is intensified as the transitions between an inhale and exhale are faster. fNIRS Data levels below the intensity section, introduce or foreground rhythmic and mediative sound which reflect the experience of the more rhythmic qualities of the soothing *prāṇāyāmas* and particularly the belly breathing of savasana. This initial score was a sketch which became an iterative process to represent the experience of time in breath modulated through sound. This explains the initial basis for the scoring process which was then further developed and is discussed later in this chapter.

#### **4.8 fNIRS Sonification**

Despite having found a method of correlating the data with the *prāṇāyāma* experience, I discovered that applying electronic sound and particularly synthesised electronic sounds, was problematic. Various patches in Max were developed using this first score as a framework, and although the system was born out of and mediated through a process of technological devices and sounds I wanted something more evidently human sounding. The work intended to use technology in order to make heard the unseen connection of the breath to the mind. However, it became important through the iterative making process and reflection (Sullivan, 2005) that the next iteration should be evocative of something sonically human or alive. In order to contextualise this reflection and the decisions that were subsequently made I discuss some broader ideas from the humanities that influenced my approach to the sonification. In scientific investigations of the mind through neuroscience, the use of technology and its qualitative data is a primary resource and this was reflected in my own utilisation of fNIRS technology. However, a humanities perspective of the self and the mind was also taken into account, specifically Marilynne Robinson (2015) and Mary Midgley (2014) in order to inform the next iteration of the sonification process.

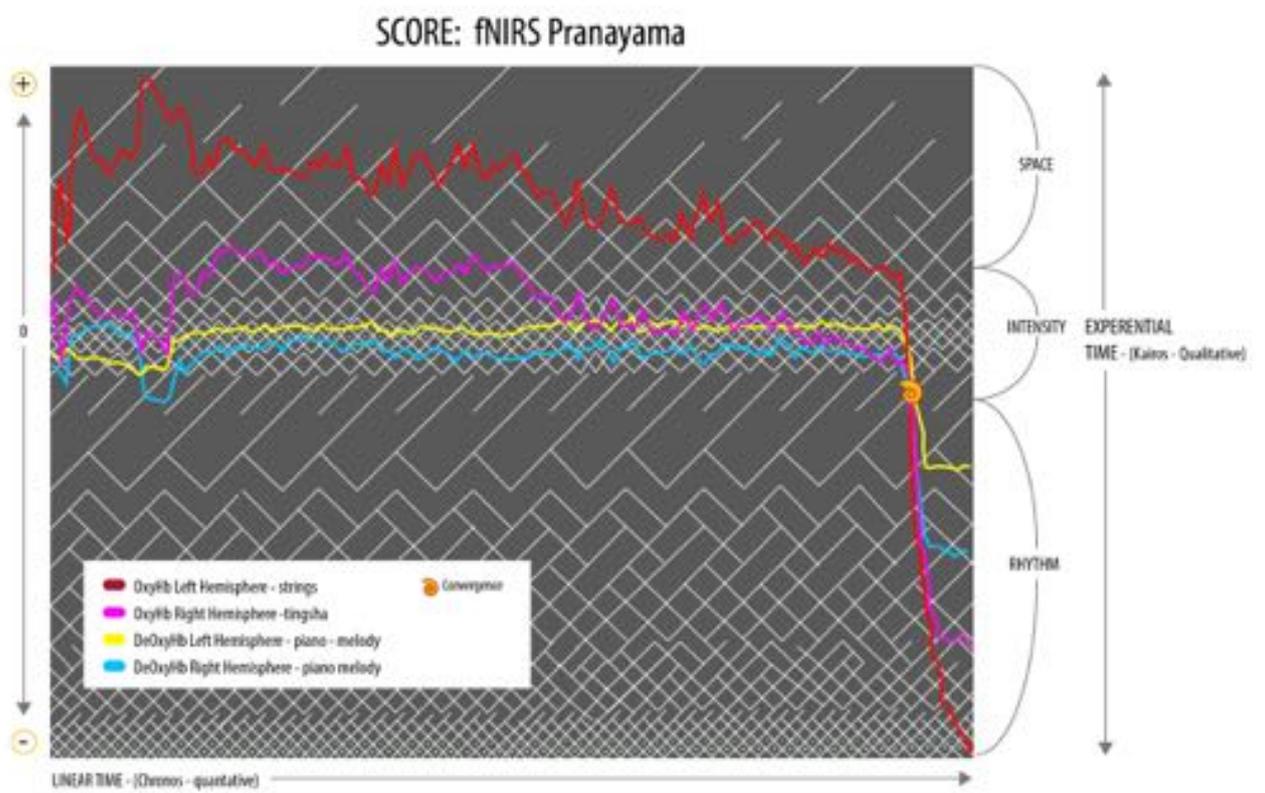


Fig. 25 Score: *fNIRS Prāṇāyāma*, Helen Collard, 2017.

#### 4.8.1 Do you Believe in Yourself?

My appropriation of fNIRS technology was influenced Robinson's (2015) proposal that the mind is most often thought to be best explained by neuroscience and its technology. She suggests that we are now, more than ever, much less interested in the understanding and refining of the mind through the arts and humanities, and much more likely to be interested in understanding the mind via the application of technologies to identify its abilities. Within this drive Robinson also identifies a "joyless urgency" (p.4) in staying ahead of "a thing" that, in our thoughts, pursues us; suggesting that this thing is an ever encroaching sense of economic servitude (for both ourselves and our children).

The urgency of staying ahead means that when we think of the arts and humanities and all "the accomplishments and therefore capacities of humankind" we actually think of them as a futile pursuit; because we are up against this thing that has "inscrutable ends that are utterly not our own" (p.4). Robinson suggests that the antidote we look to, in order to escape this ever-encroaching servitude is contemporary science. She reasons that it is because science is much more able to assert its achievements and insights "in present time" than the humanities which reveal themselves afterwards and in the "light of history" (p.4). This I argue also applies specifically to embodied practices within the arts and humanities. Science and technology are often used to validate the experience and practice. The practice often has to be proved by science in order to be considered effective, such as in the example of the work of Kuvalayanada at the Kaivalydhama Institute.

In the study of the neuroscientific study of the mind, evidence is gathered by technological resources, it captures data and images about the living brain to support assertions and to develop new avenues of enquiry. However, Robinson argues, this is very often at the cost of an understanding of complexity:

"Fear lights up a certain area, therefore fear is a function of that area [...] It prepares the organism to fight or flee [...] But fear is rarely without context. People can be terrified of spiders, dentists, the Last Judgment, fear is rarely without context, fears are the creatures of circumstance, of the history and state of a specific brain [...]. The assumptions behind the notion that the nature of fear and the impulses it triggers could be made legible or generalisable for the purposes of

imaging would have to exclude complexity — the factor that introduces individuality with all its attendant mysteries” (Robinson, 2015 p.6-7).

These reductionist methods found in neuroscience (Crick, 1994, Greenfield, 2000, p.12, Blakemore, 1999, p. 270) are implicitly present within my use of fNIRS technology contained in this research. fNIRS is an imaging device, with optical lights that measure the simplistic materialism of cerebral haemodynamic blood flow subsequently reduced again through the mapping of electronic music configurations into sound. This reduction *works against* the exploration of the self and an intimacy of mind that I was so interested in expanding in this work. In addition, Robinson directly challenges our perception of objectivity in the neuroscientific paradigm:

“We might have any number of other selves. If most or all of these speculations are only flaunting new definitions of the possible, the exercise is valuable and necessary. Possibility has been captive to a narrow definition for a very long time, ourselves with it, and we must expect to blink in the light. [The] new cosmologies preclude almost nothing, except “the physical” as a special category. The physicality enshrined by neuroscientists as the measure of all things is not objectivity but instead a pure artefact of the scale at which and the means by which we and our devices perceive. So to invoke it as the test and standard of reality is quintessentially anthropocentric” (Robinson, 2015, p.9).

In this analysis, our machines and technology might only be able to see and reflect the brain within our own current human thinking. The fact that this anthropocentricity is never acknowledged suggests that any objectivity claimed by neuroscience is to be questioned and, as with most specialisms, we have to acknowledge we are working in bias or a particular system. Robinson’s point is that, in its dominant forms, neuroscientists are greatly overreaching the implications of their evidence, with a tendency to view reality as if they were “clear-eyed and tough-minded, therefore rational and true” (p.10). A main argument of neuroscience seems to be that we already know better than to subscribe to any such thing as the self “that sustains us in lofty estimation of ourselves and our kind” (p.10). Robinson states that the evidence neuroscience offers is:

“secondary to this conclusion and inadequate to it because it is based in a simplistic materialism that is by now a nostalgia. The profound complexity of the brain is an established fact. The depiction of a certain traffic of activation in it can only underestimate its complexity. One might reasonably suspect that the large and costly machines that do the imaging are very crude tools whose main virtue is that they provide the kind of data their users desire and no more” (Robinson, 2015, p.10-11).

Robinson’s critique might be better understood when we consider the idea of the self, or an inner life. What then? In neuroscience, its images suggest that our thoughts, desires, hopes and memories are just illusions produced by the firing of tiny cells and biochemical processes operating within the brain. In riposte to this, and in support of Robinson, Midgely (2014) persuasively argues that our current scientific paradigm renders the self as “nothing more than an elaborate illusion” (2013, p.33); in which we lose so much of a human life, its wonder, awe and imagination, all solely because it cannot be adequately contained in the confines of a puritanical scientism. Midgely suggests that scientists such as Crick who argue that there is no self that “your sense of personal identity and freewill are in fact no more than the behaviour of a vast assembly of nerve cells and their attendant molecules” (Crick, 1994, p.3) are operating within a kind of “exclusive materialism” (Midgely, 2014, p.22). She believes that understanding our world, our subjective thought, and our experience of our place in that world is every bit as important. To be clear here, Midgely is not equating this neuroscientific no-self with the yogic doctrine of atman (universal self) or the Buddhist doctrine of no-self (in which the practices of questioning traditional elements of the self lead to identifying primarily with a much larger whole). To understand Midgely’s contestation of the self as an illusion presumed by neuroscience (Blakemore, 1999, Greenfield 2000) she uses the following example:

“If we are to understand why (for instance) Napoleon decided to invade Egypt or Russia, what we need is *not* – as we might think – some knowledge of the political background and of Napoleon’s state of mind, but simply facts about the state of his brain, which alone can account for his action” (Midgely, 2014, p. 23).

Furthermore, Midgely warns that this scientific doctrine that concludes a self to be solely the movement of our neurones has a heavy cost as we have “to concede to ourselves that

we ourselves are ineffectual that we are futile abstract beings detached from all practical activity in the world” (p.39).

In this research I am working across the two different systems of knowledge. Firstly, the application of neuroimaging technology – fNIRS *and* secondly through the embodied experience of a yogic body. This joining of systems raised questions regarding the nature of the sonic elements used, and what they could and should elicit during a performance. The reflections on neuroscience, given by Robinson and Midgley (in which they argue a negation of the self in neuroscience), stimulated a new way of thinking about the sonification. Although the technology was scientific the sonification should be heard as an expression of an inner mind, an inner human self that has hopes, imagination and wonder. The sonification should be reflective of the human *as a self*, which poses questions, listens and can be cultivated. This thinking was key to the new approach to the sonification process and with this in mind I began to look to sources of music that were representative of something very human; which lead me to jazz improvisation and its essential component of listening.

#### **4.8.2 Improvising: Listening to Listening**

“When they are really playing – really improvising – they *have* nothing prepared to say, but generate it spontaneously out of the musical between. Thus, in order to improvise, players have to ‘listen’ – they have to follow the familiar structure that is, be aware of it all times, where they are in the song, where the others are, and they have to listen beyond, what might come newly, originally to them” ... each player abides entirely in the present – listening, or, as Heidegger would say, meditatively thinking about ‘what at first sight does not go together at all’” (Lipari, 2014, p.132)

Communications scholar Lisbeth Lipari (2014) identifies jazz improvisation as *a form of listening* and furthermore discusses it as an example of intersubjective communion. It is evolved from intersubjective interaction. This intersubjectivity as communication is for Lipari an experience in which we empty all of “our intentions other than that of engaging with the what-will-happen” (Lipari, 2104, p.132). In jazz improvisation, a

familiar rhythmic, melodic and harmonic structure is put in place, but as the improvisation progresses the boundaries of these structures become stretched. For gifted players, the melody can be bent and lifted out of its original key, rhythm or time signature, and taken beyond these initially conceived structures and boundaries, yet still be perceived as related to them.

#### 4.8.3 Alice Coltrane (aka Turiyasangitananda)

“Her notes sparkled and then dissolved in the air around her. What better way to express one’s relationship to the larger world?” (Hsu, 2017).

I sourced a harp improvisation by Alice Coltrane (Turiyasangitananda<sup>38</sup>) in order to use it for the next iteration of the sonification. It was a 9-minute recorded piece which was to be improvised and remixed by my breath via the fNIRS system and a *prāṇāyāma* practice. Coltrane’s harp improvisation was recorded at a performance which was part of the *Jazz Jamboree Festival* at the Palace of Culture, Warsaw, Poland, in 1987. The music was relatively unheard of and unavailable in any hard copy such as CD or vinyl. However, after thirty years, a limited pressing of 10” vinyl was released in April 2017. I bought a copy, digitised the vinyl and then began devising a mapping strategy to correlate it to a *prāṇāyāma* practice.

Through my previous performance *Hawk* my intention for the sonification was to emphasise and convey breath practices *as a form of listening*. Jazz improvisation through Lipari’s analysis, is a form of listening by the player. I intended to map my own *prāṇāyāma* performance to Coltrane’s performance in which we hear her listening. Coltrane’s harp improvisation as a piece of music can be seen as a dialogic in that in some ways we cannot help but to listen to Coltrane’s listening. The sonification would map refrains of Coltrane’s improvisation to the experiential elements of the *prāṇāyāmas*. Therefore, it would be as if Coltrane’s harp would be played via my breath. Furthermore, the harp as an instrument historically has had pertinent connotations to the human body

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<sup>38</sup> Although it is not directly pertinent to my reason for using Alice Coltrane’s music, Coltrane’s change of name in 1972 to Turiyasangitananda or Turiya is worth mentioning. As described at the beginning of this chapter, *turiya* is a state of super consciousness thought to be attained through *prāṇāyāma*; a condition “in which one’s soul (atmān) is free to dwell with the universal spirit (brāhman)” (Zysk, 1993, 2005).

and mind. The harp is explored further in the next section as a “machine for translating sensory vibrations into consciousness” (Trower, 2012 p.13).

#### **4.8.4 The Loop of the Harp and the Yogic Body**

To expand on the use of Alice Coltrane’s 1987 harp improvisation, I firstly focus on the connotations of the harp as an instrument in reference to the sonification of the yogic body. Much of this discussion is informed by the research of English scholar Shelly Trower and her book *Senses of Vibration* (2012), in which she describes how the physiological and medical theories of the eighteenth and early nineteenth century took the aeolian harp<sup>39</sup> as a schematic for the workings of the human nervous system.

“The harp [...] operates not only as a vibrating object, to which the neurological self sensitively vibrates in response, but also as a model of the vibrating subject himself. The harp’s vibrations generate thought, feeling, imagination; the possibility of imaging oneself to be a vibrating harp” (Trower, 2012, p. 9).

It seems that, much like the concept of the yogic body and its network of *nāḍīs*, the human mind/body during this time was “conceived of as a machine for translating sensory vibrations into consciousness” (Trower, 2012 p.13). By the end of the eighteenth century, the notion of “nerves as a solid like musical string” (Trower, 2012, p.13) began to replace the earlier conceptualisation of nerves as pipes in which a liquid form of animal spirit flowed between the body and soul. According to a growing consensus of physiological, philosophical and medical theories at the time, the nerves were coming to be perceived as solid rather than tubular, where vibration moved along the nerves so that sensations were delivered to the brain. This paradigm developed in tandem with the rich acoustical inventions technologies whose processes were used to begin to explain how the eardrum

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<sup>39</sup> The aeolian harp is a seventeenth century instrument that changed wind into sound – a technological operation between nature and acoustics. The aeolian or wind-harp is a wooden box across which three to twelve strings are tuned in unison and stretched between two bridges. The harp is usually placed in an open sash window and as the wind blows through the harp, the strings vibrate creating sound. The pitch, harmonies, and dissonances vary dependent on aerodynamics and the force of the wind. Thomas L. Hankins and Robert J. Silverman in *Instruments and the Imagination* (2014) describe the aeolian harp’s ability to move from “harmonious and indolent” to “dissonances...like a scream ... and in which nothing could better match the sentiment of the romantic soul” (Hankins and Silverman, 2014 p.88).

resonates with vibrations in the air<sup>40</sup>. Associations were being made between the harp, and stringed instruments more generally and health. The vibratory sounds, of stringed instruments were regarded as having therapeutic effects for both mental, physical and spiritual health, especially if an illness concerned disordered or disturbed nerves (Gouk, 2004). The vibration of the strings of the harp were thought to relate to the ‘strings’ of the nervous system; it was thought that the external world vibrates the nerves, and “vibrations in the nerves transmit sensations to the brain [...] and this vibration-sensation generated ideas, feelings, memories, thought, imagination” (Trower, 2012, p.9). In the Age of Enlightenment, the focus shifted from the “transcendent soul to the mechanics of the physical form” (Trower, 2012, p.9) and the concept of vibration contributed to an understanding that the mind itself is a material. Vibration was not a thing or matter, but an energy that could simultaneously move through subjects as well as objects, from harps to people. Much like the stimulation of vibration in the yogic subtle body, vibration was a conduit and bridge to move in and across internal and external worlds.

#### **4.8.5 *Turīya* and Spiritual Universality**

Coltrane’s dedication to the practices of yoga, atman and spiritual universality underpinned her music. Her music from the 1960s as for many other African American jazz musicians<sup>41</sup> in that crucially political time (including her husband John Coltrane) had become infused with the study of Indian religion and yogic philosophy. With the advent of the Asian Immigration Act of 1965, in which people from South and East Asia migrated into the USA accompanied by new technological innovations and post-war prosperity, came a burst of exploration of Asian spiritual traditions (Berkman, 2007). The culmination of these factors was the creation of a new international network where religious teachings, rituals and practices were able to “dis-embed” and “re-embed” into each other resulting in “religious pluralism within the individual.” It was a “bricolage<sup>42</sup>” and a “mixing of codes”

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<sup>40</sup> In *Observations on Man* (1749) David Hartley applied a new understanding of the anatomy of the ear to the philosophy of the mind in terms of its corporeal foundations, where the anatomy of the nerves and brain were analogous to the vibrations of a musical string in which “vibrations in the nerves transmit sensations. Sensations generate ideas, which in turn generate thought and feeling, memory and other aspects of mental life [...] Hartley’s work was probably the first comprehensive attempt to integrate Associationist philosophy with Newtonian physics, to ground mental processes in the physical” (Trower, 2012 p16).

<sup>41</sup> Other well-known jazz artists whose music has been influenced by yogic philosophies include Paul Horn, Don Ellis and John McLaughlin (Farrell, 1997)

<sup>42</sup> Bricolage (in reference to religion) refers to the patching together of elements of several different religions to form one’s own unique religious practices and beliefs (Yip, p.309) First termed by Levi Strauss 1966.

combining traditional Christian or non-Christian customs and beliefs infused with practices from South and East Asia (Roof, 1999, p.73; Berkman, 2007, p.47). This phenomenon was perhaps most evidenced in upper class white communities, but for black America and its civil right movement there was a particular urgency to address religion, its leaders and the role they could and should play in black liberation. Gayraud Wilmore the 1960s as “an unprecedented era of black theological reflection” (1998, p.224). For some in black America, spirituality in the age of this ‘bricolage’ the draw and focus, became India and Japan, and in particular the rituals and practices of meditation and yoga (Berkman, 2007). This in turn brought exposure to new musical sounds and improvisational and compositional processes. The influence of yoga and spiritual universality teachings became an influence that contributed and “shaped jazz aesthetics, inspiring jazz musicians to dissolve formal and stylistic boundaries and produce works of great originality” (Berkman, 2007, p.42). Musicologist Franya J Berkman (2007) discusses Coltrane’s music in relationship to the teachings of Advaita Vedanta, which provided the foundation for Coltrane’s musical devotion to spiritual universality and inspired some of the most distinctive and original musical innovations of the twentieth Century. What follows here provides further understanding of my improvisation with Alice Coltrane’s music during the fNIRS sonification process. Through a contemplation of Alice Coltrane’s spiritual journey her music becomes a sonic emblem of self-realisation and spiritual universality, and a reflective on the methods of embodied practices.

In 1967 after an invitation from New York filmmaker Conrad Rooks, Swami Satchidananda visited the US. He was a well-known spiritual teacher and a pupil of Swami Sivananda and Sivananda’s Divine Life Society. Swami Satchidananda was to teach the Vedic concept of self-realisation that became central to her music making. Its emphasis on personal potential and inclusiveness was an empowering philosophy which captivated Coltrane and, alongside her first trip to India it had “a dramatic impact on her spiritual evolution and her related aesthetic sensibility” (Berkman, 2007, p.50). On her return from India, Coltrane recorded *Universal Consciousness* (1971) a mix of contrasting instrumentation, improvisation, and jazz, classical, and world music. On the release of this album, she came to be known by her new spiritual name, Turiya. In the liner notes of the album, Coltrane describes her new creative goal for her music making to surpass mere technical or artistic aims and to realise and express the experience of the absolute. Coltrane described this as “extraordinary transonic and atmospherical power” which could send

forth “illuminating worlds of sounds into the ethers of this universe” (Berkman, 2007, p.52). With this new drive came a new musical daring Alice Coltrane’s “compositional sensibility [...] was reaching beyond musical boundaries of the jazz genre to fully explore other traditions and styles and reach into the absolute” (Berkman, 2007, p.51). The political dimension of Turīya’s self-realisation should also be included in this discussion and Berkman makes the first germane argument, in stressing that the politics of an ‘authentic self’ is a form of revolutionary praxis.

“The notion of expressing an ‘authentic self’ is intrinsic to the musical philosophy of both John and Alice Coltrane, the jazz avant-garde and one might argue jazz in general. The authenticity they sought through ‘truth on your instrument’<sup>43</sup> was intrinsic to their notion of musical and spiritual universality. It also had extensive political ramifications during the 1960s particularly as a display of personal liberation and black cultural expression. In the comprehensive reorganisation of religious and political authority during the ‘60s, individual, authentic, and spiritually inspired jazz music could constitute symbolically a form of revolutionary praxis” (Berkman, 2007, p.55).

Cultural historian Melanie McAlister further suggests that the spiritual explorations of black America were “a way of forming an alternative sacred geography” (McAlister, 1999, p.630); and while neither Alice or John Coltrane were explicit concerning transnational politics embedded in their spirituality or music, McAlister positions African American spiritual explorations through non-western religions more broadly as part of a wider discourse that “encompasses a re-visioning of history and geography in order to construct a moral and spiritual basis for contemporary affiliations and identities”. McAlister describes this alternative sacred geography as lending itself to offering alternatives to the official version and that it has an ability to move “transnational affiliations and claims to racial or religious authority that can challenge the cultural logic of American power” (McAlister, 1999, p.638; Berkman, 2007).

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<sup>43</sup> Berkman (2007) identifies ‘Truth on your instrument’ the notion of expressing an “authentic self” as intrinsic to the musical philosophy of the jazz avant-garde. John and Alice Coltrane encouraged their band members to seek an “entire experience of the expressive self” and find “truth on your instrument”. This was paramount in Alice Coltrane’s notion of musical and spiritual universality. This also had extensive political ramifications as a display of personal liberation, expression and praxis (p.55).

#### 4.8.6 Appropriating Universality

It might be argued here that both my own appropriation of Coltrane's improvisation and Alice Coltrane's appropriation of non-western spirituality constitutes what postcolonial scholar Edward Said (1971) has identified as "the phenomenon of Orientalism", wherein the Western imagination all things Eastern come to represent "a place of romance, exotic beings, haunting memories, landscapes and remarkable experience" (p.1). But whilst Coltrane and I may or may not represent Indian spiritual philosophy in a reductive manner, Berkman identifies a political agenda that opposes Orientalism in Coltrane's music in which Coltrane's valuation and engagement of third world forms can be seen as a wider opposition and discourse, that potentially offers critique, relief and resistance from imperialism.

"The emergence and valuation of "Third World" forms of expression, whether they are political, artistic or spiritual, provided an important back drop to the music of the jazz avant-garde as it expanded the sources that musicians could draw from and what music could mean in the bigger picture" (Berkman, 2007, p.55).

Coltrane's musical and spiritual journey alongside her engagement with Indian and yogic philosophy and those of other African American artists during that time was an immersive engagement. This bricolage elicited value and interest to the expansion and expression of its teaching (Berkman, 2007). In order to produce a fNIRS sonification, Coltrane's music provided the essential element of *listening*. Through our hearing, of her ears and fingers working (or listening) through the improvisation I had found a means to sonically convey breath-work as a form of listening. Furthermore, Coltrane's music was a lifetime's work of cultivating the idea of a universal self, which yogic breath similarly looks to achieve. This alongside the historical connotations of the harp as representative of the human nervous system during the Enlightenment provided rich material to express the notions of a vibrating yogic body. Coltrane's improvisation was a correlative to the findings that were developing in this breath-work research.

# BREATHING SCORE FOR TURIYASANGITANANDA

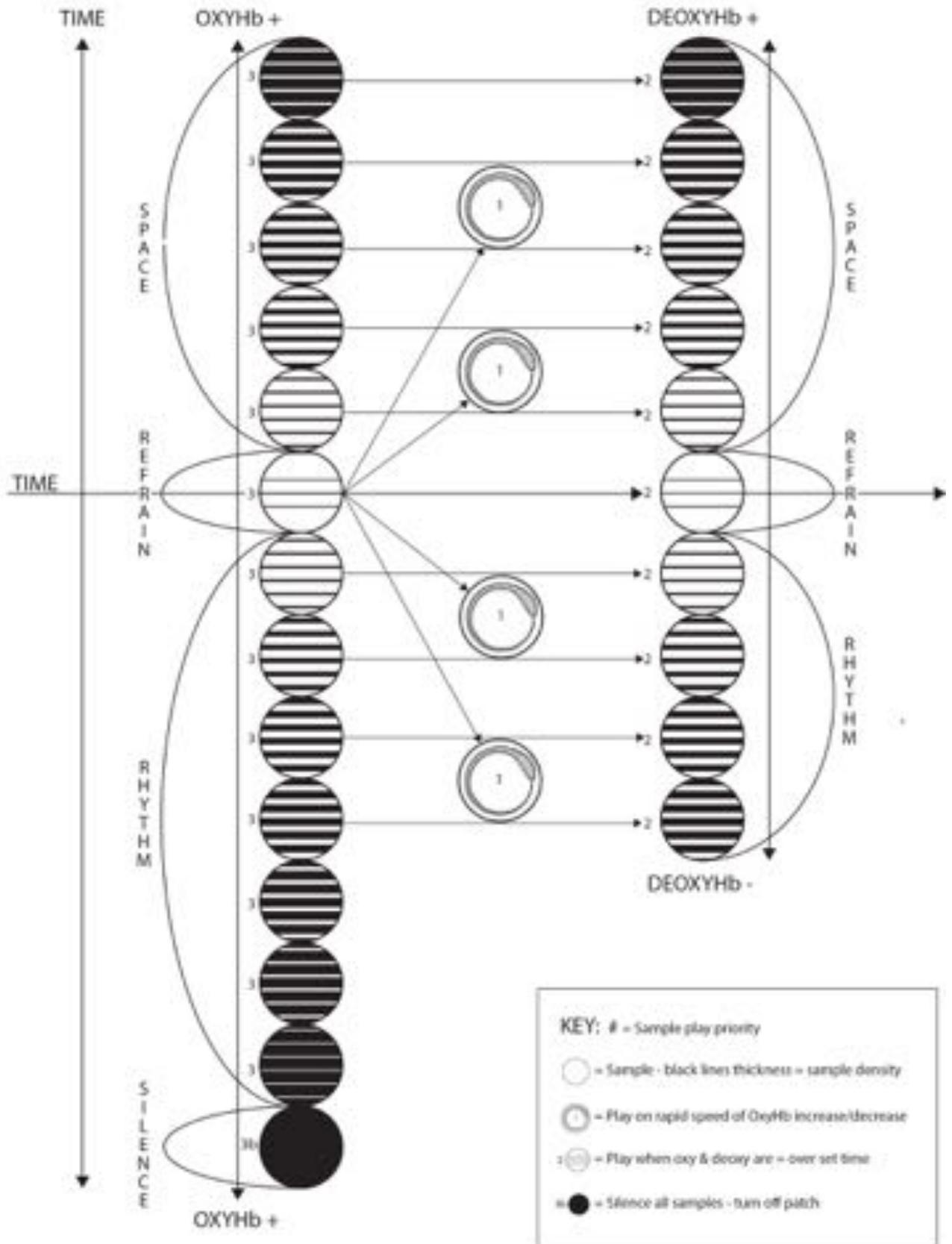


Fig. 26 Breathing Score for Turiyasangitananda. Helen Collard

#### 4.9 Graphic Score for Turiyasangitananda

I developed a second score (Fig. 26) to map Coltrane's harp improvisation to the haemodynamic response of blood flow during *prāṇāyāma* practice. Coltrane's harp improvisation was mapped into twenty-eight separate samples. The mapping of these samples to breath and its haemodynamic response was scored graphically and the phrasing and properties of each sample were placed into a scored framework for playback.

The score contains two different dimensions of time. The X axis represents the linear quantitative element of time, whilst the Y axis represents the qualitative aspects of felt time. The Y axis (felt time) was broken into four sections, titled 'refrain', 'space', 'rhythm' and 'silence'. The 'refrain' section, was bracketed around the baseline reading of 0 which indicates normal breathing. This section contained a single, sparse and simple refrain that becomes easily recognisable and familiar. The 'space' section above refrain contains five samples, and the score shows how for each sample the quality of spaciousness denoted in the graphical representation of thickening black lines increases with a relative increase in oxyHb. Below the baseline 'refrain' section, the 'rhythm' section begins contains seven samples, and the intensity of rhythm in each sample corresponds to the decreasing level of oxyHb again denoted graphically by the thickening of black lines. At the end of the 'rhythm' section the silence section begins and here one closing sample plays. This section relates to extremely low oxyHb levels, which are only achieved by time spent in a posture called savasana. Once 'silence' is triggered sonification is turned off and no more samples are played even if oxyHb levels rise again.

To indicate equal oxyHb and deoxyHb levels, alternate samples in the right hand Y axis are triggered if the difference between the levels is within a certain range. Finally, to indicate intense increases and decreases in the haemodynamic response over very short periods of time, four samples could be triggered. Two samples triggered by dramatic increases and two samples triggered by dramatic decreases. The samples were chosen for their intensity to dramatise the haemodynamic event. These samples were intense because of the speed and number of notes played by Coltrane, compared to other sections of the improvisation. All samples could be played any number of times, and the numbering on the score indicate the priority of playback so that, for example, if condition 1 is being met that sample is played, but if it is not being met sample 2 is played. Whereas if the condition of sample 2, is not being met then sample 3 is played. After practicing with this system, the number of samples used in the score was reduced to give a wider data range for

each individual sample. Rapid changes between the playing of the samples were occurring due to a small data range for each sample. By using fewer samples, I could increase the data range for each sample. Bracketing the expected range of the expected *prāṇāyāma* data. Although the rapid changes between samples was interesting, it did not achieve the intention to reflect the flow state of the *prāṇāyāma* practice. Reducing the number of samples on both oxy and deoxy axes increased the data range for each individual sample for a smoother and more coherent sonification. This simplification rendered a more musical representation and correlated with the CBF data within a particular *prāṇāyāma* state.

#### **4.9.1 Visualisation: DMX Lighting**

The visualisation of the data was implemented using DMX512<sup>44</sup> and MaxMSP. The lighting rig needed to be portable in order to be used for a performance in Colombia (ISEA June 16<sup>th</sup>, 2017), therefore I focused on one light. I used an RGB light (Cobra Par64). In a set-up which reflected oxyHb values by red light and deoxyHb values by blue light. The data values were expressed as a mix of colours ranged from red, pinks, purples and blue. As the data moved from 0 (for normal breathing) either positively or negatively the appropriate value was shown by the corresponding colour of the light. The difference between the two values of oxyHb and deoxyHb was also calculated and if this difference moved out of a set range (+25) it was reflected in the maximum light value (255 of either red or blue). During a performance, the suspension pranyamas yielded high OxyHb values, and also have a larger difference from the deoxyHb value (see: Collard and Jackson, 2016, and appendix 8.6 – Data Interpretation for an explanation of breath holds and an increase in OxyHb) and in this situation the lights were red but would also strobe due to large shifts between oxyHb and deoxyHb values. During the more soothing *prāṇāyāmas*, deoxyHb values were high and the light would be blue and purple when oxyHb and deoxyHb were close to each other. In savasana the OxyHb value drops dramatically below 0 so a red light would also be shown to demonstrate its move away from the baseline reading of 0 and furthest away from deoxyHb value.

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<sup>44</sup> DMX512 (*Digital Multiplex*) A standard for digital communication networks used to control stage lighting and effects.



Fig. 27 *Finding Prāṇa* Helen Collard 2017. Photo: Jonathon Ackley.



Fig. 28 *Finding Prāṇa* Helen Collard 2017. Photo: Jonathon Ackley.

#### 4.9.2 Performance at ISEA 2017

Although the preparation for the performance was conducted with Northumbria University's BPNRC's Oxymon device (Fig. 27 and 28) the portable Octamon was used for the performance at ISEA 2017. The portable device was loaned by Artinis Medical Systems, and is a lightweight compact Bluetooth system, that was configured to record and relay the same data sets, to Max (see appendix 8.5).

#### 4.9.3 Performance, Practice, Data, Contagion

Working with both fNIRS devices, I began to understand the *prāṇāyāma* not only as a breath practice but also as a discrete set of data values. Specific *prāṇāyāmas* and specific breaths within those *prāṇāyāmas* began to become identifiable within specific ranges and patterns of numbers. This was an important element for the achievement of a sonification to correlate sound to the experience of qualitative time (*kairos*) during *prāṇāyāma* practice. However, as the system was built around this formulation, I also found that this new knowledge of the data was influencing or infecting the way I was practising the *prāṇāyāma*. This issue became evident to me during the preparation for a second performance. The previous performance at ISEA had involved calibrating the system to a range of data and testing with the ranges and patterns of the sonification. My primary concern began to centre not so much on the implementation of the correct *prāṇāyāma* practice (and the striking the right balances of breathing) but on the oxyHb and deoxyHb data levels reaching the predicted numbers to trigger selected samples at those moments. I noticed, for example, that during breath suspensions where oxyHb levels were at their highest (and I had selected samples which were triggered at those levels), I would sometimes find myself holding or suspending the breath a little longer than was comfortable in order to keep the sample playing or to make sure it was triggered. I was riffing off the system. This phenomenon began as an amazing feeling of controlling the playing back of the sample in this way. However, there were other consequences and the *prāṇāyāma* practice due to its relationship with the data and the technology. The *prāṇāyāma* now had external parameters to achieve. The structure that I had coded in Max was responsive to the breath, but was primarily responsive to the levels which correlated with specific cerebral blood flow changes. And although I could adapt and change the ranges, the machine and data were infecting the way I practiced *prāṇāyāma*. In many ways I felt it was an incorrect way to be practising. By listening for the samples I had correlated

with particular breaths, rather than the breath itself, I became attached to achieving the playing of sounds I had intended. If a sample played in a place that I wasn't expecting it to, then I would use my breath to try and get the data back on track, to the sound I had intended. The *prāṇāyāma* practice was operating within a new system in which the machine and I were contagious of each other.

After the ISEA performance, I stopped my usual daily practice. Although it had been a fascinating insight into the sonification of my breath; or rather the haemodynamic response activated by my breath, I felt that I needed a rest period from it and I stopped my usual daily practice. However, three months later, I needed to get some clear documentation of the NIRS work so I went back into the BPNRC to use the NIRS and document the system. Part of this process involved resetting my system back to the original BPNRC Oxymon kit I had initially used.

However, during the testing, it became apparent that the sonification was not triggering the sounds as it should. Interestingly, after checking all the relevant settings and code, I decided to look at the data. What I found was a human change, the range of data produced during the *prāṇāyāma* had become reduced dramatically. I attributed this to the fact that I had not practiced for many months. And even when I reset the ranges within the sonification patch in Max, there was still not enough variation within the data to show the specific differences between and within each *prāṇāyāma*. Because of this, I had to delay the recording of the documentation and began my morning *prāṇāyāma* practice again. As soon as I went back to practising each morning and although this may have been inconsequential, I realised that both my nostrils were very blocked. After three weeks of regular daily practice and the use of a neti pot (used for saline nasal rinsing) the data had returned to the ranges that I was expecting, making it possible to apply the sonification.

The use of the listening improvisation work of Coltrane and its implications for self-realisation was an artistic decision that made sense in creating a human connection with an audience. Particularly in its evocation to a self in its listening.

### \*\*\* Summary

*Hawk* established breath as a bridge to the mind. I reasoned that *breath is a technology* in which we can listen to the self. This feedback loop between breath and self is then further

investigated in *Finding Prāṇa*, through the application of technology (machines and code) to breathing practices. The performance *Finding Prāṇa* re-appropriates neuro imaging technology to find or listen to breath via the changing hemodynamic response during *prāṇāyāma* practice. Through coupling hardware and software technology with *prāṇāyāma* an audio and visual biofeedback performance is created. The performance combines technology *with* technology; where technology is used to listen to the anatomical data as controlled and effected through breath. *Finding Prāṇa* intertwines two technological ‘mainframes’ – ‘technology of breath’ and a technology of machine (tools). The fNIRS data and the performer become accessible through a sensorial interpretation of sound and visuals, communicating outwardly and making tangible something otherwise imperceptible about our dynamic embodied breathing condition.

In order to highlight the *breath as technology* in which we can listen, the sonification of *Finding Prāṇa* utilises improvisation, specifically jazz improvisation by Alice Coltrane. Drawing on Lipari (2014), I have argued in this chapter that jazz improvisation is a form of listening. The essential component to jazz improvisations form is the player’s listening. Through my sonification of Coltrane’s harp improvisation (via *prāṇāyāma*) we are listening *with* Coltrane’s listening. The connotations of vibration attached to the harp an instrument in which to translate sensory vibrations into consciousness (Trower, 2014) are also utilised within the sonification. Neuro-imaging technology, data and human improvisation has been assimilated into an artistic tool that enables audiences to listen in real time to the changing internal states transitioning externally from within the artist-performer.

## **5. Taxonomic Element –Vibration**

## Chapter 5: Element – Vibration

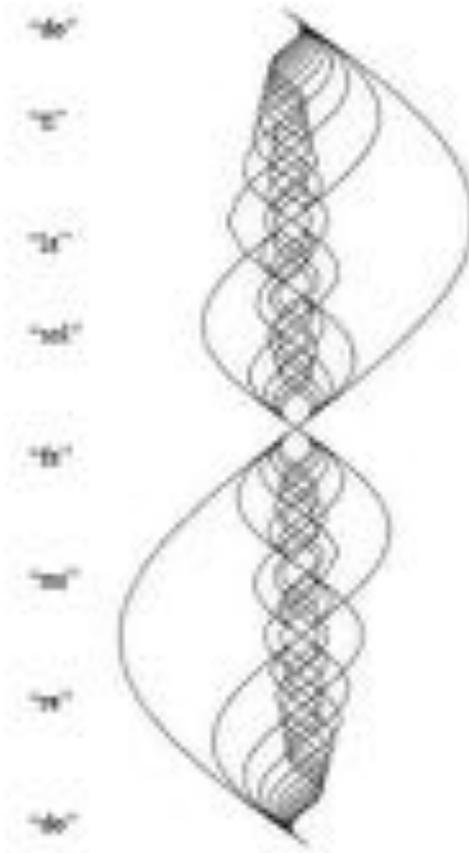


Fig. 29 String Harmonics to 16. Image © Wikipedia. 2017.

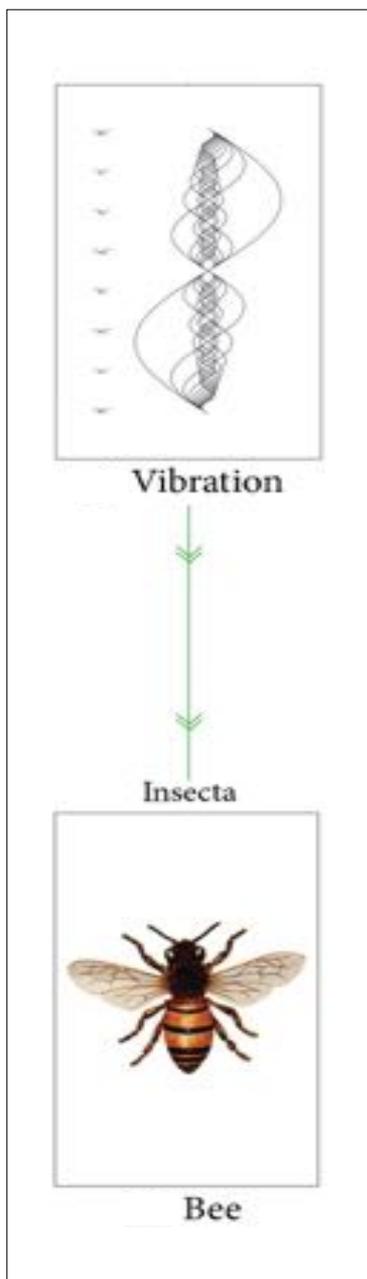


Fig. 30 Vibration & Bee Strand.

“It is said in the Kathopanishad (2:3:2) ‘This whole world – whatever there is – vibrates having originated from *prāṇa*’ (Saraswati, 2009, p.10).

This chapter identifies vibration as the embodied effect of *prāṇa* and its practices within and upon the yogic body. The element of vibration, draws on sound and listening practices and focuses on awareness and attunement of the listening self. Listening is investigated through the work of Pauline Oliveros, Lisbeth Lipari and Jean-Luc Nancy. Furthermore, listening practices are considered in the context of a vibrating material world and the significance of the consequent *methexic* (contagious participation), intrinsic to being an embodied vibrating being.

This chapter’s element of vibration also involves the Bee as its taxonomic animal. The Bee is utilised here as the symbol and embodiment of vibration as a communication system. The chapter includes a discussion of a sound installation entitled *Public Address System* which explores embodied vibration and entrainment of the listening self and otherness through a sound meditation called *bhrāmarī* (black bee).

### 5.1 Element Definition: Vibration

The vibrational effect on the yogic body of breath practices was identified through the observations, conversations and practices I engaged in at Kaivalydhama. Vibration became a new source of enquiry in my research into defining the experiential effect of embodied yoga practice in order to create a sonic map. From my notion of breath processed through the yogic body and its communication, vibration now seemed a plausible trajectory of embodied practice in order to facilitate my application and mapping of technology and

sound. To support this thinking about the yogic body and rhythmic vibration further, communications scholar Lisbeth Lipari provides a proposal that reframes the body as a whole resonating chamber. She begins this proposal by reminding us of embodiment as a living being:

“Culture is more than values, ritual, custom, belief. It is more than art and architecture [...] food, kinship [...] or language. Culture is a living being, and its habitat is the body. Embedded in the five senses, the cultured body lives and breathes in moving corporeality, enacting and re-enacting itself moment by millimetre with every gaze, and passing sigh, moving with the rhythmic patterning of gestures, postures and everyday talk”  
(Lipari, 2014, p.30).

However, more often we attribute our operations as solely conducted from the neck up, where everything is mostly, or really just happening “between the ears” (Lipari, 2014, p.30). We are reminded through both Lipari and the concept of *prāṇa* (through the prefix *pra* meaning constant and the suffix *na* meaning movement) that we are living beings in constant movement. That we “humans are embodied beings – we live in and with and from our bodies” (p.30). The yogic body and its *nāḍīs*, are posited in opposition to the Euro-American philosophical schematic, resisting the separation of the body from the mind. From the research findings of Kaivalyadhama, the biofeedback scientists and the more recent findings from science and medicine, (Noë, 2009) the mind and body as inextricably interdependent has gained considerably more purchase.

## **5.2 The Giant Listening Organ**

To explore the relationship between the mind and body and embodied practices and vibration, a proposal from Lipari offers further support: “what if our ears aren’t really in our heads, but are our whole body? What if our entire body is one giant listening organ, one great resonating chamber? What if we are, in some sense, all ears?” (Lipari, 2014, p.30). In this research I align my depictions and practices of the yogic body and its vibrating network of *nāḍī* or conduits with Lipari’s thinking and questions. Further to this consideration, when we trace the movement of sound through materials such as air, water, metal, earth and bodies, we understand vibration as sound, which has a power that can

move and change the matter it encounters. When we listen to sound, particles vibrate and acoustic waves travel via air. Sound waves enter and move through a variety of bodily boundaries, entering the eardrum along tiny bones into a fluid filled membrane lined with frequency-sensitive hair cells. Activated hairs fire off neurons to the brain (Roberts, Howard, and Hudspeth, 1988, p.77) and we are moving. Lipari expands further:

“When you are listening to music, the music is not just playing in you, it is rather playing you, your body becoming a musical instrument, a resonating chamber. The music echoes through your mind, reverberating your bones and synapses such that you become the music. Listening may or may not compel you to wiggle your hips or bounce your head, but the waves of sound are nevertheless moving you” (Lipari, 2014, p.31).

As sound waves enter our body, and move us, our bodies, our nerves, are undoubtedly vibrating. Lipari compares the body to a vibrating resonating chamber, like the ear but bigger. I am arguing here that the yogic body parallels this phenomenon through breath. I propose that in the yogic body like the ear we are listening out for the return and movement of the interior and exterior.

“When one lives with birds one sees how the noise level of the birds keeps up with the noise level of the house, with the wind that begins to whisper and whistle across the sidings, with each notch up you turn the volume dial on your record player. It is the rumble and rasping of the inert things that provokes the vocalisation of the animals; fish hum with the streams and birds chatter in the crackling of the windy forest. To live is to echo the vibrancy of things. To be, for material things is to resonate. There is sound in things like there is warmth and cold in things, and things resonate like they irradiate their warmth or their cold” (Lingis, 1994, p.96).

The concept of vibration in *prāṇa* and yogic practices is an act of resonance, a form of communion. The Philosophy and practice suggest that, through the means of vibration, we can make deep contact in which we attune and listen with the self and a world beyond that self. The relationship between *prāṇa* and vibration is evident in many classical yoga texts, including an often cited passage in the 15th century treatise the *Hathayoga Pradipika* (29,

IV). To explore this yogic teaching more fully, an examination of the original text is conducted to develop an understanding of the connection between vibration and breath, in order to explore this relationship to concepts of listening and sound.

“Mind is the ruler of the senses, *prāṇa* is the ruler of the mind. Dissolution the lord of the *prāṇa* and that dissolution (*laya*) is the basis of *nada*”  
(Muktibodhananda, 2000, p.510).

This passage in its original form adds additional information, telling us that through the rhythmic absorption or vibration of the nerves (*laya*) via the control of breath, we can experience inner sound. To think more about this vibration of the nervous system in yogic philosophy and practice, and to explore its relationship to sound. An interesting parallel reflection to consider is the well-known story of John Cage and his experience in the anechoic chamber at Harvard University. This echoless chamber was designed to absorb all sound. Every sound within it was absorbed into the waffled walls, with no single sound able to be returned back to the listener. However, when Cage visited in 1971 (Kahn, 2013), he reported hearing two distinct sounds: one low and another much higher in pitch. Cage asked the chamber’s attendant engineer, why if the room was so silent, did he hear these two distinct sounds? The engineer explained to Cage that the low sound he heard was his blood in circulation, and the higher sound was the activity of his nervous system. This internal sound experience has been cited as a key moment for Cage, definitive in his formulation and conceptualisation of silence from the perspective that there cannot be any true or absolute silence. However, Kahn (2013) stresses that the sound of the nervous system is highly unlikely (unless the nervous system is equated with tinnitus) (p.89). What follows may seem even more unlikely to those who prefer to apply the ‘rigour’ of anatomical rationality, but, for now, we shall consider this as a guide to the kind of attunement that the cultivation of vibration in the yogic body hopes and aims to engender. The classic yoga text, the *Siva Samahita* (2009), elaborates on the nature of inner sound and, unlike John Cage, it alludes to the possibility and eventuality of reaching silence; although notably with very different motivations. Swami Maheshananda, the spiritual director of Kaivalyadhama Institute describes it as follows:

“Through this gradual practice of this yoga *Nada* (internally aroused sound) certainly gets manifested. Sound that is heard at the initial stage of the practice

resembles (the sound of) intoxicated wasp, flute or lute. In this way as the practice progresses, the sound resembling that of a bell (is produced) which destroys the darkness in the form of the world. Later the sound of roaring clouds is manifested [...] When yogis mind gets engrossed in the sound thoroughly then (the mind) forgets external (world) entirely and gets extinguished along with the sound. A yogi – the renouncer of fruits of all actions – by conquering various qualities through the practice of this yoga gets dissolved into consciousness” (Maheshananda, 2009, p.206).

The two concepts of nada and laya described in yogic practice and texts, are parallel to two key concepts formulated by avant-garde composer and electronic sound artist Oliveros. The next section expands on the concepts of nada and laya through the work of Oliveros and investigates her concepts of deep listening and the sonosphere.

### **5.3 Deep Listening in the Sonosphere**

Deep listening is a process developed by Oliveros (2010), as a practice used in her artworks to cultivate a listener’s awareness of both interior and exterior sound. A process engaging bodies, time and space. It is a practice of listening to and of developing awareness of, all sound, not just music. We are deep listening when we become absorbed in the realm of the sonosphere. The sonosphere includes sounds in nature, sounds in technology, and our own thoughts and sounds. Oliveros conceived the sonosphere as beginning deep at the very core of the earth and then radiating out “vibrating sonically through [and] encircling the earth [...] the sonosphere includes all sounds that can be perceived by humans, animals, birds, plants, trees and machines” (2010, p.22). We sense this sonosphere in relation to:

“The bandwidth and resonant frequencies and mechanics of the ear, skin, bones, meridians, fluids and other organs and tissues of the body as coupled to the earth and its layers from the core to the magnetic fields as transmitted and perceived by the audio cortex and nervous system [...] All cells of the earth and body vibrate” (Oliveros, 2010, p.22).

From the artist's definition we can also clearly see how Oliveros's sonsphere maps to the explanation of an electromagnetic spectrum in science (Martin, Hine, 2015, p.191). Like the sonsphere, it too surrounds us, within air, within nature, and also within our bodies. We can also make and produce our own human electromagnetic fields with technological innovations, such as radio transmitters, mobile telephones and overhead power cables which Oliveros' calls the "technospherical layer." Our own electromagnetic bodies are vibrating within these wider electromagnetic fields. Oliveros argues we are bodies of charged molecules and like all animals, we are vibrating molecular feedback loops which keep time. Furthermore, as these charged molecules move, patterns of forces and changes in energies occur in our electrical and magnetic fields.

#### **5.4 The Mediation of Vibration**

Physicist Steven Swithenby at the Open University has measured magnetic flux or field in the human nervous system with the aid of a magnetometry device called the 'Squid' (Superconducting Quantum Interference Device). Swithenby (2004) has been able to demonstrate the extremely low-level currents and changes of magnetic field that flow along nerves when participants are engaged in thinking. Are these the deep sounds that the *Siva Samahita* might be referencing?

Scientists and artists are showing that organisms make and respond to vibrations.

The artwork of Yoshimasa Kato and Yuichi Ito and their interactive sculpture *White Lives on Speaker* (Fig. 31 & 32) mediates sound vibration into a moving haptic and interactive performance. In this artwork a vibrational link is made that connects the "external world of objects in motion and the internal world of mental activity" (Trower, 2012, p.2). Liquid potato starch is placed on a speaker and sound vibrations are played at a set constant frequency. This frequency excites the starch and it jumps about and forms into solid shapes that dance, and jiggle about. A second variable of vibration is also routed to the speaker. An audience member's brainwaves are taken via an encephalograph and the frequencies of the brainwaves add an additional fluctuating set of sonic vibrations to the speaker and the behaviour of the starch. The audience can experience the vibrational state by touching the starch on the speaker, feeling it move and dance around in their hands. In this work a mediation of vibration from the internal brainwaves of an audience member move across into an external animated movement of starch, this movement across materials and borders

offers a diverse set of connections, an interesting circuit that involves science, neurology, psychology and art. The following section considers the making of my own work using embodied practices and vibration. The sound work *Public Address System* utilises breath, sound and resonance moving across interior bodily spaces out into architectural exterior spaces in order to explore ideas of deep listening, otherness, and participation.

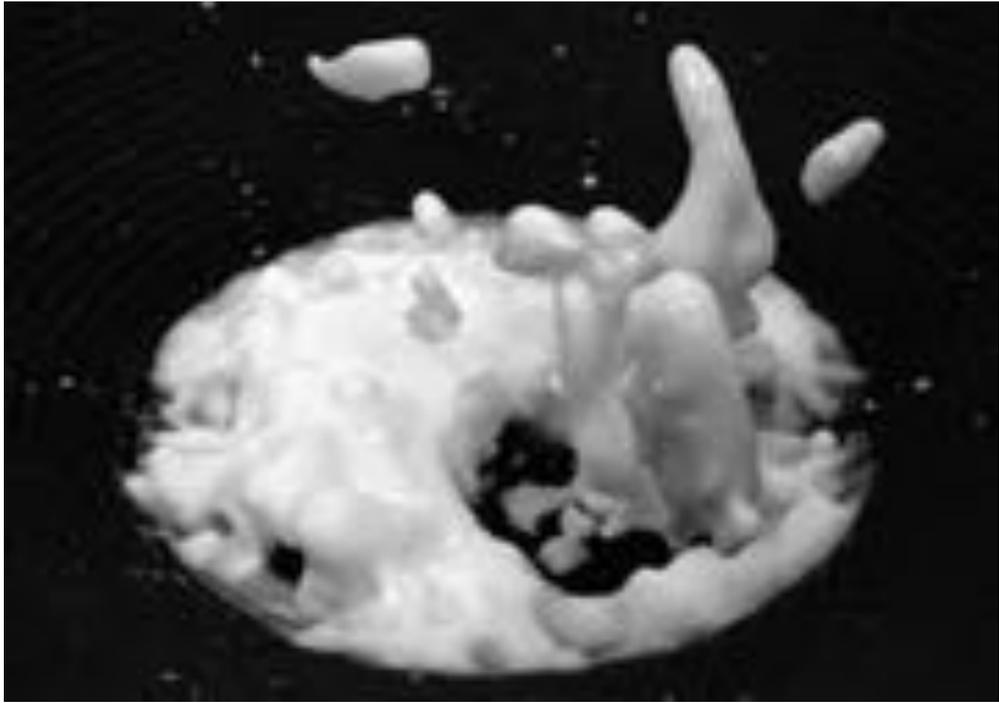


Fig. 31 Yoshimasa Kato and Yuichi Ito White - Lives on Speakers. Example of potato starch shapes excited by brainwaves. Image © Yoshimasa Kato and Yuichi Ito

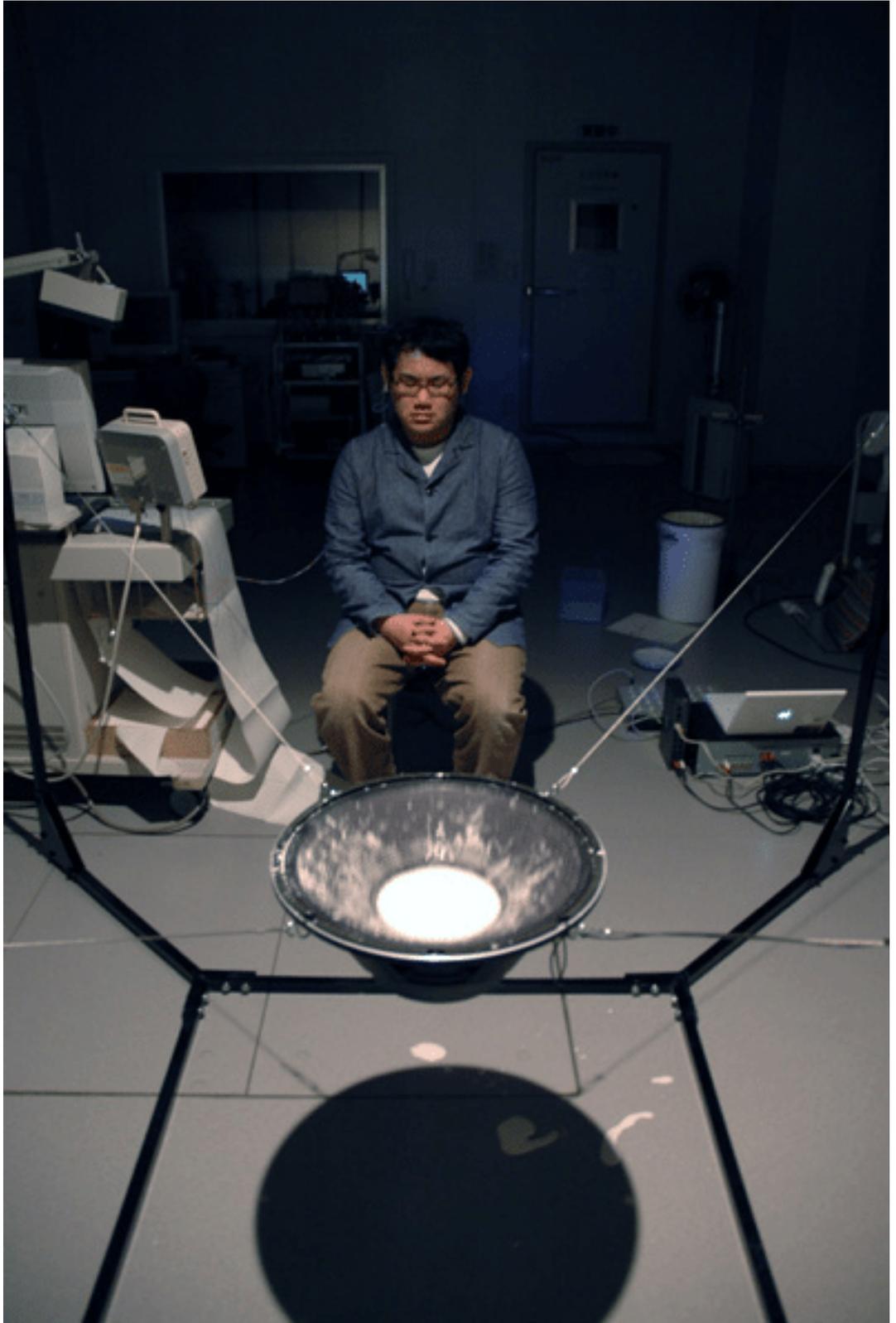


Fig. 32 Yoshimasa Kato and Yuichi Ito White Lives on Speakers. Set up.  
Image © Yoshimasa Kato and Yuichi Ito

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## **5.5 Bee**

(Ensemble Sound Art Performance: *Public Address System*)

## 5.5 Animalia – Bee



Fig. 33 Bee. Image © Britannica.com.

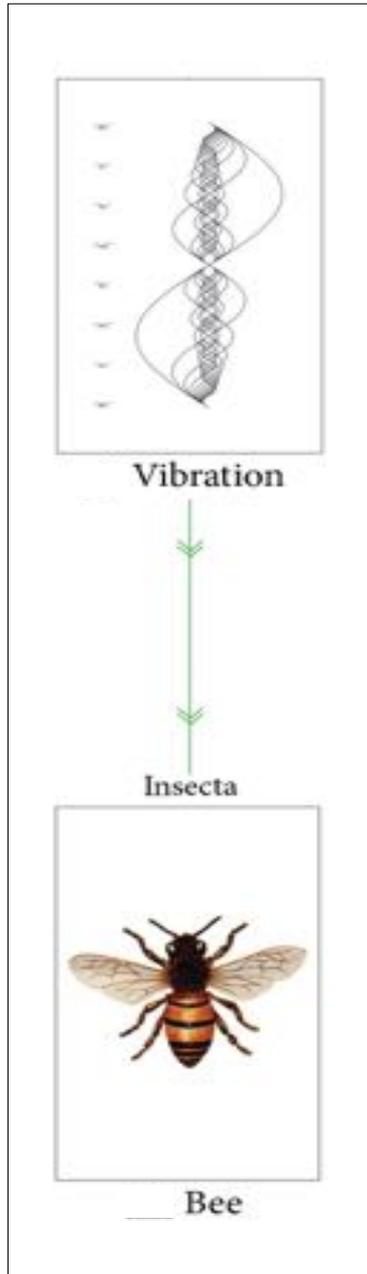


Fig. 34 Vibration & Bee Strand.

*Public Address System* is a sound installation informed by vibration and bees. The performance of this sound installation involves a *prāṇāyāma* called *bhrāmarī*. The word *bhrāmarī* is derived from the Sanskrit word *bhrāmar* which means black bee. In this breathing meditation, the sound made evokes the vibrating hum of a bee. Before I discuss this work I consider our current understanding and the place of the bee within the two technological mainframes.

### 5.6 Animalia Definition: Bee

The bee makes sound: the beating of a bee’s wings creates wind vibrations that the human ear hears as a buzz. But, in the specific case of the bumblebee, the buzz that we hear is from a vibrating body. The bumblebee unhinges its wings from its wing muscles and vibrates its body. The frequency used in buzz pollination is between the tone of middle C at 262Hz and the A above middle C at 440Hz. The peak frequency sits between these two frequencies at 330Hz (Foord, 2018). The vibration causes the flower’s anther to explosively release pollen and, in order to pollinate some types of plants with closed anthers, the bee will wrap its legs right around the flower and then buzz at 330Hz. Buzz pollination releases pollen “like salt from a shaker” (Ellsworth, 2017). Inside their hives, bees flex their flight muscles, generating not only

sound, but also heat, keeping the hive warm through homeostatic feedback at a consistent temperature close to 35° even if it is a freezing -20°C outside. The bee’s significance alongside pollinators like butterflies, is their astonishing ability to pollinate a third of all the food we consume worldwide. Inspired by the incredible work of the honeybee, the ‘RoboBee’ is a human creation designed to operate as a ‘smartbee.’ It is a contemporary industrial agricultural project based at the Wyss Institute at Harvard University. The project develops autonomous flying micro-robots capable of mechanical pollination.

Noteworthy at this juncture, is the global value placed on the biological bee and its pollinating work, the monetary value of which is currently estimated at close to \$200 billion per year (Rangel, 2017). Although quite commonly known, I should briefly iterate the current consensus on the bee's contemporary predicament, in order to consider the impetus for the 'Robobee' development more fully. The bee is under industrial assault. The survival of the honeybee on this planet is in question because of the unprecedented damage by industrial agricultural practices to its immune and nervous systems. The practice of bees being moved from mono-crop to mono-crop leads to the development of devastating microbial problems in the guts of honeybees. Meanwhile, neuropathic chemicals in neonicotinoid pesticides short-circuit the bee's navigation systems, so that they no longer know how to get back to the hive (Talen, 2014). The implications of each bee's microbial imbalance and neuropathic condition play out in terms of the longevity, behaviour, and reproduction of colonies, resulting in widespread hive disease and colony failure (Haraway, 2016a; Mullins et al.; 2010, Goulson et al., 2015). There is a growing fear that the bee's future is in jeopardy, and may well become another addition to the loss of biodiversity in the sixth mass extinction.

The anticipated demise of bees might be old news, but its anticipated replacement by RoboBees might not be so familiar. The Honeybeelula Project by artist Reverend Billy Talen, is an example of art activism that visits the RoboBee laboratories and lobbies the Headquarter of the Robobee's financiers, Monsanto and DARPA (Defence Advanced Research Projects Agency). Through art interventions and singing rituals, the Honeybeelula project involves art activism that questions the makers and financiers of the RoboBees about the development of drones as an "imminent technology to weaponise nature" (Talen, 2014). Alongside full theatrical productions, pop up actions at Harvard and the financier's offices to raise awareness and question motivations. This art activism specifically questions the use of nicotinoid pesticides in the configuration of developing Robobees. For big agriculture companies like Monsanto, Bayer and Syngenta, pesticides containing nicotinoids are an extremely profitable product, one-third of all the pesticides used in the world contain neonicotinoids (Talen, 2014).

For these pesticide companies the creation of a pollinator like the RoboBee, which is a resilient pesticide-proof pollinator, has become a possible technological wonder to making a profit. The word honey is endearing. And as Virginia Woolf (2009) reminds us a word's

meaning is not a singular and separate entity; “words are full of echoes, of memories, they have been out and about on people’s lips” (p.88). The sound of the word ‘honey’ has developed through a complex, sympoietic understanding. A vibration passed between our natural world, our food sources and our lips. What seems clear, in the light of the online literature from the Wyss Institute and the current predicament of the bee, is that the Robobee is a not a honey-making machine, but a silent drone made quite separately, from the current collective problem of the demise and decimation of its inspiration. The next section discusses *Public Address System* an artwork fabulated from the work and sound of a bee, it explores embodied practices as a communicative or listening action.

### **5.7 Public Address System and The Bhramari Ensemble**

“Listening is the invisible and inaudible enactment of the ethical relation itself; upon it, everything depends” (Lipari 2012: p.245).

Broadacre House is a utilitarian building of the 1980s which was previously the local headquarters of the Department of Works and Pensions. Situated in Newcastle-upon-Tyne, city centre, Broadacre House and many of the other buildings surrounding it, are owned by the billionaire property developers the Reuben Brothers. Whilst the Brothers await the fate of a shopping redevelopment proposal, Broadacre House became home to a project whereby it was occupied by twenty-eight charities, voluntary sector organisations and community groups. Essentially, it became a community hub that provided initiatives to tackle poverty and inequality and to improve health and wellbeing. These organisations were key in providing a diverse range of advice, support and services at a time when many people were severely affected by Government austerity cuts in welfare and local council provision. Organisations ranged from the Recovery College which supports addiction recovery, Mental Health Matters, Helix Arts, Rape Crisis, and Families in Care.

My residency there was commissioned by Monkfish Productions, an arts organisation based in the building and funded by Arts Council England. The making of the work began shortly after the building had been used as a location in the Ken Loach feature film, *I Daniel Blake* (2016), in which the character Daniel Blake attends an appeal tribunal for a disputed ESA (Employment and Support Allowance) benefit claim after a heart attack.

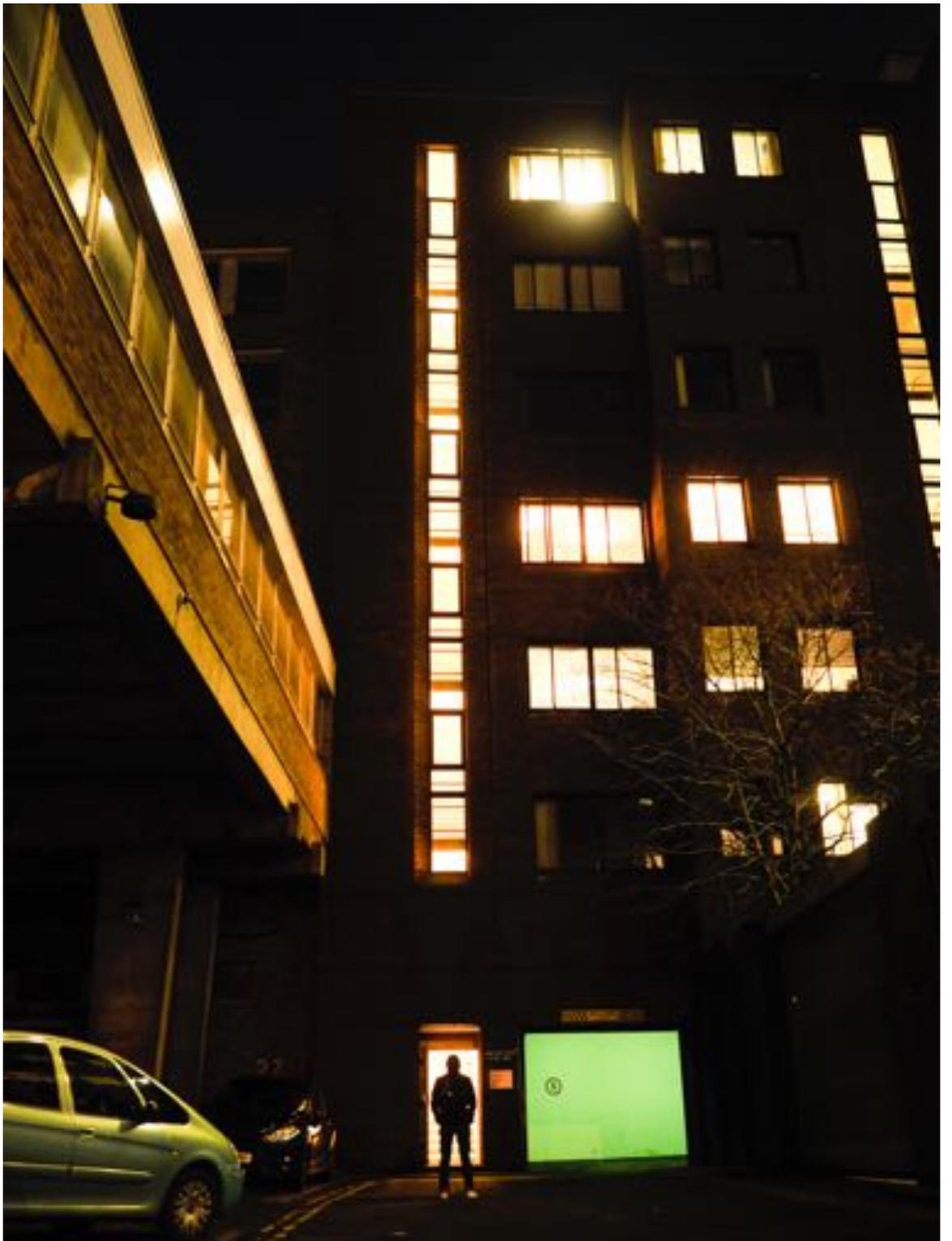


Fig. 35 Broadacre House. Newcastle-upon-Tyne. Photo: Mark Pinder 2016

My brief for the commission was to make a site-specific response to the Broadacre building (Fig. 35). In light of the volume of people coming in and out of the building and the activities and work happening there I was keen to explore notions of listening and vibration. Listening was something that I imagined was holding together the honeycomb brickwork of the building and a touchstone for many of these organisations and their users. The building had six large floors and the stairwell connecting each of the floors was concrete throughout. With no carpet or furnishings to dampen sound in the stairwell, the long duration of reverberation was striking. At the Kaivalyadhama Institute, I had immersed myself in the practices offered by the health centre and the teacher training college. I spent many early mornings seated in a large hall with over 120 people practising *bhrāmarī*. It was a very simple practice, to learn and practice, but had been the means by which I had found out that there was a yogic connection between breath and vibration, it also became a moving experience of practising breath sounds as a community. In practising *bhrāmarī* the sound of a humming bee is made, and through closing off the ears to external sounds sound is heard through vibration and bone conduction of the skull. Like the effects of the sounds we make to soothe a baby to sleep, *bhrāmarī* is known for its calming, relaxing effect in the practitioner, and it is often used to reduce stress. This *prāṇāyāma* is thought to resonate the parasympathetic nervous system and found to reduce blood pressure and heart rate (Pramanik, Pudasaini and Prajapati, 2010).

At Broadacre House I developed a series of workshops to train participants so that we could perform *bhrāmarī* en-masse in the stairwell. The workshops were scheduled at convenient times for those working or using the services, mainly during lunchtimes and evenings. Over a period of 8 weeks, a 50-strong ensemble was formed. The performance took place on the 7<sup>th</sup> December within the stairwell. It was intended to test the bee sound meditation as both a listening experiment and an audience experience lasting 40 minutes). The *Public Address System* performance began with each Bhrāmari Ensemble member seated on a step so that all six storeys were occupied. The performers blocked their ears by using a finger to press the tragus of each ear over the ear canal to close off external sounds, whilst making a humming bee sound. With the sound restricted to only bone conduction, what is invoked is a deep inward listening. It is intimate and immersive and it becomes almost impossible to think of anything else. The sound completely dominates thought and is this is perhaps why it has been found useful for anxiety (Pal, 2016) and depression (Deshbhratar, 2016). This sonification of breath in its simplest of forms, in our bones,

repeated over time, becomes an oscillation. We vibrate, we find and keep time rhythmically, During the performance after fifteen minutes had passed, (fifteen minutes in the workshops had proven to be an effective amount of time to quell any nerves and to find an inner rhythm) the performers removed their hands and could now listen outwardly. They could now hear both themselves and others, the sound resonating out in air, no longer focusing on just the inner vibrational sound, within the confines of a skull. The sound was recorded via condenser microphones positioned throughout the six storeys, and then fed outside the building via a PA system. The PA system transmitted the internal embodied sounds of the ensemble in the stairwell into an external public city space, becoming accessible for inadvertent public listeners beyond the performance inside the building. An audience of approximately fifty descended the staircase experiencing the sound both embodied and reverberating within the bodily and architectural space, and then also on leaving the building via the PA system, as a disembodied soundscape in public space.

The ensemble created a sounding experience inwardly and amongst others. It is a widening out of the return or *renvoi* of the self in Jean Luc Nancy's (2007) sonorous body: "It is not only for the sonorous body, to emit a sound, but it is also to stretch out, to carry itself and be resolved into vibrations that both return it to itself and place it outside itself" (p.8). In this artwork, through both simultaneous sounding and listening at the same time, for each participant and audience member the air is heard, oscillating. The condition of this sound, is essentially relational it emanates beyond the individual. As a sonorous experience it "is tendentially methexic (that is having to do with participation, sharing, or contagion)" (p.10). In the *PAS* performance, on the opening of the ears, sound propagates, entering, leaving, detaching and attaching to others. The private moves across into the public, and a sociality is formed. In Nancy's listening, it is in this resonance, and specifically the access to the resonance of a return or *renvoi*, from this other that we are:

"Passing over to the register of presence to the self, it being understood that the 'self' is precisely nothing available (substantial or subsistent) to which one can be 'present', but precisely the resonance of a return *renvoi*. For this reason, listening—the opening stretching toward the register of the sonorous [...] can and must appear to us not as a metaphor for access to the self, but as the reality of this access, a reality consequently and indissociably 'mine' and 'other,' 'singular' and 'plural,'

as much as it is ‘material’ and ‘spiritual’ and ‘signifying’ and ‘a-signifying’  
(Nancy, 2007, p.12).

The return of the sound event is inflected by the presence of others, architectural boundaries, objects and bodies appear, the event is social. Sound theorist Brandon LaBelle (2006) describes the sound event as both public and psychological. In LaBelle’s example of a voice – his own – the sound moves immediately beyond the self. It moves outward within a room and inward to the heads of others: “To sound then is to live in more than one head.” In this psychological reverberation the sharing of a sound event, listening becomes “a form of participation [...] however banal” (p.xi). The sonorous body, is social, eusocial, like a bee colony even. Vibration and sound is organising us, it is pervasive and penetrating, dividing and combining, an expanding interaction. In *PAS* the performers are finding and making a sonic homeostasis, a hive of sound. It is in this interaction, the spreading of resonance that Nancy (2007) suggests sonorous time takes place. Sound takes place in more than one place and sounding is not so much present on a line but unfurls in “a swell [...] omni-dimensional [...] a hollowing out” (p.13), spreading, opening a space through expansion and reverberation making a space that exists as its own. And, in listening, we enter this sound’s spatiality, “for it opens up in me as well as around me, and from me as well as toward me: it opens me inside me as well as outside, and it is through such a double quadruple or sextuple opening that a ‘self’ can take place” (p.14).

In listening Nancy concludes, within the same time we are both inside and outside, in this “division and participation, de-connection and contagion” we can feel, “time becomes space” (p.14). One of the Bhrumari Ensemble members, Terry, wrote about his experience during the performance (see appendix 11.1 for audience comments). With a background in professional engineering, Tony likened his performance experience to a rotating mechanical device used to store rotational energy – the flywheel. The awareness of a spatial experience through the ebbs and flows of energy is evident in Terry’s description:

“I remember vividly this growing awareness of the others and the sum of the parts, rather than simply being there and doing MY bit! I started actively listening to the collective as well as feeling my own sound and vibrations [...] I was aware of footsteps as the audience passed us. The sound developed a nice groove to it, almost waves ebbing and flowing as people stop to breathe then resume [...] My

main takeaway was my recollection of the ending. Before we started I was actually looking forward to it all being over so we could stop and real life would continue [...]. The second bell chimed to indicate time to wind it down and come to a stop [...]. This was the very permission I had waited for. Surprisingly I didn't stop. I was aware of the chime but I just carried on through the tone I was making, I stopped to breathe and then resumed again. This was bizarre. I hadn't wanted to do it when we first started, but now, I wanted to go on and on and on! So I did [...]. I'm a mechanical engineer by profession so it's not surprising that I struggled to describe something made up of noise, feel and vibration that I can't see, touch, draw or calculate. However, I was very much aware of an energy build up [...]. This compares to a large flywheel on an engine or power press. A huge mass of metal taking a lot of energy to get it moving by overcoming its own mass and inertia but once its underway mid-cycle it runs incredibly freely almost effortlessly. The power is then turned off but the energy contained within the flywheel means it continues to turn and slow down to a stop only very slowly indeed almost reluctantly, very much like the *bhrāmarī* performance.”

In listening, we have access to the return of the sound event. A space that is inflected with the presence of self and others. In the work of Lipari (2014), there is a further expansion on this discussion. Lipari focuses on the human experience of being as an ethical relationship with others enacted by means of listening. Furthermore, through this approach, Lipari places compassion not as the assumed fruit of understanding, but rather the foundational element from which listening and ethics can arise. A subsequent performance of this work at BAL TIC Centre for Contemporary Art is documented in appendix 11.2.

### **5.8 Encounters with Alterity**

Lipari (2014) makes a comparison between listening to the moment of quickening. In which she argues that, in moments of quickening, like in listening, the cognition of another self is involved. An example of quickening, is the moment a pregnant woman begins to feel a new life growing within her. Lipari also makes literary examples such as Ellen Bryant Voight's "hawk adrift in its fine solution of clouds" or Virginia Woolf's shell-shocked veteran in *Mrs Dalloway* who sees and feels the "interconnected vibrations of life" in which "leaves were alive; [the] trees were alive ... leaves [were] connected by

millions of fibres with his own body” (Lipari, 2014, p.176). In these examples, we see that, in moments of quickening, like in listening, the cognition of another self is involved. It is an admission of another being, an outsider, the ‘not-self’ an alterity. In the case of *Public Address System*, this notion of quickening is evoked through sound in the stairwell. A quickening of feeling of the immediate self within through bone conduction and when the ensemble removed their hands from blocking their ears the return of the tones and timbres of otherness. In the other’s presence, a concession is made, in which in some ways we are bound to each other; binding and un-binding, away from and towards each other. It is in terms of this concept of listening that Lipari thinks of an ethic that can “speak by way of listening; and more specifically, it speaks by way of listening for and to the otherness of others” Moreover, through the lens of Nel Noddings’s feminist care ethic, we can view this kind of listening as “a process of engrossment”, an absorption, “a feeling with” (Noddings, 1984, p.29) Noddings suggests that:

“I do not “put myself in the other’s shoes”, so to speak, by analysing his reality as objective data and then asking “How would I feel in such a situation?” On the contrary, I set aside my temptation to analyse and to plan. I do not project; I receive the other into myself, and I see and feel with the other” (Noddings, 1984, p.30).

Nodding’s notion of emphatic engrossment is further illustrated by her example of a crying baby. Here we sense that something is wrong, we feel the vibration of a baby’s wailing cries in our own body, it enters into our memory, into our imagination, and the baby’s feelings become our own. We are responding in a ‘feeling with’ state. It is this state that *bhrāmarī* engenders, and it is worked with in this performance. Nodding contrasts this state of ‘feeling with’ to the usual rational objectivity, the putting of ourselves in someone else’s shoes, which she describes as: “a thinking mode that moves the self toward the object. It swarms over the object, assimilates it” (p.33). We can reflect, from Nodding’s observation, upon how often it is that we think we have to understand, to put ourselves in the place of the other, in order for us to be able to feel compassion. But, as Lipari illustrates, engaging with alterity may in fact mean that we are unable, or resistant, to understand in some events and experiences may be totally beyond the realm of anyone’s imagination and comprehension. They might threaten our beliefs or feel detrimental to my sense of place and order – incomprehensibly other. Encounters with such alterity, or otherness, is a souvenir, repeated over and over of the fact “that our idea of reality is not

reality” (Lipari, 2014, p.182). In encounters with others there are considerable barriers and pitfalls that hamper an ethical response, ranging from deep denial to extreme demonisation. But what Lipari and Noddings bring keenly into focus is that “insistence on making rational understanding the ground of compassion keeps us from even listening to suffering to begin with” (Lipari, 2014, p182). Listening is an opening that occurs before understanding, and Lipari argues compassion begins before listening.

As with all our perceptions, listening is patterned and embedded through socialisation and the experiential and cultural relationships we make – our “habitus” (Bourdieu cited in Lipari, 2014). The way we listen, our ‘habits’ of listening, discerning what pleases or displeases us, what we value, remember or ignore, store or delete, is built through this construct of habitus. As described in chapter 3, and in relationship to habitus our attention is again drawn back to practices that challenge the unconscious, imprinted ways we embody and perform patterns, often unknowingly in accordance with defined structures and standards. Coupled with our current want and need to align our understanding as a route to compassion, this leads to acknowledgement of the underlying problem: “we habituate to the already existing linguistic categories, structures and schemas with which we constitute the world” (Lipari, 2014, p.183). An ethics, then that is dependent on or formed from a shared understanding can only be, as Lipari highlights, “a selective ethics – if it can be called ethics at all” (p.83). In this kind of ethics, not all can and will be heard; those others that we do not understand, those that disrupt or breach our own understanding, will be closed out – unvisited.

Lipari’s resolves this rift by re-routing our formulation of listening, understanding and compassion. Compassion for Lipari is a starting place for listening, rather than its result: “Compassion is not and never can be the fruit of our labours to understand. Compassion is instead the very ground from which listening, and ethics may spring” (p.183). This revealing reconfiguration is discussed here not so much as a reason for having made *Public Address System*, but as a theoretical support, revealing compassion as the basis of listening.



Fig. 36 *Public Address System*, The Bhamari Ensemble, Broadacre House, 2016. Photo: Mark Pinder 2016.



Fig. 37 *Public Address System*, The Bhramari Ensemble, 2016. Photo: Mark Pinder 2016.



Fig. 38 *Public Address System*, The Bhamari Ensemble, Broadacre House, 2016. Photo: Mark Pinder 2016.



Fig. 39 *Public Address System*, Erick Street, Newcastle-upon-Tyne, 2016. Photo: Mark Pinder 2016.

### \*\*\* Summary

*Hawk* established breath as technology. *Finding Prāṇa* applied neuro-imaging technology to listen to the changes of cerebral blood flow through a *prāṇāyāma* breath practice; and as such intertwines two technological ‘mainframes’ – technology of breath and a technology of machine-tools. Both *Hawk* and *Finding Prāṇa* are solitary performances. As the final performance in the series of research experiments, *Public Address System* expands from the solitary practice of the previous performances to an ensemble sound performance of fifty participants.

The sonification of the breathing-listening practice of *bhrāmarī* captures the the internal and external exchange of the breath. The neuroimaging technology used in *Finding Prāṇa* charted the internal-external exchanges of an individual solo performer. The sonification of this performance enables us to listen to a breath collection as it plays out. As such we find that breath is a technology that does not simply connect our self as individuals, but makes connections with others also. Deep listening (Oliveros, 2010) is a practice used in Oliveros’s artworks to cultivate a listener’s awareness of both interior and exterior sound. The sonification of the breathing practice of *bhrāmarī* brings awareness to both the internal and external exchange of *prāṇa* and its sound. As such we find that breath is a technology that does not simply connect our self as individuals, but makes connections with others also. In this listening we have access to the return of the breath and its sound event, a momentum in space that is inflected with the presence of self and others. Through this performance I argue that breath is a technology; which is a *technology of listening*.



## **6. Conclusion**

## Chapter 6: Conclusions to this research

### 6.1 Realising the aims and ambitions

As practice-based research this project has developed a cross-disciplinary embodied practice that draws on the conventions of yoga, biofeedback and performance art to build an experiential understanding of breath through the concept of *prāṇa*. Understood from the beginning of India's literary record (Mallinson and Singleton 2017) *prāṇa* or life-breath offers an essential connection to breath and air's physical, mental, ethical and philosophical dimensions. From this foundation, the project has engaged *prāṇa* as a tool for performance and given attention to the importance of breath and breathing as a life force and medium for art production. By doing so the research has realised its aims and in turn makes a contribution to the field not only of embodied audio-visual interaction with biosignal interfaces, (through the performance of *Finding Prāṇa*), but also as a collection of three performances to the field of biofeedback art. *The Taxonomy* makes a contribution to practice-based research through its distinct role in the methodology as a way of tracking the practice in-the-making that realises the three performances.

The development of the research practice was shaped by an initial fieldtrip to Kaivailayadhama; which is a research institute that was established in 1924 to 'bring together science and spirituality by coordinating the spiritual aspects of yoga with science (Alter, 2004, p. 83). Influenced by Kaivailayadhama, the research contribution to the field of biofeedback performance developed in two ways: firstly, by privileging the experiential elements of a breath practice – going beyond its anatomical confines; and secondly to recognise that technology goes beyond our current everyday understanding of the technology of machines and algorithms to recognise the technology of the body also.

### 6.2 Outputs of the Research

Informed by an initial fieldtrip to the Kaivalydhama Yoga Institute this PhD research project has realised:

- a documentary film also called *Finding Prāṇa* which is a presentation of my fieldwork at Kaivalydhama: presented at the Association of Medical Humanities conference, Dartington Hall, Devon (2015).

Three biofeedback performance works:

- *Hawk* – a solo psycho-physical performance in the field of performance art at Gallery North (February 2015).
- *Finding Prāṇa* – a solo performance of a *prāṇāyāma* sequence integrated with neuro-imaging technology fNIRS to render a sonification of the performers embodied state. Performed at the International Symposium of Electronic Arts (June 2017).
- *Public Address System* – an ensemble performance of sound art within an architectural and outside space at Broadacre House (December 2017).

And also produced *The Taxonomy* as a way of writing with and about the yoga-informed art practice.

- *Taxonomic Components of the Thesis* (presented in chapters 3, 4 and 5 of this thesis).

Each of the performance works have subsequently been published beyond the PhD project: *Hawk* (with a workshop) was performed at the Bòlit Centre for Contemporary Art, Spain (August 2018) as part of the Denys Blacker exhibition *Mapes efimers. Complicitats i sincronies*; *Finding Prāṇa* was published in the journal *Ubiquity: The Journal of Pervasive Media*, (Collard and Jackson, 2016); and *Public Address System* was performed at BALTIC Centre for Contemporary Art, UK (May 2018) as part of GIFT 2018. In addition, a paper is in submission at the *Journal of Affective Disorders* (Hogg, Dreary, Collard, 2019) via a collaboration with the Psychology Department at Northumbria University.

### **6.3 Research Contribution**

This project has developed performances in the field of biofeedback art informed by *prāṇa* and its practices. Beyond a purely anatomical consideration, the yogic concept of *prāṇa*

offers mental, ethical and philosophical dimensions and perspectives. Expanding from the suggestion that yogic breath practices work as a connector (Morley, 2018), through this artistic research I conclude that *prāṇa* works as a technology between our inside and outside selves. This finding has been created and developed by the following questions that were posed at the outset of this thesis:

***(Q1) How can artistic research be integrated with breath practices?***

Through three experiments with *prāṇa*, this research offers an embodied exploration of the interconnection between the inside and outside self with application in the artistic field. In each performance I have integrated a specific breath practice using *prāṇa*. Each performance and its artistic field, was configured in relation to the breath practice used in the following ways:

**1) *Āsana* in performance art through the performance of *Hawk*.**

In *Hawk*, I used the methods of performance art, a medium in which the material of the body and mind are explored (Teching Hseih, 1980; Abramovic, 1977). An intense psycho-physical *āsana* practice was formulated into this medium. This performance utilised yogic breath in which a mind and a body connection to breath was made. This interconnection between the breath, body and mind, offered a visual and sonic feedback loop within the artistic field of performance art. This performance illustrates how biofeedback processes within the body using breath can be integrated into artistic research, the artistic field of performance art offered the medium in which to demonstrate biofeedback processes using breath that do not require machine technology to render their presence.

**2) A *prāṇāyāma* sequence in biofeedback art (specifically embodied audio-visual interaction with bio-signal interfaces) through the performance of *Finding Prāṇa*.**

In *Finding Prāṇa* I used the methods of biofeedback art (specifically embodied audio-visual interaction with bio-signal interfaces). A medium in which the re-appropriation of scientific and medical technology within performance is used to render an internal state outwardly (Lucier, 1965; Rosenboom, 1976; Tanaka, 1993). In *Finding Prāṇa* a *prāṇāyāma* sequence was integrated into the medium of biofeedback art through a bespoke built technology that rendered an embodied interaction. The realisation of this project involved an extensive development of prototyping for a creative sound and lighting system which was built using Max and Oxysoft software, the ASCII writer protocol and fNIRS

medical hardware to create a biofeedback work that could correlate, sonify and visualise my *prāṇāyāma* practice through the use of fNIRS data.

This system and *prāṇāyāma* practice offer a unique contribution to this field of artistic practice in which fNIRS technology has been appropriated to explore the changing hemodynamic response during *prāṇāyāma* practice. Scientific technology, data and human improvisation has been innovatively activated as an artistic tool that enables audiences to witness in real time the changing internal states transitioning externally from within the performer. The fNIRS data and the artist-performer become accessible through a sensorial interpretation of sound and visuals, communicating outwardly and making tangible something otherwise imperceptible about our dynamic embodied condition.

### **3) A *prāṇāyāma* – *bhrāmarī* in participatory sound art through the performance of *Public Address System*.**

In *Public Address System* I used the methods of sound art. A medium in which the communication of sound, listening and vibration is explored (Oliveros, 2010; Cage, 1971). In *Public Address System* a specific sound *prāṇāyāma* – *bhrāmarī* was integrated into this artistic field. This integration within a sonically reverberant architecture became a means to explore the connections of *prāṇa*, sound, listening, self and other. The breath through sound was embodied both inwardly and outwardly within an architectural sound installation. The collective sound of this *prāṇāyāma* was broadcast beyond its acoustic capabilities through technology in order to widen the boundaries of its connection to others outside of the architecture and into public space.

This research used breath by integrating yogic breath practices into a configuration that involves: performance art; embodied interaction using technology; and participatory performance through a large ensemble. And although the artistic fields are all distinct each performance is unified under the field of biofeedback art.

### **(Q2) What does this integration contribute to our understanding of *prāṇa*?**

As promoted by yoga the goal of *prāṇa* is to connect outwardly (Ditrich, 2018) – so not just to be connected via your own individual life breath ‘inside’, but to be connected ‘outside’ with others. This is so that the embodied individual “is not viewed as an independent entity but rather as a relational, interlinked, dynamic system or process”

(Ditrich, 2018, p.100). This research explores and finds that a yoga-inspired performance art practice can find this connection – both inside the individual and outside in connection with others. The integration of yogic breath practices within the field of artistic research (through three performances) contribute to our understanding of *prāṇa* in the following ways:

Through *Hawk* I have demonstrated in the artistic field of performance art that there are biofeedback processes within the body. Specifically, biofeedback that connects yogic *prāṇa* to the mind and body. This connection, is made without machine technology. Breath is rendered in this performance as a form of listening, a technology of listening to the self.

Through the performance *Finding Prāṇa* and the use of neuroimaging technology fNIRS the anatomical changes of CBF can be sonically and visually mapped. This is a contribution to the understanding of *prāṇa*, through an embodied audio-visual interaction. In detail this comprises of a biofeedback sonification that reflects the anatomical changes of CBF through the regulation of *prāṇa* through a *prāṇāyāma* practice. Furthermore, through graphical scoring and improvisation it conjoins the experiential aspects of the artist-performers practice through sound. This understanding of *prāṇa* takes *prāṇa* from an inner embodied practice outward to an audience through sound and visuals in order that an audience or others outside of 'the practitioners body' may engage with it.

Through the performance *Public Address System* an ensemble biofeedback system is created. The integration of the breath practice *bhrāmarī* within a participatory sound art work enables an understanding of *prāṇa* beyond the individual self. Here *prāṇa* is activated collectively in sound both amongst the ensemble and the audience. Furthermore, this collective sound is publicly broadcast beyond its human sound making capabilities through amplification technology. This amplification technology widens the distribution of *prāṇa* from the human and architectural space into circuits of machine technology. Here *prāṇa* is understood as a means to connect the self outwardly; it is a means to be connected to others.

#### **6.4 Biofeedback Contribution**

Collectively as three performances a contribution to biofeedback art is made, specifically through the differing emphasis or location of technology and self within each performance.

In *Hawk* a biofeedback performance is made through the application of breath (as a technology) to connect inwardly to the self, its body and mind. In *Finding Prāṇa* through the application of both fNIRS technology and breath (as a technology) a contribution to embodied audio-visual interaction and specifically performance with bio-signal interfaces is made. Here both the breath (as a technology) and the application of scientific machine technology connect the inward self outwardly to an audience through a sonic and visual interpretation. Finally, in *Public Address System* an ensemble biofeedback performance is made through the application of breath (as a technology) to connect both inwardly to the self but also outwardly connected and connected collectively and technologically to others.

In this research an understanding of breath or *prāṇa* as a technology is offered. This technology is a form of listening or feedback to the self and others. This research has created different ways of listening or feeding back through breath practices within the field of artistic research. In this way *prāṇa* can be understood as a *listening technology*.

#### **6.5 Dissemination**

FLARE has now emerged as an international network of artists and scholars exploring concerns of the interrelatedness of performance, technology, and embodied practices. The project has worked effectively as an arena that has allowed the concepts and practices developed in this research to be extended to other disciplines, other artists and other thinking. I listened for returns, and each FLARE event has seemed to shape the direction of this research. The influence of the processes embedded in the FLARE programme have been integral to the final outcomes and findings of this research. Through the FLARE process this research has been influenced by the practices, ideas and sympoietic working of others; notably, Jane Arnfield, Denys Blacker, Steve Gibson, Magdalena Górska, Victoria Gray, Dick James Hall, Lee Hassall, Sandra Johnson, Josephine Machon, Sally Madge, Siobhán Mullen, Ocells al Cap, Harriet Plewis, Elvira Santamaria, Francesca Steele and Nathan Walker.

## 6.6 Limitations

This research is practice-based. It is scoped by the limits of my subjective experience in the self-laboratorium. Because this research is focused on the development of a practice within the self-laboratorium it is acknowledged that this research does not encompass audience feedback in the tradition of more social science or design-oriented methods. As such there were no audience surveys or interviews undertaken. However written feedback was offered by the artist Denys Blacker who commissioned *Hawk* for her show *Mapes Efimers. Complicitats i Sincronies* (see appendix 3). In addition, some feedback of *Public Address System* is in appendix 11.1; and on the video USB #3). It is therefore acknowledged that in future research this indicates possible opportunity for widening the research scope to include considerations of audience experience.

Additionally, because of the self-laboratorium, comparative analysis using fNIRS with other *prāṇāyāma* practitioners was not investigated. However, this research offers opportunity for this research to be undertaken by multiple practitioners, and therefore offers insight for future comparative study. More details are discussed in future research – 6.7.1 Using fNIRS.

## 6.7 Future & Emergent Research

### 6.7.1 Using fNIRS

Although *Finding Prāṇa* (using fNIRS) is not a scientific study there are indications from this research that suggest further scientific investigation could be warranted. Clinical trials such as those that the BPNRC use in studies investigating the effects of DHA, an omega-3 fatty acid, on cognitive function and cerebral blood flow (CBF) could also be applied to *prāṇāyāma* practice. This would involve increasing the sample size of subjects and range to encompass other *prāṇāyāma* practitioners who are both experts and novices in order to facilitate comparative analysis. In addition, longitudinal studies are a possibility when considering the significant changes that occurred during my own practice over a period of three years; specifically, the dramatic change in CBF when I stopped practising *prāṇāyāma* for a period of three months. This type of study could investigate regular practice as a key factor in affecting specific CBF trends. Finally, specific parts of the *prāṇāyāma* practice could be isolated to understand their effects on CBF and cognitive

function. For example, one study (Heesch, 1999) has found that the dropped position of the chin (*jalandhara bandha*) during some *prāṇāyāmas* and the resulting pressure this places upon the carotid sinus may be substantial enough to activate the baroreceptor reflex, in turn resulting in decreased blood pressure and changes in CBF.

Finally, there are further research implications for how I now understand my *prāṇāyāma* practice specifically in relation to its correspondent cerebral blood flow data. Much like Green and Greens (1977) biofeedback experiments (detailed in chapter 3) in which their subject, showed voluntary control of blood flow through changing the temperature in his hand I have become aware of how my breath changes CBF. Through the fNIRS experiments conducted and the data correlations with *prāṇāyāma* and sonification I have developed to a small extent a capacity for voluntary control of oxy-Hb and deoxy-Hb levels through *prāṇāyāma*. This is an unexpected finding within this research process. It also may prove significant in further scientific studies as it indicates that these phenomena are repeatable and could be voluntarily controlled.

### **6.7.2 The Life of Breath Project and the *Ohmerometer II***

Finally, *The Life of Breath* project is a five-year Wellcome Trust funded research project between Durham University and Bristol University which explores “breath and breathlessness at the interface between arts, humanities and medical practice” (lifeofbreath.org, 2019). I was commissioned with Alistair MacDonald, to make *Ohmerometer II* (Collard & MacDonald, 2018) an interactive sound installation that is played via the user’s breath. It was one of three pieces especially commissioned for the *Catch Your Breath* exhibition by the Life of Breath project using Wellcome Trust funding to draw people’s attention to their own breath. The exhibition launched in Durham, at the Dennyson Stoddart Gallery – Palace Green Library (24 November 2018 – 17 March 2019) and has moved on to the Royal College of Physicians in London (2 April – 20 September 2019). It will be moving to Southmead Hospital Bristol (September 2019). *Ohmerometer II* has been repurposed for Palace Green Library’s exhibition *Wild: A Celebration of the Natural History of the British Isles* (18 May 2019 – 6 October 2019) whilst it awaits transportation to the *Catch Your Breath* exhibition at Southmead Hospital Bristol in the autumn 2019. The *Ohmerometer II* is an interactive artwork that is comprised of a configuration of 29 holes, each hole has a bespoke made vane that captures the user’s

breath. This in turn triggers a sound (including wind, a gong, drones, harmonic om's<sup>33</sup>, tabla and dohlak rhythms and squelchy electronic renditions of konnakol<sup>34</sup> vocals) each breath also triggers a corresponding lighting change. The user can then play a unique composition by triggering the sounds (with their breath) in different combinations and in collaboration with other users. The *Ohmerometer II* is made from wood, breath vanes, a computer, neopixel lights, Arduino processors<sup>35</sup> and microcontrollers. The lights and sound were programmed using Ableton Live<sup>36</sup>, Hairless Midi<sup>37</sup>, and Arduino IDE<sup>38</sup>. *Catch Your Breath* Exhibition Project Officer Jade Westerman, describes the Ohmerometer below:

“As *Catch Your Breath* is about the experience of breathing and breathlessness, we wanted something that would enable visitors to engage with their own breath, not only in thought but through practice [...]. What I find fantastic about *Ohmerometer II* is that it is inclusive and communal. Music and the ability to play instruments – especially those that require breath techniques – are so exclusive. For those who don't feel confident enough to express themselves through music, art, dance or poetry, Helen and Alistair have shown us that our breath can create something beautiful and harmonious. Even for those who can't express themselves through different art forms, a lot of practices can be solitary experiences. *Ohmerometer II* invites group interaction to bring us together through our breath. Its colours and sounds can capture the attention of all, no matter their age or musical ability”.

The interaction created by the players of the *Ohmerometer II* was generated by both breath and machine technology. The breath “powered” the machine technology and enabled a sound composition to be both played and improvised by the user.

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<sup>33</sup> The Upanisadic syllable *om* practiced through repetition is taught in the *Patanjalayogasastra* and became an important mantra practice in successive yoga teachings (Singleton & Mallison, 2017)

<sup>34</sup> Part of the South Indian Carnatic music tradition in which percussion syllables are performed vocally.

<sup>35</sup> Arduino is an open-source hardware and software company

<sup>36</sup> Ableton Live is a software music sequencer and digital audio workstation

<sup>37</sup> Hairless Midi is a serial bridge to connect devices to send and receive midi signals.

<sup>38</sup> Arduino IDE is an open-source Software



Fig. 40 *Ohmerometer II*, Helen Collard and Alistair Macdonald, *Catch Your Breath*, Dennyson Stoddart Gallery, Durham, 2018. Photo: John Donoghue, 2018.



Fig. 41 *Ohmerometer II*, Helen Collard and Alistair Macdonald, *Catch Your Breath*, Dennyson Stoddart Gallery, Durham, 2018. Photo: John Donoghue, 2018.

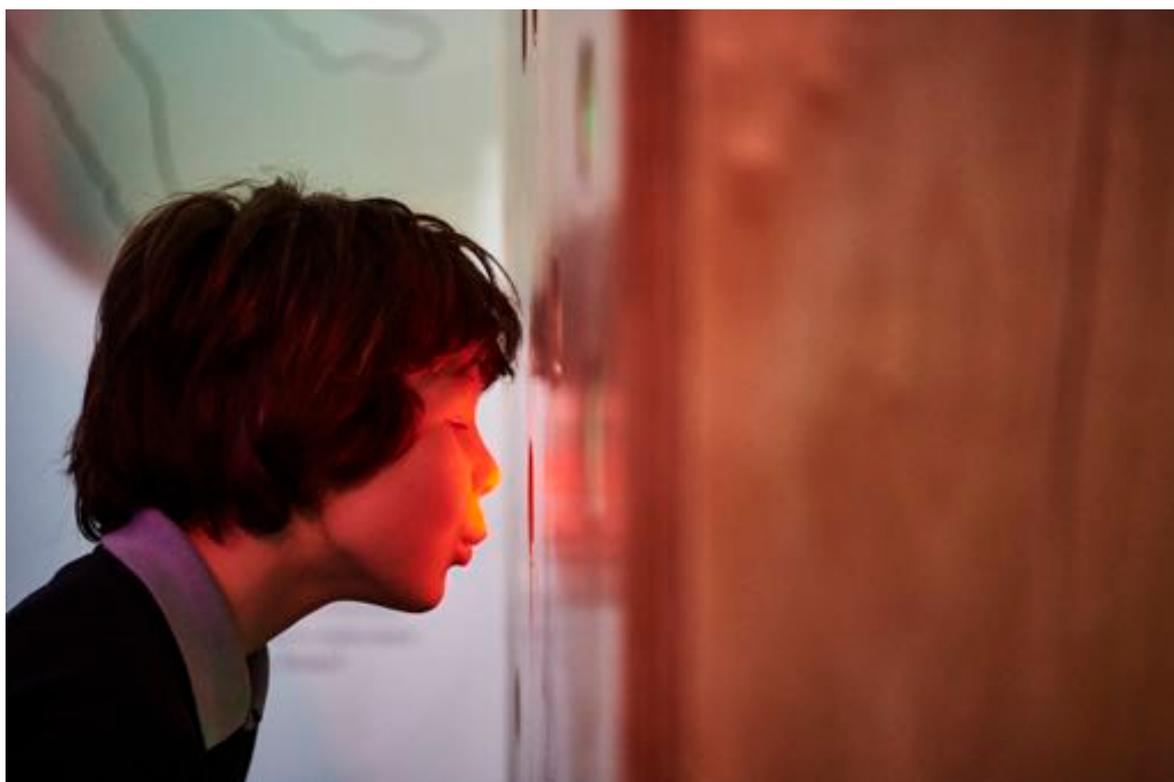


Fig. 42 *Ohmerometer II* player, *Catch Your Breath*, Dennyson Stoddart Gallery, Durham, 2018.  
Photo: John Donoghue, 2018.



Fig. 43 *Ohmerometer II* multiple players, *Catch Your Breath*, Dennyson Stoddart Gallery, Durham, 2018.  
Photo: John Donoghue, 2018.

This work is a future research output informed by the research and performance documented in this thesis. It integrated and utilised many of the ideas and findings of the PhD research. Firstly, the *Ohmerometer II* integrated breath into a technological circuit or mainframe and secondly the breath became connected out from our inside self in this case sonically within the larger environment – within “the immense lung” (Merleau-Ponty, 2002, p.246) outside of us.

### **6.8 Wider Relevance: The Politics of Air**

As demonstrated in 6.3 and 6.4 this research makes a contribution to the artistic field of biofeedback. However, at the time of the sixth mass extinction, *breath as technology* has application within a wider field of research concerned with the earth’s ecologic biofeedback system and specifically the politics of air.

This thesis acknowledges that we as technology existed *before* machines (Margulis and Sagan, 1997). Instead of privileging machine technology alone, the research returns us to our essential human rhythm – in our breath; life force; *prāṇa*. In addition, it enlightens us to the way the air we breathe as life-force is in operation in our self; but also how we are inextricably connected and interdependent. And as such, this practice makes connections between our ‘inner’ and much larger ‘outer’ selves in support of syncopating human action and direction.

Aristotle wrote in the *Politics* (350 BCE) that “what is held in common by the largest number of people also receives the least care” (Deslauriers and Destrée, 2013 p.79). In 2019, it does now seem crucial that caring for our environment, our air and the impact of considering what will happen if we do not care for what is common to all of us is fast becoming an issue for the many. Air pollution exposure is one of the most severe public health problems in the world. Around one in ten of total deaths worldwide are attributable to air pollution (Laybourn-Langton, Quilter-Pinner and Ho, 2016, p.10). The concern regarding the toxicity of our air is further amplified when we consider environmentalist Tim Flannery’s (2007) work, and his assessment of our atmosphere’s un-paralleled dynamism. In one of Flannery’s examples, the CO<sub>2</sub> emitted from our lungs, say in a park where I live in Newcastle last week, could at this very moment be feeding plankton in the

Bohai Sea, not that far from the red flag air pollution alerts in Beijing. Or, in a matter of months, the CO<sub>2</sub> could be dispersed at millions of various points around the entire planet. Flannery suggests that this level of dynamism shows that our atmosphere “is on intimate terms with every aspect of our earth, from the mantle upward. No volcano belches, no ocean churns – indeed no creature breathes – without the great aerial ocean registering it” (Flannery, 2007, p.58). These scientific findings demonstrate how intimately and dynamically we are connected to air.

Emergent research that is articulating the politics of clean, and safe air is gaining considerable traction in both activist and artistic contexts. Conferences and more radical interventions are promoting agendas that are re-cognising the *air we breathe*. In January 2017, over 3000 people participated in *Space to Breathe*, which was a weekend of creative action in response to London's air pollution crisis. The research project *Toxic Bios* is an online outlet for autobiographies about toxicity, offering a publishing platform for those that feel suffocated or trapped in toxic air and for stories of environmental injustice. Recent conference events such as *Large Objects Moving Air* at the London College of Communication explored the agency and materiality of air. The conference *Cultural Histories of Air and Illness* at Warwick University explored the links between well-being and air. Further ballast for scholarly and artistic interest around the themes of this thesis are the EVA (Electronic Visualisation & the Arts) conference *Politics of the Machine – Art and After*, which explored the politics of machines and new definitions of technological structures and artistic production that occupy spaces in-between human and non-human agency.

This thesis has developed an interdisciplinary approach that is imperative if we are to further understand the wider political, social and medical implications and dynamics of breath as *prāṇa*. As a researcher, I recognise and grasp the necessity of producing artworks that can enrich and contribute to the current movements and debates. The research intends to make artistic work that can activate beyond illustrative reporting through engaging audiences in psycho-physical experiences that illicit visceral and individuated responses to the technology of breath. Without re-cognising the attunement and connection we have to breath we may miss out on realising our true technological potential. Furthermore, not embedding these deliberations into our wider technological thinking, for it not to be

considered part of our widest technological mainframe, would mean that we may risk being cast adrift from the immense lung breathing outside of us.

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## **Appendix 1. Yoga Background – Ashtanga and Post-lineage Yoga**

Ashtanga has grown into one of the most popular forms of yoga in the world. Its founder Pattabi Jois established a global network of practitioners. This global network began in the 1970s with the first wave of North American students (including one of my own teacher's Nancy Gilgoff) studying with Jois in Mysore, India. The ashtanga method involves a disciplined 6 days a week practice, moving through a memorised sequence of postures in which each movement is assigned a breath. The Ashtanga method, popularised by Jois has grown exponentially since the 1990s with many celebrity practitioners, such as Madonna and Sting raising its profile.

In November 2017, in the wake of #MeToo conversations, Karen Rain (2018) a famous and expert ashtanga practitioner from the United States published a #MeToo statement to her Facebook page. She described being regularly assaulted by Jois between 1994 and 1998. Alongside Rain's allegation eight more women came forward, some allegations had been previously made, (but ignored) all nine were written about in an article by Matthew Remski (2018) in the Canadian Journal, *The Walrus*. Remski (2019) followed this article with PhD research that collated survivor stories of assault and abuse from students studying with Jois, including Karen Rain's. Through this analysis Remski demonstrated cultic mechanisms within the ashtanga community that assisted and perpetuated assaults and abuses over many years.

Through these revelations and Remski's research I underwent severe disillusionment not only with ashtanga's founder (Pattabhi Jois) but also more broadly with top-down, patriarchal yoga forms. There were many questions about my own practice, my teaching, its lineage and validity. I now consider my practice "post lineage" (Wildcroft, 2019). Wildcroft defines post lineage as "the way in which communities practice after their leadership is compromised by abuse revelations" (Wildcroft 2018, online). Post-lineage yoga:

“rejects the idea that any individual yogic text or modern alignment paradigm can hold complete universal truth, and rejects unquestioning allegiance to a single deity in the form of a living or historical figure. It rejects the common practice of attributing any harm caused within the practice to defects in the practitioner, and

seeks to re-situate the practice in community, and socio-political contexts. Post-lineage yoga is a re-evaluation of the authority to determine practice, and a privileging of peer networks over pedagogical hierarchies, or saṃghas (communities) over guru-śiṣya (teacher-adept) relationships”. (Wildcroft, 2018, p.15)

Rain’s writing and Remski’s and Wildcroft’s research offer tools and enhanced critical thinking about the mechanisms of yoga practice, its hierarchies and community. Their work on student empowerment, self-and-other care, and community resilience within yoga are now becoming adopted and factored within my own practice and teaching. There has been much resistance from within the ashtanga community including its most prominent senior teachers to acknowledge the assaults and abuse. However, Rains and Remski’s work has become difficult to silence and some of the ashtanga community (Monica Gauci, Gregor Maehle) are now beginning to utilise this work as an opportunity to heal and progress the yoga practice and teaching. Rains and Remski’s work not only exposes damaging and dangerous cultural mechanisms within the ashtanga tradition they also offer methods to resolve and adapt behaviours and dynamics.

## Appendix 2. Auto-ethnographic Writing

### 2.1 Notes on Hawk

At the beginning of the performance I stood, like I have stood a thousand, maybe five thousand times at the front of my mat. Ready to practice. I feel calm in the hood, a sedative, a filter. The breath cradles me, the mind comes closer. Intimate, the ears listen in to its sound. Listening to encounter an intelligence, a sound of a breath to move the mind, to move me through. The breath is audible (without any aids of technology) it is my means of communication with the audience. I decide to start the performance before the audience arrive. I want to be in deep, where things happen, habit falls away, when the breath takes me, beyond me as they arrive. An emotion expelled, postures unravel and collapse.

A thought, question or connection made, a strangled memory found. Feelings otherwise un-encountered, unprocessed, untaken care off. It's that stuff excavated when both wild and trained. I start, I'm imbibing, in aspiration, I take to the air. A floating body of air, fractal in another body. Within air's own lightness. Ascendant, to the dream of flight.

I am a bird now, the levitating evidence of a breath so fulfilled, more than in any other creature. The hawk is my daemon, like Pullman's daemon's, this hawk is a soul accompanying me. My vision is acute, a hawk can spot a hare in a field nearly a mile away. Floating high, solitude gained from distance. I soar off, I'm a watcher, of the watched. Unassailable, in-void and complete. I am in emptiness, negative capability.

Lifted free from the grubby realities of the earth's floor. At height, in aerial imagination and vantage. This air I fly in, is the vast outer-ness. Its immensity is "the origin and destination of all things... the universal solvent" (Connor, 2013). At first, I thrive in boundless illimitable space, immense abundance, edges and lines vapourise. But fog accumulates, haze accrues, both mine and others - our waste and deposits, of course, return and cache here. There are no hiding places. I fly amongst it, unfolding and entangling the boundaries, a messenger between this world and all the others I visit and imagine. Gaining orientation, my privilege, my margins, those histories on which I perch. Self-fabricating, off the trainer's jessies, I must become my own centre of action.

## 2.2 Listening to the Vinyl

Listening to the vinyl, the vinyl rotated,  
it bought us into séance,  
sound communicates,  
the moving fingers of Alice Coltrane  
playing harp strings, that once vibrated in the air of 1980s Warsaw  
and the vibrating diaphragm of a recording microphone.  
The microphones movements convert air into electrical energy;  
and this moving air pressed into vinyl.  
Here on my turntable, a needle diffuses it right back out  
defrosted. A process reversed.  
Coltrane's sounds spill out into the air.  
Cochlea hairs vibrate  
connecting to her listening,  
and a self from before this time.

## 2.3 The Bees Hum

The bees hum with a human larynx,  
a hive mind, organising ourselves.  
We are materials that reverberate, we can hear ourselves resonate,  
a super-organism, sending out and taking back, permeating through bodies,  
through sound, moving off a step, way-up into a ceiling,  
shimmering between hard return walls,  
expanding out beyond a building, into city air  
- through audio systems made of metal and minerals.  
This private imaginary is publicly amplified,  
an interconnection to singular, plural,  
inside, outside, and beyond – echo-locating  
amongst the vibrancy of things.

## 2.4 Vibrancy

The observing hawk, watching  
grass blowing in the wind.

A cell is keeping time.

The elephants subsonic rumble in a faraway air.

A snake's rattle, the wings of a hive of bees.

Clown fish and a dance-club floor and dancers.

Tectonic plates grind,

they are vibrant the wind, the oceans syncopate.

An infant's cry, a quartz clock.

A cloud of bats sound out, in an ear a tiny hair moves, a hairs breadth,  
and we reverberate in the hollow space within.

We resonate, we oscillate, living things vibrate.

We are pulsing, rhythmically beating in time,  
to frequencies on atomic and cellular levels.

We coordinate and attune to thousands of vibrations and oscillations,  
in our organs, from the filling of the lungs with air,  
to the daily circadian rhythms of wakefulness and dreaming.

Through sympathetic vibration we phase in, and out to both those around us and to longer,  
deeper environmental rhythms such as the seasons,  
the phases of the moon, the revolution of the earth.

To live here, is to resonate.

### **Appendix 3. Written account – *Hawk* by Denys Blacker**

Performed at The Cistern, Bólit, Centre of Contemporary Art, Girona, Spain. August 2018.  
Part of *Mapas efímeros. Complicidades y sincronías*, by Denys Blacker. Bólit, Contemporary art centre, Girona, curated by Maia Creus.

Walking up the worn, stone steps, the crumbling walls dripping water, I am wondering where Helen is. The tunnel is tight with people, the darkness revealing their faces in the flash of a mobile phone light or in the yellow glow of a bare bulb hanging from the ceiling. It's cold. I have been here many times and I am not surprised as we enter the space, an impressive, cavernous room. This used to be a rain-water deposit tank belonging to the convent of Saint Anthony in Girona. Built in the seventeenth century, it is fifteen metres high and the lime coated walls are coloured with the accumulation of earthy mineral deposits left by the dripping water. It is now in use as a cultural space. Despite efforts to keep the water out in recent years, it is still filtering through fine cracks in the walls that on this rainy night, are glistening wet, iron red, burned ochre, sienna brown and lime yellow.

Helen is on the floor, face hooded in black leather, eyes covered. Her torso is naked, vulnerable and only a thin blanket protects her body from the damp tiles. She swings her body, hawk-head upside down, legs stretched back over her head, neck veins swollen, pressing face to chest. Back over, flipping spine, strained arms. She stands, stretching up, saluting an invisible challenger. The hawk-woman is back down on the ground, thrusting her torso forward, all her weight on her elbows, feet off the floor, she balances, arms trembling.

This room was used as a bomb shelter in the civil war and ancient fears resonate in me as I watch, feeling her stretching muscles in my own flesh. Jaw tightening, fists closing, I find myself labouring with her, there is no way out of this strange birthing. I feel a tension that is not just physical; the fervent search of a fragile body straining to get beyond the carnal, to not be bound by muscle and bone. I can sense where she is going, unassailable, unstoppable, she is running herself to ground, hunting out the spirit, separating it from the flesh, searching for flight. Hawk-woman limbs that stretch behind her, arms twisted, she keeps on. Breathing hard, she does not seem fearful of the foe she cannot see, but we can, her own self caught in a mortal struggle.

There is no air in this rotten cavern and her lungs must be clogged with the damp mould. I am trembling from the cold. She tips back over, arching body nearly falls, pulling back from the edge, she balances lightly, head back, neck damp with sweat. This attempt to journey beyond the limits of the body is tiring her, subordinated by the perseverance of breath to hold mind to flesh, retaining her from dangerous flight. She will not abandon this scene where we are now united by intent. Her determination is keeping her in movement, her body repeating contortions that are becoming less stable. She is executing the extreme yoga postures that she has refined in decades of practice, and I feel the ritualistic tautness of her time-honoured actions.

This has never been about a carnal display of athletic ability, it's a brave incursion into a territory from which we have been discouraged to go, where knowledge is gained, not by thinking, but in moving and sensing. By stretching her physical body to its very limit, she is reaching into areas of knowing and understanding that it not possible to get too any other way. She opens herself as a container for others, a vehicle through which we can experience our bird-minds. Flocking beyond the range of our cognitive senses, the fragile pulse that keeps us in this joined place is held in the movement of her body, a strenuous, depleting task. This is a gift that she offers to us for the duration of our silent conversation and conscious of the rarity of these moments, I stay until she is unable to continue. Worn out by the effort and cold, she is covered with a blanket by caring hands.

She had built a psychic bridge, her powerful body straining to eliminate the space between my breath and hers, chipping away at the illusion of separateness that kept me from her, you from me and them from us. This place of mutual becoming, revealed not only the deep and resonant connections between us, but the difficult task of creating and maintaining such connections.

**Appendix 4. Hawk Mapes Efimers. Complicitats i Sincronies, The Cistern, Girona, Spain**



Fig. 44 *Hawk*, The Cistern – Bòlit Centre for Contemporary Art, Spain (August 2018) as part of the Denys Blacker exhibition *Mapes Efimers. Complicitats i Sincronies*. Photo: Marta Vergonyós Cabratosa



Fig. 45 *Hawk*, The Cistern – Bòlit Centre for Contemporary Art, Spain (August 2018) as part of the Denys Blacker exhibition *Mapes efimers. Complicitats i Sincronies*. Photo: Marta Vergonyós Cabratosa

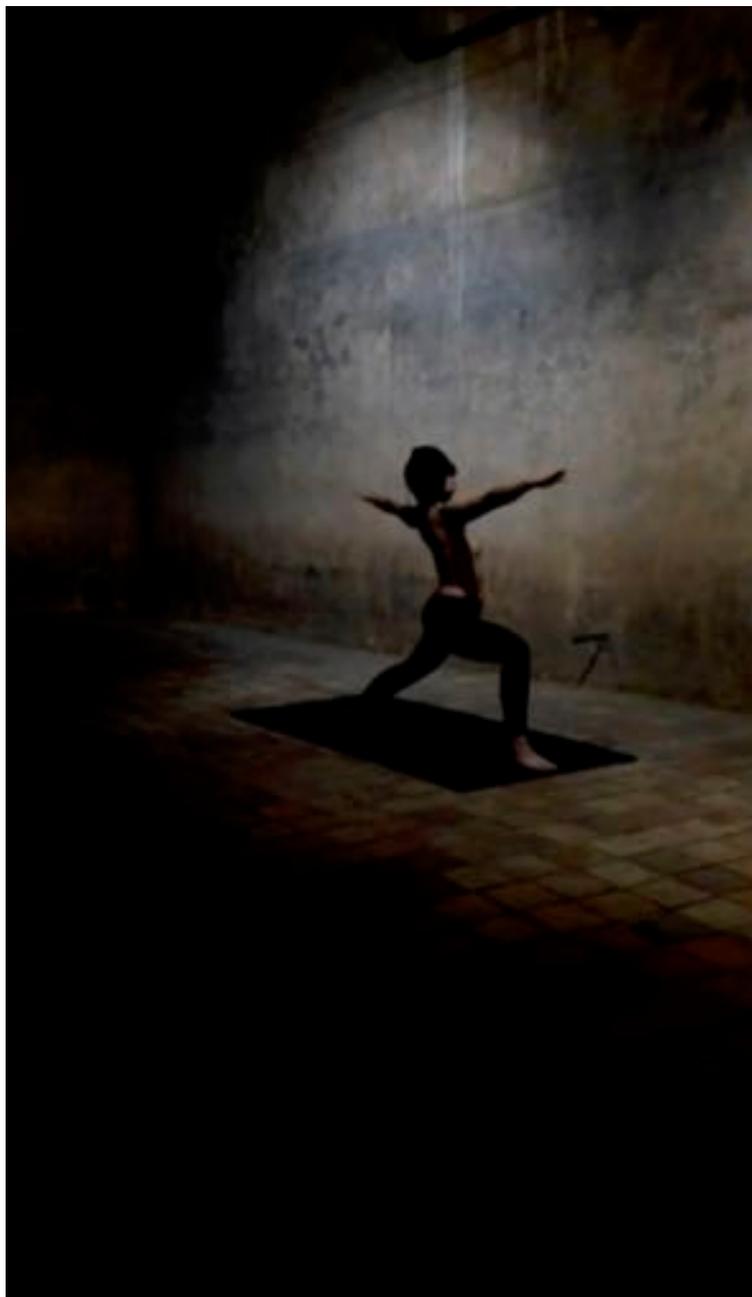


Fig. 46 *Hawk*, The Cistern – Bòlit Centre for Contemporary Art, Spain (August 2018) as part of the Denys Blacker exhibition *Mapes Efímers. Complicitats i Sincronies*. Photo: Atun

Appendix 5. FLARE 1 – Beyond Body Programme 8<sup>th</sup>-12<sup>th</sup> February 2015



ORGANISATION  
Harriet Plewis  
Helen Collard  
Denys Blacker  
Sandra Johnston

COLLABORATION  
Lee Hassall  
Tew Bunnag  
Victoria Gray  
Cormac Power  
Nathan Walker  
Chris Dorsett  
Jane Arnfield  
Philippa Jackson  
Francesca Steele  
Christine Borland  
Elvira Santamaría  
Sarah Riseborough  
Steve Gibson  
Donna Leishman

8th February - 12th February 2016  
University Gallery, Sandyford Road

FLARE

The ear of the ear  
The thought of the thought  
The speech of the speech  
The breath of the breath  
The eye of the eye

Kena Upanishad

Photo of Denys Blacker by Claudia Serrahima



## Appendix 5. FLARE 1 – Beyond Body Programme 8<sup>th</sup>-12<sup>th</sup> February 2015

### Daily Practice

The sessions are open to anyone. Please bring a yoga mat, blanket and cushion.

Tew Bunnag/Denys Blacker

#### **Six Healing Sounds & Chi Kung**

Daily - Mon 8th, Tues 9th, Weds 10th, Thurs 11th, Fri 12th Feb.

Time - 9am -10am

Tew Bunnag was born in Bangkok in 1947 and educated in the U.K. Since 1975 he has been a Tai Chi and Meditation teacher and has given courses in Europe and the U.S. as well as in his own country. Since 2000 he has been working for an NGO in the Bangkok slums helping street children and children and adults who are HIV positive. In Spain, where he is based he is president of Vinyana, an association providing training to professionals and family carers on integrating Spiritual Companionship at the end of Life. He also helps to prepare people in terminal stages of their illness as well as their family. In the workshop he will be sharing exercises and practices that he uses in his work to promote Presence, Compassion, and Transcendence.

Helen Collard

#### **Yoga and Pranayama**

Daily - Tues 9th, Weds 10th, Thurs 11th, Fri 12th Feb.

Time - 12:30pm - 1:15pm

Breath could be said to be our physical counter of time. An entire life is encompassed between a first inhale and a final exhale. In yogic philosophy this concept is found in the word prana. Prana means both breath and life. Pranayama is the practice of expanding or regulating the prana or breath. In these four sessions you will be guided through a practice of yoga and pranayama in which we explore the psycho-physical effects that occur when we develop a conscious awareness of breath; a practice that invites us to attend to the body, attend to the mind and that which is beyond ourselves.

Each of the four sessions (45 mins) will involve a short led yoga practice and a longer guided seated pranayama sequence.

### Workshops

Denys Blacker

#### **The Space Between Us**

Mon 8th Feb: 11am -12:30pm

My current research is to observe and investigate the relationship of the individual to the group in performance improvisation. The interaction between artists during the creative process requires a particular kind of attention and concentration. The workshop is an introduction to ways that we can develop this attention and experience different ways of interacting with each other. The space between us is a place of discovery and communication, of intuition and trust. We will develop this communication in individual and group exercises.

Harriet Plewis

#### **Dance Face**

Tues 9th Feb: 10:15am -12:30pm

Harriet Plewis will lead a workshop that looks at the notion of neutrality via the construct of the neutral mask and its attendant techniques. Widely coveted as a starting point for many practices, this workshop will attempt to unpick what an embodied neutrality might mean and to what extent it is desirable. The workshop will be followed by a presentation by Dr Cormac Power on presence and materiality in performance and will conclude with a collection of screenings related to the themes explored. The workshop is open to anyone. Please come with clothes which you are comfortable moving in.

Jane Arnfield

#### **Introduction of Laban Effect Work**

Thurs 11th Feb: 10:15am -12:30pm

If the arts provide a place for human beings to examine and excavate in detail the world in which they live - a place to discuss how to live then voice and gesture are intrinsic in the delivery/process of those discussions. The Laban workshop will seek to discover the tools required to prepare, deliver and understand our physicality. Working with the body as a whole and not in isolation, with reference to process and performance. Laban Efforts will be discussed in detail and practised where possible in order to promote flexibility and optimum physical and vocal functioning within the actor/student in training for performance and for all artists making work. Effort, or in Laban it can be described as dynamics, is a system for understanding the more subtle characteristics about the way a movement is actioned with respect to an inner intention. The difference between punching someone in anger and reaching for a glass is slight in terms of body organization - both rely on an extension of the arm. The attention to the strength of the movement, the control of the movement and the timing of the movement are very different.

\* Please wear comfortable clothing and bare feet or trainers. Please bring a device paper, pen, laptop, iPad etc. in order to take notes on the session.

Sarah Riseborough

## Appendix 5. FLARE 1 – Beyond Body Programme 8<sup>th</sup>-12<sup>th</sup> February 2015

### Exit Strategies

Fri 12th Feb: 10:15am -12:30pm

A movement workshop exploring what might be considered 'cultural' and 'natural' behaviours, introducing strategies intended to facilitate the transition between the two.

The workshop will include short discussions around these themes to frame the movement exercises.

Participation entails working with both conscious acknowledgement of our present conditions, and reiterating (and, perhaps, remembering) patterns of movement transcribed from the macro and the micro. From our unseen environment, molecular structures and cosmological orbits, is it possible to transcend inner dialogues initiated in cultural conditioning?

### Screenings

**Kings with Straw Mats** (70 mins). Director: Ira Cohen,1986.

Weds 10th Feb: 16:30pm

Poet and filmmaker Ira Cohen's pilgrimage into the heart of India's greatest sacred celebration, the Kumbh Mela takes place every twelve years and is believed to be one of the largest human gatherings on earth.

### Neutrality

Tues 9th Feb: 16:30pm - 18:00pm

Following a presentation by Cormac Power, a programme of works on theme of neutrality will be screened.

### Presentations

Cormac Power

**Materiality and Performance**

Tues 9th Feb: 14:30pm - 16:00pm

Christine Borland & Tew Bunnag

**Death and Dying**

Weds 10th Feb: 10:15am - 12:30pm

Helen Collard & Philippa Jackson

**Sensing Breath**

Weds 10th Feb: 14:30pm-16:00pm

This bio-art project employs the use of NIRS (Near Infrared Spectroscopy) to take real-time brain-state data during a live pranayama performance. NIRS records the moment-to-moment concentration changes of oxygenated and deoxygenated haemoglobin in each hemisphere of the brain. In this presentation we will demonstrate the process of data collection via NIRS during a short pranayama practice and also examine the significance of the data collected thus far. We will also consider the next steps in re-appropriating NIRS as a control system for real-time sound, image and light creation, controlled by the pranayama practitioners moving breath. Questions and audience discussion about the project will be very much welcomed.

Chris Dorsett

**Rawson's Rasa - sensory arousal, bodily engrossment.**

Thurs 11th Feb: 14:30pm - 16:00pm

### Performances

Donna Leishman & Steve Gibson

**Borderline** - Mon 8th Feb: 12:30pm - 13:15pm

\* This performance takes place in Squires Annexe Room 009

This text-video-sound artwork is a performative piece concerned with time-based and improvisational action, in which two participants interact together within an audio-visual environment to gain a sense of the project's latent narrative identities. Borderline re-deploys VJ software technologies (using MIDI with MAX-MSP) to develop a dual interaction experience that uses hand-based gesture (via two graphic tablets and their pens). The two participants can choose to be social: to improvise / play /perform harmoniously together or be antisocial: to be in conflict with both the narrative and indeed with each other. Their expressive actions (for example fast / slow, long / short pen gestures) will significantly affect their narrative agency, immersion and comprehension.

**Monday performances** - Mon 8th Feb: 16:30pm - 18:00pm

Elvira Santamaría, Denys Blacker, Lee Hassall, Victoria Gray, Nathan Walker

**Friday performances** - Fri 12th Feb: 18:00pm - 21:00pm

Elvira Santamaría, Denys Blacker, Lee Hassall, Victoria Gray, Nathan Walker, Francesca Steele, Harriet Plewis, Sarah Riseborough, Helen Collard.

## Appendix 5. FLARE 1 – Beyond Body Programme 8<sup>th</sup>-12<sup>th</sup> February 2015

# Beyond the Body

Mon Feb 8th	09 00h-10 00h 10 00h-10 15h 10 15h-11 00h 11 00h-12 30h 12 30h-13 15h 13 15h-14 30h 14 30h-16 00h  16 00h-16 30h 16 30h-18 00h	Six Healing Sounds and Chi Kung - Tew Bunnag Tea and biscuits Introduction - Harriet Plewis, Denys Blacker, Helen Collard Workshop "The space between us" - Denys Blacker AV Performance "Borderline" - Donna Leishman, Steve Gibson Lunch Research Session - Denys Blacker, Victoria Gray, Nathan Walker, Lee Hassall and Elvira Santamaría  Tea and biscuits Performance - Denys Blacker, Victoria Gray, Nathan Walker, Lee Hassall and Elvira Santamaría
Tues Feb 9th	09 00h-10 00h 10 10h-10 15h 10 15h-12 30h 12 30h-13 15h 13 15h-14 30h 14 30h-16 00h 16 00h-16 15h 16 30h-18 00h	Six Healing Sounds and Chi Kung - Tew Bunnag Tea and biscuits Workshop "Dance Face" - Harriet Plewis Yoga/Pranayama - Helen Collard Lunch Presentation "Materiality and Performance" - Cormac Power Tea and biscuits Screening
Wed Feb 10th	09 00h-10 00h 10 00h-10 15h 10 15h-12 30h 12 30h-13 15h 13 15h-14 30h 14 30h-16 00h 16 00h-16 30h 16 30h-18 00h	Six Healing Sounds and Chi Kung - Tew Bunnag Tea and biscuits Discussion "Death and Dying" - Christine Borland, Tew Bunnag Yoga/Pranayama - Helen Collard Lunch NIRS Demo - Helen Collard, Philippa Jackson Tea and biscuits Screening - Kings with Straw Mats
Thur Feb 11th	09 00h-10 00h 10 00h-10 15h 10 15h-12 30h 12 30h-13 15h 13 15h-14 30h 14 30h-16 00h  16 00h-16 30h 16 30h-18 00h	Six Healing Sounds and Chi Kung - Denys Blacker Tea and biscuits Workshop "Introduction of Laban Effort Work" - Jane Arnfield Yoga/Pranayama - Helen Collard Lunch Presentation "Rawson's Rasa - sensory arousal, bodily engrossment" - Chris Dorsett  Tea and biscuits Open performance space
Fri Feb 12th	09 00h-10 00h 10 00h-10 15h 10 15h-12 30h 12 30h-13 15h 13 15h-14 30h 14 30h-16 30h 16 30h-17 00h 18 00h-20 00h	Six Healing Sounds and Chi Kung - Denys Blacker Tea and biscuits Workshop "Exit Strategies" - Sarah Riseborough Yoga/Pranayama - Helen Collard Lunch Open discussion Tea and biscuits Performance Francesca Steele, Harriet Plewis, Helen Collard Sarah Riseborough, Denys Blacker, Elvira Santamaría.

Limited places, so please contact us as soon as possible for more information or if you would like to participate:  
Email: flarebooking@gmail.com

Appendix 4.1 *Hawk* – FLARE, Gallery North, UK.



Fig. 47 *Hawk*, Helen Collard (2015), *Untitled*, Francesca Steele (2015). Photo: Ko-Le Chen.

Appendix 6. FLARE 2 – In/visible programme 14<sup>th</sup> May 2015



# FLARE\_2

**BODY WORKS EXCAVATING THE IN/VISIBLE**

**14th May 2016 / 10 00h - 23 00h**

ORGANISATION: Harriet Plewis / Helen Collard / Denys Blacker / Sandra Johnston  
COLLABORATION: Victoria Gray / Nathan Walker / Elizabeth Ward / Francesca  
Steele / Brian Patterson / Marita Bullmann / James King / Lee Hassall / Christopher  
Mollon / Grace Dent / Elizabeth Black / Cally Gatehouse / Sarah Riseborough / Stuart  
Tait / Louise Mackenzie / Janaki Nair / Sally Madge / Dave Fudge / Dean Wilson

Photo: Helen Collard by Harriet Plewis

## Appendix 6. FLARE 2 – In/visible programme 14<sup>th</sup> May 2015

### EARLY SHOW: 10 00H - 15 00H

Victoria Gray, Nathan Walker, Denys Blacker, Marita Bullmann, Christopher Mollon

10 00h - 14 00h / Starting point at Gallery North moving to Streets of Newcastle  
14 00h - 15 00h / Gallery North

A project organised by James King. In January one artist performed for one hour. In February two artists, In March three artists performed for three hours, and so on. There is no theme, but there is an expectation that the performative thoughts and actions of artists in the same location will eventually interlace with each other. A fragment joins into a whole, which is a fragment of a greater whole.

### LATE SHOWS WARM-UP: 17 30H - 19 00H

Christopher Mollon / *Durational performance* / 17 00h - 23 00h / Outside Gallery North  
Christopher Mollon makes site responsive & site specific works. These can often manifest themselves in durational performance-installation, sculptural intervention or textworks.

Cally Gatehouse / *Minimum Viable Network Utopia* / 17 00h - 23 00h / Gallery North  
This interactive installation is a prototype for an idealised public realm as dreamt up by network technology. Connect to the wifi, generate data, interact with other humans. All this and more is possible in the Minimum Viable Network Utopia.

Sarah Riseborough / *Service* / 17 00h - 18 45h / Gallery North Upstairs  
A durational performance exploring the capacity of highly processed, low value and disposable objects to embody our humanity.

Dave Fudge / *Untitled performance* / 17 30h - 18 00h / Gallery North Downstairs  
Exploring the space, an unplanned dialogue with objects and architecture and mapping with video.

Dean Wilson / *Untitled reading* / 18 00h - 18 15h / Gallery North Downstairs

Grace Denton / *Sixty five* / 18 15h - 18 45h / Gallery North Downstairs  
Elizabeth Black / *Interactive performance* / 18 15h - 18 45h / Gallery North Downstairs

Louise Mackenzie / *Pandora, single channel video* / 18 45 - 19 00h / Gallery North Upstairs  
Working in collaboration with the Institute of Genetic Medicine, Mackenzie uses synthetic biology techniques within art practice to consider the concept of synthetic evolution.

### THE LATE SHOWS: 19 00H - 23 00H

Janaki Nair / *Technique of Meaning Making in Indian Classical Dance* / 19 00h - 19 30h / Gallery North Upstairs  
Based on Kathakali and Bharatanatyam discipline, this lecture demonstration with performance will explore the embodied technique of meaning- making in Indian classical dance.

Elizabeth Ward / *Techno Witch Ballet* / 19 30h - 20 00h / Gallery North Upstairs  
In the last years Elizabeth Ward has treated ballet as a living archeological field. The lines and steps of the form are seen as maps laid out by previous generations for activating a particular resonance and resilience in the body. The critiques of ballet being tenfold she uses this excavation site as a place to search for an emancipated, alive spirit embedded within the tangled mess of the archaic power relations ballet is known for. Techno music is central to her research. Why will be explained.

## Appendix 6. FLARE 2 – In/visible programme 14<sup>th</sup> May 2015

**James King / Spokeneity** / 20 00h - 20 15h / Gallery North Upstairs

A flowing stream of language, with eddies, rapids and still pools; a syllable stew of sounds, words, letters, phonemes, connections, associations and anagrammatics.

**Sally Madge / Vita Brevis Ars Longa** / 20 15h - 20 45h / Gallery North Upstairs

Sally Madge will test run her newly acquired exercise bike. During the ride she will demonstrate its value as an aid to enjoyment and creativity, drawing on a range of subjects from colour theory to American rappers, philosophy, feminism and fashion. On completion of the ride she hopes to elicit responses from the audience as to how she can improve her performance.

**Nathan Walker / Untitled performance** / 20 45h - 21 05h / Gallery North Upstairs

**Marita Bullman / Untitled performance** / 21 05h - 21 25h / Gallery North Upstairs

**Francesca Steele / Tease** / 21 25h - 21 45h / Gallery North Upstairs

This piece brings together elements of fetish and performance. It aims to leave the audience unsatisfied, antagonised by an unattainable climax. The piece is a "stand in", a reference to intimate or distant relationships. The actions parallel private discourses.

**Helen Collard & Harriet Plewis / Public Address System** / 21 45h - 22 00h / Gallery North

An open participatory group performance inciting biofeedback through sound.

**Stuart Tait / Untitled performance** / 22 00h - 22 05h / Gallery North Upstairs

**Lee Hassall / Untitled performance** / 22 05h - 22 25h / Gallery North Upstairs

**Brian Patterson / Untitled performance** / 22 25h - 22 40h / Gallery North Upstairs

**Denys Blacker / Unfinished Business** / 22 40h - 23 00h / Gallery North Upstairs

An improvisation in response to thoughts and objects offered by the audience.

### PARALLEL EVENTS AT OTHER VENUES

Friday May 13<sup>th</sup> and Saturday May 14<sup>th</sup>

**Louise Mackenzie / Pithos** / 19 00h - 22 00h / i Baltic 39

8 channel audio installation with terracotta vessel, synthetic DNA and the DNA of the artist.

Monday May 16<sup>th</sup> & Tuesday May 17<sup>th</sup>

**Elizabeth Ward / Techno Witch Ballet Workshop** / 10h - 17h / Squires 026

This is a practical workshop, open to everybody, totally regardless of skill level and prior experience of ballet with the amazing dance artist Elizabeth Ward from Vienna.

Details are here: <http://technowitchballet.tumblr.com/> (be sure to scroll down)

And tickets can be booked here: <https://www.eventbrite.com/e/techno-witch-ballet-workshop-tickets-24621264866>

## Appendix 6. FLARE 2 – In/visible programme 14<sup>th</sup> May 2015

### SATURDAY 14th MAY

Artist	Activity	Place	Start Time	Finish Time
Various artists	Cumulator Performance	Streets of Newcastle	10 00h	14 00h
Various artists	Cumulator Performnace	Gallery North	14 00h	15 00h
Christopher Mollon	Performance	Outside Gallery North	17 00h	23 00h
Cally Gatehouse	Network Utopia	Gallery North	17 00h	23 00h
Sarah Riseborough	Performance	Gallery North	17 00h	18 45h
Dave Fudge	Performance	Gallery North	17 30h	18 00h
Dean Wilson	Reading	Gallery North	18 00h	18 15h
Grace Denton	Performance	Gallery North	18 15h	18 45h
Elizabeth Black	Performance			
Louise Mackenzie	Screening	Gallery North	18 45h	19 00h
Janaki Nair	Kathakali Dance	Gallery North	19 00h	19 30h
Elizabeth Ward	Techno Witch Ballet	Gallery North	19 30h	20 00h
James King	Performance	Gallery North	20 00h	20 15h
Sally Madge	Performance	Gallery North	20 15h	20 45h
Nathan Walker	Performance	Gallery North	20 45h	21 05h
Marita Bullmann	Performance	Gallery North	21 05h	21 25h
Francesca Steele	Performance	Gallery North	21 25h	21 45h
Helen Collard	Performance	Gallery North	21 45h	22 00h
Stuart Tate	Performance	Gallery North	22 00h	22 05h
Lee Hassall	Performance	Gallery North	22 05h	22 25h
Brian Patterson	Performance	Gallery North	22 25h	22 40h
Denys Blacker	Performance	Gallery North	22 40h	23 00h

### 13th & 14th MAY

Louise Mackenzie	Audio installation	Baltic 39	19 00h	22 00h
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### 16th & 17th MAY

Elizabeth Ward	Techno Witch Ballet Workshop	Squires Building, Room 026	10 00h	17 00h
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**Gallery North**  
Sandyford Rd  
Newcastle upon Tyne  
NE1 8ST

**Squires Building**  
Room 026, Ground Floor  
Sandyford Rd  
Newcastle upon Tyne  
NE1 8ST

**Baltic 39**  
39 High Bridge,  
Newcastle upon Tyne  
NE1 1EW



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THE LATE SHOWS 10  
WWW.THELATESHOWS.ORG.UK

# FLARE 3

A three-day event exploring mind-body connections and live encounters

3rd – 5th May 2017

## Sync-Down

## Co-Arise

## Listen-In

Vane · Commercial Union House · 39 Pilgrim St. · Newcastle upon Tyne · NE1 6QE

For more information and bookings: [flarebooking@gmail.com](mailto:flarebooking@gmail.com)

<https://flare707.wordpress.com>

FLARE is funded by:



Arts & Humanities  
Research Council

FLARE is supported by:



Vane



## Appendix 7. FLARE 3 – Sync-down, Co-Arise, Listen-In programme 3<sup>rd</sup>-5<sup>th</sup> May 2017



Participants of Helen Colclough's collaborative work *Public Address System* at Flare 2

FLARE (Forum for Living Art Research and Education) was set up in 2015 by three PhD students from Northumbria University as a platform to share research and practice through performance art, technology, sound, community and environment.

FLARE is a research platform to nurture a transversal dialogue focusing on the ways in which performance and bio-art may open up new modes of thinking. FLARE hopes to inspire fresh ways of attending to mind/matter entanglements that can contribute to the imagining of more equitable futures.

Our contemporary time is fractured, community and ecological crisis are ever present. Our minds, bodies and souls cut apart. FLARE 3 presents *Sync-Down, Co-Arise* and *Listen-In*, an exciting 3-day contemporary art event, bringing together artists and academics with participants and audience from around the UK, Spain and Holland for three days of practical creativity exploring our ecologies and connections through daily practices, workshops, talks, screenings and performances.

**All events are free but booking is essential**



Daniel Becker, Victoria Gray and Lee Haxell - *Impression with eyes shut* at Flare 1



Harriet Pevens and Nicole Singh - *They Go Into a Little Room* - Performance

# Daily Practice

Daily open sessions designed to develop a sensitivity to ourselves in relation to others as well as putting us in the right frame of mind to experience the common theme in our research; the entanglement of body, mind and matter.

## The Six Healing Sounds · Denys Blacker

The Six Healing Sounds have their origins in the disciplines of ancient Chinese physical and spiritual training practices, that experience the human organism as a dynamic of interactive energies in constant transformation. The exercises we will do are adapted from the teaching of Tew Bunnag as a way to promote presence, connection and attention.

Bunnag is a Tai Chi and Meditation teacher and has given courses in Europe and the U.S. since 1975. He is co-founder and president of Vinyana, an association providing training to professionals and family carers on integrating Spiritual Companionship at the end of Life.

## Yoga and Pranayama · Helen Collard

Pranayama is the practice of expanding or regulating the prana or breath. In these sessions you will be guided through a practice in which we explore the psycho-physical effects that occur when we develop a conscious awareness of our own breath; a practice that invites us to attend to the body, attend to the mind and that which is beyond ourselves.

# Talks

A chance to enter into informal discussions with the participants and invited guests about the important themes in our research.

## Harriet Plewis · Talk Experiment: What I Do When I Think About Research: talking through sly, dormant and illicit research methods

An open invitation, to anyone involved in research of any kind, to join a discussion looking at the ways in which we move through and accrue knowledge, insights and ideas. For this experiment, 'research' is entirely self-defined: whatever it means to you.

## Josephine Machon · In Conversation

Author of *Immersive Theatres: Intimacy and Immediacy in Contemporary Performance*, which received the prestigious award of Outstanding Academic Title in the CHOICE Awards, 2014 and *(Syn)aesthetics – Redefining Visceral Performance*. She is Joint Editor of the Palgrave Macmillan Series, Palgrave Studies in Performance and Technology performance and a Fellow of The Higher Education Academy. She is also collaborating on an interdisciplinary research project with Punchdrunk Enrichment examining the impact of its work in educational contexts.

## Magdalena Górska · Breathing Matters - a feminist intersectional political matter

Assistant Professor at the Graduate Gender Program, Department of Media and Culture Studies at Utrecht University. Magdalena's research develops a nonuniversalising and politicised understanding of embodiment where human bodies are conceptualised as agential actors of intersectional politics. Her work offers anthropo-situated while posthumanist discussions of human embodiment and agency and focuses on the quotidian corpomaterial and corpo-affective practices as political matters. She is an author of a dissertation book *Breathing Matters: Feminist Intersectional Politics of Vulnerability* and a founder of the Breathing Matters Network.

# Screenings

Films to complement the activities and give us more to think about and discuss.

**Biofeedback: The Yoga of the West** - 1974 - (45 mins)

The ability of the mind to control the body is the subject of this Eida Hartley documentary. Scientists Judy and Elmer Green from the Menninger Foundation, intrigued by claims that Indian yogis can stop their hearts at will or remain in an airtight box for hours with no negative health effects, make a trip to India. This film is an in-depth look at the Menninger Foundation scientists' notion that perhaps if we can make ourselves sick, we can make ourselves well.

**Something Unknown is Doing We Don't Know What...** - 2009 - (105 mins)

Quirky documentary by Dutch filmmaker Renée Scheltema, who meets experts in the field of science, alternative medicine and parapsychology as they reveal their views about the world of the unseen and look at the evidence behind psychic phenomena such as telepathy, clairvoyance, healing telekinesis and remote viewing.

**The Self is Not an Illusion** - 2014 - (16 mins)

Moral philosopher, Mary Midgley challenges a reductive view of the human experience that seeks to explain everything through a rigid materialism. She discusses the breach created over the last 50 years between our understanding of our sense of 'self', and today's scientific orthodoxy that claims the self to be nothing more than an elaborate illusion created by our brain cells and processes. Midgley asks, "if the self really is this elaborate illusion, what do we have to sacrifice in order to hold that view?".

**My Stroke of Insight** - 2008 - (19 mins)

An extraordinary TED talk, in which neuroanatomist Jill Bolte Taylor examines her own stroke as it happened, her findings reveal compelling insights into how we might think about the brain and our connection to others and our planet.

# Workshops

The workshops are open to all. No experience is necessary. Wear clothes that you'll be comfortable moving around in. Bring a cushion and a blanket. Limited places - Book soon by email: [flarebooking@gmail.com](mailto:flarebooking@gmail.com)

**Dawn Felicia Knox - The Echo Chamber**

This workshop explores how sounds, words and ideas begin to shift and distort when they are repeated both in isolation and unison. We will investigate how we listen and distill words, ideas and sounds through our own perceptions and experience to change what they become. Then, as we reflect them back, the echo changes shape to fit the room.

**Denys Blacker and Ocells al Cap - Co-Arising**

This workshop will be co-led by the group Ocells al Cap and will explore the possibilities of improvisation as a non-verbal group communication and as a way of attaining consent; agreement through feeling. No experience necessary.

**Harriet Plewis - Dynamic Emancipation Through Imagery**

This workshop will combine the techniques of Infosomatics, Eric Franklin and some of the principles behind lucid dreaming to explore visualisation as a way of getting beyond our (often) heavy heads.

# Performances

The performances are open to all with opportunities for collaboration.

## S L I C E, including Sister ShriII

Sister ShriII's mutual interest in women's rights, identity politics and popular culture has enabled them to kick-start a powerful artist duo. They riff off one another, often switching dominant and submissive roles, and interjecting humour, wordplay and improvised movement.

## Ocells al Cap - We Were Waiting For You

Denys Blacker (UK/Spain), Lesley Yendell (UK/Spain), Mireia Zantop (Spain), Natàlia Espinet (Spain), Sabina Vilagut (Spain), Helena Hunter (UK), Marta Vergoryós (Spain), Victoria Gray (UK). The group was formed in 2014 and has been practicing techniques of attention to develop and nurture intra-connections across time and space, and an unbounded group consciousness or "vincular mind". These trans-actions are experienced as embodied and disembodied revelations of psychic and agential entanglement, where your concerns become ours, your mind, our matter. It is the generosity of "being for you", rather than "being with you". In this work we are offering you a unique opportunity; to ask us an important question. Ocells al Cap will provide you with an "answer" in the form of an improvised group performance. You can take part: If you have a question that you would like to ask, please book your place by email at flarebooking@gmail.com

## Francesca Steele - Auto-oscillate

An installation performance using nonlinear autobiographical memory, sound and light. Francesca's research in the Visual and Material Cultures Department at Northumbria University examines processes of trauma impact on art practice.

## Laurel Jay Carpenter - I have heard what the talkers were talking, the talk of the beginning and the end

A durational visual art performance. Laurel's work investigates longing, devotion and intimacy.

## Open Soundings – Collage

This session is an opportunity to read your own or found ideas, texts, poems, sounds or thoughts, and be listened to. The session will be recorded, to make a sound collage. 6 -7 places are available. To make a reading please book by email: flarebooking@gmail.com Please let us know the approximate duration of your reading or vocalisation.

## Siobhán Mullen - Velocity at Zero

Siobhan's current performative work draws from physics and fluid mechanics, using the body and immediate space as a testing ground to investigate societal perceptions of behavioural codes.

# Suppers

Every evening at 19:30h, there will be limited places for supper with the participants and a discussion about the events of each day.

## Traveling Hearth Tapas

Incredible vegan cuisine prepared especially for Flare 3 by Christine Dixon. To make sure you get a place please reserve by email at flarebooking@gmail.com

## Appendix 7. FLARE 3 – Sync-down, Co-Arise, Listen-In programme 3<sup>rd</sup>-5<sup>th</sup> May 2017

# Calendar of events

Please check <https://flare707.wordpress.com> for possible programme changes

### Sync-Down · Harriet Plewis · Wednesday 3<sup>rd</sup> May 2017

Taking time out from the upright, the eyes-open and the left-to-right to explore inner images together and where they can take us...

09 30-10 00	Morning practice · Six Healing Sounds
10 00-10 30	Tea break
10 30-13 00	Workshop · Dynamic Emancipation Through Imagery · Harriet Plewis
13 00-13 30	Yoga and pranayama
13 30-14 30	Lunch
14 30-16 00	Talk Experiment · What I Do When I Think About Research
16 00-16 30	Tea break
16 30-18 30	Screening · Something Unknown is Doing We Don't Know What...
18 30-19 30	Performance · S L I C E including Sister Shril
19 30-21 45	Supper with discussion · Proprioception

### Co-Arise · Denys Blacker · Thursday 4<sup>th</sup> May 2017

Co-Arising is a dynamically interdependent process, where no element is immutable or autonomous and cause and effect cannot be categorically isolated or traced unidirectionally. The day will be dedicated to feeling how this feels and thinking how it matters.

09 30-10 00	Morning practice · Six Healing Sounds
10 00-10 30	Tea break
10 30-13 00	Workshop · Co-Arising · Ocells al Cap
13 00-13 30	Yoga and pranayama
13 30-14 30	Lunch
14 30-16 30	In conversation with guest speaker Josephine Machon
16 30-16 45	Tea break
16 45-17 15	Open Performance
17 15-17 30	Warm-up session · Ocells al Cap
17 30-19 30	Performance · Ocells al Cap
19 30-21 45	Supper with discussion · Trans-subjectivity

### Listen-In · Helen Collard · Friday 5<sup>th</sup> May 2017

Sound and breath as channels in navigating areas of convergence in our psychological and social being. The day will be spent in a variety of ways listening in, as a means to explore the overlapping boundaries of our interior and exterior bodies.

10 00-10 30	Morning practice · Six Healing Sounds
10 30-11 00	Tea break
11 00-12 30	Workshop · The Echo Chamber · Dawn Felicia Knox
12 30-13 00	Yoga and pranayama
13 00-14 00	Lunch
14 00-15 40	Screenings · Biofeedback: The Yoga of the West · The Self is Not an Illusion · My Stroke of Insight
15 45-17 15	Keynote: Magdalena Górská: Breathing Matters - a feminist intersectional political matter
17 25-17 30	Tea break
17 30 18 00	Open Soundings
18 00-19 30	Performance · Siobhán Muller, Francesca Steele & Laurel Jay Carpenter
19 30-21 45	Supper with discussion · Flare 3, sharing experiences

Appendix 7. FLARE 3 – Sync-down, Co-Arise, Listen-In programme 3<sup>rd</sup>-5<sup>th</sup> May 2017

# Sync-Down

Harriet Plewis

Harriet Plewis's activity is rooted in performance, feminist pedagogies and the moving image. Her work looks at the mechanics of co-authorship and how theory intersects with practice. She focuses particularly on collective approaches to reading philosophy, via the body.

# Co-Arise

Denys Blacker

Denys Blacker is investigating how improvisation in group performance can reveal intra-connections that go beyond the body. In her practice she looks at synchronicity and simultaneity to explore the complex relational entanglements that emerge at both psychic and physical levels in these encounters.

# Listen-In

Helen Collard

Helen Collard's sonic and performative work is drawn from mind-body practice, yogic philosophy, and technology. The work develops listening encounters to examine community/ecology and mind/body transformations.

**Appendix 7. FLARE 3 – Sync-down, Co-Arise, Listen-In programme 3<sup>rd</sup>-5<sup>th</sup> May 2017**



# FLARE 2017

FLARE wishes to thank:  
AHRC - Arts and Humanities Research Council  
Northumbria University  
Northumbria - Sunderland Centre for Doctoral Training  
Vane and our special advisor  
Dr. Sandra Johnston (Northumbria University).

For more information and bookings: [flarebooking@gmail.com](mailto:flarebooking@gmail.com)  
<https://flare707.wordpress.com>

## 7.1 FLARE 3 – Selected Images



Fig. 48 Talk with Magdalena Górska *Breathing Matters: Feminist Intersectional Politics of Vulnerability*. Photo: Arto Polus



Fig. 49 Talk with Josephine Machon, *Intimacy and Immediacy in Contemporary Performance*. Photo: Arto Polus

## 7.1 FLARE 3 – Selected Images



Fig. 50 Workshop *Listen-in* led by Dawn Felicia-Knox. Photo: Arto Polus

## 7.1 FLARE 3 – Selected Images



Fig. 51 Screening of *Yoga and Biofeedback in the West* (Hartley Films) Photo: Arto Polus



Fig. 52 Performance – *Ocells del Cap*, *The Oracle*. Photo: Arto Polus

## 7.1 FLARE 3 – Selected Images



Fig. 53 Performance – Francesca Steele, *Auto-oscillate*. Photo: Arto Polus



Fig. 54 Performance – Siobhán Mullen, *Velocity at Zero*. Photo: Arto Polus

## 7.1 FLARE 3 – Selected Images



Fig. 55 Vitrines – Helen Collard, *Taxonomy of the Thesis Components*.  
Photo: Arto Polus

## Appendix 8 fNIRS (Near Infrared Spectroscopy)

fNIRS is a non-invasive optical imaging technique used to continuously monitor blood flow changes in the brain. The technique exploits the fact that light in the near infrared spectrum (650-1000 nm) easily passes through biological tissue and also that oxygenated haemoglobin (oxy-Hb) and deoxygenated haemoglobin (deoxy-Hb) absorb light in this range at discrete wavelengths (800-940 nm and 600-750 nm, respectively) (Chance et al., 1988, Obrig and Villringer, 2003, Okui and Okada, 2005).

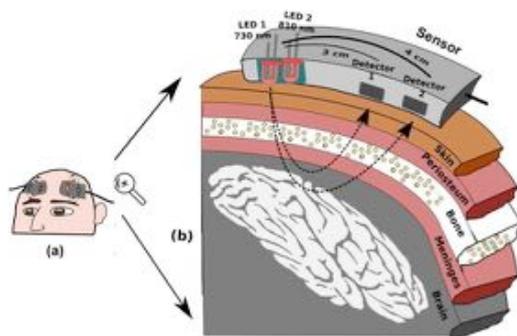


Fig. 56 fNIRS optodes. Image© Artinis Medical systems

### 8.1 Applications

The technique was originally described by Jobsis (1977) although it is only in the last two decades that NIRS has been successfully used to assess in vivo functional activation, following the first demonstrations by Tamura and colleagues in Japan (Hoshi and Tamura, 1993b, Hoshi and Tamura, 1993a). During this time the technique has been widely applied in clinical settings. More recently, fNIRS has been implemented in the field of nutritional neuroscience with a growing number of studies coming out of the lab in which I was working at Northumbria University demonstrating the sensitivity of fNIRS to changes in cerebral hemodynamic response to cognitive tasks following acute administration of polyphenols (e.g. Kennedy et al., 2010, Wightman et al., 2015, Wightman et al., 2014, Wightman et al., 2012) and caffeine (Kennedy and Haskell, 2011) and omega-3 fatty acids

(Jackson et al., 2012, Konagai et al., 2013, respectively).

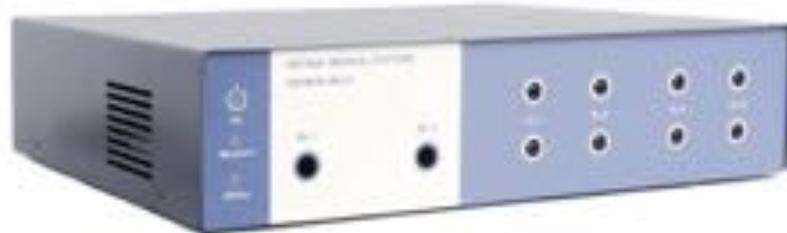
## **8.2 fNIRS and Breath**

fNIRS had been shown to be a sensitive tool by which to measure the effect of breathing on cerebral blood flow. Breath-holding, which increases arterial partial pressure of CO<sub>2</sub>, results in cerebral vasodilation (Cipolla, 2009) and a subsequent increase in total-Hb as measured by fNIRS (MacIntosh et al., 2003). Evidence from studies that have assessed fNIRS response during specific breathing practices have shown that right and left nostril yoga breathing (RNYB and LNYB, respectively) have a differential effect on concentrations of oxy-Hb in the pre-frontal cortex (PFC) with RNYB increasing oxy-Hb in the left PFC and LNYB resulting in a decrease in oxy-Hb in the right PFC (Singh et al., 2016). Arita (2012) reported that 20 minutes of Tanden (abdominal) breathing increased oxy-Hb in the anterior PFC during the breathing exercise compared to immediately prior to commencing it. These studies suggested that fNIRS could be used as a valid tool for assessing blood flow during *prāṇāyāma* practice.

## **8.3 Pilot Studies Hardware and Process**

The device used in the pilot tests is a 2-channel continuous-wave Oxymon system (Artinis Medical Systems B. V., Zetten, The Netherlands). Two wavelengths of light (approximately 765 and 855 nm) were introduced through the skull via a laser emitter and measured, following transit through the upper surface of the cortex, by an optode placed 40 mm from the light source. Optodes were placed on either side of the forehead in positions corresponding to Fp1 and Fp2 of the International 10–20 system and held in place with an optode holder and headband. Relative concentration changes in oxy-Hb, deoxy-Hb, and total-Hb were calculated by means of a modified Beer-Lambert law within the proprietary software (Obrig and Villringer, 2003). The sum of oxy-Hb and deoxy-Hb gives a measure of total haemoglobin (total-Hb), which can be used as an index of local blood flow. Given that continuous-wave fNIRS generates concentration change data that is intrinsically baseline-adjusted to the concentration immediately prior to the first data point in the recording session, in this instance the change from baseline data generated by the NIRS system was subjected to a second baseline adjustment by creating ‘change from baseline’ data with respect to the 10 minutes of fNIRS data collected immediately prior to completing the breathing exercises. During this period a non-stimulating DVD was viewed and normal breathing took place.

#### 8.4 Hardware – Oxymon (BPNRC, Artinis Medical Supplies)



The Oxymon device and two channel headband used at the Brain Performance Nutrition and Research Center (BPNRC) at Northumbria University, Newcastle for the bio-artwork - *Finding Prana*.  
Device supplied by: Artinis Medical Systems B. V., Zetten, The Netherlands.



First sonification test at BPNRC

Images: Artinis Medical Systems & artists own

Fig. 57 Oxymon (Artinis Medical Supplies)

## 8.5 Hardware Octamon – (Artinis Medical Supplies)



The Octamon device used for ISEA 2017  
planned procedure - *Finding Prana*.  
Supplied by: Artinis Medical Systems.



Images: Artinis Medical Systems & artists own

Fig. 58 Octamon (Artinis Medical Supplies)

## 8.6 Data Interpretation

Data Interpretation of fNIRS *prāṇāyāma* studies by Dr. Philippa Jackson (BPNRC) Northumbria University, Extracted from a pending article: Collard, H. Jackson, P. (2016) Ubiquity: The Journal of Pervasive Media Volume 5 Number 1 © 2016 Intellect Ltd Article. doi: 10.1386/ubiq.5.1.161\_1

Evident in the first test when comparing the ‘energising’ ‘heating’ breaths of Ujjayi where an increase in cerebral blood flow – inferred from the observed increase in total-Hb – compared with later ‘cooling’ breaths in the sequence such as Sitali. During the former *prāṇāyāma* an increase in cerebral blood flow – inferred from the observed increase in total-Hb – was observed however in contrast during the latter, concentrations of total-Hb fall below baseline levels. Secondly, although the pattern of changes in the relative concentrations of each of the chromophores was similar across both tests, there were some differences, most notably during Nāḍī Shodhana from the first sequence and Balasana from the second sequence where the pattern displayed is for increased oxy-Hb in the left hemisphere compared to the right hemisphere. Singh et al. (2016) found that concentrations of oxy-Hb in the right PFC were more sensitive to the contralateral nostril breath which may explain why repeated alternate right and left nostril breathing in Nāḍī Shodhana may have had the effect seen here, although the reasons for this during Balasana are less clear. From the second sequence, it is interesting to compare the effect of the Headstand with Savasana on the concentration oxy-Hb during these poses. The flow of blood to the head is tightly regulated via a number of mechanisms collectively termed cerebral autoregulation therefore it is unlikely that the increase in oxy-Hb seen during the Headstand is due to the gravitational effects of the heart being higher than the head. Instead, it is more likely that the pose resulted in a temporary reduction in blood pressure, which has previously been shown to have an inverse effect on cerebral oxygenation using fNIRS (Lucas et al., 2010). Similarly, Lucas et al. (2010) also demonstrated that increasing blood pressure reduces cerebral oxygenation in a linear pattern. This may explain the reduction in oxy-Hb seen during Savasana, as lying down is associated with an increase in blood pressure (Pickering et al., 2005). Interestingly, the extent to which oxy-Hb was reduced during Savasana was much more pronounced during the second sequence compared to the first. Although the exact reason for this is unknown, it is possible that this

may be associated with the breath suspensions which took place in the second sequence. Naturally this will require further exploration.

Also notable was the effect of the Rechaka Kumbhaka, Puraka Kumbhaka and Rechaka Puraka Kumbhaka (*prāṇāyāmas* with the longest held breath suspensions) on oxy-Hb. Oxy-Hb was at its highest levels during this part of the sequence in the right hemisphere and second only to Balasana in the left hemisphere. As mentioned briefly above, the increase in the concentration of CO<sub>2</sub> in the blood brought about by breath holding or breath suspension is known to result in vasodilation to allow for increased blood flow to the brain. In addition, the dropped positioning of the chin (Jalandhara Bandha) during these *prāṇāyāmas* and the resulting pressure this places upon the carotid sinus may be substantial enough to activate the baroreceptor reflex, in turn resulting in decreased blood pressure (Heesch, 1999). Together both of these homeostatic mechanisms may contribute to the large rise in oxy-Hb observed during these *prāṇāyāmas*.

Appendix 9. *Finding Prāṇa*, documentation ISEA 2017



Fig. 59 ISEA 2017 Programme Board for *Finding Prāṇa*. Image © Helen Collard

## Appendix 9. *Finding Prāna*, documentation ISEA 2017

### FINDING PRANA

Helen Collard

UK

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Finding Prana is a bio-art work that employs the yogic concept of prana (breath or life-force) and the practice of pranayama (regulation of breath) to bring awareness to our co-existence in air and breathing as our technology of being. Yoga practitioners make extraordinary claims concerning the value of the conscious observation and control of breath.

Breathing here, is not just a gross bodily function segregated away from the mind and soul; breathing is our material of time and the producer of consciousness. In collaboration with Dr Philippa Jackson at Northumbria University's Brain, Performance, and Nutrition Research Centre (BPNRC) this interdisciplinary bio-art work employs the neuroimaging technology fNIRS (Near Infrared Spectroscopy) to take real-time brain-state data during a live pranayama performance. fNIRS is recording the changing levels of oxygenated and deoxygenated hemoglobin levels in each hemisphere of the brain.

The data is sonified, turned to vibrations in air, in real-time, creating a re-appropriated system for sound creation controlled by the practitioners moving and suspended breath. This bio-art performance acts to elicit an Irigarian remembering of our most essential element in the search for consciousness, unity and peace that is thought to be found in the practices and Imaginaire of prana.

### "RAPCHIY" - ENQUIRY INTO BRAIN READERS' HIDDEN DESIGNS

Bart Vandeput

Finland

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Performative Happening.

With "Rapchiy" the ISEA participants/audiences – or people in the mentioned public space-will have the opportunity to engage with brain reading devices and in particular contribute to the revelation of the hidden designs that were subconsciously integrated in their conceptualization and fabrication by the initial device developers/makers.

In the course of embodied research with brainactivity reading technology, particular aesthetic properties emerge whilst altering the topological stance: reducing the 3D typical use of the neurodevice to a flat surface constellation. Departing from that observation, hidden designs are sought for in the entanglement of human head, neurosignal detecting machine and paper in between. They are revealed by following the contours of the device with the help of a pen and vegetal ink.

The 2D drawings can be transformed again into 3D with the help of scanning and 3D printers (ceramics or wood/PLA filament). Depending on the availability.



Fig. 60 ISEA 2017 Programme.

Appendix 9. *Finding Prāṇa*, performance ISEA 2017



Fig. 61 ISEA 2017 *Finding Prāṇa* Performance. Image © Juan Waltero

Appendix 9. *Finding Prāṇa*, discussion ISEA 2017



Fig. 62 ISEA 2017 *Finding Prāṇa* Discussion. Image © Juan Waltero

Appendix 9. *Finding Prāṇa*, discussion ISEA 2017



Fig. 63 ISEA 2017 *Finding Prāṇa* Discussion. Image © Juan Waltero

## **Appendix 10. Interview Transcript – Professor Ranjit Bhogal**

Part of an Interview (May 2015) at Kaivalyadhama Yoga Centre. Lonavla, India, with Professor Ranjit Bhogal, Director of the Scientific Research Department.

**Researcher:** Tell me the story of Kaivalyadhama, how did it start?

**Prof. Ranjit Bhogal:** This place Kaivalyadhama has got its own legacy, Swami Paramahansa Madhavdasji was guru to Swami Kuvalayananda. Swami Kuvalayananda wanted some kind of renaissance in India society, which as that time was under the subjugation of the British. Swami Kuvalayananda thought that we [the Indian people] should be first ready for freedom and to be ready for freedom would mean we should have [developed] inner thought maturity and then if freedom does come, it would be meaningful. So the psycho-physiological, the oral maturity level and the emotional stability of the people should first be enhanced before they go for freedom from the British.

So Swami Kuvalayananda, was thinking about various media, to achieve this objective then he thought that yoga would be a wonderful medium to have an oral renaissance of the people realised, and thereby make them ready enough for freedom, whenever it came our way. Oral social renaissance is possible through Yoga he was of the firm opinion. In the beginning he was also a freedom fighter, but later on he thought that fighting for freedom without being quite matured citizens would be a kind of fallacy, so he thought yoga is the best medium. His vision was also getting widened day by day, and he had in his vision the whole world now encompassed[...] Swami Kuvalayananda became a world personality and he was thinking about the good of the whole world, not only India. He was thinking about how yoga can be helpful to the whole world - as a whole humanity evolution, that was what he had perceived. So he had transcended all limits of nationalism, religion and he was universal man, we call vishwatna – vishwatna is the word for universal man - those who think of the good of the whole humanity, the whole world[...] Now, was the great task before him, how to make a start? So he thought we should have some institution, whereby the scientific outlook of yoga should be nurtured and developed, unless we do that he thought the acceptance by the people would be very difficult, because in those days, in the 1920's people were having very mysterious ideas about yoga. Swami Kuyalananda made

some early breakthroughs studying Nauli (one of the kriyas - using abdominal muscles to massage the internal organs). This research and his findings brought a host of scientists from the West to Kaivalaydhama, including Dr Behanon, Kuvalayananda inspired and educated scientists in the science of yoga.

Appendix 11. Public Address System – Broadacre House Floor Plan

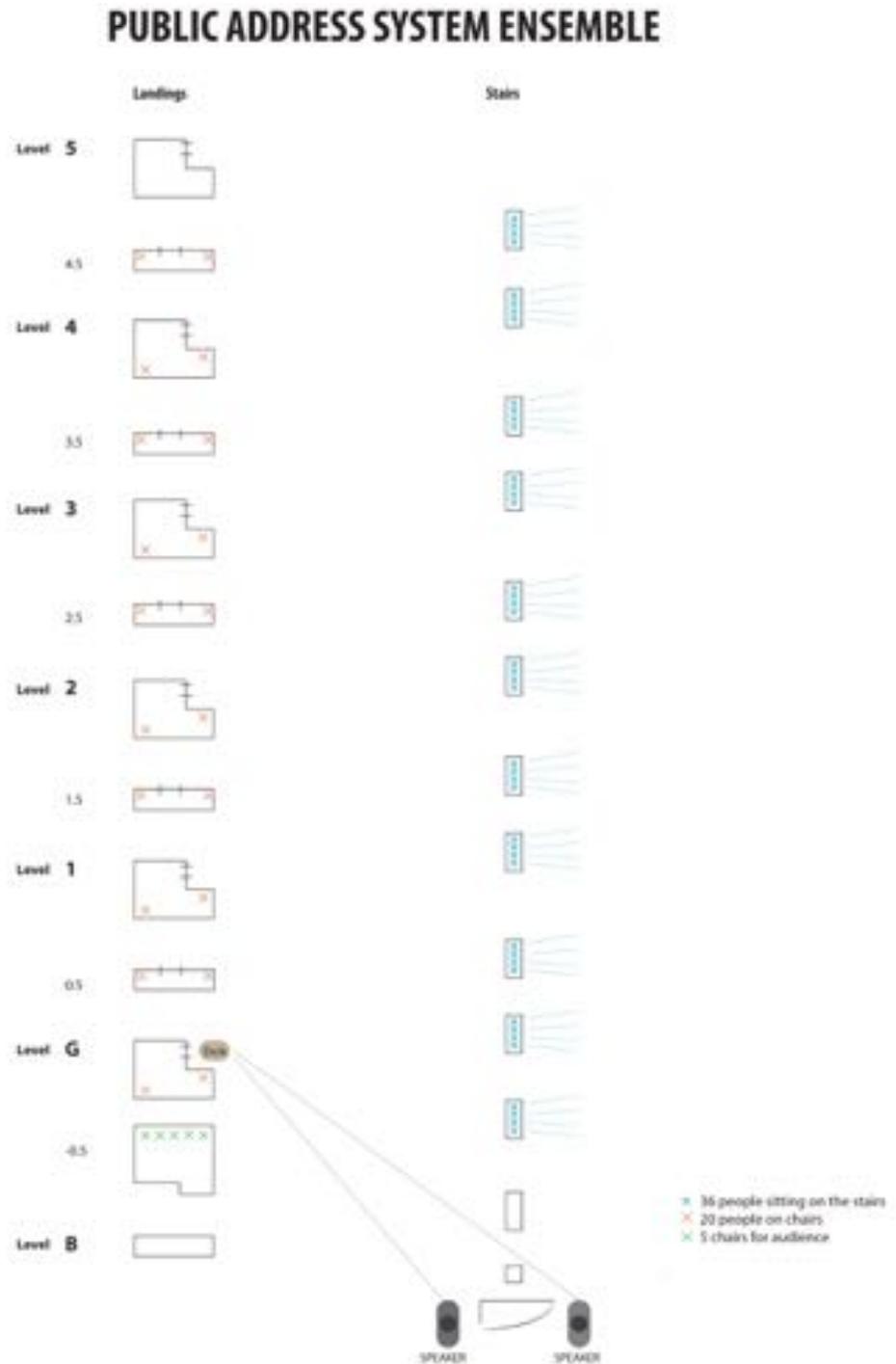


Fig. 64 PAS Floor Plan © Helen Collard

### **11.1 *Public Address System* audience and ensemble comments**

A sample of comments from *Public Address System* at Broadacre House made by ensemble members and audience. Karen Watson (Volunteering Matters) volunteered to steward the event she recorded the following comments:

- Woman standing in front of speaker " I can feel the vibrations through by body and even my blood"
- Woman with long hair and red cushion in the lift " have you tried that before[...] the top of my head is still tingling and I had such a moment of clarity[...] it was so powerful"
- In reception – " that was transcendent"
- " I am alive and yet calm!"
- In carpark – "wow I never expected that, I feel like I want to do it again and bring everyone I know. Everyone should try it"
- "That is the best thing I have ever done, I feel so brilliant"
- "That was amazing"

#### **Audience Member - Martene**

I can say in the first instance that I was overwhelmed with the sheer number of people sat on each step of the 6 floors and the resounding volume throughout the entire space, that came from the humming of all participants. I was equally in awe of the focus and commitment that each individual had for Helen and for her goal of creating a unique piece of work. On exiting the building, I stood at the foot of a speaker Helen had rigged up recording this meditative hum in real time, where I experienced a tremendous vibration through my whole body as the humming resonated through every cell of my body. Quite an amazing experience.

### **Ensemble Member - Davy**

When I did the *'Black Bee Buzz'* with my 52 new chums I said afterwards to my old chum Bill that this was one of the best things that I had ever done. And he said that he had enjoyed watching me try different things and grow in stature and spirit ever since I had joined The Recovery College.

That's the thing about Broadacre House. It's a smorgasbord of joyful weirdness that I discovered when I joined the good ship SS Recovery. We're up on the top floor and until the proposition of the *buzz/yoga workshops* double header I assumed that we alone had cornered the market in joyful weirdness. For sure *The Recovery College Collective* is full of exciting and wonderful things but as I surveyed the whole building I realised almost every floor was packed with exciting 'can do' and thrilling left field projects. So it's hardly surprising that after a hard day of welfare benefits that I should find somewhere to *buzz* and with plenty of others to do it with. Notwithstanding of course that this time we were to be recorded. Helen had somehow attached loud speakers out the building. We were going to blast out the sound right across the city, and if the wind favoured us, the signal might just reach over the water to Gateshead. Nothing much happens there - I know because I live there, so believe me when I say that there was dancing in the streets of that subordinate little town, when indeed the transmission did reach, albeit just a couple of metres over the Tyne Bridge. I learnt this wonderful news from neighbour Alfie when I finally reached home later that night, still 'buzzing' with adrenaline after our performance.

Doing the Buzz that night was just such a lovely thing to do. The night has inspired me to undertake my Mindfulness course again. And to stick with it this time! I also rather fancy The Creative Writing group as a result of compiling this little piece. Both *writing* and *mindfulness* are regular courses of many at The Recovery College. It goes without saying that I am happy there, but folks – whenever in the lift area I shall always check to see what's going on in the rest of the Broadacre building (a great name for such a construction). All the groups and projects seem cheery, artsy and educational with a progressive and healing bent, and they all complement one another I rather fancy. It is undoubtedly the most exciting place I've ever worked. Bonkers and kind. And the *buzzing* coming at the end of my very first term was some very early icing on the cake. The cake itself was packed with honey.

## 11.2 *Public Address System*, BALTIC Centre for Contemporary Art



Fig. 65 Performance of *PAS* with 95 Bhramari Ensemble members. BALTIC Centre for Contemporary Art, Newcastle.

## 11.2 *Public Address System*, BALTIC Centre for Contemporary Art



Fig. 66 Performance of *PAS*. BALTIC Centre for Contemporary Art, Newcastle.  
Image © Mark Pinder.

## 11.2 *Public Address System*, BALTIC Centre for Contemporary Art



Fig. 67 Performance of *PAS*. BALTIC Centre for Contemporary Art, Newcastle.  
Image © Mark Pinder.

## 11.2 *Public Address System*, BALTIC Centre for Contemporary Art



Fig. 68 Performance of *PAS* with 95 Ensemble members. BALTIC Centre for Contemporary Art, Newcastle. Image © Mark Pinder.

## 11.2 *Public Address System*, BALTIC Centre for Contemporary Art

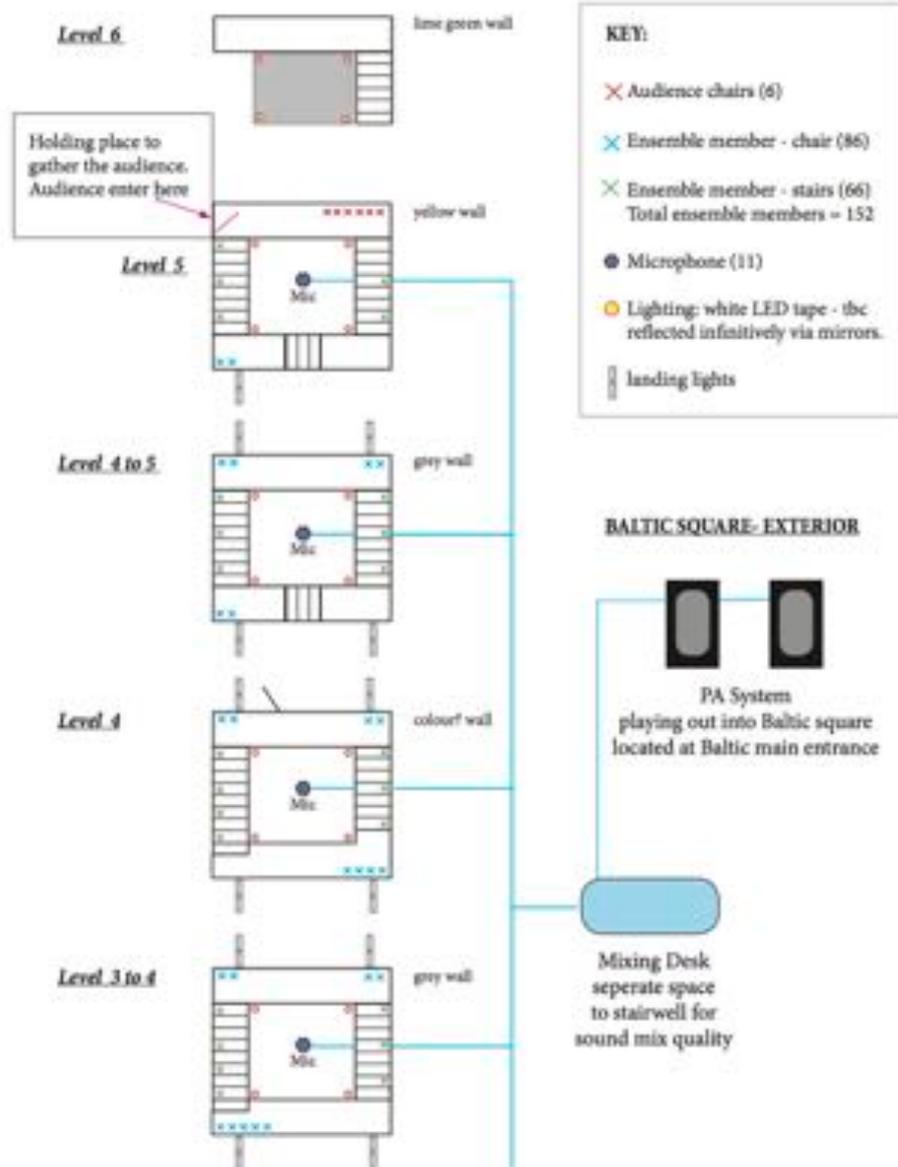


Fig. 69 Performance of *PAS*. BALTIC Centre for Contemporary Art, Newcastle.  
Image © Mark Pinder.

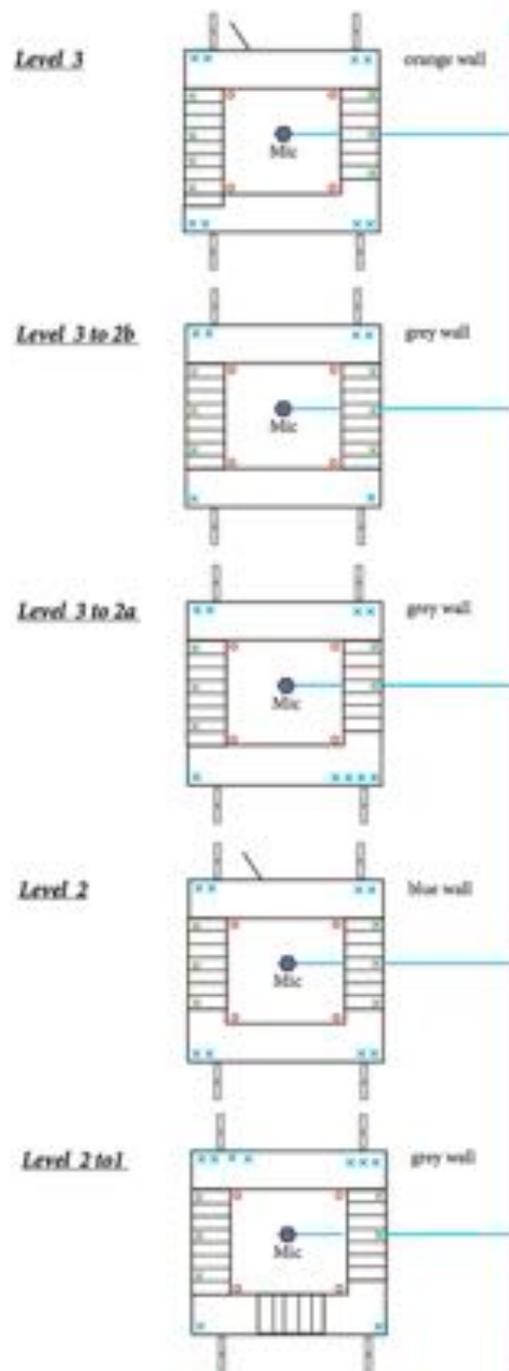
### 11.3 Public Address System, Floor plan – BALTIC Centre for Contemporary Art

#### PUBLIC ADDRESS SYSTEM

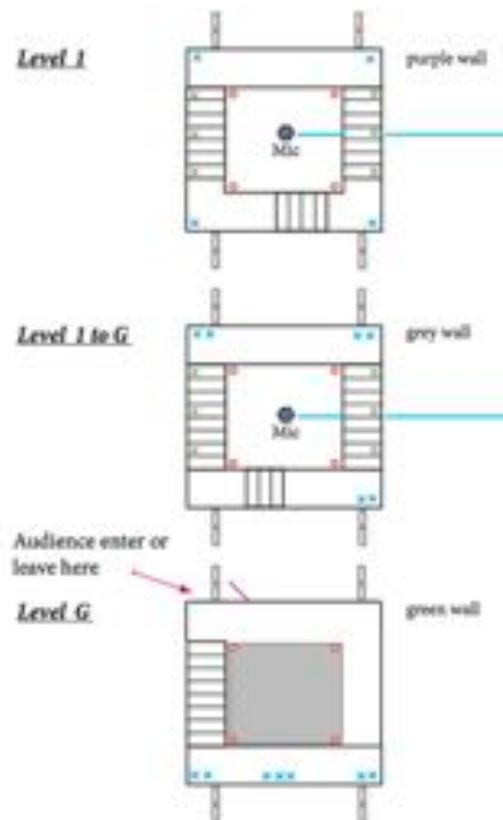
##### BALTIC STAIRWELL - INTERIOR



### 11.3 Public Address System, Floor plan – BALTIC Centre for Contemporary Art



### 11.3 Public Address System, Floor plan – BALTIC Centre for Contemporary Art



The Audience gather outside the stairwell at Level 5. When the performance opens, two people will start the movement through the staircase to introduce the etiquette of slow quiet movement through the space. The audience follow and will be asked at the stairwell entrance to move through slowly and quietly so not to hear footsteps. The audience descend the full stairwell and leave via the ground floor doors. Ideally all the other doors are closed and access is only gained from level 5. Chairs on level 5 will be provided for audience members who would rather not take the stairs.

Not to scale.  
Public Address System by Helen Collard and The Brahamari Ensemble  
Gift Festival @ Baltic 2018

## 11.4 Public Address System, training and cue sheet

# Public Address System Brahmari Ensemble Notes

### How to do Bee Breath (Brahmari)

Sit in a comfortable seated position.

Close the ears off by pressing the tragus in with your fingers, or palms of your hands.

Close your eyes and keep the mouth gently closed, relax the tongue and throat.



Inhale through the nostrils and on the exhale make a 'hmmmm' sound. The humming bee sound is made only during the exhalation. Repeat.

Bee breath has been used as a yoga therapy to ease tension and anxiety. The vibration of sound via bone conduction of the skull is considered a useful aid to cultivate a state of inward stillness and calm. Bhramari is a Sanskrit word derived from bhramar which means humming black bee.

### Ensemble Schedule

11am Training: bee breath technique (brahmari) on Level 1

11.30am Information about performance and cues on Level 1

11.40am Take a position in the stairwell

11.45am Soundcheck: in the stairwell

12.15 -12.45pm Break

12.45pm If needed meet at Level 1 for a reminder of performance cues

12.50pm Move into the stairwell in silence for the performance

1pm Performance starts (approx. 30 minutes)

1.30pm Refreshments on Level 1

## Public Address System: Performance Sequence and Cues

### 1) TAKE POSITIONS

Walk silently into the stairwell and sit in a comfortable seated position. Close the eyes and focus your attention on your breath. Breathing in and out through the nose, locate where and when the breath is entering the nostrils and filling the lungs, expanding the chest and then leaving the lungs out of the nostrils.

### 2) BEE BREATH - CLOSED EARS CUE: A single tone from a singing bowl

Begin bee breathing, fingers close the ears, eyes closed

### 3) BEE BREATH - OPEN EARS CUE: Helen or Nicola will touch your shoulder

Move your fingers away from the ears and continue with bee breath. Take as long as you like to move the hands or fingers away from the ears after your shoulder has been touched. [ Please let Helen, Nicola or David know if you do not want your shoulder touched – and just remove your fingers whenever you'd like to].

### 4) THE WIND DOWN CUE: Three consecutive tones from the singing bowl

Take your time, to stop bee breathing. To wind down to silence it may take 3 or 4 more breaths it may take a 100 bee breaths. This way, the overall sound will gradually fade out rather than an abrupt stop. When everyone has stopped bee breathing we will again sit still with eyes closed observing the 'silence'.

### 5) FINISH CUE: A single tone from the singing bowl

Performance ends, leave the stairwell, refreshments are provided on level 1.

\*If you feel like you want to take a break from bee breath at any time during the performance please do, there is enough of us to carry the sound, and this will not hamper the performance in any way. So please practice as it works best for you and your breath. Some people are very vocal others very quiet. Some move and vary between loud and quiet. The breath should not be any particular length (longer isn't better). The breath should be easy and relaxed. Short breaths suit some people longer breaths work for others. Be guided by what feels relaxed and steady for you. And please stop if you feel you would like to.

**THANK YOU SO MUCH  
FOR MAKING PUBLIC ADDRESS SYSTEM**

## Appendix 12 Fitbit tracker Experiment



Fig. 70 *Cuckfoo*, Helen Collard, 2015. Photo: Helen Collard 2015.

The fitbit is a small example of how we track and measure our fitness goals and achievements. The online phenomenon of unfit bits (unfitbits.com) and my own contribution *Cuckfoo* (Fig.a), explore elements of technology, its data and a bodily disconnect from the self. *Cuckfoo* was a visual image, a spoof prototype made at an early stage during the present research, indicating a speculative cheating or circumnavigation to future fitbit systems and some of the darker and corporate trajectories which are moving toward using outputs of fitness data in order for people to obtain health insurance, salary increments or educational merits. In 2016 Oral Roberts University in the USA made it compulsory for new students to wear ‘grade–issuing’ fitbit trackers (Ali, 2016,18:4). Meanwhile, Vitality, a US health insurance provider, applied discounts or penalties to life insurance premiums according to customers’ achievement or failure to achieve fitness tracking goals (Mearian, 2015, 17:4). Put simply, achievers and non-achievers are systematised by accelerometer movements and each individual’s abstracted achievement becomes allied to how much they can be supported. *The Cuckfoo* clocks up steps for you, fulfilling the needs of your employer or insurer via the movement of the clock’s pendulum; whilst the fitbit owner can attend to their own more immediate needs. The passing of time and steps are clocked on the hour by the cuckoo sound.

Appendix 13 *Listening Clocks* Broadacre House, Newcastle



Fig. 71 Recording of *Public Address System* with *Listening Clocks*, Helen Collard, 2016.  
Photo: Mark Pinder 2016.



Fig. 72 *Listening Clocks*, phase-locking. Helen Collard, 2016. Photo: Mark Pinder 2016.

*Listening Clocks* (Fig. 71) was an installation that accompanied the performance of *Public Address System*, it was sited in a converted exhibition space within the Broadacre building. The installation consisted of two mechanical pendulum clocks hung on a beam attached to a wall, the *Listening Clocks* were set off a day before the *Public Address System* performance. The clock's pendulums were deliberately triggered to be swinging asynchronously. However, pendulum clocks oscillate and they both send and receive sound pulses. Through these sound vibrations, and over time, the pendulums gradually become synchronised with each other. The clocks then move together in time, representing saved energy, entrained, phase-locked and attuned to one another. Much like the dynamic of *Public Address System*, the clock's sounds are sent and in their 'renvoi' a mutuality is formed in the resonance of a return. This exchange between two mechanical pendulum clocks is described in an essay by Ursula K. Le Guin (2004). It is used by the author to illustrate her model of human communication and interaction and I adopt it here to further underpin breath as a listening technology. To illustrate her own communication model, Le Guin begins with a diagram and explanation of the default model of human communication she thinks most of us currently adhere to: the stimulus-response model.

“Box A and box B are connected by a tube. Box A contains a unit of information. Box A is the transmitter, the sender. The tube is how the information is transmitted – it is the medium. And box B is the receiver. They can alternate roles. The sender, codes the information in a way appropriate to the medium, in binary bits, or pixels, or words, or whatever, and transmits it ... the receiver, receives and decodes it. A and B can be thought of as machines, such as computers. They can also be thought of as minds. Or one can be a machine and the other a mind”  
(Le Guin, 2004, p.185).

However, counter to this, in Le Guin's model, shown in Fig. 74 something similar to the *Listening Clocks* and their vibrations is occurring. Le Guin's model and diagram depict two amoebas having sex, but not the usual dull amoeba sex of the solitary amoeba dividing or budding itself into two amoebas. Instead it is the sex amoebas have when some genetic swapping is necessary to “improve the local crowd” (Le Guin, 2004, p.188). In this situation, two amoebas come together, by reaching out and melding their “pseudopodia into a little tube or channel” (p.188) which connects them together and through which

inner bits of both bodies moves through the tubes into one another. The amoebas are engaged in genetic exchange, infecting each other; a sympoiesis.

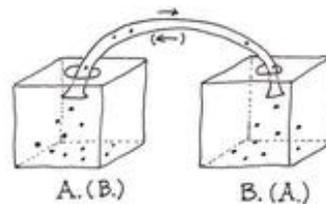


Fig. 73 A and B Boxes. Image © Ursula K. Le Guin, 2004

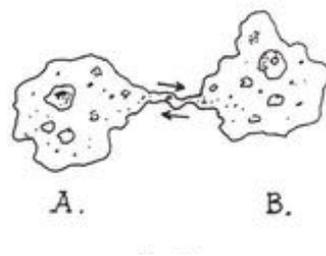


Fig. 74 Amoeba Pseudopodia Exchange. Image © Ursula K. Le Guin, 2004

“They hang out for quite a while sending bits of themselves back and forth, mutually responding each to the other. [It is a] continuous intersubjectivity that goes both ways all the time” (Le Guin, 2004, p.189).

In this mutual interchange of communication and action, Le Guin describes how, amongst human beings, everything that is “transmitted”, everything that is said “is shaped as it is spoken by actual or anticipated response” (p.189). Through Le Guin’s model, the two pendulum clocks, the two amoebas, or two people performing *bhrāmarī*, a community and mutuality and phasing is formed. In addition, in Le Guin’s model, the message is not just a packet of information, a fixed cognitive entity. It is a communicative action, and like the

amoeba's pseudopodia it is a deeply embedded relationship between the speaker and listener that is active and transformative. Alphonso Lingus's noisy birds at the beginning of the taxonomic element of vibration, focus our thoughts on vibration as listening. Lingus observed that "One sees how the bird's noise levels keep up with the noise level of the house" (Lingis, 1994, p.96) and now, through Le Guin's model, we might see how our own selves, like the birds and the *Listening Clocks*, also seek to echo and live in the vibrancy and timing of things.

