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REPRESENTATIONAL STRATEGIES ON ALZHEIMER'S STUDIES: A PRACTICE-BASED ART RESEARCH IN A NEUROSCIENCE LABORATORY

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REPRESENTATIONAL STRATEGIES ON ALZHEIMER'S STUDIES: A PRACTICE-BASED ART RESEARCH IN A NEUROSCIENCE LABORATORY

MARIA MANUELA CARVALHO DE SOUSA LOPES

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Abstract

This project is practice-based and developed progressively through a body of four interrelated installation artworks. The personal practice focuses on specific areas of critical investigation, and on a continuous exercise seeking a reflective research hypothesis and an emerging methodology. Research methods familiar to my practice and an ethnographic approach have been used, with studio work mirroring an evolving embedded research process from fieldwork in neuroscience laboratories and a hospital.

This research constructs connections between visual art practice and neuroscientific research studies in the field of Alzheimer's disease (AD). It explores the relationship between the evolution of four installation works (which correspond to the chapter structure of the written thesis) and the nature of autobiographical memory, and the location of my art practice with regard to three artistic case studies. The aim is to explore the representational strategies of AD studies in the laboratory through art practice, alluding to the (dys)functioning of autobiographical memory. Key elements include the visual, ordering, archiving and montage. The research acts as a metaphorical toolkit for providing a wider understanding of my practice of montage, archiving and time in connection with specific practices of neuroscientific research. Using successive artwork installations at different venues to elaborate on several simultaneous methods, I reflect on how images and sounds relating to AD research may be understood as interacting elements which, when enacted and re-enacted, produce certain effects and affects that aim to account for the nature of memory and the disease itself. Theories of autobiographical memory and current neuroscientific research on AD (clinical neurology, neuropsychology, neuroimaging and molecular and cellular studies) are introduced and explored. Debates on visuality and 'looking at', the institutional gaze and the technology within which the visual and science are rooted are examined using Foucault's concepts of heterotopia and panopticon and Latour's actor-network theory.

In creative terms, the major conclusions are the development of several novel methods of research, the resulting artefacts, and the practical materialization of these via the agency of installation. Overall they are infused with qualities such as the temporal, the invisible, the archive and the creative re-enacting character of biological cognitive processes and scientific representational strategies. This is suggested as a fertile area for new art-based explorations and critiques of developments in both contemporary art and science.

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DVD 2 The narrative of the context for making documented in Appendix II reveals the multiple ways in which memory and montage act in this thesis: as a conceptual relationship of ideas, as a mode of scholarly investigation and artistic engagement, and as my material processes of producing, connecting and transforming representational strategies on Alzheimer's disease studies. This DVD includes additional images from my documentation of the studio as an archival space, and the assessment guidelines that I used to help me through the self-assessment studio practice, including the NTB and ADAS – Cog assessment scales. It also shows the making of the *Lost Words* video project and an early video essay on the hand (finger naming) assessment strategy.

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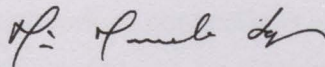
Declaration

I declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree, and does not incorporate any material already submitted for a degree.

Signed:

Dated: 22nd January 2013

Abbreviations

AD – Alzheimer's Disease

ADAS – Cog - Alzheimer's Disease Assessment Scale (cognitive subscale)

AM – Autobiographical Memory

ANT – Actor-Network Theory

CSF – Cerebrospinal Fluid

CT – Computer Tomography

DLB – Dementia with Lewy Bodies

ECG – Electrocardiogram

FCT – Fundação para a Ciência e Tecnologia

fMRI – Functional Magnetic Resonance Imaging

FMUL – Faculdade de Medicina da Universidade de Lisboa

HSM – Hospital de Santa Maria

IMM – Instituto de Medicina Molecular

MCI – Mild Cognitive Impairment

MMSE – Mini Mental State Examination

MRI – Magnetic Resonance Imaging

NTB – Neuropsychological Test Battery (cognitive subscale of the Alzheimer's Disease Assessment Scale)

PET – Positron Emission Tomography

UCA – University for the Creative Arts

Introduction

Literature review

Recent neuroscientific research, centred on the neurophysiological case studies of patients with brain injuries as well as cognitive studies on healthy subjects, suggests that memory is in fact a multiple memory system (Tulving, 1972; 1985). Memory seems to be not a single entity, but a group of different abilities mediated by distinct brain systems, such as the sensory cortex, the dorsal striatal, the amygdala and the hippocampal region. Each neural system holds differing connections and receives different information from distinct brain structures. The working of these neural systems is understood as both independent and cooperative, which explains dissociations in people with brain lesions, as well as the unified experience of memory in a normal person. This view is supported by advanced functional neuroimaging investigations (Schacter et al., 2000). Susan Greenfield explains the importance of functional neuroimaging to elucidate the multiple memory system.

> Whole constellations of brain regions become active at different times and in subtly different configurations, depending on what the person being studied is doing [...] (2000: 25).

In neuropsychology, when a test is performed on a patient's memory, the meaning associated with memory is, according to Tulving and Craik (2000), a neurocognitive capacity described as a three-stage process of encoding, storage and retrieval. The process of encoding the links to the initial absorption of information into the memory leaves traces in the nervous system that preserve the effects of experience across time. Storage is the maintenance of these traces. The act of remembering in neural terms is described as a network of connections among nerve cells (Kandel, 2006). Information arriving from the world is stored in the limited-capacity process of short-term memory, before being lost or transferred to a separate long-term memory system.

Autobiographical memory (which is the main focus of this project) is consensually understood as part of this long-term memory complex. Traditionally studied from a general psychological perspective, it is described as a type of episodic memory that contains information about one's self (Tulving, 1972), for example memories of specific events across time, such as marriage. In addition to episodic autobiographical memory, several

researchers (Tulving and Craik, 2000; Conway, 2005) have identified a semantic category of autobiographical memory[1] that consists of general information about a person's past, such as name of school attended. Memory[2] is currently seen as an activity under constant construction and reconstruction (Rosen, 1998), subverting the traditional view that it is a storage machine for record, retention and unaltered retrieval[3] (Sutton, 2004).

In cognitive psychology, 'mental time travel' is the process recognized as allowing, in autobiographical memory,[4] the awareness of this dynamic retrieval. Various studies have separated it into two distinct forms: conscious and direct retrieval, and involuntary retrieval[5] triggered by a smell, sound or image. Subjectively, it is understood that memories are mediated, personal and subject to change, rather than a fixed archive of pristine data awaiting the appropriate command to re-form them into images. This subjective weaving quality allows psychologists to qualify them as autobiographical memory.

This type of memory links us to places, people, sensory-perceptual details of events (episodic memory) and facts (semantic memory) such as when we were born, or where we studied. Cognitive psychologist Daniel Schacter (2001) views such information as personal interpretation rather than truthful record, asserting that the awareness and reconstruction of the individual's personal experiences depends on other mental capacities:

> [...] retrieval of past episodes usually recodes, or updates, the information. Thus, active reconstruction, rather than mere retrieval, appears to be essential to episodic memory, and this necessitates the involvement of certain cognitive faculties [...] (2001: xx)

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[1] Recent major theories on autobiographical memory include Tulving's (2005) view that episodic memory is the conjunction of the self, autonoetic awareness and subjective time, entailing mental time travel and providing a sense of self-continuity, and considered as the latest appearing memory system sustained by frontal lobes; and Martin Conway's (2005) conception of episodic memories as phenomenological records that may be rapidly forgotten or linked to autobiographical knowledge.

[2] 'Memory is a label for a diverse set of cognitive capacities by which humans and perhaps other animals retain information and reconstruct past experiences, usually for present purposes. Our particular abilities to conjure up long-ago life events are both familiar and puzzling. We remember experiences and events that are not happening now, so memory seems to differ from perception. We remember events that actually happened, so memory is unlike pure imagination. Memory seems to be a source of knowledge, or perhaps is simply retained knowledge. Remembering is often suffused with emotion and is an essential part of much reasoning. It is connected in obscure ways with dreaming. Some memories are shaped by language, others by imagery. Much of our moral life depends on the peculiar ways in which we are embedded in time. Memory goes wrong in mundane and minor, or in dramatic and disastrous ways.' (John Sutton, 2003, *Stanford Encyclopedia of Philosophy*, http://plato.stanford.edu/entries/memory/; accessed 06/09/2009).

[3] As the archival function of a computer memory.

[4] Martin Conway says: 'Autobiographical memories are conceived as temporary mental representations constructed and maintained by a set of central processes' (1996:167). To retrieve such memories one needs to reintegrate the correct memory fragments containing contextual, temporal and sensual information.

[5] Marcel Proust widely and poetically describes this flow into involuntary memory in his multivolume novel *In search of Lost Time*.

Psychologist David Rubin claims that many systems play a role in autobiographical memory:

> [...] individual senses (especially vision, hearing, and smell); a multimodal spatial system, which notes the location of objects and people; emotion; language; a narrative system that keeps track of causal relations [...] and an explicit memory system that coordinates or binds information from the other systems. Each of these systems has its own processes, forms of organization, and roles with respect to memory (2005: 79).

I propose that this process in a multiplicity of systems implies a tendency to assemble, and may be evoked through montage, juxtaposition and video installation. In Alzheimer's disease communication within this system seems to be disrupted; the assembling capacity therefore seems to be shattered.

Alzheimer's[6] is a silent, neurodegenerative disease that effaces the map of connections drawn from the experience of living; its onset is heralded by destruction of autobiographical memory. According to neuroscientist André Dellacourte (2006), Alzheimer's disease is the most common form of dementia, a brain pathology that leads to a progressive cognitive decline in the ability to remember, learn, think and communicate. Sufferers present difficulty accessing and using words, recognizing faces, images, places and objects. It is a complex phenomenon, due to the coexistence of two degenerating biological processes, tau protein aggregation and Beta-amyloid deposition, that affect polymodal association in brain areas (i.e. synapse networking).

The American National Institute on Aging's web page clarifies:

> Alzheimer's disease disrupts critical metabolic processes that keep neurons healthy. These disruptions cause nerve cells in the brain to stop working, lose connections with other nerve cells, and finally die. The destruction and death of nerve cells causes the memory failure, personality changes, problems in carrying out daily activities, and other features of the disease.[7]

Alzheimer's patient Thomas DeBaggio says in his autobiography:

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[6] Amyloid plaques are found in the spaces between the brain's nerve cells and were first described in 1906 by Dr Alois Alzheimer. Plaques consist of largely insoluble deposits of the apparently toxic protein peptide, or fragment beta-amyloid. Accumulation of aggregated proteins in the brain is a shared feature of many neurodegenerative diseases including Alzheimer's, Parkinson's, and Huntingdon's. Alzheimer's is characterized, according to Oksana Berezovska, on a molecular level by an increased deposition of senile plaques and neurofibrilary tangles in the brain, synaptic dysfunction and neuronal loss. For an extended explanation see Outeiro, Tiago Fleming, ed. (2008) *Protein Misfolding in Biology and Disease*, India: Transworld Research Network.

[7] 'Alzheimer's Disease: Unraveling the Mystery' (2008) in Alzheimer's Disease Education and Referral Center, The American National Institute on Aging, Department of Health and Human Services website, http://www.nia.nih.gov/alzheimers/publication/part-2-what-happens-brain-ad/hallmarks-ad (accessed 25/01/2009).

> Without memory you lose the idea of who you are. I am struggling more than ever to find answers to questions of identity. I am flooded with early memories preserved in protected places of my brain where Alzheimer's does not reign supreme. These memories become the last remnants of my search for who I am. (2002: 42)

The notion of linear time dominates our daily lives and is intertwined with narrative convention and construction of the self. Narratives allow us to link past, present and future, and memory, due to their dynamic functioning around encoding, storage and retrieval, implying an assemblage capacity that binds fragments to experience and imagination.

In Alzheimer's disease, the assemblage capacity and narrative are brought into sharp relief because of their inherent mystery, fear and unknowability. The progressive loss of brain network connections inhibits patients from assessing not just recent events, but well-rehearsed skills and known facts:

> It is not just about remembering things; it is about where things are and how they work. It is about the retrieval of knowledge; it guides speaking, sleeping and rolling in the grass. (DeBaggio, 2002: 199)

My practice-based research was in the Instituto de Medicina Molecular and hospital. This provided a unique and complementary scientific/laboratory/artist studio in which to develop a progressive and situated practice-based inquiry into how memory loss is scientifically researched. Science and health philosophers Marc Berg and Annemarie Mol (1998) claim that medical and scientific investigation is based on practices of construction, assemblage and incorporation of techniques, habits, ideas, images and conversations. This represents my concept of an archive, envisioned[8] as a network of four intertwined 'archival spaces' (Fig. 1):

1. The patient;
2. The art studio;
3. The Alzheimer's research laboratory;
4. The cellular and molecular research laboratory.[9]

In this process I have documented the assessment and categorization of Alzheimer's patients and their exposure to various therapies. I have also documented molecular and

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[8] This spatial articulation process is further described in the methodology section.

[9] Further extending my observation to other locations the research networks lead me to, in order to follow the topic on research (e.g. the MRI clinic where patients are scanned or the Memory Clinic where patients receive therapeutic treatment).

cellular research laboratory procedures and collect laboratory materials. In order to maintain a common thread when approaching these spaces, methods have focused on neuroscientific diagnostic images (MRI and PET scan), graphs, diagrams, notes, models, photographs, instruments, physical space conditions and hybrid forms of these, and establishing a critical link to art practice. In laboratory studies these visual approaches are designated representational strategies or practices (Lynch and Woolgar, 1990: 1-18).

Analysis of my working methods identified the need for some studies on the status of images, visuality and representation, due to the interdependency of my ethnographic exploration on vision and technology. This reflection served to critically consider my voyeuristic position, using the artistic gaze on others' practices and diseases to question the roles of observing, archiving and reconstructing. For example, Jonathan Crary (1992) focuses on the embodied observer's ways of looking. He examines how practices were shaped by optical devices, including the camera obscura,[10] panoramas, magic lanterns, kaleidoscopes and stereoscopes, thus ascribing supposed neutrality to the technologies leading to codified modes of viewing. The concepts of 'visuality' and 'scopic regime' are often used in discourses around image and vision and, according to Gillian Rose (2007: 2), refer to ways in which both what is seen, and how it is seen, are culturally constructed.[11]

Reflecting on the idea of 'looking at' in institutions, French philosopher Michel Foucault explores the ways in which institutions such as schools, prisons, hospitals or asylums depend on several forms of surveillance. In his 1967 lecture 'On Other Spaces'[12] he identified specific types of spaces that have links to all other sites in our culture, but in a way that contradicts or reflects the set of relations they designate. Places such as cemeteries, theatres and museums are termed 'heterotopias', and this metaphor has been used to describe my network of archival spaces because of a recognized similarity of principle.

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[10] The camera obscura is a common metaphor for memory. In *Metaphors of Memory: a History of Ideas About the Mind*, Douwe Draaisma presents an interesting case study of the way in which descriptions of memory, supported by the vague but continuous and dynamic images of the *camera obscura*, rapidly gave way in mid-19th-century psychology to the photography-inspired contradictory notion that memories are fixed and accurate but static.
[11] US historian Martin Jay (1993) prefers the term occularcentrism to portray the emphasis on the centrality of the visual in western world.
[12] Lecture presented to the Architectural Studies Circle 14 March 1967 and published as 'Different Spaces' in Faubion, James D., ed. (1998), *Essential Works of Foucault: Aesthetics, Method, and Epistemology*, vol II. The Penguin Press, London.

Foucault views 'crisis heterotopias' as places reserved for individuals in a state of crisis with respect to society and the human milieu (1998: 179), though he refers to transitory crisis such as adolescence, citing examples such as educational experience or military service. This characteristic corresponds broadly to two of my archival spaces: Alzheimer's patients and the hospital/clinical research unit, because of their association with a state of crisis. Another principle refers to connections and relations simultaneously juxtaposed and previously non-existing, exemplified by the way in which theatre and cinema provide symbolic meanings. In my research these correspond to the studio, where montage and reconstructions are actuated and new connections forged.

An additional principle presupposes a system of opening and closing, isolating heterotopias and thus at the same time rendering them penetrable, either through coercion, as in imprisonment, or via rituals and purifications. I see a similarity with scientific laboratories, as places that are only accessible with special permission obtained by following bureaucratic and aseptic procedures. The processes of filling in various consents, contracts, health and safety or ethics forms, in addition to procedures such as donning white coats and cleansing of hands, are seen to equate to ritualistic and purification performances.

In *The Birth of the Clinic* Foucault argues that the mechanical-clinical gaze transforms our bodies in sites where organs and eyes meet (2003: xiv), detaching the body from the person, or 'externalizing the internal'. He explains that this gaze allows a passage from small-scale practice to an archival kind of functioning, substituting body presence for large manipulation of coded records permanently present. This approval (Struken and Cartwright, 2002: 281) of the instrumental image as a provider of access to invisible truths is linked to an increased use of institutional regulation and categorization or archiving. This allows the clinical gaze to extend from the individual body to the wider population, and a stronger weaving of technology, culture, medicine and society.

The late or scarce physical symptoms of Alzheimer's disease prompt my interest in how the intermediation of the technological image substitutes for some clinical sensorial examination of the body, and how certain laboratory practices turn the biological materiality of the loss of memory into a visible phenomenon. In clinical practice, perspectives similar to those adopted by Crary or Cartwright assume a supposed

neutrality of the technologies and ascribe objectivity, methodological consistency and precision to the images.[13] Representation is the substitution of symptoms and behaviours reported by the patient. Images are seen as essential to systems of power and concepts of knowledge and self-regulation.[14] Foucault uses a powerful metaphor to explain this idea: the panoptic[15] prison functioning as a reminder of the permanent exposure to visibility to which one is from then on subjected.

> The panoptic mechanism arranges spatial unities that make it possible to see
> constantly and to recognize immediately. (1995: 200)

As Foucault suggests, scientific and medical understanding of the body focuses on surveillance using practices of assessing, recording and archiving to classify and define the boundaries between illness and health. The panopticon links visuality and power. Foucault says:

> The Panopticon [...] is a type of location of bodies in space, [...] of hierarchical
> organization, [...] of definition of the instruments and modes of intervention of power,
> which can be implemented in hospitals, workshops, schools, prisons. Whenever one is
> dealing with a multiplicity of individuals on whom a task or a particular form of
> behaviour must be imposed, the panoptic schema may be used. (1995: 205)

An apparent organization of the sensorial perception of space and time thus articulates power relationships. According to Struken and Cartwright (2002) this looking is linked to other activities that ascribe meaning to what vision uncovers, such as experimenting, measuring, analyzing and ordering. My practice uses a similar approach to deal with reorganisation of materials, space and time around the study of Alzheimer's. The panoptical gaze surveys the human body, which for the purposes of the clinical investigation becomes transparent; the invisible disease becomes accessible; volumes,

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[13] 'The notion of photographic truth hinges on the idea that the camera is an objective device for the capturing of reality, and that it renders this objectivity despite the subjective vision of the person using the camera.' (Sturken and Cartwright, 2002: 280)

[14] Foucault coined the notion of *biopower* as a reflex on the body on the regulatory power institutions. The training, exercise and regulation of the body, categorized and registered through photography, is explained as the simultaneous rise of 19th-century social institutions and the emergence of photography. For expansion, see *Practices of Looking* (Marita Struken and Lisa Cartwright, 2002).

[15] Foucault uses the design of a model prison conceived by reformist Jeremy Bentham (1748-1832). In Bentham's model: 'at the periphery, an annular building; at the centre, a tower; this tower is pierced with wide windows that open onto the inner side of the ring; the peripheric building is divided into cells, each of which extends the whole width of the building; they have two windows, one on the inside, corresponding to the windows of the tower; the other, on the outside, allows the light to cross the cell from one end to the other. All that is needed, then, is to place a supervisor in a central tower and to shut up in each cell a madman, a patient, a condemned man, a worker or a schoolboy. By the effect of backlighting, one can observe from the tower, standing out precisely against the light, the small captive shadows in the cells of the periphery. They are like so many cages, so many small theatres, in which each actor is alone, perfectly individualized and constantly visible.' (Foucault, 1995: 200)

spaces and time become visible in representational strategies, both portable and juxtaposable in a translation format. Vision prevails but is dependent on other sensory and cognitive processes, and also on context.

The most radical example of this practice was the development of the X-ray as a medical representational strategy. The opening of the clinical gaze to a wider audience is explored in several studies that focus on transparency and approach of the body's interior, an experience only possible via X-rays and medical imaging techniques such as ultrasound, MRI and PET scans. Lisa Cartwright's pioneering *Screening the Body: Tracing Medicine's Visual Culture* (1995) examines the intersecting histories of cinema and X-ray from a cultural studies perspective, raising questions on scientific spectatorship and cinematic surveillance. In *Practices of Looking* (2002) Cartwright and Sturken explore how images are observed and by whom.[16] They present a social and cultural association between truth, knowledge and vision intertwined in the scientific representational strategies:

> The idea that the truth lies beneath the surface, and needs to be seen to be fully understood, has predominated in Western culture since of the Greeks. It is a common sign in contemporary culture to use the image of looking inside someone as seeing their 'true' identity. (2002: 298)

Joseph Dumit[17] (2004) examines how identity is constructed visually through PET scans,[18] arguing for a direct link between a person's behaviour and symptoms and the image representing it. Dumit's study focuses on the shifting meanings and uses of these images when they move from the laboratory to contexts such as magazines or scientific journals. In a parallel methodology this research also explores and re-frames the representational strategies on Alzheimer's studies outside their usual confined paths.

Several studies have focused on visual strategies common to science, medicine and art, questioning the externalization of the invisible body and the relationship between seeing and knowing. These include Barbara Stafford's (1991) Enlightenment Era survey on pictorial common practices such as abstraction and marking; Bettyann Kevles's (1997) study on the social and cultural impact of X-ray technology; José Van Dijck's (2005)

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[16] Clearly reporting the influential approach taken by John Berger in *Ways of Seeing*, a seminal text on the relationship between the image and the viewer.

[17] Anthropologist and Director of Science and Technology Studies at the University of California.

[18] His work is important to reinforce the connections established between the biology of the body and of the cellular and molecular research on it and the cognitive impairment dementia that patients present.

exploration on the myth of the transparent body undamaged and ready for improvement; and Robert Zwijnenberg's (2009) reflection on how scientific knowledge is transformed in art, questioning integration of these new image technologies in the construction of identity.

Some art/science collaborations that question notions of personhood, self-identity and autobiographical memory are reflected in both *The Molecular Gaze* (Anker and Nelkin, 2004) and *Art in the Age of Technoscience* (Reichle, 2009). Both approaches consider recent art projects close to technological and social advances in molecular biology and reflect on the use of biology, materials, processes and theory by artists, exposing attempts to decode the cultural codes also enclosed in the scientific images in a bid to make them a space where other fields of culture may be inscribed.

> Whether artists work with brain scans produced by advanced imaging processes or lab equipment, the focus of the artistic approach is very often the diversity of human experience, which rarely lends itself to portrayal by standardized scientific procedures […] However it is apparent today that even with the amazing insights these new worlds of scientific imaging offer us, such images must, of course be understood as historical snapshots, which carry with them own historicity. (Reichle, 2009: 35)

The relationship between technology, science and nature is explored in Bruno Latour and Steve Woolgar's seminal study of 'laboratorial life', and Latour's studies around action in science.[19] Latour suggests that science is a process of addition of inscriptions, which primarily works through study of images, graphs, maps, tables and text data rather than the real phenomena. He emphasizes the advantage lent by such images and inscriptions over scientific claims, with a focus on the whole process of mobilization surrounding their production. The invisible truth may be sustained by showing an image:

> We are so used to this world of print and images, that we can hardly think of what it is to know something without indexes, bibliographies, dictionaries, papers with references, tables, columns, photographs, peaks, spots, bands. (1986: 13)

Latour's analysis suggests that observing means constructing and bringing into being. This applies particularly to technologies such as MRI and PET scans, in which observation by construction is mediated and functions at the very boundary

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[19] These are particularly useful and new insofar as they interweave discourses on biotechnology research and production of facts and knowledge using an ethnographical approach. The reader is driven through different construction sites of facts and machines staging science as an inscription-making practice, prompting discussion of issues around representation and inscription and science as a semiotic practice dealing with signs and symbols, presence and absence.

of what can be conceived as visual.[20]

Bruno Latour, Michel Callon and John Law developed the actor-network perspective (or theory, i.e. ANT) on scientific knowledge, taking Foucault's power/knowledge understanding as a starting point but focusing on networks. Actors may be objects as well as people. The network suggestion allows entities to circulate in the laboratories and be exported as scientific facts or representations following processes of scaling down, inscription and construction. The conditions of art/science 'collaboration' in this project derive from my understanding and appropriation of metaphors from the ANT allowing a free circulation and non-hierarchical use of representational strategies from each archival space. The word collaboration when used can be understood as facilitation. Networks are intended to connect laboratories to chains of actors in different spatial locations and to address the contradiction that so few people seem to embrace the world:

> The word network indicates that resources are concentrated in a few places – the knots and the nodes – which are connected with one another – the links and the mesh: these connections transform the scattered resources into a net that may seem to extend everywhere. (Latour, 1987: 180)

Latour (1987) emphasizes the central role played by images such as inscriptions and material artifacts in consolidating the networks established between laboratory and the outside community. He calls these delegates 'immutable mobiles', which should provide important information of the places and people concerned. The concept of 'translation' is used to a practical end: anyone who needs to construct a fact must involve other people and technologies, but must simultaneously control their performances. He calls attention to the interpretation these actors hold on relating their own interests in the construction of the facts. The term 'translation' is chosen for its linguistic meaning – relating versions in one language to versions in another – and for its associated geometric meaning of moving from one place to another (1987: 117).

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[20] For example, MRI depends on the use of very strong magnetic fields to make the nuclei of atoms spin in a certain direction. This effect is fundamentally undetectable in any form by the human senses, although the amount of noise might be misleading in this respect. In contrast to a microscope that magnifies visible light, the sophisticated measurement of electromagnetic energy, outside the scope of human sight, must be reconstructed in a pictographic way that may be interpreted by expert technicians and doctors. Accordingly, not only is the interpretation subjective, but also the visual choices made in the graphical interpretation of the scan data for diagnostic purposes may obscure other readings; norms and consensus are under constant discussion in terms of choices of how to represent the scaled measurement of the magnetically spinning nuclei in a visual way.

If in the laboratory images are mainly read against the background assumptions of medical discourse and practice, in the studio they surface under other cultural assumptions. Through different visual strategies, Suzanne Anker, Mark Dion and Helen Chadwick deploy metaphors relevant to the current neuroscientific approach to memory and biological research. They also explore a cultural critique that resonates within those theories. I have therefore constructed case studies connected to the specific headings of my investigation as described in the thesis outline: The Approach, The Archive, The Assessment and The Therapy.

Research methodologies

Central to my research methods is the use of 'virtual spaces'[21], suggested by interconnected rooms, which mimic both ideas of archival spaces and some spatial organization of the laboratories (Fig. 2):

1. The patients' space: their bodies and actions as physical ground of a neurodegenerative disease; the centre of attention of the scientific archive;[22]

2. The art studio;

3. The Alzheimer's[23] research laboratory (hospital Santa Maria, Faculty of Medicine, Lisbon University);

4. The cellular and molecular research laboratory[24] (Instituto de Medicina Molecular,[25] Faculty of Medicine, Lisbon University).

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[21] The concept of the 'virtual space' is central to my method. It is intended to work as a metaphor which includes the Alzheimer's patient. I cannot enter directly into the subjective or physical space of the patient but I wanted it to be concretely represented within my work.

[22] Facing the patients definitely reinforced the notion that to look at is an empowering position; a mixture of a desire to understand and a voyeuristic redemption behind a photographic or video camera. It made me far more conscious of the ethical implications and the reconstructive power of memory when facing images and proposed narratives.

[23] The research group name is Dementia Research Group but their main area of study is Alzheimer's disease – the leading investigator is Alexandre de Mendonça, PhD.

[24] The leading investigator is Tiago Fleming Outeiro, PhD.

[25] 'The mission of Instituto de Medicina Molecular (IMM) is to foster basic, clinical and translational biomedical research and innovation in this area with the aim of contributing to a better understanding of disease mechanisms, developing novel predictive and diagnostics tests and developing new therapeutic approaches; support scientific postgraduate training of young graduates, doctors and other health professionals; support science communication and

I have developed four installation works according to the circulation and collection/production of data in the four archival spaces, and the time frame of my research. The installations correspond to the chapter structure of the main thesis.

The notion of dividing the inquiry into four different spaces emerged from myriad feelings provoked when physically working between the hospital, the IMM and the studio, and attempts to identify how the patient becomes a brain, a disease, and fragments in the medical archive. I am investigating not only particular principles but also the individual sites' diverse physical characteristics and complementary roles in the articulation of Alzheimer's research, and the different representational strategies produced. Each place produces separate representational strategies, rhythms, archiving strategies and structures. The chaos of the studio, the tense and emotional atmosphere of the hospital or clinical setting, and the patients' unravelling memory capacities may be related to Foucault's crisis heterotopia.[26] In contrast, the laboratory situation is characterised by emotional drive, subtly masked by hierarchical coordination, aesthetic and aseptic purposes, and is therefore linked to the ritualistic principle of heterotopias.

Experience in the clinical and scientific spaces is oriented to observation, collection and video and photographic captures of repeated gestures, sentences, materials produced, archival strategies; this includes recording the neuropsychological assessment sessions and part of the clinical research and aftercare, as well as digitalizing the material outputs of their direct performance (drawings and handwritten narratives). This process is considered an enactment of the archive.

I have recorded myself undergoing comparable self-assessment sessions in the studio space, which involves the production of further drawings, hand-written sentences, sound and gestures. These sessions included revisiting recordings of the laboratories and patients, as well as visual materials produced, and contrasting them with the recordings of myself, and their respective outcomes. This process is considered a re-enactment of the archive. Decisions about editing and juxtaposition were informed by reading

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the provision of external services in the areas of specialized diagnosis, health expertise, quality control and collaboration in national and international committees. Located in the campus of Lisbon Medical School, the Instituto de Medicina Molecular is an Associate Laboratory of the Portuguese Ministry for Education and Science and a reference for science in Portugal'. (IMM website, http://imm.fm.ul.pt/web/imm/home; accessed 22/02/2009)
[26] Elements including corridors, roads, car parks and landscaped areas facilitate transition between spaces that are physically allocated in other buildings. These transfer zones allow me a breathing space during which I am able to recall and consider images and feelings about the last location in preparation for adjustment in the next space event.

neuroscientific studies on autobiographical memory and Alzheimer's disease, which gave clues to editing rules. This re-enactment of the archive was intended to establish a critical gap between the original scientific coordinated performance and the parallel cultural and subject-driven practice.

Cognitive psychological theory on autobiographical memory informed by other fields of neuroscience is rich in metaphor and suggestions for a visual approach; I have applied some of its vocabulary to descriptions of my installation and time-based work. Thus, to describe the characteristics of autobiographical memory, terms such as multidimensionality, coherence, continuity, reconstruction, representation, narrative or perception could be included.

An example of this is the suggestion of Georgia Nigro and Ulric Neisser (1983) that people assume two different visual perspectives when remembering an event[27] according to their identification with the action remembered: first person/field memories, that present events one still identifies with, are visualized as if through one's own eyes; observer/third-person memories, that present actions one requires detachment from, such as a previous smoking habit, are visualized as if through the eyes of a spectator. I have used these conceptual leads to test use of camera perspectives in the recordings of laboratory and studio sessions, and in further editing decisions taken according to my role as observer, actor or recollector. Theory and practice have reinterpreted and informed each other.

I have explored the similarities between visual technologies in the laboratory and in the studio. Most of the representational processes in the laboratory require decisions regarding framing, colour, exposures, time and other settings in parallel with my studio practice. Latour claims that much effort is devoted to the cascade of inscriptions such as enhancement, contrasts and scaling, which reflects the power to make believe in the invisible world of scientific research. I propose that in employing artistic methods of editing such as delays, superimposition and the use of filters, I am critiquing and

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[27] 'These examples imply that the experience of thinking about a past self is influenced by the degree of consistency between that past self's actions and the present self-concept. It is possible to relive a past experience in memory, focusing on re-experiencing a past reaction to the environment. However, when people recall behaviors that are discrepant from the current self, their talk about that past self suggests that instead of reliving a past reaction to the environment, they are focusing on the past self as an object distinct from the present self.' (Libby and Eibach, 2002: 167)

challenging the associations of scientific images to an invisible truth and exploring their potential power to deploy the discourse of autobiographical memory.

To facilitate access to the patients' space in a diversified approach I accompanied several patients under various clinical and therapeutic approaches. Personal experience on location allowed me to focus on my topic, share moments of tension, hope and drama, and to observe and participate in moments of corporeality. Eight patients undergoing different innovative Alzheimer's therapies were to be followed during the stages of their clinical journey (four from a phase 3 clinical trial of a new injected drug,[28] two from a phase 3 tablet prescription clinical trial and two undergoing cognitive stimulation therapy). This meant accompanying the pre-defined designs of the medical investigation set up[29] as well as similar ethical protocols, thus circulating in the Alzheimer's research laboratory space. Over a period of nine months I collected visual, audio and written information on their treatment and also digitally copied their own material productions, such as drawings and written texts.

The cellular and molecular laboratories were visited regularly and data collected (video, photography records and inscriptions) from observation of their investigations of molecular and cell death mechanisms.[30]

Methodological strategies and outputs

Some materials are both methodological strategies and outputs:

a. My own photographic and video recordings of laboratory technicians and researchers producing experiments; patients being examined by neurologists and psychologists; nurses handling patients' medical procedures, neuropathology sessions and MRI and therapeutic sessions;

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[28] During these trials each patient attends Lisbon University's Santa Maria Hospital at 6-week intervals for treatment that includes blood tests, administration of medication, a short neuropsychological assessment (MMSE test), clinical consultation, and longer neuropsychological assessments (full battery of tests over a 2-hour session). MRI scans are performed at a specialist centre elsewhere in Lisbon.
[29] Under the supervision of principal Dementia Research investigator Alexandre de Mendonça.
[30] The number of patients followed may vary; it may prove impossible for some to proceed with the experimental therapy due to the unpredictable pace of the degeneration of their memory and cognitive capacities.

b. My own photographic and video recordings of myself performing identical neuropsychological tests in my studio;

c. Scientific inscriptions (including patients' drawings and sentences), neuropsychology test guidelines and props such as a pen, plastic flowers, comb or watch;

d. Drawings and sentences produced in response to my own experiences in the enactment of archival spaces.

Linking this mobilization of multidimensional materials is part of the challenge of organizing the virtual archival spaces. I have developed four installation works according to the circulation and processes of enacting and re-enacting the archive on Alzheimer's disease studies.

Aims of the investigation

1. To develop strategies for evoking the nature of autobiographical memory within a contemporary art practice, by generating installations using a period of residency at Lisbon University's Instituto de Medicina Molecular (Institute of Molecular Medicine).

2. To explore the representational strategies of Alzheimer's studies in the scientific laboratory through art practice.

3. To explore and construct connections between visual art practice and scientific research in the field of neuroscience studies on Alzheimer's.

4. To further locate my art practice in relation to other artists conveying activities with regard to natural sciences laboratories and topics that overlap with autobiographical memory.

The function of both the laboratories and my art practice is very much bound into an idea of montage, juxtaposition and circulation, where space, time and producers are not

clearly limited, but tend to overlap according to the creative, interpretative or archival processes they undergo. The images are assembled and transferred between locations as diagnostic, inscriptions, suggestions, or metaphors according to the transporter and delivery context. I found visual plasticity, and narrative and metaphorical richness, in the neuropsychological assessment materials and in mobilized laboratory representational strategies. These representations allow translations, and simultaneously evoke absence and presence (blots and gels instead of cells, cells instead of brains, diagnostic images instead of the patient's body).

Both thesis and practice work focus on the following research questions:

a. How may the artworks contribute to the display of autobiographical memory discourse, via exploring the representational practices circulating on neuroscience research into Alzheimer's disease?

b. What kind of representational strategies does each laboratory produce?

c. What meaning will these images, sounds and gestures acquire or extend when they are subjected to further processes of montage, juxtaposition and edition, inserted in a new aesthetic and cultural framework and experienced in a different context?

d. How have artists critically approached this permission to observe, enact and construct the movement (physical or symbolic) from laboratory to studio?

This research offers a wider understanding of my practice of montage, archiving and time in connection with specific practices of neuroscientific research. The project elaborates on several simultaneous methods through successive artworks. Images and sounds of Alzheimer's research may be understood as interacting elements which, when collected, moved and juxtaposed by editing, produce certain effects and affects that aim to account for the nature of memory and the disease itself.

In *Six Stories from the End of Representation*, James Elkins (2008: 18) proposes an exercise to build bridges between the humanities and the sciences. This involves

allowing them to stay side by side telling stories in their own languages, thus forcing the viewer to decide which threads may tie the presented images together. In my work, fragments of text, images, sound and time are enacted and re-enacted into art practice, during which the scientific materials are re-framed within cultural and social conventions. This process locates them in the history of artists such as Helen Chadwick, Suzanne Anker and Mark Dion, who have explored scientific laboratories and medical imaging and practices in the form of personal portraiture, commentary on biological identity, nature, the interweaving of culture and technology, as well as critique on practices of looking, ordering and archiving. My engagement with the scientific research renders the process of archiving contingent on my subjective experience. This contextual immersion depends on conceptualization and reflection of my artistic role in their scientific ground. My work therefore involves challenging scientists in this specific field of neuroscience to adopt a visual approach to their research topic.

Chapter overview

Chapter One outlines briefly the debates surrounding Alzheimer's disease and autobiographical memory, focusing on the methods by which it is researched and investigating performative and visual strategies and technologies. By examining the relationship between neuroscience concepts and visual culture, which endows the observer with the power to compose and adjust the perceived and experienced world, I question issues surrounding looking at, and institutionalization of, a disease. This coincides with an approach to the laboratorial ground (though not yet to the patient, only to the structure in which he or she becomes a subject). My contextualization is framed by a discussion of visual culture, with particular reference to Foucault's theories of power and knowledge. Artwork by Suzanne Anker, for her experience on interlacing the discourse and materials of art with science imagery, is analyzed as a case study to contrast with my first outcome and installation, *The Approach*.

Chapter Two introduces the overall concept of archiving in relation to the concepts and production of my second installation, *The Archive*. This installation has changed according to data added during the research period. The works produced are analyzed in relation to notions of bodies, fragments and reconstitution activated according to

Foucault's theories of clinical manipulation of records and surveillance, and Mark Dion's artworks' strategies, such as re-creating and critiquing both scientific and artistic processes of cataloguing, archiving and display. Thoughts on images as means to generate and diagnose hypotheses, on whole bodies and parts of bodies, and on how people become patients, organs or illnesses, are articulated with ideas of memory as constituent of the archive.

Chapter Three focuses on the performative character of the constructed nature of scientific experiments, the assessment of patients and circulation between the laboratories. It explores notions of the constructed role of scientific brains images and theories of the visual in relation to the process of interpretation, circulation, translation and montage. Latour's actor-network theory and concepts such as the immutable mobile are explored in order to elucidate hybrid methods of evoking memory loss through the scientific representational practices. The installation *The Assessment* explores multi-screen strategies as a departure from a single perspective on memory and identity, as well as the interplay between presence and absence. Helen Chadwick's works, for her intense exploration into identity through body and the diverse visual strategies and her proximity to scientific laboratories, are used as a case study and contrasted with my installation.

Chapter Four investigates, through production of *The Therapy*, the repetitive nature of memory, the narrative structure of the autobiographical memory, the nature of Alzheimer's and the character of therapies such as cognitive stimulation. Further, it constructs a conclusion of the total outcome of the installations as a single investigative experiment into connecting art practice and neuroscience research on the field of memory loss.

Chapter One: The Approach

Part I – Alzheimer's disease: approaching the context

Alzheimer's note: She sat on her bed with a helpless expression.

Alzheimer: What is your name?

Auguste D: Auguste.

Alzheimer: Last name?

Auguste D: Auguste.

Alzheimer: What is your husband's name?

Auguste D: Auguste, I think.

Alzheimer's note: A purse, a key, a diary, a cigar are named correctly. At lunch she eats cauliflower and pork. Asked what she was eating, she answers 'spinach'. As she was chewing the meat and was asked what she was eating, she answered 'potatoes' and then 'horseradish'. When objects were shown to her, after a short time she did not remember what objects had been shown. In between she always speaks about 'twins'.

Alzheimer: How are you?

Auguste D: During the last days I was very good.

Alzheimer: Where are you?

Auguste D: Here and everywhere. Here and now. You don't mind.

(M. Jucker et al., 2006: pp. 21–23) (Fig. 3)

Alois Alzheimer[1] reported this conversation and notes in his talk at the annual meeting of southwest German psychiatrists on November 3, 1906, when he described the psychiatric symptoms and changed brain histology[2] of his late patient, Auguste D. (Fig. 4). This seminal moment marked the beginning of research into one of the most debilitating of conditions, which would come to bear his name (Fig. 5). Though the world has

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[1] Alzheimer, Alois (1864–1915): German neuropathologist born in Markbreit, Bavaria. The young Alois excelled at science, and received his medical degree from the University of Würzburg in 1887 aged 23. Appointed clinical assistant at a Frankfurt asylum, he collaborated with neurologist Franz Nissl in studying the nervous system. They published the six-volume *Histologic and Histopathologic Studies of the Cerebral Cortex*.

[2] 'Histology: The study of the form of structures seen under the microscope. Also known as microscopic anatomy, as opposed to gross anatomy, which involves structures that can be observed with the naked eye. [...] The word histology comes from the Greek *histo-* meaning tissue + *logos*, treatise. Histology was a treatise about the tissues of the body and the cells thereof.' (*MedTerms Online Medical Dictionary*, 2011, http://www.medterms.com/script/main/art.asp?articlekey=7318; accessed 10/09/2011)

progressed towards the present technological culture, and though much has been researched in terms of biology, clinical neurology and daily care, conversations similar to the one Alzheimer reported take place daily, and have often been witnessed in the evolution of this research project.

This study has focused on memory, loss of memory and Alzheimer's disease in the context of clinical and biological research, in a bid to show how Alzheimer's disease can be readdressed artistically using visual strategies. In this chapter, I shall define the theoretical domains of what I propose as three of my four key 'virtual archival spaces': the dementia clinical laboratory, the molecular and cellular laboratory and the art studio. For this, it is important to lay down the main concepts that will be referred to throughout the thesis. I shall first clarify the distinction between dementia and Alzheimer's disease and summarise the debates witnessed in the laboratories. This is a fatal disease for which there is still no cure; it evokes fear and suspicion and has multiple causes that are sometimes difficult to distinguish from its consequences. In order to elucidate what is disrupted in Alzheimer's and how the disease is studied and perceived, some insight will be offered into the various theories surrounding memory and specifically the complex nature of what is termed autobiographical memory. The leading theories in the field will be discussed to emphasise the complexity and fragility of the neurocognitive function. The concepts of Michel Foucault and other theorists will be explored, as part of a discourse on visual culture that I shall appropriate to frame the analysis of the first artistic case study. The resulting first installation and outcome is entitled *The Approach*.

Dementia / Alzheimer's disease

Few words evoke more fear or uncertainty than dementia. Dementia comes from the Latin *de-* 'apart, away' and *mens*, 'mind', but for millions of people the word indicates a thief that has stolen away a loved one's personality, memory, language, and knowledge. The transformation typically is gradual; a slow decline in abilities that eventually leaves behind a victim who is uncommunicative, uncomprehending, and unresponsive. I use the term victim deliberately, because anyone who has seen a loved one changed by the progression of these relentless disorders knows this image is apt. (Turkington, C. and Mitchell, D., 2010: ix)

According to the World Health Organisation, dementia[3] is not a single disease but is rather an indication of many conditions that cause brain dysfunction. It is a common problem usually associated with ageing, and is associated with a wide range of symptoms,[4] signs, clinical choices, and therapeutic responses. Initially a patient may experience problems in only one area, such as becoming disoriented, repeatedly asking the same question, being unable to follow directions or getting lost in familiar places, and neglect of personal safety, hygiene and nutrition.

Dementia caused by drugs, alcohol, or hormone or vitamin imbalance may be treatable, but when caused by disease or injury it is permanent.[5] Causes may include an infectious process such Creutzfeldt-Jakob disease (CJD), reduced blood flow to the brain, or a hitherto-undiagnosed problem such as Alzheimer's disease. In older people, the two most common forms of dementia are Alzheimer's and multi-infarct or vascular dementia, which often present simultaneously, making conclusive diagnosis difficult.[6]

The boundaries between age-related cognitive decline and very early dementia are sometimes uncertain; the incidence of dementia increases with age, but normal older adults present a wide variation in test performance. Terms such as 'mild cognitive impairment' and 'age-associated memory impairment' have been proposed to define those who have some memory challenges but in whom cognitive abilities and functions of daily life are relatively intact. Consensus on how and when these terms should be applied has been difficult to reach. Dementia clearly poses a challenge that affects many sectors of society. Though the diversity of clinical symptoms makes dementia a devastating and complex condition, researchers from different fields consider it fertile ground for developing insight into the basic inner workings of the brain.

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[3] 'Dr Philippe Pinel (1745-1826), the founder of modern psychiatry, first used the word 'dementia' in 1797. [...] Dementia is generally defined as the "loss of intellectual abilities (medically called cognitive function) of sufficient severity to interfere with social or occupational functioning"'. (*Diagnostic and Statistical Manual of the American Psychiatric Association,* in World Health Organization webpage, http://www.searo.who.int/en/Section1174/Section1199/Section1567/Section1823_8057.htm; accessed 12/06/2009).

[4] Emotional problems in the elderly may be mistaken for dementia because they can affect many areas of intellectual function, and may include changes in personality, mood, and behaviour. Older people facing retirement or coping with the death of a spouse, friends or relatives often feel anxious, unhappy, lonely or bored; this may in turn trigger episodes of confusion or forgetfulness.

[5] Medical conditions that cause dementia include Parkinson's disease; Lewy body dementia; Pick's disease; Creutzfeldt-Jakob disease; Korsakoff's syndrome; AIDS; brain tumours; hydrocephalus (fluid on the brain); head injury. Other treatable causes of dementia may include high fever, dehydration, vitamin deficiency and poor nutrition, reaction to medicines, thyroid problems, or a minor head injury.

[6] Scientists once believed that most cases of irreversible mental impairment were caused by multi-infarct dementia, but current thinking is that most older people with irreversible dementia have Alzheimer's disease.

Alzheimer's disease

Since the 1906 Alzheimer's conference, remarkable progress has been achieved in several areas. Understanding of the pathological process has relied largely on developments in technology and other specialised areas. The co-dependency between the models, the technology and the scientific discoveries may be considered a starting point: Alzheimer's findings would have been impossible without the microscopic staining techniques he developed.

In Alzheimer's disease, nerve cell changes in certain parts of the brain result in the death of a large number of cells. Symptoms begin slowly and become steadily worse. Though no cure has yet been found the outlook seems encouraging: Alzheimer's is no longer regarded as an inevitable consequence of ageing and is now recognized as a specific disease. Diagnosis is, however, complex, as there is no single method, and during the last three decades the perception of patients with the disease has largely been that of 'individuals confined to nursing homes and psychiatric institutions, bedridden and incontinent, unaware of their surroundings' (Gavin, 2010: x). Most other individuals with memory problems have been included in the 'getting old and senile' category. Neurologist James E. Gavin (2010) claims that two factors dramatically influenced the search for the causes of and treatments for this disease. The first was the creation in 1974 of the (US) National Institute of Aging (NIA) within the National Institutes of Health (NIH), which created centres of excellence for clinical and scientific research into AD and other forms of dementia. Chemical analysis of proteins found in the brain lesions of Alzheimer's patients (i.e. amyloid beta protein in senile plaques and tau protein in neurofibrillary tangles)[7] was undertaken. The second factor was government and academic interest, leading to increases in available funding for research and targets of scientific inquiry.[8] Neuroscientific research became one of the largest areas of scientific growth, along with cancer and cardiovascular disease. As a consequence the pharmaceutical industry supported the move. With advances in

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[7] Within current molecular and cellular biology, the mutual contribution of genetics, clinic practice and brain imaging is vital, as is research in related fields. For example, the discovery of the role of apolipoprotein E enabled scientists to apply research findings from the cardiovascular field, and fundamental findings from research into neuropathology have been applied to the neurodegenerative diseases.

[8] The ageing of society over the last century has led to a continuous increase in the number of Alzheimer's patients diagnosed, with a consequent burden on individual care-givers and social and medical institutions: the greatest risk factor for the disease is age. The risk increases considerably after the age of 65, but Alzheimer's disease can occasionally affect people in the 30–40 age group. Though public awareness has increased, nobody is ever prepared for the social and economic consequences of this devastating disease.

molecular understanding of Alzheimer's disease, the first medication for its treatment was approved in 1992. Currently, several new types of medication are undergoing clinical trials and expectations in the fields of molecular biology, genetics, pharmacology, and biochemistry are high. However there is a long gap between scientific experimentation, clinical trials and the arrival of medicines approved for use.

Alzheimer's disease is characterised by a range of gradual, subtle changes. In order to arrive at an early, correct diagnosis[9] a comprehensive physical, neurological, and psychiatric evaluation is essential, since medication and care options are most effective in those with mild to moderate Alzheimer's. An early diagnosis gives people with the disease a greater chance of benefiting from existing or experimental treatments.

Doctors at specialist centres can correctly diagnose Alzheimer's in more than 90% of cases by conducting physical and neuropsychological testing with care-giver input. However, post mortem analyses are the only conclusive way to diagnose the disease. The United States Alzheimer's Association developed a list of 10 warning signs,[10] directly related to memory loss, language and spatial/temporal coordinates. A person is advised to consult their GP if several symptoms are experienced concurrently.

As we grow old, the brain undergoes a number of changes[11] (Castro-Caldas and Mendonça, 2005). In healthy older people, the impact of these changes may simply be that it becomes a little harder to remember day-to-day details. In people with Alzheimer's, some of these changes are far more severe and may have devastating consequences.

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[9] The diagnostic process and associated treatments and therapies (pharmacological and non-pharmacological treatments) will be addressed in the following chapters. Diagnosis usually requires a consultation that undertakes a complete review of personal and family medical history, a comprehensive physical and neurological examination and a wide range of laboratory tests, which can include X-rays, CT scans and MRI diagnostic imaging, as well as tests for blood, thyroid and liver problems. These help to eliminate the possibility of any other major cause, such as Parkinson's disease, thyroid problems, depression, brain trauma and stroke, some of which may be treatable.

[10]   1. Memory loss that affects job skills
        2. Problems in performing familiar tasks
        3. Problems with language
        4. Getting lost in familiar places
        5. Problems with judgment
        6. Problems with abstract thinking
        7. Misplacing items
        8. Change in mood or behaviour
        9. Personality change
        10. Loss of initiative

[11] Degeneration occurs in some cells in certain brain regions, even if most neurons important to learning remain healthy; gradually, cells begin to shrink and stop functioning, especially in areas important to learning, memory, planning, and other complex mental activities. Neurofibrillary tangles develop in brain cells, and senile plaques appear in surrounding areas in regions such as the hippocampus.

Alzheimer's disease often develops in older people who may already have other health problems such as heart disease or high blood pressure, so scientists suspect that these conditions may play a role in its development. There are similarities between Alzheimer's disease and other progressive neurodegenerative disorders leading to dementia. Other brain diseases that also involve neurodegeneration range from prion diseases or transmissible spongiform encephalopathies such as CJD, to Parkinson's and Huntington's disease, which also present a number of important overlapping characteristics. The main characteristics of Alzheimer's disease include deposits of beta amyloid[12] protein in plaques and blood vessel walls, as well as the appearance of neurofibrillary tangles and loss of neurons (Fig. 6). While plaques are made of beta amyloid clumps, the tangles are made of another kind of protein called tau.[13] These changes greatly impair the function of neurotransmitter systems. Lower levels of acetylcholine are typical in Alzheimer's patients, and have been associated with problems in learning and memory. The pathogenic mechanisms of the disease are at the centre of current research to determine whether lesions observed post mortem in the brains of Alzheimer's patients are the cause or a consequence of the disease. Epigenetic research technologies are giving scientists unprecedented insight into the earliest biochemical pathways that lead to the disease. Researchers are intensely focused on developing new instruments, neuropsychological tests, and finding biomarkers in cerebrospinal fluid[14] and blood. Importantly, neuroimaging methods can also now be used to diagnose[15] cognitive decline and Mild Cognitive Impairment (Fig. 7).

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[12] 'For nearly a century scientists have wondered which of the brain lesions associated with Alzheimer's causes the disease: the plaques that clutter up the empty spaces between nerve cells or the stringy tangles that erupt from within those cells. In the mid-1980s, researchers discovered a class of sticky proteins called beta amyloid in the plaques of Alzheimer's patients ... For some reason, in Alzheimer's disease the brain identifies the tiny broken bits of beta amyloid as foreign, and immune cells try to clear them away using free radicals of oxygen. The chronic inflammation that results progressively injures nearby nerve cells.' (Turkington and Mitchell, 2010: 55–56)

[13] Scientists diverge (Turkington and Mitchell, 2010: 56) on what plays a more central role in the destruction of brain cells: the sticky plaques of beta amyloid in the brain or the tangles of tau protein inside brain nerve fibres. There is also a debate on the consideration of tangles as a secondary part of the disease.

[14] 'Cerebrospinal fluid (CSF): a watery fluid, continuously produced and absorbed, which flows in the ventricles (cavities) within the brain and around the surface of the brain and spinal cord. CSF is produced by the choroid plexus, a series of infolded blood vessels projecting into the cerebral ventricles, and it is absorbed into the venous system.' (*MedTerms Online Medical Dictionary*, 2011, http://www.medterms.com/script/main/art.asp?articlekey=7529#; accessed 27/10/2011)

[15] As clarified in the US Health Department *2008 Progress Report on Alzheimer's Disease*, translational initiatives (a bench-to-bedside approach) and worldwide clinical trials should provide important new approaches for prevention and treatment because they will ensure opportunities for researchers with promising therapies to develop them. Many compounds that test well in animal models and that have a sound theoretical basis fail in clinical trials because of safety or efficacy problems. The bidirectional collaboration between basic science (in the cellular and molecular laboratory) and clinical application (in the clinical dementia laboratory) that is at the heart of translational research is essential to helping investigators understand why this happens and to develop improved medication.

Among many myths[16] surrounding Alzheimer's disease is the notion that dementia and Alzheimer's are the same. Dementia is not in itself a disease, but describes symptoms that may accompany certain diseases or conditions.

Memory

Memory is a complex construction, a biological phenomenon rooted in the senses, that begins with perception and actively utilizes many areas of the brain to reassemble a thought into a coherent whole. When a person rides a bicycle, for example, the memory of how to ride it comes from one set of brain cells, the memory of how to get from here to the end of the block comes from another, and the memory of cycle safety rules from another. We are never consciously aware of these separate mental experiences, nor that they are coming from different parts of the brain, because they work together so well. In fact, experts say there is no firm distinction between how we remember and how we think. This does not mean that science knows exactly how the system works. It is still not fully understood exactly how a person remembers, or what occurs during recall.

Memories are hard to explain and to translate into words. Many authors (Schacter, 2001) posit that the very act of remembering transforms the remembered: what we store in the brain is not definitive proof of the lived experience or of fact. New experiences and facts that have been accumulated modify the remembered, and the links within the nervous system cells. Memory is so close to our thinking actions that we tend to take it for granted:

> Sometimes we forget the past and at other times we distort it; some disturbing
> memories haunt us for years. Yet we also rely on memory to perform an
> astonishing variety of tasks in our everyday lives. Recalling conversations with
> friends or recollecting family vacations, remembering appointments and errands
> we need to run, calling up words that allow us to speak and understand others,

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[16] Another myth is that Alzheimer's disease is hereditary. Alzheimer's disease occurs either in patients aged between 30–50 (rare early onset) or after the age of 65 (late onset). The early-onset form of the disease is very rare and has been linked to three different genes; those who carry one of the early onset genes will probably go on to develop Alzheimer's disease. The late onset form, which does not seem to be hereditary, corresponds to more than 90% of all cases. A further myth is that memory loss is a natural consequence of ageing. In fact, everyone occasionally forgets where the car keys are; many otherwise-healthy people, as they get older, are less able to remember certain kinds of information. The symptoms of Alzheimer's disease, however, are far more severe and consistent, affecting communication, learning, thinking, and reasoning. A final myth is that it is not deadly. Alzheimer's is a lethal, degenerative disease that attacks the brain and impairs memory, thinking, and behaviour. It is the most common form of dementia, and is the fourth leading cause of death in people over the age of 65.

remembering foods we like and dislike, acquiring the knowledge needed for a new job – all depend, in one way or another, on memory. Memory plays such a pervasive role in our daily lives that we often take it for granted until an incident of forgetting or distortion demands our attention. (Schacter, 2001: 1)

The flux of time allows a constant stimulation of our senses, and therefore a permanent flow of messages sent to the brain. Sensorial stimuli vanish very quickly, leaving a pattern of neuronal activity; an impression in the brain cells. Portuguese neurologist and director of Oporto's Memory Clinic in Oporto, Belina Nunes (2008), explains that this pattern does not represent the stimuli but the meaning of the stimuli to the person receiving it. From the billions of impressions our brains accumulate, some last only a few seconds, others a lifetime. The information our senses bring at every moment is transformed into perceptions and these into memories, which are constantly reconstructed and reassembled according to context. Memory, therefore, is a complex function: it is the image that comes to mind when we remember the schools we attended, and is embedded in the capacity to drive a car without thinking; it is also the knowledge of facts, and, further, plays a part in the feelings that words and images trigger in us.

Memory is understood by researchers as a cognitive process, structured by a network of biochemical operations that meet the rules of integration with the environment with momentary events that generate neural substrates. Neuroscience works to identify functions in the brain organization of memory and seeks to identify how/where memories are acquired and stored. The process of memory begins with encoding, proceeding to storing and then retrieval. Nunes (2008) explains a formula: reception – codification – consolidation – recuperation. It is generally accepted that reception or encoding involves the sensorial stimuli; codification is the organization and processing of the information in different formats (some authors consider codifications part of the encoding process); storing and consolidation is accepted as the archiving of information; and recuperation or retrieval is evocation and remembrance, either spontaneous or assisted by cues.

Different types of memory are stored and evoked using diverse neuronal networks located in distinct parts of the brain.[17] Memories, therefore, consist of an association between groups of neurons that triggers other associations to create specific patterns. A simple event is constituted by a large number of sensations and perceptions such as luminosity, duration, time of day, smell, temperature, sound, shape and colour, and emotion. Any of these may be retained to a smaller or lesser degree according to several factors including feelings, attention to detail or goals; for example, isolated smells or even smells associated with a specific event cannot usually be recalled, but scent is a powerful trigger of remembrance, as illustrated by a well-known episode from Proust's classic novel *Remembrance of Things Past*. In this, Proust describes the experience of a flood of childhood memories triggered by the smell and taste of madeleines dipped in tea, confirming the notion that perception of external stimuli (smell, images, objects) is sometimes essential in retrieving memories of one's past.

In the process of reassembly, adjustments to context are conducted, which means that what is remembered is a construct rather than the reality. Schacter (2001) asserts that false memory is the rule rather than the exception. This 'reassembling' phenomenon is considered in approaches to Alzheimer's disease: an understanding of its workings helps to explain how autobiographical memory can disintegrate in Alzheimer's patients.

Alzheimer's disease and autobiographical memory

At the onset of Alzheimer's disease, people have little difficulty remembering events from long ago, but may forget that they have had lunch. On the other hand, remote memories may be intact, but may interfere with present activities. For instance, a person may fail to recognise the person speaking to them in the present and address them as though they are someone who died long ago.

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[17] 'The use of functional magnetic resonance imaging (MRI) has enabled researchers in two new studies to gain a better understanding of how the brain creates memories. In one study focusing on visual memory, individuals given an MRI scan while viewing colour pictures were later asked to identify which senses they recognized in a new series of pictures. Another study tested word recognition: after viewing a number of words while undergoing an MRI scan, subjects were asked to identify them by meaning or appearance. In both studies, the MRI scan revealed greater activity in certain regions of the brain as subjects viewed items that were later recognized. These findings confirm that different kinds of memory are stored in different parts of the brain. Such knowledge can help explain memory formation, as well as provide insight into the processes that underlie memory disorders...' (Johns Hopkins White Papers, *Science*, August 21, 1998, cited in DeBaggio, 2002: 28)

Frequently, memory events are recalled in a differing timescale; for example, the death of a parent 40 years ago may be experienced as though it occurred yesterday. Commonly the identity of close family members becomes confused and individuals are placed in a different social role, for example when husbands are interpreted as fathers. As an Alzheimer's sufferer relates in his autobiography:

> Memory is a mental stabilizer and without it the mind becomes chaotic and unstructured, allowing 1999 and 1940 to merge. (DeBaggio, 2002: 33)

In normal circumstances, the process of reassembly is similar to an editing process, in which each registered fragment must be inserted in a coherent narrative built from those fragments. This is usually interpreted as a sense of self-identity. Nunes (2008) explains that we have evolved to generate stories with a beginning, a middle and an end, which provide a consistent sense of self. When the information necessary to evoke a certain event is missing, we establish connections with other areas of the brain that hold similar archived information, and use it to fill the gaps in order to provide a cohesive narrative. Alzheimer's patients seem to lose this ability to (re)create: the facility to juxtapose fragments in order to compose a personal narrative. In Alzheimer's (Nunes, 2008: xxiv) the damage is not just to the frontal circuits that are responsible for assembling, bringing together and bringing into consciousness parts of memory; the sustaining network of memories is also evaporating, leaving a person with Alzheimer's as if they were without a past (Fig. 8).

Each of us has an uncountable number of event memories, such as evocations of places, things, or people, and an even larger number of events that have been forgotten. The process that mediates the event and the formation of a long-term memory of it is lengthy; during the process memories may become frail and vanish. Memory consolidation is dependent on the hippocampus, a brain structure that is densely interconnected with any part of the neo-cortex, thus allowing information to migrate between zones. Nunes (2008) proposes that one function of the hippocampus is as an editing suite that allows a recreation of the global representation of events; they are relived and re-enacted, thus transforming memories and their expression in time and adjusting the distance to the present moment. Sometimes, in order to evoke and date a specific life-event such as travel to a distant country or the death of a relative, other

clues and episodes have to be sought. This shows that memory is not static and fixed, but depends on evocation and reliving an event, and is therefore changeable.

Markowitsch (2003) argues that memory can be divided with respect to time and content. In general, the temporal dimension is perceived to range from very short-term memory (in the order of a few milliseconds) to very long-term memory. Very short-term memory is responsible for storing. Researchers such as Baddeley (2000), describe what is commonly understood as working memory, a type of short-term memory, which provides the conditions necessary for the manipulation of information (e.g. such as a phone number we must remember after being told and until we write down). The term long-term memory[18] generally is related to memories that have been retained in patterned traces for a longer period of time (perhaps days or months).

Memories are categorized and structured in relation to time and place or the context in which they were acquired (Markowitsch, 1998/99; Tulving, 1987). Researchers into memory use the terms episodic or semantic to distinguish different types and functions. Episodic memory refers to the past: it is more specific in terms of context and time (i.e. where and when) and allows continuity of individual identity through the evocation of facts of personal history. Semantic memory is understood as a resource we have to collect and remember facts not requiring temporal and contextual details. The boundaries between these memory systems are subject to change by the will of the subject. For example, a description may be commenced using more semantic data, and continue citing specific instances that require an episodic access to past data.

The concept of memory as a neurocognitive phenomenon structured by multiple systems provides a conceptual basis for important clinical data in cases of Alzheimer's disease. In general, with Alzheimer's there is dissociation between types of memory, and it is common to witness fragility of recent/working memory and solid retention of remote/long-term memory. Researchers consider this dissociation as an indicator of specific neural circuits for different memory systems.

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[18] Some memory is independent of conscious processing – for example, perceptual memory, which refers to the trial of familiarity, the phenomenon of pre-activation or 'priming' to enable processing of information not previously perceived consciously, and procedural memory, which is responsible for the storage of sensory skills. (Markowitsch, 2003)

Researchers such as Greenberg and Rubin (2003) or Addis and Tippet (2004) propose autobiographical memory as a combination[19] of episodic and semantic memory, consisting both of memories of personal lived events, and the ability to recall facts about oneself.

Episodic memory, according to Tulving's conception,[20] consists of three basic levels: self, autonoetic awareness and subjectively sensed time (Tulving, 2001, 2002, 2005). 'Self' refers to the identity of the individual as opposed to others; it is a mental entity, considered to be the way in which an individual reflects on his/her own existence in the past, present and future. Autonoetic consciousness is, as noted above, the capacity to become aware of the self's experiences across time. Subjective time is the time extended from the self's past to the self's future, in one's mind, so that an individual can go back in the past and anticipate the future in their mind. Thus, an individual can mentally re-experience an event from their own past and plan an event in their own future.

This formulation of episodic memory emphasizes the fact that the conjunction of the self, autonoetic awareness and subjective time makes episodic memory a uniquely human and late-maturing memory system, which entails mental time travel and provides the sense of self-continuity. According to Conway and Pleydell-Pearce's (2000) model of autobiographical memory, recently revised by Conway (2005), autonoetic awareness is an important concept, as in Tulving's model, since it allows the person recalling to feel that the current mental construction is a memory of a past event experienced by her/himself. It also distinguishes autobiographical remembering from other states such as imagining or dreaming, as well as from retrieval of facts about the self.

Autobiographical memory is thus a complex cognitive system, which relies on the self and autonoetic awareness and allows human beings to reconstruct their own experiences

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[19] Terminologies relating to autobiographical memory vary, however: for example, the term episodic memory is used in two different ways in the relevant literature (Wheeler et al., 1997). It is applied to laboratory tasks, which require participants to encode and later retrieve lists of items (please see reference to recognition memory tasks in Chapter 3) and also to a memory system that enables the re-experiencing of personal events from one's whole life, which therefore corresponds to autobiographical episodic memory.

[20] Wheeler et al. (1997) claim that autonoetic consciousness is the ultimate achievement of the human brain/mind, which makes episodic memory possible by allowing a person, via recollection of sensory-perceptual details, thoughts, and feelings, to become aware of an event as part of his/her own past, as well as to project into the future. The authors suggest that autonoetic capacity is subserved by the frontal lobe[20]. Under this view, episodic memory, defined in terms of its dependence on autonoetic awareness, is considered to be the most advanced and late-appearing (both evolutionary and ontogenetically) memory system, built on top of earlier systems (Tulving, 2005).

through recollection of sensory-perceptive details, thoughts, and feelings. Its unique quality arises from the fact that it is an eminently self-reflexive phenomenon. Importantly, autobiographical memory is not isolated from the other cognitive systems. It interacts with emotion and influences semantic memory. Its operation involves a dynamic assemblage between past and present, with qualities experienced in the past modifying the motivation at the time of recall, while the process of seeking to relive a particular personal experience appears as a true remembrance, incorporating sensory, visceral, imaginative and conceptual dimensions.

My work is based on the premise, following Tulving (2002) and Conway (2005), that memories are rehearsed performances of reconstruction, narrated and practised, rather than simple access to fixed archived data. The sensory details and images that are held, comprising the feeling, context and meaning of experiences, become linked in the process of remembering to form memories, rather than existing innately as memories.

From this perspective, the following fragments of my research journal are an example of autobiographical memory, and may thus be assumed to be a composite of imagination and fragments of sensations of experience, though not necessarily truthful:

> The days I sat on the red leather sofa, with embedded stories and lost memories, correspond to the days of studying Alzheimer's. The frosted glass doors separate me from the universe of clinical gaze; the sounds are muted, muffled. I see only shadows that allude to the Platonic universe and prevent me from achieving the true essence of thickness and texture. Permission to pass to the world of 3-D shapes and sounds depends on the response of the ethics committee. I am approaching... I wait.... (Research journal, 2009)

It became necessary for me to explore memory, in the sense of active construction, in order to reflect on strategies of representation and technologies that are fundamental to my art process and also sustain part of current scientific research. Images, mainly those produced with the help of a camera, have become almost synonymous with memory and remembrance in the world of visual culture. Photography and video worked in tandem to record a timeline of the experience of my artistic residence: firstly, by picking up the fragments of space and time that are constructed in the gestures and stories – so similar and yet so different – unfolded by people including physicians, researchers, patients, care-givers and technicians; and secondly, through the intrinsic relationship of those media to reality and truth in the descriptions of the experiences (memories) that we so dearly (in most cases) store and so firmly believe.

At the IMM I visit two laboratories as usual: the clinical Dementia Research and the Molecular and Cellular Neuroscience labs. The Approach in this context requires the consent of the directors of the institute and its groups, and certain allied rituals of hygiene and safety. The guiding principle is no longer the crisis, though this is implicit in the pathologies, but the principle of opening and closing. The molecular lab is the place where replicas (models for our molecular body) are isolated and confined, though penetrable via rituals and 'purification' – the bureaucratic procedures and aseptic actions involved in the applications and forms, the safety regulations and the hygienic paraphernalia such as gowns and handwashing. (Research journal, 2009)

Though the laboratory's aim is the creation of new paradigms and the development of drugs and therapies, references to life and memory are typically associated with concepts and understandings attached to the textual metaphors of genetics. In *The Molecular Gaze*, artist Suzanne Anker and sociologist Dorothy Nelkin explore how genetic techniques, the possibilities of cutting and reassembling DNA, are assimilated by visual culture to emphasize, in particular, the associations of the body (and disease) to a molecular text.

Though I am close to the most developed technologies in bioscience and medicine, the sense of distance from the subject increases again. 'Look' means new – as I approach the subject (in this case the cellular and molecular functioning of Alzheimer's disease), I feel that I am seeing it on a scale so increased that I lack the experience to understand and interpret. A plethora of tools, graphics, mathematical computations, glass jars containing transparent solutions, refrigerators, non-human beings in symbiosis with the tools and human beings; everything linking a veiled language that throws us into an almost exclusively visual domain, where repeated gestures no longer indicate boredom and waiting but expertise. (Research journal, 2009)

My interest, however, is not defined solely in terms of visuality and representation, and my focus is not on the epistemological power of images, graphs, figures, sounds or perceptions associated with such qualities: my aim lies in their mobilisation (as in Latour's networks of knowledge production) and juxtaposition with theories and associated practices, in which lies the power to evoke memory.

Part II – Vision / Order

I shall introduce Foucault, and other writers on visual culture who focus on the image in medical-scientific discourse, in order to analyse the methods of my ethnographic experience and explore the similarities between visual technologies in the laboratory and in the art studio. This reflection serves to critically consider the position of the voyeuristic gaze on the practices of others, objects, and understandings. In the last few decades, technologies that provide access to views of the body have developed in parallel with the ability to create research models and theories concerning the workings of memory, and there has been a growing connection (or replacement) of the phenomena of mind and psyche with the mapping of the brain.

Foucault considers the 'birth of the clinic' in France at the end of the 18th century and beginning of the 19th century. In this historical period, characterized by great changes, in particular the French revolution, the hospital, previously a charity institution governed by religion, becomes a lay instrument of collective medicalization. There was a change of paradigms following the French revolution; key factors were the need to study epidemics, and the birth of the Royal Medical Society. Medical practice became part of a changing discourse of science.

A new way of looking at the patient developed. Hospitals initiated a functional reorganization in which control and surveillance were key elements in addressing therapeutic and academic needs. Foucault (2003) in *The Birth of the Clinic: An Archaeology of Medical Perception* explains the history of the conceptual rupture by which medical science shifted from a practice entirely sustained on the knowledge of the doctor (classificatory of pathological species) towards the raised status of the knowledge of the ill patient. Anatomy becomes linked to pathology, a direct relationship between body and disease is perceived and physiological medicine appears.

In the preface of the book Foucault claims,

> the clinic appears – in terms of the doctor's experience – as a new outline of the perceptible and statable: a new distribution of the discrete elements of corporal space (for example, the isolation of tissue – a functional, two-dimensional area – in contrast with the functioning mass of the organ, constituting the paradox of an 'internal surface') a reorganization of the elements that make up the pathological phenomenon (a grammar of signs has replaced a botany of symptoms), a definition

of the linear series of morbid events (as opposed to the table of nosological species), a welding of the disease onto the organism (the disappearance of the general morbid entities that grouped symptoms together in a single logical figure, and their replacement by a local status that situates the being of the disease with its causes and effects in a three-dimensional space). The appearance of the clinic as a historical fact must be identified with the system of these reorganizations. This new structure is indicated—but not, of course, exhausted – by the minute but decisive change, whereby the question: 'What is the matter with you?', with which the eighteenth-century dialogue between doctor and patient began (a dialogue possessing its own grammar and style), was replaced by that other question: 'Where does it hurt?', in which we recognize the operation of the clinic and the principle of its entire discourse. (2003: xviii)

According to Foucault, in the new exercise of medicine it was necessary to separate bodies but make them visible for observation. Thus hospitals were organized to allow ordering, regulation, and separation of bodies according to pathologies and analyses of objects and individuals. The domain of the hospital came to be valued for its ability to observe and compare a multitude of cases in different periods of the same disease. Post mortem inspection became more frequent and supported an understanding of the pathogenic processes. Controlling time schedules for prescription, medical appointments, external visits, meals, and hygiene practices became a rule in the clinic. This time coordination within the hospital organizes and directs individual tasks. Disciplinary division of medical practices and hierarchic surveillance methods of patients such as direct observation and consequential reports and diagnostic images constructed the patterns of normality and categories. Assessment methods and archival strategies became an extension of the clinical practice of examining the patient. The comparative system thus established transformed each individual into a single case to be observed, studied, analysed and healed.

According to Foucault, the post-classical humanist episteme still adhered to the primacy of sight, though mobilized in the new visual regime. In *Birth of the Clinic*, Foucault claims that even as the surface of the body is penetrated to allow the invisible to become the object of scrutiny, even with the introduction of a discourse surrounding this medical gaze, vision was still the dominant sense (Jay, 1994). 19th century medical practice in the hospital established a surveillance routine of few people observing many: a continuous archival production in a circulation of the exercise of power and control. Hence, Foucault's introduction of the metaphor of the panopticon.

As noted in the previous section, since the 1970s scientific research has tended towards an investigation of multiple memory systems, focused on neuropsychological studies of patients with brain lesions informed by imaging. Before the advent of digital technology, wax models and engravings made from dissected bodies were used for scientific education; these were eventually replaced with more durable plastic models and real fragments preserved in aqueous solutions. With the invention of the microscope around 1600, the smallest structures of the natural world became accessible to human perception, introducing new concepts of reality such as the cell. Camillo Golgi (1844–1926) and Santiago Ramon y Cajal (1852–1934) were jointly awarded the Nobel Prize in 1906 for their work in staining and subsequently detecting internal cellular structures including the nervous system. Their conclusion that neurons (a term coined by Waldeyer-Harts in 1891) were the basic units of the nervous system represented the beginning of modern neuro-anatomy. Recent histology and microscopy techniques still follow similar principles and working practices, including the staining of nerve tissue, because undifferentiated chromatic internal cellular tissue cannot fulfil different levels of morphological research needs.

By the 19th century, the ability to reveal the inner body no longer depended on the eye and the hand of skilled individuals; their function became replaced by photography. An emphasis on interpretation was thus replaced by a notion of objectivity. Photography was faster and could 'see' what the eye could not. Chrono-photographic investigations of moving animals by Eadweard Muybridge (1830–1904) and Jules Marey (1830–1904) extended existing graphical models and allowed complex problems to be approached in a concrete and visible way. Artists shared science's interest in visualization via photography, as shown by the work of the end of the 19th and early 20th centuries, particularly the Futurists, Cubists and Surrealists (Anker and Nelkin, 2004).

> Duchamp took up the challenge of revealing in paint the images captured by the physiologist-photographer Etienne-Jules Marey, whose sequential images broke down movements such as walking as taken by fast film, or as seen fluidly on a fluoroscope [...] The most literal depiction of the everyday fear that X-rays stripped the body bare (a frequent theme in ribald rhymes and cartoons) was captured in Dulcinea: Duchamp overlaps images in a series reminiscent of Marey's chronophotographs. (Kevles, 1997: 127)

The photograph laid the groundwork for standardization of medical records and for a new visual understanding of the inner body, with the development of X-rays in 1895 by

Wilhelm Conrad Roentgen. With this technology, the barrier of the skin in the living body was finally trespassed, and a new look and a new era in medicine and anatomy arrived:

> With astonishing speed, people got used to seeing their insides displayed as snapshots in black and white or in moving images on a screen. This unprecedented familiarity with our own anatomy separates the modern view of external and internal from that of previous eras. That earlier, opaque world so full of mysteries on every level anatomical, sexual, and mental began to dissolve when X-ray mania swept the West. (Kevles, 1997: 2)

Doctors now added another diagnostic tool to the known representations of the body. Traditional methods of investigation through the medical gaze were supplemented by an apparently more objective look into the body and illness, that involved smelling, palpating, looking at and listening to the patient. It also allowed the patient to see (though not decode) their own diseased organs. The popularization of technology[21] led to many interpretations in which the contours of the body were associated with feelings and qualities of a person. Marcel Proust alludes to the belief that X-rays could 'see' personality and emotion when in *In Search of Lost Time* he relates the words of the servant Françoise, whose mistress has asked her about her feelings on her absent family: 'You always know everything, the lady is worse than X-rays ...' (Proust, 2003: 61).

Thomas Mann's novel *The Magic Mountain* has been cited (José van Dijk, 2005; Kevles, 1997; Cartwright, 1995, Zwijnenberg, 2009) as an example of the social significance of the X-ray image, illustrating the friction between the medical, artistic and ritualistic dimension of this technology.[22] In Mann's novel, Claudia gives her chest radiograph to an admirer as a sign of intimacy and dedication, suggesting an emotional significance far beyond the diagnosis. Sanatorium physician Dr. Behrens displays X-rays alongside his amateur paintings; he has produced both an X-ray and an oil painting of Claudia. Mann illustrates how artists such as Picasso, Picabia, Braque and Duchamp creatively explored the optical and emotional associations of this 'new' vision of the world.

The photograph seemed to verify external reality until its power was suddenly

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[21] Interpreting X-ray images, however, was a specific skill because, though technically resembling the photograph they are very different: there is no perspective; spatial relationships between organs are not perceived, and there are areas of vague outline that only an expert eye can distinguish and identify.

[22] Before people became aware of the danger of successive exposure to x-rays this technology was available and widespread in shoe stores. Many people followed Roentgen's example and took radiographs of the hand as evidence of passionate affection.

undercut by its supposed companion technology, the X-ray. By revealing the skeleton beneath the skin, the X-ray destroyed not only faith in the judgment of the naked eye, but also faith in the total veracity of the photograph as a recorder of truth. The X-ray helped undermine not only the validity of the optical world but the idea that the artist's mission is to reflect that world. (Kevles, 1997: 136)

Because X-ray technology does not recognise variations in hardness of tissue it did not satisfy many aspects of medical research for a long time, especially at the neurological level. In 1969 electronics engineer Godfrey Hounsfield shared the Nobel Prize for Physiology and Medicine for using a computer to translate an X-ray into a 3-D image, following neurologist William H. Oldendorf's prototypes. In 1971 computerized axial tomography (CAT) scanning was developed in the UK, and the following year an image of a living brain was published. Magnetic resonance imaging (MRI) was developed in the US in 1960. While CAT is based on X-rays and essentially shows the bones, MRI uses radio waves and strong magnetic fields to provide detail of tissue. Other technologies such as parallel-imaging MRI and positron emission tomography (PET) were developed, and with them the reintroduction of spatiality and time to the anatomical views. When skin barrier technology 'broke through' the skull, the way had seemed open for discovery of the mysteries of being and mind. Now neurologists were able to see the structure of the living brain in 3-D; measure, using functional MRI and PET, several activities (blood, oxygen, sugar), and compare it with the anatomy. The mapping of the brain followed the understanding of the mind in biological terms with the development of molecular biology. If the gene has become an undisputed cultural icon (Nelkin, 1996), the image of the brain shares its popularity: it is used by the media either to refer to a scientific subject or to standardize and typify the individual, as discussed by Dumit (2004). He examines how identity is visually constructed through PET scans, arguing for a direct link between behaviour and character and the image symptoms representing it. Dumit's study focuses on the shifting meanings of, and uses for, these images, when they move from the laboratory to contexts such as magazines or scientific journals.

Artists have paralleled this development in different ways, reflecting and criticizing social and scientific issues in a visual language and exploring the practices of representation and signification. According to Reichle, (2009) art has attempted[23] to

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[23] György Kepes (1906–2001) professor of design at MIT in the mid-20th century believed (cited in Reichle, 2009) that the existing relationship between art and science was mediated by the common platform of technology, which allows various graphic associations, such as between an aerial view of a road network and neurons.

decode scientific images by linking them to artistic investigation of new ways to read and decipher the cultural codes and canons of representation that convey these images.

The process of visually accessing the inside of the brain, however, mimics the complexity of brain function: it requires the ordering of the functional parameters of the equipment (a mix of physics and cybernetics); instructing and coordinating the patient; data acquisition; image building; viewing; cleaning; interpretation and analysis; reporting and then using as a diagnostic aid or monitoring. A series of processes of different natures are synchronized to obtain a slide and a caption, from the physical alignment of the apparatus, through the patient's psychomotor coordination and technical imaging, and the mathematical formulas in the variants of the computer programs and visualization that allow multiple images to be added to.

Medical images only enter into their diagnostic function when understood and interpreted by specialists[24] trained to recognize, read and interpret the structures and to see: the readings derived depend equally on the image and the conventions, beliefs, school, and institutional commitments that allow that image to be interpreted differently by different specialities or even, if additional diagnostic data is provided, by the same person. To the layperson they may be indecipherable, and are thus synonymous with objectivity and very convincing. Reichle (2009) says the relationship between the knowledge associated with new kinds of vision and the tools and technologies that produced them is vital:

> However, it is apparent that even today with the amazing insights these new worlds of scientific imaging offer us, such images must, of course, be understood as historical snapshots, which carry them with their own historicity. (Reichle, 2009: 35)

The way in which we see, hear, feel or pay attention to something depends largely on where we are. It is not just that 'representations of the body' change historically: the material body itself is necessarily entangled in the complex web that is in part historical. In *Techniques of the Observer* (1992) and *Suspensions of Perception* (1999) Jonathan Crary explores the theme of the historicity of perception by researching philosophical discourses, artefacts, treated scientific apparatus and image production. According to Crary, the 19th century saw a deep rupture in the way that perception was understood, as well as the ways in which it was exploited in various institutional and social

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[24] These interpretations are based on a multidisciplinary system of computer specialists, nuclear chemists, mathematicians, neurologists and neuro-radiologists.

practices. In the 17th and 18th centuries, the epistemological model of perception was based on a subject/object division. The body hindered the smooth operation of perception held by reason; the soul was endowed with true perception. In this context, the camera obscura worked not only as an apparatus for producing images but also as an epistemological model of the times. The orderly and calculable penetration of light by a single orifice of the camera obscura corresponded to a mind guided by the light of reason. The image formed inside the camera was absolutely guaranteed by the representation of objects in the world; founded on the optical laws of nature, it provided a useful reference point for the universe.

This picture changed from the second half of the 19th century, with a displacement of the epistemological model of the camera obscura to the model of stereoscopic perception. Stereoscopic vision sets up a regime of visuality that is no longer based on absolute laws of vision but on the material body of the observer. Both the observer and the observed were subject to the same types of empirical study. Thus, the body and perception were subject to investigation, regulation and discipline throughout the 19th century, as Foucault has shown. Crary (1999) analyses some of the consequences, suggesting that the rise of mass culture in the late 19th century and the advent of modern art belong to the same network, in which the subject has become highly important. Perception, or reception, of the world as image, corresponds in a synchronized and complementary way to a condition that is the perception of their own body as an image. It may therefore be said that the body was invented as a theoretical object at the beginning of the 20th century, as outlined in Foucault's *Birth of the Clinic* (2003), which analysed the body as object of observation, investigation, classification and regulation.

Visualisation technologies therefore have a crucial role in contemporary medicine: they are responsible for the current utopian ideal of the 'transparent body', which is a cultural construct mediated by medical instruments, media technologies, artistic conventions and social norms. The more we see the inside of the body, the more we understand its complexity. Thus the body is mediated, and is at the same time the object of scientific research, and an artistic object of observation and public understanding.

Researchers into the history and philosophy of science have paid special attention to the connection between medical images, and social and cultural images of the development

of disease; according to Foucault (2003), our bodies have become 'places where the organs and the eyes meet'. In the 17th-century anatomy theatre, public dissections of cadavers presented an audience with a fascinating spectacle that exposed them to death and intimacy; while in contemporary state-of-the-art images, MRI and PET scans are able to see something that might become a disease, thus changing concepts of body, illness and time. Now, images are the products of instruments, but instruments are the products of our imagination and become, as Bruno Latour (1987) points out, possible systems of knowledge. Optical technology has another, sometimes overlooked feature: it is often presented as a technique of illusion; a special effect that enables beautification, voyeurism and confusion.

The scientific image and the technologies that produce it contain the dispute between scientific and cultural authority. This tension calls attention both to what is seen and to what lurks in the image (Steve Miller, cited in Reichle, 2009: 39). On the one hand images are produced for purposes of research, diagnosis and monitoring, on the other hand they are also interpreted (in different ways) and recognized outside the medical-scientific arena. This is only possible thanks to the codes of representation in which images are bound to fall into the visual tradition and symbolism acquired. Such representations, though ostensibly appearing objective, are in fact anything but neutral and are revealed as such via the work of artists who deal with visual abstractions of systems and technologies rather than outward appearances. We may then consider, following Miller (2009), the image to be an illustration of experience that is inseparable from its enunciation; an image-memory implying a (re)construction and a performance combining the gestures of production, presentation and reception in a single action-image. This continuous construction would be implied in a contemporary view of any system of representation and language, as organizing, constructing and mediating our understanding of the world by replacing more traditional ideas that images reflect reality (Sturken and Cartwright, 2002).

Part III – Praxis

The Approach

This installation[25] arises from the focus on images produced in studies of Alzheimer's disease and my ethnographic exploration of the relation between what I considered to be different virtual archival spaces. Its main aim was to establish a critical link between the scientific images and visual studies/visual arts. It centres on real theory/practice interaction (i.e. practice-based research), and on self-reflexivity in which theoretical research, ethnographic exploration and studio practice all trigger the experimental process, as well as on developing and reflecting on the practice, elucidated by the methods and structure of the written work, which in turn fed into the practical decisions. During this process of transition and reinvention, a great deal of time and energy was spent solving the problems of data acquisition, ethical clearances, theoretical framing, archiving, analysis, and visualization. Though fundamental to the resulting installation, these are also embedded and hidden within it, and are thus generally unperceived by the casual observer.

The building of bridges between art and science, and the development of strategies for evoking the nature of autobiographical memory within this practice posed many questions. Among these was how, using familiar materials and processes, to reflect simultaneously on *The Approach* to a new stage of my practice as research, and to a new neuroscience field in which a disease that leads to lack of memory and severe cognitive impairment is researched. Images circulate through different contexts (enactment of the archive) and undergo some ordering and editing processes in the studio as a reflection of the capacity of memory to reconstruct lived events from archived cues of sensuous impressions, feelings, context and time (re-enactment of the archive). The exhibition serves as a starting point for artistic research into the representational strategies of the scientific universe of Alzheimer's disease.

In the laboratory, registrations or inscriptions such as examples, graphs, sketches and files present, according to Elkins (1999: 40), a challenge to reconsider the status and

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[25] This installation emerged in the dual sense of image as an aid to memory, triggering an active construction of previous lived or imagined experiences, and image as synonymous with the construction of an understanding of reality. It represents a change in the course of my artistic practice from studio-based installations based primarily on previous research and ongoing trial/error situations.

function of the image per se. Neuroscientific images can be understood as 'performative tools of information' (Burnett, 2005: 6), an idea based on a pragmatic view of what it means to 'represent'. As Nelson Goodman and Catherine Elgin suggested in 1988, resemblance is not a sufficient condition for representation. For example, the colours of brain images do not resemble the brain functions implied: there are statistical models (brain atlases) that generate the relationship between the numerical and pictorial elements of the image and allow experts to operate with the image. Colour is understood as the property that facilitates operating with the image, not as the replacement of something else.

This relationship between resembling and representing is implied in the construction of my work, which questions the value of the object/image in its circulation both within and outside the institutional and scientific frame. If, in the laboratory, images are read into what Foucault called (1997) 'medical discourse' and Latour (1990) called 'immutable mobiles', in the studio or in the exhibition they are re-enacted under cultural assumptions.

In this project I identified four areas of movement that I constantly explore as a network of production of data, articulating and questioning. These spaces are:

1) The studio;

2) The laboratory studies of dementia (at the hospital and the IMM);

3) The laboratory of Molecular and Cellular Neuroscience (at the IMM);

4) The public space (the observer's participant body) as a reference to the patient to be introduced later.

The Approach explores assembly and movement of images and experiences between the various spaces, whether organized and almost aseptic (the laboratory or the gallery) or highly emotional and almost chaotic (the hospital and the studio).

In my research journal at the time I wrote:

> The project is for me a true test of an approach to space and matter that involves
> a structure of a complex investigation and questioning the moral standing and
> encompassing aesthetic challenge. Hardly distancing materiality and spatiality
> they presented the draft of the intrinsic relations to thought and experimentation,
> how to structure my thesis research. Latent feelings about the pressure of

defining which memory is being scrutinized, self-identity of whom or the importance of contributing to knowledge that has to be disciplinary. The importance of the support material is placed on the need to define a framework that allows seeing beyond (through) subjects and concepts keeping in vulnerability (intrinsic to the glass) the ability to support a coherent and transport of contribution in the field of visual arts.

Entering the exhibition space, the viewer sees a distant landscape in three reflective surfaces juxtaposed and positioned on the floor and wall (Fig. 9). The landscape is an assembly of medical neuroanatomical images outlined like a contour drawing in faded colours and almost invisible, with an evident spectral image of the place of exposure, or rather the outer limits of the showroom. The viewer is suddenly aware that the surface functions as a mirror and that his or her own body is part of that landscape. Entering the landscape four suspended colour images, also printed in the centre of transparent glass, can be seen but the subject cannot be distinguished. Moving again, a slide projection light invades the central area of the landscape on the floor along the wall. As if in a game of seduction, the light shows and hides, and some might feel deceived. Now it is almost possible to distinguish the outlines of the drawings in which fragments comprise a familiar mountainous landscape; the invasive light prevents the eyes from focusing and compels a decision: to go back, forward, move away or keep still. Mobility options can cause the light to go off after a few seconds or remain activated, though the off-axis observation of the overall picture allows the observer to understand what it is. If the observer stands still, the focus rests on the spot of light on glass that casts shadows of (and by) the drawings on the wall behind the glass. Patient observers discover that the spotlight is 'breathing'. It breathes in the sound of the projection apparatus and in the contour of the light, 'shrinking and stretching' in rhythmic movements of retraction and expansion. What follows is a sense of your own body movement in this eternal rhythm of the living.

In *The Approach*, representational strategies are drawn from the context of the laboratory and inserted in the laws and the handling of cultural context. Intersecting and overlapping images corresponding to three distinct spaces (studio, hospital and IMM) transform science into a personal, subjective interpretation and reconstruction that alludes to autobiographical memory processes. The translation mediates and appropriates the tension between fact/fiction, truth/construction that is inherent in the use of scientifically oriented images and in references to memory narratives.

The collection and selection of images challenge my thoughts around holding my gaze, in which lies my fascination and anxiety. Why did I choose these fragments and articulate them in this way? I am only able to identify the formal aspects and criteria that relate the affinity with the visible, compared with the patients' loss of memory, the connection with my memory, the diagnostic process, building models, therapeutic processes, spatial organizations and other criteria unlikely to become words.

Transparency and overlay are handled as a metaphor of the panoptic, where the body has become the object of the gaze, and of the practice of medical and scientific archiving where there is overlapping information (Fig. 10). Transparency is also associated with the medical examination (TAC/PET/MRI) and the cinematic practices I use in my work (projected video, slide projection, installation). There is a luminous quality that I explore to make visible the interaction between viewed objects. The light interacts subtly with the possibilities of visualization of the portion or the whole, in inverse proportion to the proximity of the spectator, 'leaning' towards the tradition of painting. These modes of interaction device – the sensing slide projector and the viewer's voluntary movement in order to understand the images – are a form of re-establishment of the temporal dimension. The light of the void refers at second 'look' to an absence in a second look, deleting by the excess (of light) in the additive colour process of the projected image and evoking the omissions of brain connections in the degenerative process of dementia.

The images deliberately contain no white, so the standard white exhibition wall forms the background and a literal formal context for reading the work. The marks, cracks and colour variations of the wall add texture, and suggest a critique of the supposed expertise present in the scientific images used.

The work is back-printed on a transparent glass support and comprises superimposed layers of images, without backgrounds. These were acquired from scientific publications and hospital archives relating to processes developed in the two laboratories and in my studio. On each montage a drawing of a landscape – a copy of a Cézanne landscape – corresponds to my studio; images of the brain correspond to the laboratory processes of dementia, and 'inscription devices' correspond to the molecular and cellular medicine laboratory. Thus far I had no access to patients, so the 'patient layer' was replaced by the mirror image of the observer in the exhibition space.

During this period I had images of the paintings of Cézanne in my studio as a souvenir of an exhibition and a talk by my first research supervisor Kathleen Rogers. These reminded me of personally experienced events, and were used as metaphor for the construction of artistic identity through memory in the processes of copying and repetition, reconstruction and representation. Cézanne returned to the same location each year to paint the 'same' landscape, and this idea prompted my decision to start copying some of the lines of the landscape he explored. This copying exercise drove the decision to perform the neuropsychological tests that memory-loss patients undergo, including copying set exercises, recognition and other tasks. For me, the need to know a domain is often replaced by the act of drawing, as though the repetitive copy can inform in the same way as when, after making repeated visits to a space, we may find ourselves in attentive mode, noticing what is happening there instead of the space itself.

The Approach was my first research outcome; my aim was simply to devise a system to help me organize my thoughts on the experience of getting closer to the structure of the research. I also wanted to use the exhibition opportunity to explore the metaphorical poetry embedded in the title, almost as a critique of the status of visuality, which is traditionally linked to the achievement of reason and to Foucault's metaphor of the panopticon and the inspecting clinical gaze.

The analogy I worked with throughout the development of the work was of the 'transparent body' (Van Dijck, 2005) and the 'inscription' (Latour) produced at different sites (corresponding to the different laboratories and studio), in which the theme of memory was being dissected and explored at different scales and under distinct but comparable visualizing technologies such as microscopy, brain scans or video. Viewers or participants would slowly and seamlessly drift through, from collated image to collated image, either playing with their own reflections both literally and metaphorically or remaining in a central observational position that, even with full light (because the slide projector would stay on) would permit them to see no more than shadows. I questioned whether the artworks could contribute to the display of autobiographical memory discourse, by exploring the representational practices circulating on neuroscientific research into Alzheimer's disease.

As noted, memory is constructed of many fragments, types, systems and processes. Through this work, I suggest that the assembly may evoke this by the use of overlapping, juxtaposition, edition and installation practices.

Throughout the installation and research process, attention has been paid to the way in which particular materials (e.g. glass and colour) support specific qualities of engagement, and considerable energy has been invested in the exploration of light and reflection in an attempt to reflect Latour's understanding that memory, as research, functions in a network of systems and processes.

The attempt to link images from these different locations, and to design and produce an exhibition from them, required the consciousness of a multi-spatial construction, which emphasized the distinct locations and their different natures and ecologies and explored the possibility of constructing a new experience. The provenance of the individual images that constitute the installation is precise and usually (except for the studio drawings) consists of evidence or a diagnosis, but the overall experience of what I have tried to depict does not depend on a determined meaning. The installation does not propose a definite hypothesis; it rather explores the resonance of several verbal and visual associations with the history of art, as well as with the scientific discourse/research on memory.

The overlapping or assembling of a collage relies not only on the construction's own impact, but on the space and light to focus on the glass. This alludes to the need for constant repositioning and adjustment of our perception of consistency and truth that is imposed by the memory's constant process of review and reconstruction.

An individual brain scan is constructed using a software programme from numerous markings, maps and images of other bodies. It seems incredible that even a trained eye can integrate, view and interpret this multitude of images (layers, slices of data) allowing the ambiguity of the image to surface. I explore this ambiguity by emphasizing the overlapping layers, which visually re-introduce a complexity apparently lost in the false objectivity of medical imaging. According to Ron Burnett (2005) and Silvia Casini (2008) images always work as an interface to structure the interaction between people and the environment. In this case they provide a way of structuring the tracks and traces of a technological process as a pattern of biological status.

New considerations arose to complicate the critical task: the epistemological value of these images and building networks in the processes of representation and scale involved; the ethical responsibility of looking at 'the other'; the potential psychological impact of an artistic reinterpretation of these images; the meanings attributed by the scientific community, and the significance placed by the experience of the project in an artistic context.

Case Study I: Suzanne Anker

Suzanne Anker[26] is a well-known visual artist who teaches art history and theory at the School of Visual Arts in New York, and is Chair of the Fine Arts Department. This case study on her work is used to reflect on the construction of *The Approach*, and focuses on exploring some connections between neurosciences and art practice. Anker's practice intersects both art and science and, despite the use of apparently traditional media, attempts to question and reconcile empirical scientific knowledge, technologies and imagery (metaphors and icons) with the strong, though impressionist and poetic, veracity of art. I am interested in two key topics for reflection that Anker proposes in her installations. The first of these is the importance of the visual, and the institutional and disciplinary framing of her approach; the second is the complexity proposed in different uses of metaphors, language (visual and semantic) puns, and juxtaposition of fragments from different sources, with the technology as a binding medium. I propose that the visual framing correlates with my aim to categorise the representational strategies implied in Alzheimer's research studies as similar (at this stage) to other biological science strategies, and offers permission to look into the 'intersections of distinct, yet overlapping disciplines' (Anker, 2009) circulating in the laboratory and the studio. I also suggest that Anker's practice contributes to

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[26] Anker occupies a prominent position in this field: for the past two decades she has been established as an artist in scientific theories, practices and technologies, theorizing on art/scienceproductions in numerous articles, conferences and books and also curating several seminal exhibitions such as the first exhibition to explore the intersection between genetics and art *Gene Culture: Molecular Metaphor in Contemporary Art* at Fordham University in 1994 or *Reprotech: Building Better Babies* at the New York Academy of Sciences. The exhibitions explore understandings of genetic imaging functioning as aesthetic signs. Anker's interest in the intersection of art and genetics is further developed in her book *The Molecular Gaze: Art in the Genetic Age* co-authored with the late sociologist of science Dorothy Nelkin and in editing the online symposium *Visual Culture and Bioscience* edited with J.D. Talasek, She also organized the public forum *Embryonic Visions: Social Implications of Reproductive Technologies*. Her work has been shown at various museums, including the Getty, the Smithsonian, and the Phillips Collection. In addition she has hosted 20 episodes of *Bio-Blurb*, an internet radio show produced by PS1 and the Museum of Modern Art, New York, and transmitted by WPS1 Art Radio.

understanding the complex nature of autobiographical memory, in which the assemblage and juxtaposition of fragments in an orchestration of a multiplicity of systems stands for the capacity of constant construction of reality, interpretation of the past and projection of future actions.

Anker's work is usually contextualized as based on the textual/scriptural nature of genetics, and specifically the potential of the imagery of karyotypes to evoke a language. This position places her in a domain in which the visual and sensual take the primary role in framing an understanding of this new world of (genetic) perception that science has been constructing. She has been questioning the technologies and codes (language systems) or discourses following Foucault, implied in the life sciences, such as the genetic code as well as the visualizing technologies and practices underlining this molecular understanding. As Anker asserts in her website, her work 'investigates the semiotics of the genetic code and its conjunction with other forms of language systems'. The basis for Anker's practice is information derived from scientific and media sources; her installations create 'in-between spaces' that modify information derived from their sources, counter-balancing the residual epistemic power of the first reading (the appearance of a codified but well known representational strategy of science) and establishing formal relationships in the hermeneutic perspective of creating meaning. Further, she creates sensuous encounters that engage the viewer by subverting the immediate apparent meaning of the language so the forms appear to conduct the viewer, using deceiving techniques such as producing a model karyotype in sugar, or a *Rorschach* blot from medical transparencies.

Though all Anker's work could be used as a case study, I shall focus on three installations that unconsciously inspired the formulation and production of my first outcome *The Approach*. These are *Zoosemiotics: Primates, Fish, Frog, Gazelle* (1993), *Laboratory Life* (2004-2007) and *Butterfly in the Brain* (2002).

Zoosemiotics: Primates, Fish, Frog, Gazelle

The materials used in this installation are a glass vessel (1000ml); steel, water, hydrocal and metal pigment; dimensions: 82 x 144 x 84 inches (Fig. 11). This sentence reprises the usual caption on a *Zoosemiotics* photograph. Another way of approaching the

installation is by describing the physical location of the materials and their respective arrangements in space. A wall stands as a support for several lines of dense sculptural forms inspired by the biological karyotypes of the four different species of the title. The uneven figures are carefully arranged in pairs looking like fragmented characters of a text in a foreign unrecognizable language. Opposite, or in between our body and the wall, we face an elegant metal stand with a large round transparent glass container, similar to that found in high-school chemical laboratories or biological laboratories, filled with transparent, odourless liquid (Fig. 12). Before reading the title (if one could be naively unaware of the insertion of the work in an art-science exhibition) one is confronted with a quasi-aseptic regime and structure of the scientific domain, and all the materials (cold, static, clean, untouched) reaffirm this assertive and objective disci art-science pline as well as the mathematical coordination of the natural order. This cleanness is shattered when one sees the chromosome figures through the water and all the appearances are distorted. The exhibition space looks upside down, and as we move the figures on the wall seem to mingle in a fraternal dance: what we see is not what is there. One doubts one's own eye (Fig. 13). According to Reichle:

> The intention is not to visualize the diversity and forms of the chromosomes but rather to instruct the eye in the simple, analogue, optical technique of magnification through a glass filled with water. By utilizing the laws of optics, Anker draws attention subtly to the production of visual patterns of abstract content with regard to their historicity. (2003: 3)

I assume that Anker is reflecting on the transversal technologies that condition our viewing and understanding of the world, namely the digital technologies that cross traditional discipline boundaries. The methodology applied by Anker in this installation is very much drawn from the laboratory actions and practices, allied to the slippery meanings that are lost in transition from scientific practice to scientific communication to the social cultural world. As she notes in a 1996 special edition of *Art Journal*:

> Fashioning a chart with scissors and paste, the laboratory technician matches identical pairs of chromosomes in alphabetical and numerical size places. This artificial arrangement of 'colored bodies', reminiscent of paper dolls, is known as a karyotype. Congruent with an ideogram or a shorthand language, this synthetic arrangement behaves like a museum display, encoding a morphology of signs. A cellular archaeologist, the laboratory investigator correlates subtle differences in identity among specimens. Differences, for example, between a fish, a flower, or a bacteria can be discerned by looking at linear configurations of an organism's abstract sequence. (1996: 33)

If in the laboratory the invisible, magical and abstract code is turned into something material, manageable, transportable and shared, which corresponds to a translational (Latourian) category of the scientific inscriptions, I suggest that it can be viewed as something playful and reminiscent of childhood such as cut paper dolls (Fig. 14). Paper dolls are fragile and almost symmetrical, like the balance of the biological script of life in which so many details can go wrong and cause abrupt disruption in life processes (including early-onset Alzheimer's). In Latin chromosome means 'coloured body', and this may have been an incentive to include the chromosomal composition of body-like 3-D figures in wall alignments that resemble charts of signs from biological diagrams. For Anker, changing the karyotype to a form that is readable in all directions and positions (from right to left, or upside-down in the reflection or even 'dancing' in the water refraction) 'evokes another language system perhaps suggestive of Chinese calligraphy' (Kevles and Nissenson, 2001); for me, it underscores the learning processes of writing in which children treat letters as formal, magical entities that dance holding hands, to provide meanings to the owners of the semantic keys (Fig. 15). According to Barbara Stafford (2007) Anker's methodology alludes to these 'fractions of life', not from the point of view of the human needs and diseases but from an ecological overview of endangered creatures, victims of the global spread of human species. She says:

> Anker underscores the fragility of such vulnerable, threatened, and endangered creatures—remote from the glamorous bestiary of rarities festooning conservation posters—by sculpting a sheltering enclave. Luminous wall-hung reliefs made of hydrocal and metallic pigment impart a sensual quality to an otherwise abstract code. In this buffer zone, a panorama of silvery chromosomal projections dynamically body forth the notational understructure of living matter. These capering ciphers and dancing glyphs, in turn, are elegantly compressed and refocused for our narrowed attention within a shimmering, water-filled orb, their marvelousness suspended within a biological reserve. (2007: 280)

In looking at her work one becomes aware of the 'pictogrammatic' signs of the karyotype, used as abbreviated blueprints, a coded script for the materialization of ideas into abstract visual and 3-D form. One recalls different systems of writing and a recurrent association of the power of language and words to the sacred dimensions of life: from Holy Scripture to DNA. In her reflections, one encounters a conscious approach to the metaphorical dimension of scientific experimentation as a representation or scaling-down of the natural process under study. As Latour proposes,

science is an inscription practice dependent on the sustaining technologies of creating the visual (even through manipulation of DNA in order to prepare living organisms to express the effects of a certain action upon them). As discussed previously, science depends on models, maps, diagrams, schemas and images of different natures for communicating within the different disciplines inside the scientific institutions and with the extended social and cultural network. Anker reflects:

> Science has always presented itself metaphorically. An experiment maps a natural process by presenting convertible data in the form of charts, numbers, or visual images. Models, diagrams, or schemas are an integral part of scientific formulation and communication. Those representations, while seemingly objective, are at the same time forays into the ways in which thinking proceeds along both traditional and experimental networks. Art's role in this complex is to question assumptions of the visual. A more profound and difficult role for art is to make visual those aspects of systems and ideas that inherently rely on non-visual parameters of communication. Genetics provides the maps of biochemical futures and living forms of cellular script. It is a particularly fertile and untapped field for visual participation [...] (2000: 372)

Reichle (2003) claims that Anker crosses her own visual language with the imagery of genetics, using the chromosome as a popular metaphor, a cultural icon of molecular biology. These thoughts concur with Nelkin's reflections on studies of the uses of scientific representations outside the margins of scientific institutions:

> Indeed, scientific visualizations of chromosomes, molecules, DNA sequences, and the double helix are appearing in both the multilayered genre of high art and the more direct iconography of media illustration. [...] For DNA artists the biological gene – a nuclear structure – appears as a cultural icon, and the science of genetics provides a set of visual metaphors through which they can express the essence of person-hood, the nature of human destiny, and, especially, their concern about the social implications of an expanding, important, but historically dangerous scientific field. [...] Suzanne Anker uses her own DNA fingerprint to create a self-portrait that she titles Chromosome Chart of Suzanne Anker, Artist. [...] For these artists genetic metaphors are a way to represent the inner essence of a person, the truth behind appearance, the nature of authentic self. As essentialist visions their work often has quasi-religious overtones. [...] The gene in contemporary art has become a cultural icon. Genetic metaphors offer a way to represent the link between nature and culture – a problem that has always fascinated artists and long attracted them to scientific and, especially, biological metaphors. [...] Can the self be reduced to a molecular entity? (Nelkin, 1996: pp. 56-61)

Thus, according to Nelkin and Reichle, Anker appropriates the dual use of the chromosome as a metaphor for science and as a model within scientific practice to

question the link between nature and culture, and reflect on the subjective and constructed character of the visual language of science. They declare that, for Anker, the task of the artist is to highlight the functions that are inscribed in the visual metaphors of science. Her reflections on the molecular gaze highlight the dependency on visual inscriptions within the scientific field. On the domain of this scaled-down reality within biology she says:

> Reducing life itself to molecules, it has displayed the visceral references that had once defined the authenticity of the body and the authority of traditional biology as a descriptive science. Despite the complexity of life, this vision implies that we are but a sequence of nucleic acids, a 'code script' of information. This transformation of biology from organism to code and/or text parallels developments in art. Artists are adapting images revealed through high technology apparatus, and their pictorial and sculptural products have shifted towards the abstract. They have recognized in genetic iconography an underlying narrative that resonates with familiar forms and issues in the history of art. (2004: 19)

In *Zoosemiotics*, the refractive properties of water and associated optical distortion as a medium by which to revise the sculpted chromosomes 'takes on the task of demonstrating how the visualization of scientific images depends on the human subject, their dependence on optical media, and the specific conventions of perception obtaining in a particular epoch' (Reichle, 2003) (Fig. 16). For George Gessert careful consideration of the pictorial space, spatial arrangement and materials implied in Anker's works produces:

> paradoxical ways of seeing: on the one hand it permits appreciation of chromosomes as pure visual entities; on the other, it encourages a contemplative and intellectually playful frame of mind. From arcane alphabets and visual puns come ramifying associations, and in the process chromosome images scatter through the matrixes of consciousnesses. (2001: 17)

Though writing has generally been considered a liminal form of the divine, associated with the word of God, it has also been associated with memory and the human capacity to retain episodes and knowledge for re-visitation and communication. The language in it operates as a communicating device via symbols inscribed on a surface, an abstract of traces and signs or as a lexicon. I therefore consider that what Anker secures in her work is this transitional and translational capacity encapsulated by icons such as chromosomes, brain MRI and the Rorschach blot. Anker recognizes the terrains her work operates within, and in 2000 asked:

The definitions of art and life are inescapably vague, slippery. Is a virus a living entity? Is a genetically altered organism in some way a work of art? We do intuitively grasp the ways in which both culture and science operate outside of the laboratory and spill over into our lives. However, this proposition does not necessarily provide answers. Instead it merely signals the issues and problems to be addressed in the contemporary theoretical domains of art, science, and culture. (2000: 375)

Laboratory Life

This[27] is a series of photographs, or more precisely digital montages, printed on watercolour paper, consisting of:

several layers of images [...] superimposed on top of one another in the form of a palimpsest. Images garnered from scientific laboratories form the technological base layer. An image of a transparent garden is then transferred as a top layer. The chance provokes questions concerning our enchantment with both nature and technology. (Anker, 2009: n. pag.)

The general views of different scientific working spaces were gathered at different locations and different times: the Max Planck Institute, Dresden (2004); the European Molecular Biology Laboratory (EMBL), Rome (2006); and Imperial College, London (*Biophysics*, *Biophysics II*, *Jump Cut* and *Blue Grass*, 2007) (Fig. 17). At first glance, these photographs show some blurred interiors almost devoid of humans, except for a gloved hand placing a Petri dish in a microscope tray. On closer inspection, it is almost possible to perceive that a drawing technique is responsible for the unclear nature of the images. After some time, the depth of field increases and the observer is confronted with a compound image corresponding to a superimposition of a lawn and a laboratory photograph. Each photograph evokes a different kind of conceptual material, some referring to the chemical nature of a natural composition of life, others to the physical and structural confinement of all natural forms. Most of them evoke a feeling of an unfinished, ongoing process whereby a captured, frozen moment says nothing of the hidden nature of the complex task (Fig. 18). The nature-culture discourse is bound definitively to this work, and in consequence with *Zoosemiotics* and *Butterfly in the Brain* (see below). In what follows, Anker seems to argue for a reflection on new notions of the boundaries between nature and culture, at a time in which the term

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[27] These images were exhibited in 2008 at *Foto-Fest* in Houston Texas, as part of Suzanne Anker's exhibition *Bio-Blurbs* at the Deborah Colton Gallery and at *Hothouse Archives* at the Institute for Cultural Inquiry/Kulturlabor and the Max Planck Institute for the History of Science in Berlin in 2009.

'nature' is blurred by the biotechnological creations that are replacing the concepts of evolution:

> In contemporary art, many exhibitions in recent years have taken as their theme the effects of this 'biological revolution' on people's self-image and on the multi-layered interrelations between art and genetics. However, in contrast to the first encounters between art and genetics, which began in the early twentieth century with art's visual and affirmative engagement with genetics, today these 'scientific' images are decoded through the linking of art and the images of the life sciences and a new way of reading them results. (Reichle, 2003: 1)

Anker here is not just playing with the genome or inscription devices directly as icons standing for the 'stuff of life' or molecular biology, but rather acts on human perception. In order to decipher the provenance of the images in the different layers that constitute the image, the eye must adjust to the greenish colours of the photomontage and the graphs of the surface (Fig. 19). Anker interrogates the relationship between the concrete and the abstract of scientific graphicness and cultural codes (Reichle, 2003: 9). She also seems to play on the tension between the interior and exterior as a correspondent between the visible surface and the invisible structure unified as one (person), as well as on the highly-mediated and constructed scenery of biology through the use of models and visualizing technologies. The visual is a common ground in the construction, understanding and communication of biology and art. The use of watercolour paper as a printing surface is another strategy that reinforces the cultural and historical domain of high art painting, in which the understanding and reading of the images should lie. Anker recognizes that art and science share the characteristics of abstraction, fragmentation and reductionism and a strong relationship between these disciplines within styles, modes and devices of visual representation (Fig. 20). Though the sight of maps, diagrams and notations as mirrors for thoughts is familiar, in *Laboratory Life* Anker seems to be simultaneously building a visual diary of her migration interests and journeys within the life sciences and commenting on the construction of the 'black boxes'[28] of science as the chromosome or the double helix, presented as givens rather than as results achieved by successive trial and error efforts in laboratories throughout the world (Fig. 21). This problem was approached by Latour's definition of the inscription and immutable mobiles in the active construction of science.

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[28] 'The word black box is used by cyberneticians whenever a piece of machinery or a set of commands is too complex. In its place they draw a little box about which they need to know nothing but its input and output.' (Latour, 1987: 2)

The Butterfly in the Brain

This work is a peculiar collection of butterfly-like forms that investigate how images of the brain, and the Rorschach blot (a parallel to the chromosome) have become highly culturally charged icons (Fig. 22). In addition to advances in molecular and biotechnology laboratories, and in medical imaging, we are familiar with the process of collecting images of our bodies/brains. In consequence, the brain has never been so meticulously observed. The three kinds of works in the exhibition examine concepts of the hippocampus and the brain and its possible permutations: framed photomontages of MRI transparencies on the walls that resemble 'trophies' or totems, walls that have black-painted Rorschach blot-like figures, and metamorphosed brain forms in glass vitrines (Fig. 23). The large wall figure in the exhibition appears as a huge Rorschach blot, a drawing of a bat, as a new proposed technology (similar to MRI) by which to inspect the internal structures, tissues and functions of the body, or as a mixture of all these in a montage fiction that stands for the metaphorical nature of scientific language and the symbolic character of the artistic explorations. The installation/show *The Butterfly in the Brain* contains several individual works (*Engram, Rorschach, The Sum of All Fears* and *Code X: Eyespot*) of sculpture, mixed media, screen printing, and digital printing, that work thematically together to establish an analogy between the morphological characteristics of the symmetrical butterfly and the (usually taken as) symmetrical brain (Fig. 24). Further, it enhances the beauty of the flying insect and poeticality of the flying brain (as a metaphor for mind).

On one wall, a large Rorschach blot appears to have a bat contour that immediately evokes feelings of fear or curiosity, and plays with our cognitive capacity to be creative; assigning meanings in order to inform splotches of paint and relive past experiences (Fig. 25). I would suggest that this natural tendency to assign meaning and evoke past experiences is an important point in the context of this research, as it is one of the detachments that occurs in Alzheimer's patients: forms and meanings begin to separate (Fig. 26).

Engram, a collection of twelve black-and-white inkjet prints hung solemnly in formal black wooden frames, resembles a curio cabinet in a natural history museum. As the viewer approaches, the secrets are revealed (Fig. 27). Again, via the title and the arrangement in frames, there is a misleading cue towards the recognizable and the expected; in *Butterflies,* images that resemble butterflies are made by

juxtaposing acetates from brain sections. Seen more closely, the overlaid PET, MRI and other brain scans (possibly even of different brains) promote recognition of something understandable and at the same time magical; not the natural beauty of a butterfly, a quasi-magical entity so readily associated with a fairy-like world; not the complex brain, keeper of the secrets of evolution and our own memories, but oriental Goddess figures (Fig. 28).

In *The Sum of All Fears*, the brain assumes a sculptural form. In a vitrine fashioned to match the wall frames, models of brain hemispheres can be seen. These cast-wax moulds have numbered, white-headed pins stuck in a central area. These pins are placed in the hippocampus zone and form the outlines of small sea horses, in a direct allusion to the Greek meaning of the word hippocampus; they further refer to drawing-by-numbers technologies such as MRI and CAT scans. In the other vitrine, Rorschach tests are transformed into sculptures using 3-D software programs. Anker uses modelling software programs such as Maya and Solid Works, which are currently used in medicine, architecture, and for Hollywood special effects. After scanning images from medical journals and other sources, she develops them in 3-D. The definite manufacture of the forms is through rapid prototyping technology:

> I proceeded to see what would happen if a dimensional axis could be instrumentalized to revision the Rorschach inkblots into objects. Would they still appear as if randomly generated? Would they allude to possible new connections between the ways in which three-dimensionality becomes a value-added strategy in both artistic practice and regenerative medicine? (Anker and Talasek eds., 2009: 82)

In this, Anker was questioning how iconic these psychology tests have become, as well as the extended way in which those images have been scientifically researched and applied. Her conclusions allude to the 'embodied imagination':

> What in fact resulted in my experiment was a series of sculptures that appeared to be reminiscent of the natural world. The sculptures in some cases looked like animals and in other cases body parts and bones. Holding these sculptures in my hands generated within me an uncanny feeling of embodied imagination. (Anker and Talasek eds., 2009: 82)[29]

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[29] Anker's association of 3-D rapid prototyping with animal creatures (bear, wolf and crab) reminds me of children's fairy tales and infancy comfort stuffed animals.

I wonder whether the strategy to place the moulds behind glass away from touch allows them to be seen as closer to medical props, again in the heterotopian principle of limited access allowing proximity only after certain rituals of purification.

In *Code X: Eyespot*, a series of 15 silkscreens on frosted Mylar, Anker orders images of chromosomes, which show a mirror-like symmetry that alludes to the folding symmetry of butterflies, in a strategy similar to the use of MRI scans of the splayed outline of the material brain, suggesting a butterfly's wings.

The *Butterfly in the Brain* installation alludes at once to the evolution of the organic brain and consequently the mind, the symmetrical nature of both butterflies and brain and the provenance of the name hippocampus. Stafford claims that the leitmotif of this work is the 'morphological permutation – caused by artifice or as a consequence of optical devices'. The author also seems to play with the emotional tension and poetic associations with fear and delight of bats and butterflies. The complex and minute system of the superimposed scans mirrors the complexity of the mind or brain, and also asserts the mind's harmonious connection with nature and the universe as a whole. Other forms and subjects are linked by the shared trait of bilateral symmetry.

The sober, monochrome, yet complex installation spreads out like a metaphor for the virtual archival space, alluding simultaneously to the rigorous, authoritative and epistemic power of neuroscientific representation and the symbolic and institutive domain of the studio space. Scientific images of brains in bodies or parts of brain tissue provided by new imaging technologies such as MRI, PET or CAT scans and microscopy, have become part of the visual environment surrounding us, not just in scientific magazines but pervading advertising, news and the entertainment industry.[30] In the digital era the possibility of manipulation turns this invasion into a colourful reality that we adapt ourselves through desensitization due to over-exposure. The digital manipulated image becomes the accepted sign of the natural world (Michael Sappol, in Anker and Talasek eds., 2009). The complexity of the scientific images is drawn from mathematics, physics, computer engineering and other intermingled disciplines, as noted previously. The resulting views are most of the times colourless; colour is applied

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[30] Examples include movies or television series that belong to our cultural imagination such as *Fantastic Voyage, Hannah and her Sisters, Fight Club, Blade Runner, Emergency Room, CSI, Bones, Grey's Anatomy*, as playing with the possibility of visualizing and changing the interior of our bodies.

to them via filters, histograms[31] and other digital photography techniques. Stafford claims that visualizing technologies are mediating and constructing our understanding of the complexities of the world:

> Again, technology used in the discovery of overall pattern works to illuminate the complexities of interindividual and intercommunity relationships. The opulent archive displayed in Anker's *The Butterfly in the Brain* counters the naked, freshly concocted aspect of genetic mutants. With its wall-mounted, quasi-Victorian collection of flamboyant butterfly wings, dramatic blowups of Rorschach digital brain scans, and glass table vitrines – which contain an illustrated volume of natural history and an assortment of wax casts of intricate mammalian parts – this museological cabinet captures the symmetry, logic, and interconnectedness shared by all living things. (2007: 381)

Reflection on *The Approach*

Art based on neuroscientific representational practices and metaphors should be not be seen as merely illustrative of and subordinate to molecular or diagnostic scientific inquiry. Visibility in art is not bound to scaling down of reality or illustrating an outside world; it creates realities as much as autobiographical memory. This proposition also epitomizes, in my view, Anker's position on contemporary art relative to genomics. In this research, I propose instead that art, establishing the link between neuroscience research and culture, should be imagined as a fictional equivalent to the manoeuvres of autobiographical memory.

A characteristic of Anker's work, specifically *Butterfly in the Brain* and *Laboratory Life*, that I believe reinforces similar readings to *The Approach*, is the use of superimposition techniques: the transparencies built from brain scans, photography and images of different places. Anker uses different laboratories and grass, and I use different laboratories and my studio. These techniques produce clashes of different contexts and associated readings, thus creating hybrid realities with new meanings. By enhancing the juxtapositions and collage techniques I am intentionally allowing the viewer to acknowledge the manipulation and determination to place the fragments in a certain order and context. This collated reality speaks as much of the nature of the fragments as of cues to the scientific context from which most were

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[31] The histogram processes of colouring will be further developed in Chapter Three: The Assessment.

extracted: my studio and the reconstructive and associative nature of autobiographical memory. This is in terms of the transformative effects that such art has upon the way medical and scientific developments are considered, understood, shaped and re-incorporated into society, specifically as a consequence of the transformational and interactive qualities of such art.

Representational strategies are catalogues or archives of categories or systems, by which life and diseases are ordered in the biological sciences. They may be considered as a way of translating the invisible under-structure of life to a visual domain of notation and drawing. The sign becomes an outline of the cultural code, abbreviating the materialization of an idea into visual form.

In the following chapter the quasi-ethnographic exploration will continue, allowing me to move beyond the 'transparent doors'[32] to create a broader picture of the four intertwined archival spaces. I shall describe the laboratories and patients, as well as the studio both at first glance and also in closer detail. I will seek clarification, in the enactment of the archive, of the second aim of this thesis: 'To explore the representational strategies of Alzheimer's studies in the scientific laboratory through art practice', in a movement inspired by Latour when 'following scientists in action'.

Meanwhile, I shall examine the laboratories in which interdisciplinary teams of researchers work to decompose clinical cases and reconfigure natural objects into inscriptions and actions producing the scientific discourse on Alzheimer's disease. I shall further approach the archival notion of medicine and biological research, in which the body becomes a reduction of the patient and the signs are assemblies of living fractions that form the basis of their scientific symbols. Defining an organism from a collection of fragments creates a fabricated condition comparable to an archive or a museum display. I shall investigate, through the production of the second installation and the work of Mark Dion, the process of inserting fragments and images into a new aesthetic and cultural framework experienced in a different context, such as cultural traces displayed in a museum. In line with my research aims I shall explore what narratives this ordering of fragments are alluding to, and

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[32] The 'transparent doors', referred to before as the frosted doors, correspond in the hospital to an architectural feature dividing the public waiting room and the private neurology research centre (Centro de Estudo Egas Moniz); metaphorically these doors divided the first and second chapters of my thesis and represented the ethical consent to move into the scientific domain of the research trials and the psychological domain of the patient, therefore, the new virtual archive.

what meaning these images, sounds and gestures will acquire or extend when they are subjected to further processes of montage, juxtaposition and edition. The molecular signs of the chromosomes and the brain, like the museum display, construct the notion of identity from material configuration and style.

Chapter II: The Archive

Foucault and the archive

As noted in Chapter One, researchers' understanding of memory has shifted from the model of a simple store of fixed, retrievable data, to a personal, subjective concept, permanently under reconstruction (Rosen, 1998; Sutton, 2004; Nunes 2008) and 'a key to our emotional understanding of ourselves and the world' (Gibbons, 2007: 4). Archives such as libraries, museums and the internet, allied to techniques including photography, video and digital records management, render the need to enhance memory skills redundant (Gibbons, 2007: 5), thus transforming attitudes to memory. Archives are integral to the functioning of society, especially in terms of recording scientific endeavour (Foucault, 1991), and have therefore attracted considerable attention in the field of art. Archival strategies are a key methodology in my work, and in that of several contemporary artists including Mark Dion. Examination of his work will show how re-enactment and visual methods are used to critique the processes by which authoritative institutions construct and order knowledge and memory.

The word 'archive' is traditionally understood as a physical collection of data held in a collection, usually associated with text and writing: Latour's 'flattened inscriptions'. Deriving from the Greek *arkheion* (repository for official records), its root *arkhé* (government) reinforces the notion of order and organization. It evokes images of dusty rooms filled with secrets on mouldering stacks of paper and in racks of catalogued files. The notion of archive is underpinned by the relationship of past and present: scripts, letters, photographs, drawings and even body fragments become traces and signs that define the author, artist, family, community or institution. In its most common form, the archive is a bank of diverse information that may include contradictions, preserved by the subject or institution that created it. Archives are usually heterogeneously constituted: the significance of individual fragments is superseded by their collective significance.

In *The Archaeology of Knowledge,* Foucault (1997: 128) uses the archive as a way to describe the 'space of dispersion': the systems that 'establish statements as events'. For Foucault (1997: 129), the archive is neither a virtual memory space nor a safe realm of storage for future use, but the systematisation of a more general ordering structure.

Foucault suggests that the archive is grouped 'in accordance with multiple relations' and that any inherent contradictions are merely possibilities in a '… field in which all statements, from the most creative to the most banal, emerge' (Gutting, 1991: 245). The *decentred structure* no longer stores, but *generates* signification.

In the design framework of my research, my interpretation of archive depends on a complex negotiation of the space and time between people, objects and concepts. Unlike a traditional archivist, who might be concerned with the recovery and perception of presence from an established set of records, I follow Foucault's suggestion that an archive may become a generator of signification and evoke autobiographical memory. I regard the archive as a fluid generation methodology, envisioned as a network of the four virtual intertwined archival spaces already outlined (Fig. 29):

1. The patient;

2. The art studio;

3. The Alzheimer's research laboratory (Dementia Laboratory);

4. The Cellular and Molecular Research Laboratory.

My concept of the archive departs from the understanding of Berg and Mol (1998) that medical and scientific investigation is based on practices of construction, assembly and incorporation of techniques, habits, ideas, images and conversations. The enactment of my archive depends on circulation through these real and virtual spaces, physical areas and conceptual domains, following Casini's notion that an archive exists simultaneously in two formats:

> firstly, as a physical space where artifacts and materials are collected and displayed according to certain criteria/rules in order to be accessible by visitors and users. Secondly, […] [*as*] terms of discourse within a specific space, time and cultural location: it is 'the system that governs the appearance of statements' (Foucault, 1976: 129, cited in Casini, 2010: n.pag)

In this circulation, fragments or *traces* (Derrida, 2010) are both produced and collected, disrupting a temporal assumption that links through deferral the part to the whole, the past to the present. My copies of archival fragments of neuroscientific records or direct records of laboratory sessions relate to something other than themselves, thus functioning at the level of evocation or memory. Engaging with Michel Foucault's understanding of the archive in the

medical arena, I shall explore how the archive can establish a complex set of relations. These will be further examined through the re-enactment of archival processes themselves.

Foucault (1997) critically studies the role played by the archive in the construction and realisation of government. This interaction of archive, writing and the state reveals the importance of visual traces in the construction of identity and collective memory, identifying archival strategies as a method of maintaining control. For Foucault, official archives play a key role in the formation of the modern state, as part of the legal apparatus of social regulation. An archive is more than a deposit of records belonging to a collective memory; it is an epistemic space of visibility of a specific order of knowledge. Power resides in the construction of discourses, practices and organizing mechanisms that constitute the archive, and further in decisions relating to access to and uses of that specific knowledge.

In the medical arena, the archive is the structure of the process that enables medical practitioners to relate the partial symptom to the totality of the disease, and the path of the absent subject to the present disease. These empirical techniques involve comparing organisms, recollecting normal functions, enumerating frequencies, and post-mortem examination. Medicine is therefore seen as the constitution of relations:

> between a number of distinct elements, some of which concerned the status of
> doctors, others the institutional and technical site from which they speak, others
> their position as subjects perceiving, observing, describing, teaching etc. (Foucault,
> 1997: 59)

During the 19th century, according to Sturken and Cartwright (2002: 283), photographs of bodies were catalogued to create archives of 'typical' pathologies for institutions including hospitals, asylums and prisons. Scientific studies of criminality, prostitution and hysteria by Francis Galton, Alphonse Bertillon and Jean-Martin Charcot involved multimedia fragments such as drawings, live performances and photographic sequences used for visual motion studies. These were supported by the 'pseudo sciences' (Sturken and Cartwright, 2002: 281) of phrenology and craniology and are therefore less credible today, but are useful in terms of establishing the archive's regulatory system and the institutions' operating categories. They further constitute a visual theme in a scientific discourse that encompassed multiple strategies and disciplines (anthropology, anthropometry, photography, medicine, optical

precision, statistics and refined physiognomic atlases) to establish the subjective bodies as objectified subjects of study (Sturken and Cartwright, 2002: 285).

In his seminal text *The Body and the Archive* (1992), artist and critic Alan Sekula approaches Foucault's views of photography as a power strategy rather than as an aesthetic order, claiming a proximity between the 19th century disciplinary paradigm and photography as a powerful archival tool with which to regulate the deviant (criminal) body. Sekula represents the paradigm of the police archive, emphasising its central role as a means of control, rather than the camera. He argues that, though links established by the camera and the archive depended on other, external systems of knowledge for systematization and control, advances in technical reproduction allowed the movement of images between different archival spaces. This approaches the concept of inscription and 'optical consistency' described by Latour, which will be analysed in the following chapter.

Representational strategies on Alzheimer's disease and my archival method

Focusing on witnessed procedures such as repeated sounds and gestures that are integral to the neuroscientific discourse on memory and 'representational strategies' (Lynch and Woolgar, 1990: 1), I assemble a parallel set of fragments to record the multimodal network that is hidden from public view. My archive's heterogeneous form of capturing lived events mimics the multimodal system of autobiographical memory and resembles the 19th century studies cited by Sturken and Cartwright. In medical research, anonymized data fragment individual identities. I use this process of fragmentation to establish a dialogical relation to my self-assembled collections of archival research.

In terms of archiving, details of decisions concerning which materials were preserved or discarded prior to public access are often unavailable. These decisions are often seen as pragmatic considerations imposed by pressure of money, space or time. In the case of my archive, ethical restrictions and unpublished research were also factors. The constitution and keeping of materials is subject to systems, schemas, and structures of ordering and classification. Even cataloguing, which is designed to enable or restrict access, serves to emphasize some of the archive's contents, effectively marginalizing or

excluding its remaining contents. I was privileged to be present during discussions concerning some of the rules governing archival methods, i.e. the laboratory meetings, as well as the construction and growth of its related inscriptions, such as laboratory books, medical records and articles.

As noted in Chapter One, Alzheimer's disease continues to figure as a threat in public consciousness because of its effects of effacing memory, self-stories and self-sufficiency. In the medical field all patients tend to be disempowered, but Alzheimer's patients may be seen as even less able to resist the control exercised over their bodies. I therefore understand them, as Foucault describes, as bodies in crisis.

Within neurological discourse and practice, attempts are made to understand Alzheimer's by observation, visualization, and measuring and archiving methods. These ascribe meanings that are confined to specific areas of knowledge and therefore correspond to standard ways of understanding. These models of knowing are inaccessible to those outside the specific biomedical field and, I would argue, are opaque; they reflect socio-cultural norms and are thus unable to evoke the subject of memory. They also fail to reflect the agony of being lost in oneself, and the material reality of the bodily practices to which patients are subjected because they are perceived to be outside the norm (i.e. in crisis or deviated).

Cultural representations of Alzheimer's disease usually appeal to the idea of the perfect model of care in the family or nursing home, showing elderly people supported by their families. These images are charged with emotion, compelling us to reflect on our own mortality and ethical values. Images in the medical arena, however, usually show the disease in terms of imaging technologies, invariably in fragments such as analyses of cells, brains, spinal fluid or blood. The patient is thus located in terms of the disease, stripped of identity and objectified. In recording laboratory data or copying MRI scans, ECGs or microscopic images I am appropriating and re-contextualizing images as a familiar methodological tool. When confronted by patients' records I am studying not an embodied, contextualized patient but a heterogeneous fragmentary compound of standardized information; a translation of the individual patient's crisis that is inaccessible to the non-specialist. The dependence on these technological viewings of the interior of the body in crisis for diagnosis and treatment (and in this case the discovery of new treatments) discourages looking at the patient's material body.

The medical gaze

Foucault's analysis of the medical gaze described in *The Birth of the Clinic* (2003) follows shifts in medicine from small-scale practice to an archival kind of functioning, substituting body presence for large manipulation of coded records permanently present. This notion (Struken and Cartwright, 2002: 281) of the instrumental image as a provider of access to invisible truths is linked to the growth of institutional regulation and categorization or archiving. Images that circulate in the medical archive are therefore fragmented accounts, usually anonymous to preserve identity and privacy, and intended to confirm medical and scientific knowledge or processes. This allows the clinical gaze to extend from the individual body to the wider population, subsidizing a stronger weaving of technology, culture, medicine and society.

Specialist modes of knowing and rules of representing and constructing the archive may be necessary for the scientific process, but reflecting on their mediated nature reveals that they cannot be taken at face value. My appropriation and artistic deployment therefore aim to reframe and disrupt their systematic visual order, reconstructing by juxtaposition and montage the idea of a complex self-body.

Alzheimer's disease produces few tangible signs[1] and is mainly revealed by the debilitating effects it produces, such as disorientation, inability to read or – in its latter stages – to control the simplest physiological needs. As a consequence, probably more than in other health condition, the need to equate seeing with understanding reinforces the reproduction of brain images in the media and popular science publications. These fragments hold the promise that an invisible problem of the mind may be translated into a present record of it in the patient's brain.

For Foucault (2003), the patient is a construct of medical science. The medical gaze by which medical discourse separates the normal from the pathological constructs the disease socially. Foucault identified the concepts of body, archive and disease by observation of the anatomy/pathology laboratory. He underlines the historical character of the body via medical actions, the disciplines of capitalism and personal aspirations.

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[1] During clinical consultation I often feel that the carer is the sick person and the patient the healthy one; the disease renders the patient unable to recognize that they have a severe condition, as reinforced by characteristic positive responses such as: 'I am good' or 'I feel fine'. The 24-hour care required by the patient and the lack of available help causes enormous stress and effort to the carer, who is thus transformed into a victim of the disease.

Medicine is understood as a practice that invests politically in the body through the gaze. The capitalist need for healthy, productive bodies becomes an articulation of space and seeing based on surveillance and control.

Foucault (1997) explores the notion that knowledge is articulated within separate architectural areas that correspond to overlapping complementary discourses and producers of knowledge, in this case clinical neurology, molecular biology, pathology, psychiatry, psychology, radiology and nursing care. Sanity or sickness correspond to separate geographies within the hospital ground, and the body in crisis/deviation is accordingly submitted to a visible regime and scrutiny of control. Looking and examining is bound to an endless task of ordering, cataloguing, archiving and production of visible traces or records.

Lecturer in Archives and Records Management at UCL Geoffrey Yeo asserts that record systems and schemes of classification propose a correspondence to systematic relationships in the world in which the records originated, but that in fact they can only approach the 'complexity of those relationships' (2008). The original activities are history,[2] and the records that refer to them are a trace created by participants or witnesses. They are thus, inescapably, representational and interpretive.

> [...] records are *persistent representations of activities* or *occurrents* created by persons or devices that participated in or observed those *occurrents* or by persons authorized to act as their proxies. (2008: n. pag.)

The establishment of a system of presences and absences was one of Foucault's (2003: 143) aims, and implies knowledge of where and how to locate individuals and to set up useful communications. Disciplinary spaces emerge from the division of space into as many sections as there are bodies or elements to be distributed, thus rendering possible the supervisory role undertaking a classifying and surveillant gaze (2003: 25–6). As noted, the term 'panopticism' is used to define how power is exercised in the 'empire of the gaze',[3] and how power relations are enacted in the visual register. Panopticism thus links the 'eye of power' to the 'problem of visibility ... organised entirely around a dominating, overseeing gaze' (Foucault, 1980: 152). Further, surveillance is coextensive

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[2] Medical notes and laboratory books should describe what occurred when patients were diagnosed, or how an experiment was performed and what results were expected. Inclining towards Yeo's view I suggest that their content is dependent on narratives chosen by doctors and bench-work scientists, and by the cultural and organisational contexts in which interactions took place.

[3] This term is derived from Martin Jay in *Downcast Eyes: The Denigration of Vision in Twentieth-Century French Thought.*

with the arrangement of bodies in space.

Foucault defined the notion of heterotopias, 'other spaces' in which limits are contested (Foucault, 1998: 178). These counter-sites contain the possibility of new discoveries and strategies that elude or evade the dominant panoptic gaze. Heterotopias are located at the limits of one episteme and the beginning of another, and are thus perhaps at the edge of art practice and scientific and medical research. They push knowledge to the limits of that which can be thought or said. They may be understood as spaces that subvert the dominant spatio-visual ordering and distribution of bodies in space, re-conceiving space as that which is 'not fixed' or 'immobile'. Emphasis is thus placed on the situation of lived, embodied spaces. An aspect considered in my research is a conceptualization of heterotopic principles, creating ideas about spaces beyond existing spaces, and allowing recognizable similarities to be associated with my archival spaces, which are to be considered heterotopias.

Case Study II: Mark Dion

Museums and libraries are defined by Foucault (1998: 182) as places where 'time never ceases to pile up'; a general archive that aims to contain 'all times, all ages, all forms, all tastes in one place'. They also articulate relationships of power and knowledge in which organization of bodies in space (scientist, curator, staff, the public) and time is coordinated by choices about who can see what, where and how. In the tradition of artists such as Beuys, Smithson or Broodthaers, Mark Dion has explored the politics of representation enclosed by the museum. In an interview with Miwon Kwon, he notes the importance of process as a methodology in his practice:

> In the case of natural history museums, what you see on display [...] is usually
> remedial pandering equivalent to material in science and science textbooks. [...]
> Art Museums also act like butterfly collectors, always repressing context and
> process. [...] So I say freeze the museum's front rooms as a time capsule and open
> up the laboratories and storerooms to reveal art and science as the dynamic
> processes that they are (2007: 18–19).

It is this will and experience of placing himself in the context of production, and ordering the constitution of knowledge, that has led me to analyse Dion's work as an aid to framing my own choices.

Born in the US in 1961, Mark Dion was educated at the University of Hartford and later at The School of Visual Arts and the Witney Independent Program, New York. His work has been reviewed by authors in fields from ecology to archaeology, from activism to site-specificity. He has worked with representations of nature, themes of zoology and representations of culture, borrowing from scientific methodologies including biology, entomology and archaeology. A common thread (Corrin, 1997) might be seen as the presentation of the often-hidden process of archiving and classifying. By discussing *On Tropical Nature* (1991) and *Tate Thames Dig* (1999), two projects that relate to different process of collecting and displaying, I shall attempt both to consider key links to visuality, order, archiving and montage and to contrast his strategies with my own in terms of aims and results.

Dion borrows the methodology, and sometimes the skills, of scientists to critique classificatory systems. In this, he offers the viewer the laboratory process as a real object, supported by performative events and the resulting object of display. Collected specimens and artefacts are assembled according to concepts, rules, functions or systems associated with science; components are categorized, lined up and sometimes labelled, bringing new approaches to composition and display, and new aesthetics to art. Dion acknowledged the influence of previous artists:

> I'm interested in artists who have expanded the definition of art and enriched the field by looking outside of it. Marcel Broodthaers, Robert Smithson, Joseph Beuys, Joseph Cornell, Gordon Matta-Clark [...] That's my pantheon. Smithson is of particular interest because he forged a convergence between geology, the science of time, and critical art discourse [...] his practice made art very expansive. (1997: 19)

Dion shares Smithson's passion for the Museum of Natural History, and several reviewers agree that this influenced his departure from the conceptual territory in which his art was grounded after leaving college for a representation of nature with its critique. Following his predecessors, Dion also contributes to expansion of conventional notions of art. One strategy he uses is mimicking (Marshall, 2010) by exploring the tools and methods associated with other disciplines. In this, he calls attention to the research protocols and practices of science while highlighting roles implied in the art field such as those of artists, curators and audiences as observers, presenters and commentators.

Dion discovered[4] common ground and a path leading to an interest in nature (i.e. collecting insects and curiosities) and his artistic education in the work of Alexander Wilson, Donna Haraway and Stephen Jay Gould, all of whom study in some way the metaphors that organize scientific knowledge and claim that the environmental crisis is cultural:

> Here was someone applying the same critical criterion implicit in the art I aspired to make – which can loosely be described as Foucaultian – to problems in the reception of evolutionary biology. It became very clear to me that nature is one of the most sophisticated arenas for the production of ideology. Once I realized that, the wall between my two worlds dissolved. (Dion in conversation with Miwon Kwon, in Corrin et al., 1997: 9)

The strategy of Dion's that is more relevant here, because of its similarity to my own, is the kind of 'Foucauldian' structure of circulation to which materials are subjected in the construction of installations. Dion usually collects materials from different locations and uses them in the exhibition space without hierarchical discrimination. This displacement, with all its bureaucratic and material reality, is part of the process. Kwon (1997: 40) says: 'Dion's displacements highlight the very process of such displacements and their role in the formation of scientific knowledge...'. Dion uses the mimicking and performance re-enactment of scientific procedures as a tool to bridge dialectically the different spaces, including himself, within the context.

Like Broodthaers, Dion is interested in the ordering of knowledge and classification systems. He explores the museum as a 'very unself-critical site of the production of truth', and prefers the excitement of the laboratories and storehouses behind the scenes to the excessive cleanliness and didactism of public displays. Gibbons notes:

> Dion's signalling of museums' attachment to data and documentation can also be seen as a reminder of the limitations of cognitive memory, which comprehends facts and data but does not necessarily do so reflexively. Dion employs a number of strategies in his interrogation of the ways in which natural history is investigated and represented, harking back in many cases to historical practices such as the scientific expedition. (2007: 125)

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[4] Documented by Lisa G. Corrin in her 1997 essay 'A Natural History of Wonder and a Wonderful History of Nature'.

On Tropical Nature

Using the naturalist model of the scientific field expedition, Dion departed for this jungle adventure, leaving behind his 'reliance on text to illuminate the historical and political thrust of his work' (Corrin, 1997: 63). In appropriating the methodology of field research as a central part of this artwork, Dion re-enacted the activities of scientists (Fig. 30). This strategy was expanded in later projects such as *A Meter of Jungle, The Great Munich Bug Hunt*, and *Tate Thames Dig*, in which collaborations were forged with scientists in the production of his installations. Dion's works often make parallels between the historical aspects of the natural sciences and contemporary art practices (Fig. 31). He clarifies the analogy:

> Things that live at a distance were brought into one's own environment to be studied as specimens. Which is to say, what was thought to be observation of life was actually the study of death. Then came the breakthrough when naturalists became field scientists, not only observing nature's operations in its own context, but discovering nature as a system of relationships, an ecology. Similarly, making art is no longer confined to the institutional spaces that we've created for such activity. It's more in the 'field' now. The focus is on relations and processes [...] (Dion, 1997: 22)

Thus Dion bridges conceptually the practice of contemporary artists and scientists: both are self-conscious about the context in which they operate. During the three weeks of *On Tropical Nature* Dion was based at a forest site in the Orinoco Basin in the Venezuelan Amazon (Fig. 32). Simultaneously, the exhibition *Arte Joven* opened at the Sala Mendonza, Caracas, with three empty tables. Each week, a boat collected crates of material from Dion for delivery to the museum. The empty tables gradually became a display of instruments, notebooks, equipment, collected insects, leaves, feathers, plants, seeds, nests and soil samples, along with the crates used to transport material (Fig. 33). The performative element was key: the activities of the artist in the field are a central part of the process, and are mirrored in the evolving installation. Through this, a connection between gallery space and jungle is established and, it is suggested, a bridge between the scientific fields of botany, entomology, biology and art is created, forming a space in which to reflect on the ever-present problems of categorization when building an archive or deciding how to construct and display knowledge. It further seemed to 'remind us that nature, whether on canvas, in a museum or in the laboratory, is always being framed' (Corrin, 1997: 60) and its meanings affected.

In *Some Notes towards a Manifesto for Artists Working With, or About the Living World*, Dion reflects and locates the principles by which he was driven in 2000:

> Work reveals complex contradictions between science and art [...] some artists
> may wish to dissolve the contradictions in our social relations to the natural world,
> others may be interested in analyzing or highlighting them.' (2005: 38)

Reflecting on the work, Kwon asserts that Dion was not working site-specifically in relation to context, i.e. the field. She further claims that Dion was 'highlighting ideas of nature and its displacement within an institution' (2004: 28) by displaying it within an institutional framework (Fig. 34). Robert Smithson also explored the relationship between the natural space and the gallery, but unlike Dion, he resisted institutionalized mechanisms of categorizing and presenting art (Corrin, 1997: 50). Smithson captured fragments of temporary outdoor events that were reactivated and inserted into a new work frame. Unlike Dion (1997: 10) he was more interested in establishing dialogical relations between the 'amazing laboratories of evolution', 'greenhouses of biological diversity', the 'map of assumptions of what constitutes nature' and the authoritarian institution as an 'artefact' of our knowledge and its past.

Besides this contextual approach, an interesting reflective tool for my own project is the rhythmic pace imposed by the shipping and displaying of the jungle fragments (Fig. 35). This was dictated by bureaucratic and pragmatic invisible structures – the panoptical metaphoric invisible system of display – and by the actual movement and actions of people. The rationale of four sites, envisioned by Kwon (2004: 28) as 'operating concurrently' in the project, resembles my four archival spaces, which involve a mix of real and constructed spaces as per Foucault's description of the archive. For Kwon, the initial site was the rainforest campsite and collection point, the second the gallery's delivery room, the third the 'curatorial framework of the thematic group exhibition' and the fourth the abstract site belonging to group memory and knowledge, the 'discourse concerning cultural representations of nature and the global environmental crisis' (Fig. 36). This division could not be applied to my project, but there is a certain similarity of principle. Dion's project highlights concerns about methods of categorizing and grouping elements, such as intuitive associations of colours, shapes, materials and sizes, and loosely concerns the desire for visual order.

Tate Thames Dig

This enterprise, commissioned during the summer of 1999, took place on the margins of the Thames. Dion and almost 20 community volunteers collected fragments of different materials on the foreshore between Tate Britain and Tate Modern (Fig. 37). The project echoed archaeological research and nodded towards previous projects including *History Trash Dig, 1995 – Fribourg* and *History Trash Scan 1996*, at the Venice Biennale. Archeologist Colin Renfrew's description helps to illustrate the performative task management implied in this artwork:

> Three tents on the front lawn of the Tate Gallery during August. Teams of volunteers washing, cleaning, sorting artefacts – shards of pottery, scraps of bone, bits of broken glass – all carefully collected by this same team of workers in the course of a programme of field work, [...] first at Millbank (Tent A) then on Bankside (Tent B). In one of the tents Mark Dion is classifiying the finds, in another conservation work is underway. (2003: 85)

During the laborious two-week installation process, different stages of the archaeological method came under public scrutiny including the structured performance of excavating the ground and collecting materials, laboratory analysis of samples and the framing of discoveries for the audience's delight (Fig. 38). The performative character of *On Tropical Nature* was still present, but in this enterprise Dion's professional support structure of specialists (archaeologists, curators, critics, art historians) and non-specialists (those responsible for beachcombing, sorting, cleaning, classifying and displaying) was evident. In the previous project this was only implied when the viewer was invited to visit the changing room during the exhibition period. Dion worked alongside the public wearing a white coat, thus emphasizing the work's important aspect as a process rather than a resolved display.

Through a close relationship with scientific methods the working artist makes himself visible, signalling an intention to borrow methods and re-enact performances. He is thus objectifying the stage of archaeology and rendering the conceptual frame behind the expertise transparent, almost as though building a panoptical situation (Fig. 39). The viewer knows that he is visible but can also control the actions and choices of others. As an artist who usually works with heterogeneous installations, Dion considers himself better able than scientists to represent the scientific field via sculptural approaches. In a much-quoted interview he said:

> Even if scientists are good at what they do, they're not necessarily adept in the field of representation. They don't have access to the rich set of tools, like irony, allegory and humor, which are the meat and potatoes of art and literature. (1997: 11)

This claim may be seen as an attack on scientific ability for self-criticism, but that is not Dion's intention. He explains that he is just able to maintain a distance from his subjects, yet approach, from outside their own fields, the themes and methods that he knows contribute to scientific attention and debate. On closer examination, his claim can be seen differently: Dion, in borrowing methods from scientific research, is aiming to critique culture at large, through scientific means (Fig. 40).

In a 1999 *Artforum* article Daniel Birnbaum connects Dion's Thames project to Foucault's classificatory system. He reflects on how this work, rather than shifting from the theme of nature to the museum, returns to the 'fundamental contingency of all systems of representation' with a nice touch of 'humour' and new 'pertinence' and is liberated from the 'official version of history' that constrains an actual archaeological dig and the state archive.

In *The Archaeology of Knowledge*, Foucault (1997) refers to the parallel histories of states, war, and famine, such as gold mining, sea routes and irrigation. Birnbaum sets these concrete recovered material traces against fragments of real lived histories such as the 'history of lemonade', locks, keys and knives discarded in the river (Fig. 41).

In contrast to classical taxonomy, Dion's archive is organized according to main groups defined by their materiality, such as glass, bone, organic and plastic. These are further subdivided into smaller categories. The system was flexible and was adjusted and evolved according to new findings (Fig. 42). This attitude revealed the belief of the author in the need to attend to the ecology of context and time of practice. Referring to taxonomy in his notes, he says:

> [...] the classification of the natural world [...] is a system of order imposed by man, not an objective reflection of what is present in nature. The categories are actively imposed and contain the assumptions, values and associations of human society. (2005: 41)

The findings were left unlabelled; it was intended that meaning should be ascribed by the context, leaving viewers the freedom, as prescribed by Elkins (2008), of building personal histories of art and science (Fig. 43).

In mimicking archeological practices, Dion's 'digs', which are performance/installation art projects, may become 'parodies of these practices' (Gibbons, 2007: 126), but he also emphasizes the visual aesthetic value subjacent to the discipline, and contributes to the reflection and critique that emerge in the gap between the original process and the parodied and almost-simulated one. Details such as depth of excavation, archive categories and emphasis on public display (a purpose-built space inspired by a display in Oxford's Pitt-Rivers Museum) render it difficult for the non-expert eye to distinguish Dion's work from an actual, scientifically-coordinated archaeological dig. As Renfrew (1999) notes, backed by Birnbaum (1999), Ede (2005) and Gibbons (2007), archaeology connects us to the past in a particular way 'characterised by an immediacy of contact with its material remains' Renfrew (1999). This materiality of the traces of a revealed archive (private, medical or archaeological) has the seductive power to invoke personal autobiographical memory (Fig. 44). Gibbons notes:

> [...] the uncovering of history through its artefacts, which, to me, now invokes the notions of reliquaries and *memento mori* and the psychological as much as the academic hold that objects from the past have over us, no matter how anonymous. (2007, 126)

Dion proposes a form of interdisciplinary practice that *reveals* a close link with the scientific community by the concepts he explores visually and in his working process. He skilfully combines expert knowledge with productive collaboration and exchange between faculties, departments and disciplines. He questions establishments or methods that claim to collect and preserve knowledge in an organized and objective way, by exploring scientific strategies of collecting and organizing the object of study, as well as referencing the evolution of natural history museums and how their collections express changing perceptions of nature and culture (Fig. 45). When making decisions about the presentation and permanence of his performance actions, Dion also materially explores how earlier private collections were incorporated into the model of the Enlightenment museum, thereby introducing a subjective point of view to a scientific approach. As a whole, his project can be interpreted as an epistemological reflection on the history of natural science, following several investigative paths: representations of nature, ecology and cultural institutions from *cabinets de curiosités* to the natural history museum (Fig. 46).

According to Iain. A. Boal (1998: 5) Dion's parodies of re-enacting and mimicking the hidden working spaces inside the frame of facts and knowledge, and their respective

agencies, followed Latour's anthropological studies of the laboratory of life sciences. Latour approached the scientific field as a fictionalized character, and developed his actor-network theory, which recognizes the importance of networks in the construction of scientific objects of study, as well as the rhetorical power of instruments, people and research protocols. In next chapter I shall introduce 'the assessment' methods: comprising instruments, people, research protocols and network as memory performance, and linking the networks mentioned by Latour with the mimicking and re-enacting strategies applied by Dion.

The Archive

The Archive is not a unitary installation work that can be reproduced in different contexts, but consists of multiple evolving works/exhibitions presented in different locations:

A: Museu Nacional de História Natural e da Ciência, *Cabinet d'Amateur*, July–Oct 2010
Work title: *Do Not Allow Me to Forget About Me*.

B: Pavilhão do Conhecimento-Ciência Viva, *CorpoImagem*, February–March 2011
Work title: *Drawing the Invisible*
Note: this is related to a nationally funded project connected to Lisbon University's Philosophy of Science, a department within the Faculty of Science

C: James Hockey Gallery, *Concept & Context in Practice*. March 16–26, 2011
Work title: *Lost Words: Retracing*

D: Instituto de Medicina Molecular (IMM) March 18–25, 2011
Work title: *Enactment/Re-enactment of the Archive*
Note: part of the European Week of the Brain; Performance Installation

Each venue provides access to different audiences using strategic modes of addressing. Audiences include artists, philosophers, students, scientists, medical doctors, staff and members of the public. The multi-media formats include a heterogeneous range of media: audio-video documents (including partial views of clinical consultancy); scientific and clinical data from different scientific research locations; apparatus; drawings; objects removed from their original sites and presented in another context;

performance and actions on materials collected in the laboratories and the studio, and edited forms of all these.

Work A: *Do Not Allow Me to Forget About Me*

This installation, presented in the context of a large group show, consisted of a short video (remember – knowing – being) and some personal objects placed on the exhibition room floor, covered in talcum powder (Fig. 47). On the adjacent wall, beneath a closed window, a yellow sticker bore the hand-written phrase *não me deixes esquecer de mim* (do not allow me to forget about me). The video represented an attempt to provoke viewers to testing their own memory functions. It comprised a sequence of numbers spoken aloud, with intervals during which the viewer is expected to silently reproduce them, and subsequent images of the clinical trials and hospital and laboratory trial images. Superimpositions of neuropsychological assessment sessions and my own self-assessment studio sessions are viewed using subtracting filters so these two moments meld into a new possible reality (Fig. 48).

Work B: *Drawing the Invisible*

This fragment of the archive, viewed in the context of image in art and science, comprises three video drawings formed from manipulated laboratory images. The first section is obtained from a molecular microscopic sequence showing a cellular (neuronal) synapse. The second presents a moment during an MRI scan when the technician records the limits of the patient's body to adjust the modulating frame of the diagnostic visual examination. The third is a microscopic image of melting ice captured at the beginning of a laboratory testing sequence on a frozen brain tissue fragment. The images are edited to invert their original greyish contrast and are transformed into a black and white drawing. Their original timeframe is slowed to a rhythm that allows the viewer to conceive their biological and technical modulation as something that results from the act of bringing them to existence through drawing or metaphorically remembering (Fig. 49).

Work C: *Lost Words: Retracing*

This comprises two video works presented on two television screens placed side-by-side but not so close that both images can be seen simultaneously – a choice of viewing is implied. The images show me, retracing projected sentences written by Alzheimer's patients during assessment sessions onto a blackboard. These 'lost words' are fragments of the medical record, revealing the loss of the cognitive capacity to articulate writing as the disease progresses. They simultaneously evoke a sense of lost and last words, as from session to session patients' ability to understand the meaning of sentences and their ability to execute the task of writing diminish. The first film shows me mimicking their actions of retracing their words in a parallel exercise of memory. At one point, I must remember the position of the projected line when my body obscures the projected light. Subtitles give access to the meanings of the sentences, and as a strategy to emphasise Latour's description of translation as a double meaning of translation into another language and geographical displacement, alluding to the displacement of observing gaze. The second film presents images of laboratory apparatus and performances, as well as a slow video scan of my naked body horizontal on the studio floor, as though in a MRI scanning tube. The soundtrack mixes sounds of chalk on a blackboard, my hand erasing the written sentences and sounds of an actual MRI session undergone by a patient (Fig. 50).

Work D: *Enactment/Re-enactment of the Archive*

This is constituted by an action of constructing four tables addressing the four intertwined archival spaces of my investigation and the resulting visual display. Following my methodology and Dion's mimicking, re-enactment and displacing strategies I have constructed, using materials provided by the laboratories, the patient and my studio, four interconnected spaces on the ground flour of the building in which both laboratories physically exist. The patient space was filled by a table, chair and television set that exhibits a video made exclusively from patients' drawings, as a way of implying a presence through the fragmentary result of a previous action, as happens with the medical record data. The studio space was constructed from materials brought from my own studio (board, tripods, lamp, sketchbook, Indian ink, pencils, brushes, video camera, computer). The ground floor of the building became my studio for the

week, and all regular and casual visitors to the space, in which a bar is also located, became potential witnesses and participants. The other two tables were constructed from materials (laboratory books, Petri dishes, texts, test-tubes, pipettes, flasks, films, MRI scans) gathered from the physical laboratories that constitute my archival spaces. I undertook my regular studio investigations on site and the work incorporated the evolution of the selection of space for placing objects, their placement and organization, self-assessment and drawing sessions, following of patients under study, the recording of the evolution of the installation and all the events that surrounded the action including reflection on what the action might mean when performed as an archive in a scientific research site (Fig. 51).

Reflection on *The Archive*

Decisions must be made about how to enact and re-enact the archive in a way that would generate new work by the displacement and manipulation of scientific representational strategies, thus increasing understanding of autobiographical memory and Alzheimer's disease as individual and cultural constructs. Memory, as described in Chapter One, is always a reminiscence of something or someone – an object, event, word, or person – and is a personal, transient, fragmented experience, constituted through instability, reconstructive processes and unreliability.

To produce this archive I followed scientists in their daily work in the molecular and cellular laboratories, and five patients under a Phase 3 clinical trial. Patients' symptoms were consistent with middle-stage (moderate) Alzheimer's disease. Alzheimer's patients gradually lose the ability to comprehend narrative structure and the chronological time systems (i.e. contextual memory – Nunes 2008) that orient our personal autobiographical memory system. Lacking an almost permanent translation of the world, it becomes difficult for them to function. Short-term memory makes them forget names and faces, and they also easily become disorientated and paranoid. Trust must constantly be gained, so that when questions such as 'where am I?' or 'who are you?' are formed in words or by facial expression, the response must demonstrate safety and authority. The crisis patient occupies a liminal, unstable position, precariously situated

between home and hospital, data and stories, embodied subjectivity and disembodied fragmented traces within the archive. Though attended by care-givers, doctors, nurses, family and friends, their shattering neuronal and cognitive condition threatens to dissolve connections with the world and to exile them in that fundamental solitude of the sick and demented. Gradually, as forgetting details extends to loss of concepts, they not only forget how to read or write but cannot understand the significance of a book or a pencil in speech, written word, image or even as an object.

Part of my reflection on the archive or its construction, and the possibility of circulating between investigative dimensions, relies on the possible consequences of my project. It may provoke valuable social engagement within the process of production by inviting patients to take a leading role in hospital recordings and by the re-enactment of the archive and public presentation, if the results of the medical/scientific output and my studio production are seen simultaneously.

The flexibility and adaptability of the digital technologies of photography and video are crucial to my work on memory. They allow official lived events of scientific performances and archive records to be mixed freely with personal visual strategies and my subjective productive methods. My enactment of the archive, through self-assessment sessions and collecting copies of material produced by and with the patients, also provides numerous memory traces. These, by being reproduced and connected (re-enacted) in a non-sequential or fixed way create various divergent and possibly contradictory narratives. I needed to devise an archiving strategy that could record both the functioning (or loss) of memory and its associated metaphors, and the experience of entering another field of study, taking a route designed to present self reflexivity in a more structured way than my own constantly-reconstructed autobiographical memory.

During the enactment of the archive I retained objects resulting from neuroscientific experiments, including discarded biology laboratory films that were out of focus or had not provided a clear reading; ECGs and MRI scans; patients' clinical records, partial audio and visual records of medical processes undergone by patients, and digital copies of patients' drawings. Objects taken directly from the scientific environment carry emotional and cultural emanations beyond their primary function; I attempt to expand on their power to extend their relationship to memory outside the frame of the official scientific record. Objects that I could not remove, such as props from the

neuropsychology assessing kit, were replaced by similar things that I owned. My possessions provided useful material support for the self-assessment sessions which will be discussed in Chapter Three, but somehow seemed too personal to be used to illustrate the memory discourse I was aiming for, since they belonged neither to the research context of Alzheimer's disease, nor to my studio space. Sketching and casting proved to be a valid way to mediate a form of experiencing and understanding them. A similar distance was achieved by editing videos or photographs used in the enactment of the archive as a documentary tool. Drawing and editing are ways to maintain attention in the present moment; the need to make decisions about issues such as framing, direction and the speed of unfolding lines or sequences lends the studio sessions a certain sense of research trial.

Of particular interest to this investigation are the oppositional and dialectical relationships between body and fragment, presence and absence, in the scientific archive and indexical artistic media. Casting, drawing, photography and video combine that which is present with that which is not, the residue of the original that forms as a memory in the viewer's mind. In their use of re-enactments and strategies such as editing, retracing copies and castings, my installations convey and highlight the abstract yet recognisable traces that remain after a person or thing has gone, i.e. memory. As a consequence, reactions to what traces remain in the archive and what the archive produces with them are important to this investigation: those inscriptions, like the sentences written by the patients, literally represent a situation of 'presence/absence'.

In this multiform/multi-location installation, I explore the disjunction between the fragment and the whole by using a structure in which disparate meanings are simultaneously possible. The images and objects in the works are a presence, representing something beyond what is ascribed by the authority of science. In a sculptural montage of the appropriated images/objects the disjunction of the fragment (present signifier) and whole (absent signifier) is manipulated in a way that gives priority to no specific meaning, but endless possibility of interpretation. The different values attributed to the fragments of scientific research in the studio or exhibition context, or in the quasi-original context of the recordings or IMM performance, coexist in no hierarchical order, none claiming a higher degree of truth than another, in the heterogeneous space created by the works. When all four installations are seen as part of the larger piece *The Archive*, the viewer is aware of an intrinsic aspect of the research:

the 'epistemic space of visibility' (Foucault) constituted by an archive, as well as the emphasis on the experience of artist as witness.

The work evolved from a transposition of critical strategies from ethnographic documentary film and photography to a sculptural and live performative field. Through this extended action I am weaving a story – that of the representational strategies of Alzheimer's disease research – by presenting documentation and editing as interpretation. This refers directly to Schacter's (2001) view of autobiographical memory as personal interpretation rather than truthful record.

The display of objects from the laboratories used in various ways in the studio emphasises a need for visual spatial order, and also provokes excitement about the idea of visiting and exploring the 'other space', to use Foucault's term associated with crisis or ritual. These objects refer directly to the workings of autobiographical memory, and thus resemble mnemonic traces of a lived experience. They are also part of the ongoing archive. The actions of mimicking and staging live performance and enacting/re-enacting the archive in terms of process, presentation to different audiences and reflection, set up a rhythm with an experienced and relational nature that is comparable to the nature of episodic memory. In exploring the archive, I propose to challenge the meaning of the scientific representational strategies, extending their possible readings by transforming and bringing them into the context of the exhibition. This reframing will encompass cultural representations of both the disease and the patient through the scientific archive, and add a further discursive dimension to the art/science discourse.

While Chapter One and the installation provided a quasi-aseptic atmosphere of a subject explored at a distance – through glass, a lens, and white light – and provided a space for stillness and body/breath-focused reflection, the archive relies on the chaotic material of fragments produced during exploration of the settings, with all the tensions and contradictory feelings of invasion or impotence experienced by the researcher or observer. Despite the emotional tension raised by immersion in the 'patient's space' the installation acknowledges the implicit regulatory power of the representational strategies, in the archive construction, emphasizing certain parts and erasing or effacing others.

Chapter Three: The Assessment

Assessment methods

Definitions of 'assess' include 'to estimate, judge, evaluate (e.g. a person's work, performance, character) and 'to sit beside (esp. of judges in a court)' (*The Chambers Dictionary*, 2003). Assessment may thus be understood both as witnessing and in terms of estimation or evaluation. My research places me in both positions: I am a witness to investigations into Alzheimer's disease; patients' physiology; the construction of medical and biological archives, and various sub-products or 'inscriptions' (Latour and Woolgar, 1986) that result. Simultaneously, I evaluate how these representational strategies may be used to explore the discourse of memory through art practice.

In the medical field, assessment and diagnosis of Alzheimer's disease involves a series of stages or steps.[1] Symptoms may vary, but often begin with concern about memory loss. US medical practitioner Alan Jacobs describes a case:

> I initially suspected that Sue had early-onset Alzheimer's because of her
> symptoms [...] I gave her a series of tests, one of which involved having her
> memorize a list of words. Then I distracted her for a while and afterward she
> couldn't remember them as well as she should have. It was clear that she had
> MCI, mild cognitive impairment, which can be the first sign of Alzheimer's.
> There's no specific diagnostic test for the disease. An MRI really can't tell you
> much. All it does is take a picture of the brain, and in the early stages of
> Alzheimer's everything usually looks normal. I sent Sue for a PET scan, which
> allows you to see the brain in action. The scan showed a pattern of cell activity
> that is consistent with the disease. This, the results of her memory tests, and her
> history all led me to the diagnosis.[2] (2010: n. pag.)

The Alzheimer's patient tends to have a more subjective and emotional understanding of the diagnostic process and conclusion. In his autobiography, early-onset Alzheimer's patient Tom DeBaggio describes the diagnostic process:

> When the doctor returned, he asked me to stand and commenced an abbreviated

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[1] Science has established links between specific regions of the brain and certain abilities, so tests to measure these can abnormal function in areas of the brain. No single neuropsychological test can simultaneously assess all functional areas; the dementia laboratory uses various assessment tools to evaluate areas of function, including cognition, behaviour, general physical health, and quality of life. Some tests measure specific abilities, such as attention, short- or long-term memory, language, abstract thought, perception and orientation.

[2] Jacobs, Alan R. (2010, revised 2012), 'Losing Sue: A Story about Alzheimer's Disease', *Ladies' Home Journal*, Meredith Corporation, http://www.lhj.com/health/conditions/mental-health/losing-sue-a-story-about-alzheimers-disease/?p.2 (accessed 19/03/2011).

physical exam. [...] Soon the type of questions changed direction and began to explore the workings of my mind in simple quick ways. [...] The most humiliating moment of the day occurred when I was asked to count backward from 100 by 7s. 'Got serial sevens correctly back to 86', the neurologist noted, 'subsequently said that he forgot what we were doing and then recalled on his own and then got serial sevens back to 58 correctly.' That first tentative look at how my brain performed chilled me [...] (2002: 22)

The measures described in these passages involve standard diagnostic procedures for Alzheimer's and other cognitive impairments, including medical history, physical examination and MMSE.[3] These were regularly performed during neurological consultation and neuropsychological sessions at Lisbon's Hospital de Santa Maria.

While awaiting consent to follow five[4] patients throughout their clinical trials, the Dementia Research Group's principal investigator Alexandre de Mendonça invited me to attend neurology consultation sessions. Here, I gained first-hand experience of the clinical neurology and assessment options available in the domain of the specialist public heath system.[5] I was immediately struck by the noise and tension of the crowded waiting room, and the impersonal aspect of the doctor's room with its primarily grey and brown décor, heaps of files, stacked chairs[6] and numerous superimposed rectangular shapes.[7] Noise from an air conditioning unit and construction work outside intruded on both the discourse and the silences between, setting up a tension. I then observed the gestures and sounds orchestrated by the doctor, which produced a corresponding response from the patient. These actions took place mainly on opposite sides of a desk, an institutionalized tool for demarcating authority and performing surveillance practices in a 'neutral domain' (Foucault, 2003: 109).

A recent issue of *The Lancet* featured a joint publication by a multidisciplinary team of several world-class institutions researching into Alzheimer's disease. This posited that the disease has traditionally been defined as a dual clinico-pathological entity, which to

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[3] Mini-Mental State Examination, which has become the most universal method of grading cognitive impairment. An example may be found in the appendix.

[4] One patient later failed one of the criteria for inclusion in the clinical trial when white spots that corresponded to specific pathologies were observed during an MRI scan, so I included in my study another patient recently accepted for the clinical trial. The excluded patient and their family were, however, interested in the success of the trial and its potential to transform medication in the public realm.

[5] During the many revelations of how patients arrived at the hospital, I realised that a specialized diagnosis of dementia is rare, and that I was fortunate to be able to observe those moments of intimacy.

[6] The chairs were stored there because HSM is a teaching hospital and several students may attend sessions.

[7] While at consultation my attention was caught by the rectangular shapes of the furniture, plans on walls, walls, doors, window, files, computer screen, etc.

be confirmed demands a clinical phenotype – usually centred on episodic memory impairment – and progressive loss of other cognitive domains and skills, and specific neuropathological changes including neurofibrillary tangles and senile plaques. It claimed that new criteria[8] for diagnosis imply both the discovery of clinical evidence of the disease phenotype and *in vivo* biological evidence of Alzheimer's pathology; that the term AD has previously been used to refer to the pathological process alone has contributed to the erosion of the original clinico-pathological duality. It suggests that the validation of disease-specific biomarkers such as laboratory and neuroimaging examinations has contributed to an increased possibility of identifying *in vivo* evidence of the specific pathology. These biomarkers are categorised by the authors as pathophysiological, including Cerebral Spinal Fluid[9] (CSF) measurement and PET scans,[10] and topographical, including MRI and PET scans[11] (Dubois et al., 2010: 1119). Pathophysiologial markers appear to have diagnostic use at all stages of AD including the pre-clinical period, while topographical markers are more useful when the first cognitive symptoms are manifest (ibid.: 1120).

The European Federation of Neurological Societies' (EFNS) 2010 guidelines for the diagnosis and management of Alzheimer's disease made recommendations for good practice in assessment, interpretation and treatment of patients' symptoms and disabilities, as well as of issues surrounding the care-giver:

> Clinical history should be supplemented by an informant. A neurological and physical examination should be performed in all patients with dementia. ADL [*Activities of Daily Life such as bathing or shopping*] impairment due to cognitive decline is an essential part of the diagnostic criteria for dementia and should be assessed in the diagnostic evaluation. [...] Cognitive assessment should be performed in all patients [...] Quantitative neuropsychological testing should be made in patients with questionable or very early AD [...] The assessment of cognitive functions should include a general cognitive measure and more detailed testing of the main cognitive domains, and in particular an assessment of delayed recall[12] [...] Assessment of BPSD [*Behaviour and psychological symptoms of dementia*] should be performed in each patient. Information should be gathered from an informant using an appropriate rating scale (good practice point).

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[8] The International Working Group for New Research Criteria for the Diagnosis of AD in 2007 proposed a new diagnostic framework, and was published by Bruno Dubois et al. in *The Lancet* (2007); 6: 734–46.
[9] Seeking reduced concentrations of protein amyloid B, increased total tau protein and increased phosphorilated tau.
[10] Amyloid PET scanning with Pittsburg Compound B (PiB) or other radioglands.
[11] Structural MRI with hippocampus volume measurement, and Fluorodeoxyglucose PET scan. These are used to assess less-specific brain changes that correspond to the regional distribution of Alzheimer's pathology, including medial temporal lobe atrophy and reduced glucose metabolism in temporo-parietal regions.
[12] In patients with moderate memory impairment cued recall could be more appropriate than free recall. (Hort, J. et al., 2010: 6)

Assessment of co-morbidity [*co medical conditions such as depression or cardiovascular diseases*][13] is important in AD patients, both at the time of diagnosis and throughout the course of the illness (good practice point) and should always be considered as a possible cause of BPSD […] CT and MRI may be used to exclude treatable causes of dementia. Multislice CT and coronal MRI may be used to assess hippocampal atrophy to support a clinical diagnosis of AD. […] FDG PET and perfusion SPECT are useful adjuncts when diagnosis remains in doubt […] Dopaminergic SPECT is useful to differentiate AD from DLB [*dementia with Lewy bodies*] Follow up with serial MRI is useful in a clinical setting to document disease progression […] (J. Hort et al, 2010: 6)

Isabel Santana (2005: 61–82), a neurologist at the University of Coimbra's hospital, outlines the diagnostic process in Portugal. The four-stage process first excludes reversible causes for cognitive deterioration such as hypothyroidism, moves to prevention of dementia in specific cases such as HIV infection or vascular problems, and continues to etiological diagnosis of specific dementia diseases of which Alzheimer's is the most common:

1) A thorough clinical history that follows the evolution of symptoms;

2) Neuropsychological examination to assess the degree of cognitive decline;

3) Neurological examination to identify specific signs;

4) A complementary investigation that includes laboratorial and image-based examinations.[14]

The assessment depends, as noted, on a multiplicity of expertise that usually begins with the family and family doctor and ends in memory clinics or hospitals. The process requires considerable effort from patients, families and institutions. Some of these methods are expensive, exhaustive[15] and demand attention and will, and usually

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[13] 'Levels of folate, vitamin B12, thyroid stimulating hormone, calcium, glucose, blood cell count and renal and liver function should be tested at the time of diagnosis. Serological tests for syphilis, Borelia and HIV may be necessary in cases with atypical presentation or clinical features suggesting these disorders.' (Hort, J. et al., 2010: 6)

[14] From my understanding and experience, these are usually topographical examinations such as CT scans or MRI rather than more specific pathophysiological examinations such as spinal fluid analysis and PET scans, which are costly and may involve pain or a reaction to the injected marker. Such examinations are undertaken only when demanded by the protocol of a specific clinical trial, or when less-intrusive tests prove inconclusive.

[15] Full neuropsychological testing may take as long as four hours, and is not just useful for assessment of the earliest symptoms of Alzheimer's disease; along with clinical trials, this type of assessment is used to track symptoms through the course of the disease, or measure the effects of experimental treatments. As noted above, in the case of Alzheimer's disease, no single test can simultaneously assess all areas of functioning.

coordination between different people in different locations. Tom DeBaggio describes the moment following diagnosis[16] when the apparent 'death sentence' is pronounced:

> He [*the neurologist*] looked at us both [*Tom and his wife Joyce*] uncomfortably; then he looked at me. He was quiet and controlled.'Have you received the final report?' I asked.'You have Alzheimer's', he said matter-of-factly.The statement exploded in my head and I was swept with emotion and struggled to hold it beyond recognition. Before I could catch my breath, he began talking about the medicines to be prescribed for me. It was at this moment Joyce entered the conversation. She was shocked at the manner with which the neurologist announced what amounted to a death sentence. She wanted details, understanding, some base from which to gain strength. (2002: 37)

The words spoken are so powerful and evocative that I can only imagine how those events influenced the building of the autobiographical memory of those present. It reminds me of a similar episode that I witnessed during one of Mendonça's neurological consultations. I felt that the situation, though of an almost routine nature, demanded much personal effort from the physician, who was forced to distance himself from events in order to protect his own humanity. For the care-giver, it was clearly a traumatic moment filled with rage, doubt and fear of prospective pain and effort; it seems clear that the care-giver would be able to recount the conversation in detail. For the patient, the burden of remembering may have been lifted by the impairment of memory skills. For me, the experience was new and extremely emotional; though I tried to conceal its effect, it has endured in detail in my long-term memory. This accords with accounts of how autobiographical memory operates (Nunes, 2008: 126–127). For the immediate effect, I return to DeBaggio:

> To have Alzheimer's is a humbling experience in itself, and an emotional backbreaker. At the sound of the word you become bumbling and stupid, suddenly unable to divine the simplest of life's equations, although you try to hide it with a stiff upper lip and a knowing nod. It does not help when a doctor treats it as if it were a cold. (2002: 37)

During my observations and emotionally charged experience I remembered Berg and Mol's definition of medicine as an 'heterogeneous coalition of ways of handling bodies, studying pictures, making numbers, conducting conversations' (1998: 3). I was

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[16] This is not straightforward and depends on local policies allied to socio-political and economic constraints such as a government obligation to support medication and support (i.e. institutional care, professional help for daily life tasks such as bathing, shopping, etc.). AD is presently defined in vivo, usually by episodic memory impairment and supportive biomarkers that indicate its pathology. With these specific and sensitive examinations designations of probability are being substituted by 'typical ' and 'atypical' AD (Dubois et al., 2010: 1120).

researching, attentively reflecting on the scenario and consciously present during a masterly orchestration of factors such as tone of voice, choice of words, rhythms, gaps, positioning in space, looks, images and reports and all the 'flattened inscriptions' (Latour, 1990: 39) that constitute the medical report and archive.

This final stage of assessment, the announcement (the call[17]) of the specific category of the pathology, in oral and written forms, is a performance event that concludes one assessment cycle to start many others; it is no longer concerned with categorization but with the evolution and effect of possible therapies. It does not describe the patient, but the act of calling/writing has visible consequences and impacts on the patient's body and life, returning as further acts, interventions, and memories. Berg and Bowker note:

> The body is materially reconfigured – its flesh is part and parcel of the discursive transformations we witness here. In Star and Bowker's terms, we witness a *convergence* between body and representation: in its production, the representation inscribes itself in the body it represents (1994).[18] It is this re-written body, subsequently, which is the site of the diagnostic and therapeutic interventions. At this point, it becomes meaningless to debate whether these interventions address the body 'itself' or its representation, since it is *in and through* this representation that the body 'itself' is known, surveyed and intervened upon. (1996: 4)

Medical and laboratorial practices associated with assessment conditions transform the biological materiality of memory loss into a visual phenomenon. I would argue that the visibility of loss of memory is constructed through space/time performances and objects in a reverse of autobiographical memory: the larger the accumulation of inscriptions constructing the patient via the representation of the body (Berg and Bowker, 1996: 4) the fewer their potential autobiographical memories.

In medical terms, assessment requires the visual identification of symptoms, confirmed by diverse material traces of the archive that may include detailed blood tests or MRI scan results. The 'scopic' understanding of bodily functioning is thus revealed via practices of enacting the archive such as gazing, measuring, ordering, naming, and defining therapeutic approaches. The written notes thus reformulate the material body.

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[17] In televised medical series such as *Emergency Room* or *Grey's Anatomy*, viewers are often presented with the call of death or 'the pronouncement'. This action transforms the dramatic event into a ritual during which the doctor in charge proclaims the time and nature of the event. According to Kirsti A. Dyer, MD, MS (2001) the official time of death corresponds to the time at which medical assessment of a series of vital signs is completed.
[18] A reference to Star, Susan Leigh, and Bowker, Geoffrey (October 1994), 'Of lungs and lungers: the classified story of tuberculosis', in *Annual Meeting of the Society for the Social Studies of Science*, New Orleans, US.

This formulation relates to theoretical proposals about the perception of scientific and clinical practice put forward by the scientific sociologist Bruno Latour, whose theories have been touched on in previous chapters. Latour observed the production of scientific and medical knowledge in the laboratory. He observed how the materiality of the body of the patient is replaced by a collection of two-dimensional records that form an archive.

In *Visualization and Cognition: Drawing Things Together* (1990) Latour cites Svetlana Alpers' (1983) proposal[19] that visual culture changes over time as a result of the way in which the world is seen and made visible by overlapping cultures including science, art, theory of vision, organization of crafts and economic powers. Alpers focuses primarily on phenomena associated with the camera obscura whereby an image of the world appears on a flattened surface. According to Latour, Alpers was drawing on Foucault's description of the panopticon. Latour emphasizes the replication processes of the camera obscura and the printing press as inscription devices. The camera obscura, significantly, led to an analysis of two-dimensional visual perspective, thus creating it as a relational object. Latour uses the concept of inscription[20] to describe and analyse laboratorial practice that 'transforms pieces of matter into written documents' (Latour and Woolgar, 1986: 51) or 'any set-up, no matter what the size, nature and cost, that provides a visual display of any sort in a scientific text' (Latour, 1987: 68). The notion that scientific practice is a performance of inscription-making is central to his methodology of shadowing scientists and engineers at work and of observing the 'precise practice and craftsmanship of knowing' (Latour, 1990: 42). For him, the manipulation and transformation of representations, and thus the constant assessment and archive building, are key aspects of scientific practice.

Reflecting on the operations of the laboratory and his role within it, Latour claims:

> [...] I was struck, in a study of a biology laboratory, by the way in which many aspects of the laboratory practice could be ordered by looking not at the scientists' brains [...] at the cognitive structures [...] nor at the paradigms [...] but at the transformation of rats and chemicals into paper (Latour and Woolgar, 1979). Focusing on the literature, and the way in which anything and everything is

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[19] Alpers, S. (1983), *The Art of Describing: Dutch Art in the 17th Century*, University of Chicago Press.
[20] In note 2 of chapter 2 of *Laboratory Life*, Latour and Woolgar establish a link between their use of the term inscription and Derrida's use. They claim: 'the notion of inscription as taken from Derrida (1977) designates an operation more basic than writing (Dagognet, 1973). It is used here to summarize all traces, spots, points, histograms, recorded numbers, spectra, peaks, and so on.' (1986: 88)

transformed into inscriptions was not my bias, as I first thought, but was what the laboratory was made for. Instruments, for instance, were of various type, ages, and degrees of sophistication. [...] But their end result, no matter the field, was always a small window through which one could read a very few signs from a rather poor repertoire (diagrams, blots, bands, columns). All these inscriptions [...] were combinable, superimposable and could [...] be integrated as figures in the text of the articles people were writing. (Latour, 1990: 21-22)

The unique feature of inscriptions is their power to allow mobilization, which resides in a path linking people, timed performances, material places, institutions and claims. Latour argues that much time is devoted to producing and cleaning these inscriptions because they provide advantage in a rhetorical and polemical situation such as: 'You doubt what I say? I'll show you.' (1990: 36; 1987: 64).[21] Without moving physically, it is possible to be drawn into foreign lands via maps, diagrams or figures that immediately establish a 'two-way connection' (1986: 3) and a present-absent link; thus the many geographical metaphors circulating in the assessment tools such as the topographical qualification of some diagnostic procedures. Latour argues, however, that inscriptions have limited explanatory and persuasive powers: these are only gained when transformed into 'mobilisable allies' (Latour, 1987) that convince others to change their opinions or behaviour.

> [...] the precise focus should be carefully set, because it is not the inscription by itself that should carry the burden of explaining the power of science; it is the inscription as the fine edge and the final stage of a whole process of mobilization, that modifies the scale of the rhetoric. (1990: 40)

My own visual research aims to expand on this theme of an inscriptive view of science by maintaining an understanding of medicine that depends on the mobilization of fragments of the archive, applying knowledge to several simultaneous traces and records coded and archived but simultaneously present:

> the same medical mind will generate totally different knowledge if applied to the bellies, fevers, throats and skins of a few successive patients, or if applied to well kept records of hundreds of written bellies, fevers, throats and skins, all coded in the same way and all synoptically. (Latour, 1990: 37)

Accordingly, an archive or a collection that extends[22] endlessly in nature is useful only

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[21] In *Science in Action* Latour writes: 'You doubt what I wrote? Let me show you.' (1987: 64).

[22] For Foucault, medical assessment is based on the order of the archive: 'the unity of the medical gaze was not the circle of knowledge in which it was achieved but that open, infinite, moving totality, ceaselessly displaced and enriched by time, whose course it began but would never be able to stop – by this time a clinical recording of the infinite, variable series of events. But its support was not the perception of the patient in his singularity, but a collective consciousness, with all the information that intersects in it, growing in a complex, ever-proliferating way

when highly organized, labelled and precisely coded to preserve the fragments that belong to it; more items can be added and more conclusions and groups formed in order to organize it permanently and transform it into a smaller collection of 'simpler inscriptions that mobilize larger and larger numbers of events [and objects] in one spot'. Latour calls this process (1987) the 'cascade of inscriptions'; through this process 'harder facts'[23] are produced. This level of analysis links practices and achievements in traceable pathways, facilitating understanding of how assessment steps are drawn from session to session, and how individual diagnostic images may be assembled or may cascade with other images produced at different times. These may be further produced with other individuals until the group represents certain pathology. Sociologist Anne Beaulieu, who has a PhD in Digital Representations, Brain Mapping and Cognitive Neuroscience, says:

> This set of cascaded representations accrues authority, so that it can in turn serve as a diagnostic tool, and so that further individual scans will be made for comparison with this new standard. Alzheimer's patients, or normal males or dyslexics could all be populations whose brains are averaged in this way. The representations are produced in relation to notions about illness and through new combinations or representations, these conditions come to be redefined. (2000: 19)

Karin Knorr-Cetina [24] disagrees with Latour, arguing that he attributes exaggerated semiotic power to inscriptions. Latour argues that even subtle visual cues can alter meaning and shift interpretation.

> Thus, one more inscription, one more trick to enhance contrast, one simple device to decrease background, one coloring procedure, might be enough, all things being equal, to swing the balance of power and turn an incredible statement into a credible one which would then be passed along without further modification. (Latour, 1990: 42)

Latour identifies nine features of inscriptions. These may be used as the bases of an empirical analysis of representation (Beaulieu, 2000: 19) and may be summarized thus: inscriptions are mobile, immutable, and flat; their scale can be altered; they can be reproduced and spread at little cost (so all instances of time and place may be

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until it finally achieves the dimensions of a history, a geography, a state' (2003:29) and 'Medical certainty is based not on the completely observed individuality but on the completely scanned multiplicity of individual facts.' (2003: 101)

[23] What Latour calls a *black box*, the '… word used by cyberneticians whenever a piece of machinery or a set of commands is too complex. In its place they draw a little box about which they need to know nothing but its input and output.' (Latour, 1987: 23)

[24] In Knorr-Cetina, K. (1981), *The Manufacture of Knowledge*. Pergamon Press, Oxford.

gathered in different times and places); recombined (or reshuffled); superimposed or part of written text.

Finally, they rely on optical consistency: the merging of geometry and perspective allows continuity from the two-dimensional world of paper to the three-dimensional world of objects and performances 'out here'. In *Drawing Things Together* (1990), Latour links inscriptions such as image, text and numbers in print with this geometric phenomenon associated with the camera obscura.

As noted, medical assessment through visual evidence is associated with specific cultural practices and 'modes of seeing' (Sturken and Cartwright, 2002: chapter 8).[25] Science has thus been interpreted as a process of generating ever more accumulating and circulating 'drawings', rather than observing the natural world.[26] This clearly applies to medical practices represented by images and text, such as those discussed here, in which the performances behind their construction vanish like a memory event and are replaced by a diagram of the sensual path the brain has experienced through that same time/place action.[27] When these are published, shared in meetings and circulated in the media as 'immutable mobiles' (Latour, 1998: 426), these inscriptions become self-referential and evocative of other, previous representations[28] rather than the messy, sensual material reality we belong to.

My visual research in the Alzheimer's research clinic seeks to define the loss of memory, the disease, and the autobiographical construction of the self. How can autobiographical memory be evoked by scientific representational practices? I use Latour's set methodology to examine my practice. No matter how clean and tidy a scientific fact may seem it is a result of a series of mediating actions built on the

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[25] For a more expansive discussion of how memory records lived events see Chapter One.

[26] In *Science in Action* Latour discusses the constructed nature of science and how reality is a re-enactment in the laboratory: 'Showing' and 'seeing' are not simple flashes of intuition. Once in the laboratory we are not presented outright with the real [...] whose existence we doubted. We are presented with another world in which it is necessary to prepare, focus, fix and rehearse the vision of the real [...] We came to the laboratory in order to settle our doubts about the paper, but we have been led into a labyrinth. (1987: 67)

[27] Citing Michel Mercier's doctoral thesis *Recherches sur l'image scientifique: genèse du sens et signification en microscopie electronique* (Bordeaux I, 1987), Latour claims: 'We have at least two reasons for being fascinated by, for example, the action of preparing an electron microscopy image: one will come from the hundred or so intermediary steps going into the construction of the artifactual image, but the second will be the gradual *disappearance* of those hundred steps into one shape that will be kept as a reference through those re-representations.' (1987: 426)

[28] This specialized way of knowing reinforces Foucault's power/knowledge discourse to provide a hierarchy by which to assess the understanding of a disease. We are so used to privileged access to discursive practices and authority structures that we seek constantly to confirm and validate feelings, understandings and practice via the doctor, art critic, curator or members of the public.

consensus of a multidisciplinary community.

Latour, Michael Callon and John Law devised what came to be known as the actor-network theory[29] (ANT). They employ a broad definition of the 'social' that is taken to be the associations and web-like[30] relationship between heterogeneous material elements in any situation. I also use this theoretical frame for my research. ANT describes social networks in science as fluid and expansive, leaving traces; offering a parallel to my practice. Theorist Jim Dolwick (2009, 4–37) sees similarities and influences of numerous other authors in the formulation of actor-network theory. From his list of proposed influences, I have drawn on Foucault's analyses of micro-powers (1975),[31] Deleuze and Guattari's Rhizome (1980)[32] and Haraway's Cyborgs (1991),[33] recognizing similarities of approach and theory foundation for my current position.

In the application of ANT, binary oppositions are bypassed. ANT researchers perceive not dichotomies, but intertwined, networked relationships, between nature/culture, self/other, agency/structure, knowledge/power and human/non-human. Latour (2005: 76) disassembles the dualist paradigm in sociology, asserting that principles of symmetry described within the actor-network results in a relational intermix. He sees no reason to establish separate categories of the natural and the social in order to privilege one category. In ANT, 'actors' are seen as relational entities. When everything is treated as a relational entity, the social becomes something that is 'actively assembled' (Dolwick, 2009: 36).

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[29] According to Dolwick (2009: 36) ANT emerged in the field of science and technology studies in texts including Callon and Latour (1981); Callon (1986a); Law (1986) and Latour (1988a-d) and has passed through changes of name from 'sociology of translations' (Callon 1986a), 'actant-rhizome ontology' (Latour 1999b) and 'sociology of associations' (Latour 2005). His claim refers to Latour, B. (1988a), *The Pasteurisation of France*, Harvard University Press; Latour, B. (1988b) *Irreductions* (ibid, part II); Latour, B. (1988c) 'A Relativistic Account of Einstein's Relativity', Soc. Stud. Sci. 18 (1): 3–44; Latour, B. (1988d) 'The Politics of Explanation: An Alternative', in Woolgar, S. (ed.), *Knowledge and Reflexivity: New Frontiers in the Sociology of Knowledge*, Sage, London; Callon, M., Latour, B. (1981) 'Unscrewing the Big Leviathan: How do Actors Macrostructure Reality?' in Knorr-Cetina, K. and Cicourel, A. (eds.) *Advances in Social Theory and Methodology: Toward an Integration of Micro and Macro Sociologies*, Routledge, London; Callon, M. (1986) 'Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay', in Law, J. (ed.) *Power, Action and Belief: a New Sociology of Knowledge?* Routledge, London; Law, J. (1986) 'On the Methods of Long Distance Control: Vessels, Navigation and the Portuguese Route to India' in Law, J. (ed.) *Power, Action and Belief: a New Sociology of Knowledge?* Routledge, London; Latour, B. (1999b) 'On recalling ANT', in Law, J., Hassard, J. (eds.) *Actor Network and After*, Blackwell, Oxford. Latour, B. (2005), *Re-assembling the Social: An Introduction to Actor-Network-Theory*, Oxford University Press, is probably the most recent book from the original founders to introduce the subject, so I have used it to outline the theme.

[30] The network in ANT does not hold a fixed reality or a form once it is constituted by relationships and alliances.

[31] Referring to Foucault, M. (1975) *Discipline and Punish: the Birth of Prison*. Pantheon, New York. (I have used Foucault, M. (1995) *Discipline and Punishment: The Birth of the Prison*, Second Vintage Books Edition, New York.)

[32] Referring to Deleuze, G., Guattari, F. (1980) *Mille Plateaux*. Les Editions de Minuit, Paris.

[33] Referring to Haraway, D. (1991) *Simians, Cyborgs and Women: the reinvention of nature*. Routledge, New York.

ANT is not, I repeat is not, the establishment of some absurd 'symmetry between humans and non-humans'. To be symmetric, for us, simply means not to impose a priori some spurious asymmetry among human intentional action and a material world of causal relations. (Latour, 2005: 76)

Following Dolwick's (2009: 37) understanding, the social world would not be used to explain the natural-material world and vice versa, because 'it is all just one world'. Distinguishing subjects from objects is no longer necessary. Scientific facts depend on the performances and actions of objects; Latour (2005) proposes that they should be part of the explanation and should not simply be merged into the logic and reasoning of scientists at work. The subject/object divide is not an issue; the aim is to 'learn from the actors' (Latour, 1999: 20) without imposing on them an a priori definition of their construction power. Objects do not control social action, which must be accounted for by empirical means. A researcher should be able to follow the trace of prior activities, including references to relevant artefacts. The primary aim is not to mechanize humans but to constantly add non-human actors to sociological and anthropological studies.

ANT focuses not on isolated objects but on the complex subject-object web of relationships. According to Dolwick (2009:36),[34] an actor[35] or actant[36] such as a person, group, idea, material, object, plant, animal, is something that acts, or to which activity is granted by others. It is not necessarily the source of an action, but it modifies the state of affairs by making a perceptible difference. It may have as many dimensions as it has attachments. An actor may thus be regarded as an intricate 'network' in its own right. On the other hand a network – a person, group, material, idea, object, plant, or animal – is an interactive assembly of actors, group, or 'string of actions' that involves a number of potential mediators. More importantly, a network must leave a physical trace of some prior activity that can be empirically followed and recorded. Such a trace is made noticeable by

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[34] Summarizing Latour (2005: 71, 129) and Law, John and Mol, Annemarie (2008), 'The Actor-enacted: Cumbrian Sheep in 2001', in Knappett, Carl and Malafouris, Lambros (eds.), *Material Agency: Towards a Non-Anthropocentric Approach* (pp. 57–78) Springer, Düsseldorf.

[35] The reason why objects were not previously assigned a role involved both the definition of 'social' used by sociologists, and the usual definition of actors and agencies. If action is limited *a priori* to what 'intentional', 'meaningful' humans do, it is hard to see how a hammer, basket, door closer, cat, rug, mug, list, or tag could act. They might exist in the domain of 'material' 'causal' relations, but not in the 'reflexive' symbolic' domain of social relations. By contrast, if we adhere to the decision to begin from the controversies surrounding actors and agencies, anything that modifies a state of affairs by making a difference is an actor – or, if it has not yet any figuration, an actant. The questions to ask about any agent are: 'Does it make a difference in the course of some other agent's action?' 'Is there a trial that allows detection of this difference?'

[36] In *Science in Action* Latour proposes 'to call whoever and whatever is represented an actant'. (1987: 84)

conflict/controversy, flows of translation, labour, effort, movement and production (Latour, 1997: n.pag; 2005:128, cited[37] in Dolwick, 2009: 36).

As suggested by these definitions,[38] nothing is irrelevant; everything is potentially important. I use actor-network theory as a working methodology for each of my four virtual archives. For example I might assign equal importance to the human gesture of transferring chemicals carefully between glass vials and a digital image obtained via measuring some qualities of the different amounts of the substance after the first step/action has been disregarded. According to Latour's theories, not all 'actants' are the same: 'their differences rest in their form'. Latour described how, for example, a 'tag', such as a simple post-it note, can become an actor when given figuration. Materiality is consequently vital in the establishment of a relationship. Laboratory instruments have technical limitations, and these limitations condition what can be communicated to others in the network. Equally the technical specifications of my stills camera or video camera impact on the image quality, aspect ratio of the frame, data capture and physical proximity to laboratory events. Every actor is part of a complex montage. Every Petri dish or MRI scan, or even a light in a room or a postcard on a refrigerator door is a possible event capable of translation. Strength in building science comes from this flux of interactions; 'cascades of inscriptions' which in turn become chains of translation.

Following scientists in action is central to Latour's rationale (1987). His examination of what constitutes an actor enables us to not only follow scientists in action but also 'follow the actors' (2005). In his view it matters little whether one follows a scientific process at the beginning, middle or end of its progress because the smallest 'actant' has equal value.

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[37] Dolwick is referring to Latour, B. (1997), 'On Actor Network Theory: a Few Clarifications', nettime website http://www.nettime.org/Lists-Archives/nettime-l-9801/msg00019.html (accessed 13/10/11) and Latour, B. (2005), *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford University Press, Oxford.

[38] Dolwick's explanation on the interchangeability of the terms is useful: an actor may be viewed as a network, and a network may be viewed as an actor. For instance, a 16th-century Portuguese carrack [in another text] may be viewed simultaneously as an actor within a much wider network, such as the spice trade, and a network of wooden planks, mast(s), sailcloth, crewmembers, investors, wind, stars, and navigational equipment, etc. ... In turn, each of these actors may be regarded as networks, and so on. The spice trade itself may even be viewed as an actor in other networks, such as the Arab market and the Portuguese Empire. (2009: 39).

Therefore, for instance in my research, an Alzheimer's patient is never a simple case study or an archive of virtual fragments. In my own work the patient is understood to be an actor and a network, owning a complex subjectivity and personality that, rather than being transformed into a series of inscriptions, may be seen as a relational entity. Latour in his article 'How to Talk About the Body?' says:

> When you enter into contact with hospitals, your 'rich subjective personality' is not reduced to a mere pack of objective meat: on the contrary, you are learning to be affected by masses of agencies hitherto unknown not only to you but to doctors, nurses, administration, biologists, researchers who add to your poor inarticulate body complete sets of new instruments. (2004: n. pag)

Latour argues that to this experience we may further add the reaffirmation of a body as a container of a multitude of systems, organs, cells and microbes 'folded in a puzzle' (2004: n. pag). On the articulating role of disciplines, he declares the impossibility of a dualistic approach to a physiological and a spiritual and phenomenological body. He notes that neurophilosopher Paul Churchland carried his wife's 'portrait'; a PET scan of her brain.[39] For Latour (2004: n. pag) this can be viewed as 'adding one more contrast, one more articulation to what is to have a body'.

Case Study III: Helen Chadwick

Throughout her brief but intense artistic career British artist Helen Chadwick (1953–1996)[40] attempted to articulate the relational and complex dimensions of what it is to have a body, and how our embodied condition is linked to the need to explore concepts such as identity, consciousness and memory via relationships established with a material ground (Fig. 52). Her work was informed by, and enmeshed in, art history and other areas of the humanities, and also life sciences.

Chadwick used collage and juxtaposition of fragments from contexts including science, art and philosophy to 'disrupt the representation of the subject and to demonstrate the interpenetration of the self and the world' (Mark Sladen, 2004: 16). This became

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[39] In a similar approach to the Doctor in Thomas Mann's novel *The Magic Mountain*, who displayed amongst normal portraits on his wall the chest X-ray of his muse Claudia.
[40] Chadwick was born in Croydon and studied at Croydon College of Art, Brighton Polytechnic (1973–1976) and London's Chelsea School of Art (1976–1977).

integral to my own artistic development and informs my working and research methods. Chadwick's view of the relationship between art and science remains fresh, though some of the ethical issues and developments she explored have been superseded, and some aspects of the art/science relationship have changed since the 1980s and 1990s. Despite this, I decided to include her as a case study.

While analysing which of Chadwick's works would best suit my methodology and provide a basis from which to refine my reflection on my own practice, I looked at *Ego Geometria Sum* (1983), which many critics feel is her primary autobiographical piece. I also considered work that deals directly with the spatial and technological ground of science, such as *Viral Landscapes* (1988-89) or *Unnatural Selection* (1995–96), in which images produced either in the realm of scientific and medical inquiry, or using similar technologies[41] constitute the final piece. I chose *Of Mutability* (1984–86) after studying catalogues of her work and noting areas of congruence with my own, including the establishment of a research project, multimodal and multi-temporal installations and links to Latour's theories. The photographic piece *Self-Portrait* (1991) was chosen as an empirical response to the dissection of a human brain during my artistic residency at the hospital.

Of Mutability

This installation comprising various independent works was presented as a solo exhibition at London's Institute of Contemporary Art (ICA) in 1986 (Fig. 53). Chadwick included the rigorous character of the exhibition space – the neoclassical rooms on the upper floor – in her planning decisions. The largest room contained *The Oval Court* (1984–1986), a collage made from photocopier paper. Each of its twelve sections featured a reduced-scale image of the artist's body, posed against a background of actual-size images of objects including vegetables, fruit and flowers, animals and drapery. Images were produced by placing objects directly on the glass of a photocopier loaded with blue toner.[42] These were cut and pasted in a complex scene and set on a

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[41] *Viral Landscapes* (1988–89) is a series of large photographs presenting the coalition of landscape from the shoreline of Pembrokeshire and microscopic images of Chadwick's own cellular material. *Unnatural Selection* (1995–1996) is the result of a residency at the Assisted Conception Unit of London's King's College Hospital, in which she manipulated human, pre-implantation embryos that would otherwise have been left to decay (discarded).
[42] In a 1996 interview with Mark Haworth-Booth, Chadwick says: 'after *Ego* I wanted something more leaky and fluid and I was looking at things like Greek pottery [...] and from them I looked at rococo and baroque, fresco,

raised Formica floor. Five golden orbs were set in the centre of the composition, 'evoking the touch of a divine authorial hand' (Sladen, 2004: 16).

The viewing position, coloration and the fluid poses of the objects and female body in the work 'suggested a kind of pool' (Sladen, 2004: 16). On the wall were computer prints of baroque-style columns topped with photocopied images of Chadwick's face. From her closed eyes,[43] vegetable tears slipped towards the symbolic pool. In an adjacent room a 2.25 metre high column – *Carcass* (1986) – contrasted markedly with the digitally printed ones. It consisted of glass panels filled with a compost of rotting plant matter that emitted a strong smell of fermentation (Fig. 54).[44] In an interview with Mark Haworth-Booth, Chadwick said:

> 'It was really a stitching together of so many references, ultimately post-modern, a kind of bowerbird theft of facets from everywhere, from architecture, from painting, and I kind of commandeered these and distorted them for my own ends [...]' (Cited in Haworth-Booth, 1996: 58)

The exhibition's most visible influence was the serpentine style of Rococo, a direct result of the impression left by churches[45] and palaces during a visit to Bavaria. Sladen (2004: 17) says the author 'was interested in the style both because of its embrace of pleasure and because of its embodiment of fluidity'. The title *Of Mutability* reflected exactly that volatility: understood as 'the cue for a concept of the self as being infinitely subject to change' (Sladen, 2004: 17). Mary Horlock (2004: 34) notes that the

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painted vaults [...] I also had a bad experience with a photographer and problems of authorship in terms of collaboration with photographers and I thought I want to work absolutely directly so that I have all the power at my disposal. [...] it's just me pressing the button, I don't need a camera, a technician, anything at all, it's much more intimate' (1996: 57).

[43] Contradictory accounts describe the eyes as open or closed. My conclusion is that most people read them as closed. Marina Warner claims: 'the face of the weepers [...] has open eyes, though screwed up by tears' (1989: 39).

[44] According to Sladen (2004:29) and Chadwick (interview with Mark Haworth-Booth, 1996: 57) *Carcass* was made using kitchen organic waste collected by Chadwick and her neighbours, plus remains of the vegetables used in *The Oval Court*. The oldest, most decaying materials were deposited in the bottom of the vitrine with recent ones on top, forming a colour pattern and different textures along the case. The fermentation process, though alluding directly to the mutable nature of our existence, became problematic: the smell and liquid emanating from the case drove staff to perform a maintenance task that broke the seal and led to the removal of the piece from the exhibition. Sladen notes the naïve intentions of the author, but the problems may have been caused by an error in scaling up from model to actual piece. When contrasting her work with my installation *Ethology I*, which used large cases of scientific agar, I experimented with a metre-long smaller model. The fermentation of the larger quantity of agar in the vitrine produced far more condensation and a foul smell, and in consequence became distorted by suction as the live material exhausted available oxygen. Lids had to be replaced towards the end of the first month of exhibition.

[45] In her trip to Munich, Chadwick saw Rococo and Baroque buildings including Die Wies (1745–54), by Domenikus Zimmerman, Agostino Barelli's Schloss Nymphenenburg (1664–1675) and François Cuvilliés's Amalienburg Lodge (1734–1739). She said: ' [...] in Die Wies everything inside dissolves, you're in a space that defies architecture [...] The church is dedicated to a statue that wept, and the rocaille wasn't just a decorative device but related to [...] the melting of the snows at Easter and to rebirth' (cited in Warner, 1989: 43). And: 'The rococo [of the Amalienburg] is incredibly light, and optimistic. It's not about power but about pleasure. It's unique – an attempt at finding a spiritual path through a pleasure principle.' (ibid.: 43)

transience of the scene was reinforced in the impermanence or degradation of the photocopied paper with the evanescing images.

Chadwick explained:

> I was trying to […] identify new spaces that could act as mirrors to that internal experience of other individuals and try to touch that and make some kind of identification for them, not to read the work as a series of objects or symbols that they could interpret […] (in Haworth-Booth, 1996: 58)

The Oval Court presented a still life series evoking the *vanitas* tradition and allegories of the passage of time, perhaps reinforced by choosing twelve panels to suggest a year. According to some critics (Mary Horlock, 2004: 37; Warner, 1989: 48) she mimicked poses from Bernini's ecstatic *St Theresa* and the reclining figure of Boucher's *Mademoiselle O'Murphy* – images also associated with literary (Georges Bataille) and psychological (Jacques Lacan) studies of expression of joy and sensual pleasure. By re-staging the scenes she was being 'provocative' (Horlock, 2004: 37), including all the network of associations the images were loaded with.

Though she exemplified[46] an expansion of the field of art practice, with work that attempted to break the boundaries of disciplines and media, creating a space between performance, sculpture, drawing and photography, Chadwick was criticised for her use of the naked body as an object of the gaze. At the time her work was seen as an exploration of female identity that evoked rituals and myths surrounding womanhood, mirrored by the artistic context of feminist discourse that aimed to challenge the male dominant discourse (Fig. 55). At a distance, and analysing her words along with the work, it is understood (Horlock, 2004: 33) that she was addressing a generalized category of being human and attempting to dissolve distinctions such as gender and age (Fig. 56). Chadwick maintained she:

> was looking for a vocabulary […] I was the subject and the object of the author. I felt that by directly taking all those roles, the normal situation in which the viewer operated as a kind of voyeur broke down […] the only way to enter was through a kind of mirror identification. (cited in Sladen, 2004: 18)

In taking responsibility for the spectacle of nudity, Chadwick transformed the object of desire into an empowering tool for subversive ends (Fig. 57). She later distanced herself

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[46] Chadwick was one of the first women shortlisted for the Turner Prize for the 1986 ICA exhibition *Of Mutability*.

from the use of explicit performance and nudity and turned attention to the materials of the inner body, following Surrealist experiments with physical reality and interior and exterior perceptions of the self in the manner of Frida Kahlo. Light boxes became a mediated way to convey her interest in diluting frontiers and oppositions. These combined two- and three-dimensional media; matter and light, and attempted to find new ways to interpret her understanding of this binary relationship of identity and self. Her move into works performed with flesh or isolated organs rather than her own body facilitated a move from a self-centred perspective that was gendered and less inviting for general viewer identification.

Self-Portrait

In a different approach, Chadwick came closer to the medical and scientific method of isolating the example to be analysed and subtly suggesting the network of relations. The photographic work *Self-Portrait* [47] is from 1991, when she wrote about relations and pairs as metaphors for life, referring directly to scientific formulae to explain her intentions:

> Relations are ambiguous, in excited equilibrium, pared down to reciprocity of energy and matter that is living meat. Selfhood as conscious mirror – I am mc2, my mass ties the power of my light. At its most bald this is our fleshhood – a red mirror [...] (1991[48]: n. pag., cited in Sladen, 2004: 28)

Her self-portrait provokes a 'shock of recognition' (Dumit, 2004: 131) similar to that experienced when presented with an X-ray or an MRI scan of our body (Fig. 58). It may also provoke nausea and trigger ethical issues. Despite this, in mastering the formal qualities of the work, Chadwick was able to transform a potentially disgusting material and a controversial action into something appealing, compelling and instilled with significance. There is a humane quality of resemblance/identification that allows us to perceive as ours the brain that Chadwick holds, as though offering the opportunity for our own *vanitas* picture. According to Warner (1986: 4) Chadwick 'offers a brain for view [...] a stripped analogue for the face'. The simplicity of this image, in contrast to

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[47] Photographic transparency, glass, aluminium frame and electric lights; size: 50.9 x 44.6 x 11.8cm. Source: National Galleries of Scotland (2012), http://www.nationalgalleries.org/collection/artists-a-z/C/6023/artist_name/Helen%20Chadwick/record_id/2265 (accessed 06/10/2012).

[48] The original text is Chadwick, Helen, *Untitled text*, in *De Light*, exhibition catalogue, Institute for Contemporary Art, University of Pennsylvania (Philadelphia, 1991: n. pag.).

other self-portraits such as *Vanitas*[49] or *Of Mutability*, transports me to a kind of laboratorial frame in which the object is framed or flattened into a surface that is explored in detail. It seems that by marvelling at a certain perspective of (or inscription of) our object brain it is possible to learn from that intricate landscape the wonders of subjectivity, memory and consciousness.

For Chadwick light, in relation to flesh[50] that represents corporeality, is read as evoking consciousness, though Horlock understands this as closer to 17th century medical illustrations where flesh is set in beautiful fabrics, or is represented by wax anatomical models on silk. In this work, she mixes images of delicate matter, and professional practice such as autopsy or neuropathology studies, with professional execution (photography by Edward Woodman) and sophisticated production (high quality Duratrans; translucent acrylic oval with aluminium structure and lamp behind). As an intentional tension she presents delicacy and refinement in the methods and production, plus extra delicacy and refinement, but some inevitable repulsion, in the materiality and viscosity of the brain. It could be argued that she is exploring the fringes of ethical terrain: in terms of science and medicine a permanent philosophical reflection (resulting in practical norms, codes of practice and informed consents), while in terms of art seeming to imply a fluid negotiation between subject and object (producers, promoters and audiences) grounded in volatile agreements that are contextually changeable. James Elkins (1999[51]) compares dissection to the experience of seeing or the cognitive act in general:

> A picture of a dissected body can also be experienced as a literal version of a common trait of seeing, in that the mind's desire to analyse and the eye's desire to pierce and separate are kindred motions, and they are both embodied in cut flesh. (Elkins, 1999: 126–127, cited in Horlock, 2004: 39)

The presentation of the fleshy nature of an actual brain rather than a diagnostic image seems to confirm an intention to appeal to the material nature of the body in terms of memory, identity and consciousness. It removed the problem of constructing the visual, which Chadwick may also have been addressing by choosing photography as a medium.

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[49] *Vanitas* is a photographic self-portrait 110mm high x 80mm wide that Chadwick executed just after *The Oval Court* (1986). In a Cibachrome photograph taken by Edward Woodman she presents herself semi-naked holding a round mirror that reflects *The Oval Court*. The work was purchased by Birmingham Museums and Art Gallery in 1987. Source: Birmingham Museums and Art Gallery website, http://www.bmagic.org.uk/objects/1987P5 (accessed 21/02/2010).

[50] Referring to works carried out between 1989 and1991 (*Meat Abstracts* and *Meat Lumps* – which includes a self-portrait).

[51] Horlock cited Elkins, James (1999), *Pictures of the Body – Pain and Metamorphosis*. Stanford, pp. 126–127.

I suggest that she was addressing the dilemma of the mind linked to the materiality of the brain, thereby refuting the notion of separation that Robert Zwinjeberg (2009) believed diagnostic images could propose. As noted in Chapter One, access to viewing the inside anatomy of the body has effectively been popularized, allowing the construction of an 'imaginary' around it.[52] Chadwick did not use a scan of her own brain, but it may be argued that both the brain and the feminine hands that cradle it are intended to be read as hers. It is initially difficult to reconcile the work's title with its imagery; the organicity of the brain is anonymous (Zwinjberg, 2009). But both brain and hands are fragments of someone's body; thus, through its characteristics, movement, and other social and psychological traits we identify others (Zwinjberg, 2009). A dilemma is set up concerning the impossibility of identifying the owner of the brain, and the hands, which nevertheless offer information about their owner via the specifics of jewellery, fingernails and skin.[53] Zwinjberg (2009) also sees this work as a mirror (an inference shared by both works addressed in this thesis) that reflects on the notion that we are only permitted to see the brain in the image because we ourselves possess one, in a constant pursuit for self-identity.

The impossibility of assigning a gender to the brain intentionally challenged the compulsion 'to read gender, and automatically wish to sex the body before us so we can orient our desire and thus gain pleasure or reject what we see' (Chadwick, 1992: 71). In this self-portrait, the divisions and symmetries, or the dualist definition of life were interrogated. Of the image that shows the same brain,[54] minus the hands and with an identical (symmetrical) image beside it, Chadwick says:

> The oval locket of a cranium is opened to reveal the amatory *vanitas* more vital
> than the traditional melancholic emblem of mortality, the skull. Here singularity is
> doubled. Two brains lie enraptured, exposed to our gaze, yet we witness the

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[52] Our interior body has always been sacralised, mystified and desired, perhaps because it implies the possibility of being individually felt but not touched or seen (except through the natural orifices also associated with sensual pleasure). Pathology, alongside war and catastrophe, has been for centuries the only way to access this domain of our bodily experience. Scientific and diagnostic visualizing technologies have contributed to the effacement between the interior and the exterior of us.

[53] An endnote of a text by Marina Warner in the Portfolio Gallery catalogue (1996: 18) reveals that this photographic work was involved in an actual medical assessment when a doctor who visited the Serpentine Gallery exhibition identified potential heart disease by the deterioration of the tissues of Chadwick's nails. Chadwick replied that the possibility had been assessed by other experts and excluded, but that she suffered from another type of disease possibly due to her manipulation of chemicals.

[54] This claim is integrally sustained by my accurate observation of both images (*Eroticism* and *Self-Portrait*); further the resemblances in all the details of the pictures, plus the assumed problematic ethical implications of holding a human brain with bare hands, make me speculate on the possibility of the self-portrait being a photographic montage which would raise a further question on how the viewer co-constructs the work.

turbulence of the fabric they rest on. [...] like butterfly wings[55][...] a blind
narcissian projection of oneself towards an unseeable other? (Chadwick, 1992: 73)

Pia Kontos conducted an ethnographic study (2006) of Alzheimer's patients. She claims
that self-identity is intrinsic to an intentionality of the body: non-reflexive,[56] innate and
enacted through body movement.[57] In this understanding, tasks such as typing,
needlework or playing an instrument, seem to correspond to this notion of self-identity
sustained in 'implicit memory', and preserved in amnesia or Dementia.[58] Considering
Kontos's perspective, Chadwick's self portrait appears to suggest that we are more than
our brains (Zwinjberg, 2009). At the same time, it is a reflection on how
autobiographical memory and identity are constructed and dependent on physical
experience and hands-on knowledge. I suggest that Chadwick, through a balanced use
of effect via visual encounter – using oppositional forces to dissolve contradictions –
was also questioning the superiority of vision and provoking resistance to reductionist
understandings of life.

Chadwick's declared interest in bypassing and dissolving binary oppositions such as
visceral/cerebral, male/female or seductive/repulsive, thus dismantling hierarchies and
power positions, allows comparison of her approach to the actor-network theory. This
involves mobilisation of objects and inscriptions; permanent transformation of facts into
doubts and doubts into experiments, and from there into further inscriptions and
relationships that end up as facts. I see this endless chain of circulation of inscriptions or
drawings (Latour, 1986: 19) as Chadwick's intention: a challenge to the idea of taking
anything – such as notions of identity, autobiography or memory – at face value or as
definitive. I read her works as a call for a multilayered and relational understanding of
identity and memory, and a celebration of the need for constant adaptation according to
context and time.

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[55] As noted with regard to Anker's work the analogy with the butterfly becomes recurrent not just via the
morphological resemblance but by the metaphor of flying away as a thinking, remembering or dreaming act.
[56] In her article she compares this understanding to Merleau-Ponty's embodied consciousness; with the body in direct
relationship with the space-time we live in.
[57] Examples can be observed in a direct relationship between a pain in the body and the reflex movement of placing a
hand on top of that area.
[58] This notion appears to contradict Kandel's (2006) notion that loss of memory equals loss of self.

The Assessment

During my research I submitted myself to three[59] neuropsychological assessment tests similar to those undergone by patients followed during a clinical trial for a new therapeutic drug. In an approach that resembled Chadwick's when producing *Of Mutability*,[60] the act of being assessed, whether myself in the studio, or a patient in the laboratory, is an intimate action, performed with an economy of means.

This installation results from the progressive investigation of *The Approach* and *The Archive* and attempts concisely to explore the ideas framed by both Latour and Chadwick. Though Chadwick's concerns and methods were very different from my own, I recognize some principles in her approach that resonate with my own work. These may be summarized as her will to be the subject and object of her work, the mimicking and restaging of existing gestures and meanings, the multitude of assembled references and her curiosity and investigation of scientific practices and paradigms. Latour frames the production of inscriptions, knowledge and the growing network of associations my research project condenses; specifically because the project deals with the investigation of a disease in the scientific ground.

The final form of this installation is a double split-screen projection of four simultaneous video narratives: the condensation of an extended exploration of different actions, moments, locations, and materials (Fig. 59). The body of my studio research incorporates two-dimensionality, three-dimensionality, photography, sound, and video performance exercises. In performing these exercises, I experimented with drawing, text, voice, collage, mould-making and casts, photography and video. The notion of repetition, the visual, order, and montage is significant to my work's content and physicality, and allowed exploration and experimentation to evolve into a synthetized video installation work.

The time spent reflecting on and making decisions about my laboratory records and studio output, informed by comments from those who attended previous exhibited works and conferences, is intimate; it is also a process of investing knowledge and emotion into a recurring process of construction and deconstruction that resembles the function of autobiographical memory.

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[59] These are MMSE, ADAS – Cog and NTB. Examples of the tests may be found in the appendix.
[60] Exposing her to the photocopier machine.

When placed in sequence and presented together, the fragments of video establish previously invisible links that approach the separate actions and construct bridges, transforming what was an invisible link (or a formless 'actant' such as a whistle[61] that later identifies the protagonist) into a necessary narrative (Fig. 60). The idea of assessment is transposed from the content and context of the images to the negotiation between viewer and multiple viewpoints, i.e. multiple simultaneous projections, implying a heterogeneous outlook. The multidimensionality of the installation and the fragmented experience of the viewer becomes the representation of multiple layers of memory and meaning, in a constant interrelation between the external experience and its internal reality.

These articulated fragments of memory and fragmented bodies, mainly hands and representations of the body, aim to change the path of our understanding of the construction of autobiographical memory and identity from a basis in lived or observed experience to a witnessing process of permanent reconstruction – or, in the case of patients, to an increase in the gaps and silence and absence (Fig. 61).

The evolution of *The Assessment* stems from the emotions I experienced during the diagnosis and follow-up procedures of Alzheimer patients, and from reflection on the data I captured in the molecular biology laboratory plus those I was producing in the studio by a mimicking strategy.

Once diagnosed, Alzheimer's patients become trapped in a semi-visible network of assessment strategies; they surrender to the vigilance that surrounds their condition and become observed – hence the panopticon metaphor – by everybody, all the time. The institution constitutes the medical and scientific archive by producing endless chains of inscriptions and actions, as noted (Fig. 62). Outside the institutional frame, friends and relatives silently observe every mood, move and sentence to identify growing flaws. The most frightening observer is the patient himself. Tom DeBaggio explains how diagnosis of an incurable disease influenced his self-reflexivity and production of a written self-centred or even narcissistic journal:

> With any untreatable, disabling malady, victims become sensitized to every
> movement of their body, every breath, searching for change and studying the

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[61] The whistle is one of ten objects used in the recognition test of the neuropsychological assessment. The other nine are a baby's rattle, doll's bed, wallet, harmonica, plastic flower, carnival mask, funnel, scissors and stethoscope.

course of the illness until it threatens to destroy friendships and love of those around them. Writing about it may be a way to legitimize my almost continuous contemplation of the subject [...] (2002: 7)

Reflection on *The Assessment*

In translating the theoretical themes discussed above into my installation work I used video recordings, photographs, drawings, writings and sound, to record myself working in both my art studio and the Alzheimer's laboratory. I use these as inscriptive devices for self-observation. I regard all elements of my research, both inside and outside the laboratory, to have equal significance.

My bodily features and actions are emphasized and magnified alongside those of researchers and patients, except that I have no ethical restraint on identifying myself. No attempt is made to idealise my body or actions or to edit my appearance or performance. The alignment of my actions with researchers, medical staff and patients also serves to heighten this condition. Continual repetition of the same fragments diminishes the allure of the body and the focus on appearance in favour of the accuracy or intention of the actions performed and the act of remembering and anticipating.

The aim of the installation is to assess the performances and the objects (Latour's actors) of the investigation into this debilitating disease as appropriate representations for evoking the intimacy of the experience.[62] I sustain my decisions not just by using medical reports on how memory operates but also by the emotional tension of being in the 'witness' position. What DeBaggio seems to be claiming is turmoil, not just of his cognitive abilities but also of his life relationships, including his relationship with himself. This can be seen as a double disruption in the autobiographical memory system; the person is gradually deprived of the facility to constitute new memories and juggle those they have in order constantly to construct their identities. They are also deprived by their constant state of assessment, which fragments their embodied experience of living and their identity. Patients are left in

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[62] Including my own performances in which I identify with the subject: in editing, I have to make my own self-assessment performances, in which I recognize my slow replies and memory slippages as something happening to another person and must confront wrinkles or gestures I have forgotten that I have in the mirror and simultaneously see myself assessing me.

the liminal position of consciousness of their sickness while forgetting what they experience while sick – they are constructing, I would suggest, a transparent identity that departs from a volatile (i.e. *Of Mutability*) status and the impossibility of taking anything for granted (i.e. status of uncertainty).

The installation unsettles conventional representations of the loss of memory, and also unsettles viewing relationships. The audiovisual work offers ways to negotiate individual memory loss, and explore scientific practices for investigating this process. My visual strategies in postproduction incorporate editing grammars, strategies such as fractures, slow motion, mute moments or repetitions, which engage the viewer in an emotional affective reaction. I intend to draw viewers into the process of memory and remembering without relying on their identification with the theme, but allowing through experience and feeling an engagement and intellectual reflection.

Chapter Four: The Therapy

Previous chapters have explored issues surrounding the search for neuroscientific understanding of Alzheimer's disease. In my studio, I have re-enacted some of the procedures relating to hospitalisation of the patient, the archiving methods used in molecular and clinical laboratories, and assessment of the patient's condition, such as neuropsychology tests.

This chapter examines therapeutic approaches to Alzheimer's disease and my own studio research. It explores visual art's potential for re-enacting established practice in four virtual archival spaces, as an evocation of autobiographical memory, a reflective experience and an act of humility. The evolution of my artwork is detailed as a series of cycles and stages, and as a systematic engagement with people and procedures, inscriptions and inscriptive actions, that involves both me and the patient in the process of investigating their own reality. During this process I became both apprentice and instructor: the subject and the object of the gaze of my camera and my own mental reflections.

As discussed, from my understanding of the scientific research field, it is difficult to formulate a coherent strategy that encompasses all the signs of a disease, its assessment criteria and the archival data. Following the lengthy process of screening, assessment and diagnosis, doctor and patient must negotiate a therapeutic approach to Alzheimer's disease. This usually involves pharmacological intervention to diminish symptoms such as anxiety and depression. Hope is sustained by the delaying of further consequences and the slowing down of dementia.[1]

The therapeutic approach

The pharmacological therapeutic approach has been able to delay the stronger and more perceptible manifestations of the disease, but has failed to alter the path and natural

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[1] A study by University of Barcelona neuropathologist Isidro Ferrer (2012) posits that Alzheimer's does not necessarily lead to dementia, despite previous literature and the documented experience of families and medical staff involved in its treatment that seems to suggest the opposite. He reinforces the need for all types of therapeutic approach in the early stages of this disease in order to prevent its progression.

pragmatics of memory loss, and has enhanced cognitive performance and functional autonomy only slightly. Joana Pais (2008: 309) says that many clinicians and institutions are still reluctant to use non-pharmacological therapies alongside conventional medicine. The main obstacles are seen as patient resistance and health service reluctance to support anything beyond speech therapy. This disregards scientific evidence (Pais, 2008: 309) of the benefits of alternative therapies, evidence that shows how repetition and regular training can benefit both patients and carers. In the unit where I was resident, however, neurologist Professor Alexandre de Mendonça and his team endorsed many different non-pharmacological therapies in conjunction with pharmacological treatment.

Professor Manuela Guerreiro[2] (2005: 121) notes that though cognitive rehabilitation techniques have been used on Alzheimer's patients since the 1960s, academic and scientific curiosity in the area was initially limited. This has changed over the last two decades, but it is still difficult to quantify the efficacy of such intervention and the extent to which competences have been acquired or enhanced. Cognitive intervention is generally proposed only when a rapid decline in the capacity to perform daily life tasks, associated with the decline of memory and related physical and cognitive actions, has taken place.

Alzheimer's disease is frequently categorized in three stages relating to the functional autonomy of the patient: initial, moderate and severe. Therapists suggest that cognitive stimulation should begin during the initial stage or even in the pre-Alzheimer period known as Mild Cognitive Impairment. Such programmes aim to enhance the ability to perform daily life tasks, thus maintaining the patient's independence for longer. Guerreiro (2005: 124) sees the patient as a whole person, not reducible to cognition or cognitive deficits. Each intervention, whether medicinal or alternative therapy, takes account of the biological subject as well as issues of cognition, emotions and the familial and social context; there can be no 'match all' programme for non-pharmacological therapy. A programme tailored to the specific needs of the patient must start by assessing the capacities he or she has preserved, as this rehabilitation aims to preserve undamaged functions and increase less-visible or diminished capacities. Assessment should include (Guerreiro, 2005: 126) quality of life, assessed either by the

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[2] PhD researcher at the Language Studies Laboratory, Centro de Estudos Egas Moniz, Lisbon University Faculty of Medicine and Dementia Clinics IMM, Lisbon University.

patient or a carer if the patient is unable to judge the reality of their own life, in order to identify the most significant areas for each individual.[3] Such assessment should be carried out in conjunction with diagnosis and should include tests[4] to quantify the functions of the superior nervous system and their respective processes, according to normative scores based on age and education.

Therapeutic methods and techniques

Any approach adopted should take account not only of the severity of the patient's condition but also of preserved memory and language functions. It should incorporate training in specific areas such as episodic memory and attempt to enhance daily operational skills. It should be subject to constant review, and be capable of adjustment according to the current capacities of the patient: 'flexibility' (Guerreiro, 2005: 127) is possibly the prime factor.

The therapeutic methods most often employed in the pre-degenerative stage rely on explicit memory, with an emphasis on re-establishing a more efficient use of memory. Therapeutic interventions include repetition and training as well as learning and compensating strategies. Though the use of these repetitive techniques is widely associated with learning and better general memory function, there are fears that rehearsed skills are not easily translated into other activities so have limited efficiency. Results seem to be better in terms of numerical capacity than language. When training is directed towards implicit memory, including procedural memory, results seem better, because this type of memory is better preserved in AD patients. Besides repetition, another technique uses multi-sensory systems to acquire and codify information, which translates into easier retrieval. The inclusion of visual and verbal stimuli for direct patient participation ensures that the patient is not simply a passive subject being shown or told something to remember or repeat. Patients are encouraged to use external

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[3] Guerreiro also defends the need to assess the quality of life of the carer and respective family, and to identify clearly the impact that the proposed intervention would have in the familial structure.

[4] Usually including the *Californian Verbal Learning Test* directed towards the codification, consolidation and recuperation of information. Further instrumental activities of daily life scales include the *Lawton* and the *Disability Assessment for Dementia* scales and psychopathological symptoms scales such as the *NPI*, the *Satisfaction with Life* and the *Geriatric Depression* scales. For information on these tests see the bibliography and appendix.

memory aids including watches, pagers, notebooks, calendars, signposting or coloured stickers to aid retention.[5]

An increasing use of the arts, including crafts, drama, poetry and music, as an intervention method is usually associated with improved social and emotional function and a reduction in behaviour problems. Gregory (2002, cited in Guerreiro, 2005: 131) concluded that such intervention has a positive effect on stimulating attention capacity and dynamic social relations within the patient group, as well as for carers and medical staff, thus increasing emotional and affective responses.

In recent years interest in art therapy[6] for older people with dementia has grown. Information on the professional background of practitioners, the client group, care settings, theories and methods that underpin this work is limited, but it is likely that many art therapists are the first from their profession to work in a care setting. The fact that these pioneer therapists are unheard and stay unheard relates to their newness within these established settings.

If not kept motivated, Alzheimer's patients can quickly become dependent on carers. From the late 1980s, therapeutic activities such as *Reminiscence Therapy, Validation Therapy* and *Reality-oriented Therapy* were introduced to care settings and memory clinics. Robert Butler (1963, 1974) believed that people could be helped to find 'a state of peace in old age' (Butler, 1963: 529) via a life review. The resulting *reminiscence therapy*, which is still used, centres on a themed group activity focusing on a specific time, using props such as postcards, photographs, newspapers or household objects and music of the period to stimulate discussion and memories. The therapy aims to provide a shared activity and to increase attention span: a personal interest activity that values the subject's history thus enhancing the sense of identity. *Validation therapy*, initiated by Naomi Feil between 1963 and 1980, brings together techniques from behavioural and psychodynamic therapy. Initially conceived as a communication stimulus for cognitively impaired people, it has in recent years been used widely for those with dementia (Guerreiro, 2005: 135). It is based on accepting the person's reality as he/she experiences it through a series of validating techniques. This therapy increases

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[5] In one laboratory meeting I was shown a patient's archive that contained all kind of date keeping. The obsessive writing down of dates on every surface was the first symptom that the person was unwell, and using the assessment methods described in previous chapters it was proved that this person had a cognitive impairment.

[6] Other experimental techniques such as doll therapy are the focus of recent investigations.

communication and empathy and has much in common with the principles of person-centred therapy (Brooker, 2001), as does resolution therapy.[7] *Reality Oriented Therapy*, created by J.C. Folsom in 1966, aims to promote relearning of information on orientation in order to enhance control and self-esteem, and is performed daily for roughly 30 minutes. Themes such as date, space, location, meals, participants' names, the weather and personal and cultural main events are brought into informal or formal stimulation and help is provided if necessary.

During the 1990s, awareness of the need for non-verbal psychological intervention, combined with circumstantial evidence of the benefits of therapeutic activities in the care setting, led to interest in the arts and then to art therapy. It is difficult to quantify the changing dynamics of the therapeutic relationship.[8] It is also difficult (Guerreiro, 2005: 139) to demonstrate the potential quality and significance of the therapy encounter, the complexity of establishing and maintaining a therapeutic relationship[9] and further to set the conditions for a controlled clinical trial.

The Therapy

Studio research methods

These include: performing rituals; making instructional performances; exercises such as copying simple forms, spotting patterns and rhythms of letters and numbers; establishing items in the appropriate places, making relationships between one archive and another; editing video and photographs; travelling and translating; finding order and remembering. The concept of therapy and my decision not to try to follow new

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[7] Resolution therapy develops aspects of validation therapy, adopting a 'less structured, more psychodynamic and individualistic approach' Woodrow (1998: 247). Carers are encouraged to listen for hidden meanings behind the verbal and non-verbal responses the person makes and to respond to these.

[8] Psychotherapists offer patients a relationship different from that of the medical/care staff worker. They are trained to identify the symbolic and metaphorical themes that emerge from their client's stories. The aim is to support the client, to help him/her with ego strengthening. The verbal psychotherapist may act as narrator helping a person to remember the stories and words he/she has used. When verbal skills deteriorate other non-verbal psychotherapeutic forms of support are required. The arts have increasingly been seen as a source of potential healing, though some debate surrounds the use of informal versus formal arts. Current literature displays a lack of understanding about how art therapists work with this client group.

[9] Joana Pais, a psychologist working in Oporto and a collaborator of Belina Nunes (2008: 316) outlines three core factors for the success of cognitive stimulation in AD patients: duration, intervention flexibility and carer devotion. Regularity and maintenance through several months involving carers and home tasks allow the learning process to expand towards the patient's life context.

patients[10] allowed me to locate my studio activities round objects and materials, via a project that was essentially a process. The artefacts produced in the studio were not conceived as an installation work but are the residue of the research process. They constitute the basis for the work both of this chapter and the thesis as a whole, and are part of the archival enactment/re-enactment in the studio. In the process of translation from an orchestrated scientific approach towards the more associative montages of the re-enactments, I propose the use of fresh personal narratives or an intertwining of the imaginary with the real stories of the 'actors' (Latour's term), thus blurring the boundary between the real and the invented and approaching more closely the associative power of autobiographical memory.

I use deceptive and disappearing techniques including paper works, cast wax objects, video fades and semi-erased chalk inscriptions as metaphors for the dialectic relationship of reconstruction and decomposition of memory and the persistence of presence/absence in the memory of the materials. The works produced by these techniques resemble diagrams found in laboratory protocol science manuals, neuropsychological assessments, children's 'how to draw' books and cognitive stimulation therapy exercises. Understood as part of this procedure are forms that are invisible at first but gain substance over time, such as meaning in diagnostic images, as are other forms such as laboratory records. Science and art may be bridged via these links, as noted by Anker.

In therapy sessions, in my studio and in the laboratory, schematic type of figures grew repeatedly and slowly from recurring, rehearsed actions. Such methodology is therefore responsive to observations made in the actual laboratory context, in therapeutic guidelines, in my studio practice and in textual understanding of how autobiographical memory functions. My interest in therapeutic neuroscientific guidelines arose from the ways in which these challenges and descriptions may be indirectly incorporated into video sequences, as a transforming layer of the image sequence that actively engages affect. What emerged from these words and images represented a heightened synergy between the optical and linguistic type of images. Transforming this working process

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[10] Initially I had hoped to follow patients during their therapeutic sessions. This became impossible for various reasons including the deterioration of the patients' condition and inability to afford the expense of attending sessions. After rethinking the process I decided to follow the most important criterion of therapy, flexibility, and use the psychology guidelines and my own studio performance instead. This resulted in a productive reflexive tool allowing me time to return full-time to this archival place and conclude the practice-based research.

into an installation work has been challenging: presentation of *The Therapy* has been planned in various formats including a different series of work appropriate for a large space, whether a gallery or some other place.

As discussed in the introduction, representational strategies addressed by this thesis are not limited to the visual; they can be anything that is a conduit for a message. They may include gestures, elements of language, spaces and experiences in time. When re-enacting the archive as part of my methodology and also as a therapeutic strategy – a repetition of previous actions – I observed that video depicts the body and action flowing and changing over time. Like photography, video is often understood as a technology that is designed to frame and document 'the real'. The images I captured, however, were influenced by the attention I gave to the object of my gaze, my ideological imperatives and ethical sensibilities, and also by the logic and formal qualities of the setting and the technology itself.

The audio-visual data I recorded in the laboratories allows me to examine coordination and mutual elaboration through various semiotic resources and the environment in which the action takes place, exploring how actors constitute their social world though juxtaposition using language, body orientation, gesture, and material structure in the environment. Examination of the details in the laboratory images that the camera inadvertently picked up, such as random objects left lying on work surfaces and background noise, highlights the similarities between everyday, generic human activities and specialized, scientific practices.[11]

The power of images

The complex dynamics of the gaze have been articulated in some depth throughout this thesis. Writers including Foucault, Crary, and Sturken and Cartwright have sought to explore the power dynamics inherent in looking, and have highlighted the ways in which hierarchies are established in these representational structures. As with the

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[11] Alač (2006) and Latour and Woolgar (1986) have demonstrated in their laboratory work on image learning processes that the often-unseen details of the scientific world are embedded in ordinary gestures and generic interactional practices. Gaining knowledge consists of an active involvement of gesture, talk, gaze, body orientation, and the historically built material world.

performance/installation and video artworks, I have incorporated into this project key aspects of critical thinking about the gaze and in particular how it operates as a mechanism of control.

Researchers who are interested in the social aspects of fMRI, PET scans and medical time-coordinated visualization, including Anne Beaulieu[12] and Rosana Monteiro, examine questions of visualization and digitalization of knowledge in science. They assert that scientists who use fMRI, PET and ultrasound reject the importance of representations as visual data. While this research, largely grounded in analysis of discourse on fMRI and PET by practitioners such as Dumit, Monteiro and Beaulieu, engages successfully with questions concerning objectivity, standardization and generalization, it remains somewhat removed from particular circumstances of scientific practice. It thus leaves questions of materiality and embodiment largely unexplored. Morana Alač (2006) examines everyday laboratory practice, describing how practitioners engage with digital brain images while they coordinate a variety of multimodal semiotic means such as gestures, speech, the gaze and body orientation. In her research on fMRI she examines how disturbing sounds and movements are re-enacted as part of discursive social action, and how scientists reuse these events in knowledge production. In a similar approach I reintroduce the unseen performances and results of neuroscientific studies in the poetic understanding of the subject/object under study with the intention of extending the rhetorical effect of scientific images.

As noted, many investigations have studied the role of visual representations in various scientific domains (Cartwright and Sturken, 2002, or Elkins, 2008). In her research on the role of visual representations in brain mapping, Anne Beaulieu (2002) noted that neuroscientists highlight the potential of brain imaging measurement to render spatial components and anatomical referents. Simultaneously, they downplay the visual form taken by this information in order to emphasise the quantitative information it represents. Everyday activities in neuroscience laboratories are largely devoted to visually- and sound-expressed experimental data; scientists spend a significant amount of their time examining these archived traces via different strategies including document files, laboratory books or computer screens. As shown by Elkins (2008), Reichle (2009)

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[12] Beaulieu's article (2004) is mainly concerned with digital information and the networked character of research in neuroscience. Her research successfully explains some aspects of the fMRI discourse, but does not explain how scientists actually engage with visual data because it is based on researchers' reports of their practice.

and Latour (1987), visual data is necessary for transforming quantitative data into something manageable, editable and transferrable. Scientists use their hands and bodies to make sense of the material world through social actions (Latour, 1986). The artist's works I have explored in previous chapters take account of these elements in the productions and presentation of their artworks.

Vision is an embodied process because acts of seeing are produced by the enactment of purely visual information in the world of embodied actions. Scientists progressively negotiate the appearance of brain images according to the standards of the neuroscience community. Meaning does not lie in the images themselves, nor is it entirely lodged in the visual system; the reality revealed by diagnostic images is impersonal, like the general cell lines used in the molecular laboratory experiments and unlike personally acquired data such as blood tests and neuropsychological assessment and therapy.

When the results of a scientific practice move outside the laboratory in the form of scientific articles, conference talks, or newspaper reports, the human bodies they refer to become entirely transparent. The effect of these seemingly objective representations has been to constitute and legitimize definitions of normality, advanced by a range of scientific projects in the 19th and 20th centuries. In exploring the idea of visible and invisible I return to Foucault, who in *The Birth of the Clinic* claims that with practices of body dissection, the standard of medical prudence became what could actually be seen with the eye, rather than what had been fictionalized. From that point, understanding of the brain was linked to perceptual practice. Inscriptions now replace the direct gaze through the use of mediation technologies that construct visibility. Researchers who determine what needs to be seen organize themselves in multidisciplinary teams in order to produce those inscriptions, construct meaning and identify the significance produced by performing these actions. However, as noted by Casini (2008), Monteiro (2001) and Alač (2006), seeing in science requires training. It involves coordinating different processes and representational structures that exist not only in the minds of individual practitioners, but also in the immediate environment of their practice. In addition to exploring the subjects, objects, sounds and graphical representations of the neuroscientific field of Alzheimer's disease studies, my current research is concerned with dynamic, embodied, time performances and their interaction with my own performances and produced inscriptions.

As noted by Latour and Woolgar (1986) and Latour (1987), the effort to clarify and refine data from artefacts is central to laboratory practice. In a studio or an exhibition setting almost the opposite is done, by reintroducing surrounding actions, sounds, and using montage and juxtaposition to evoke the complex workings of the systems that enable production of these facts (and the complex system of memory work), rather than the facts that science claims to have achieved. 'Looking at' and 'seeing' not only relate to what goes inside the frame, but also to actions that arise from memory (experience) in the management of things/objects. Seeing takes place at a translational level and relates to the establishment of collective significance. Process thus becomes a crucial concept, and these ideas of memory and process are integral to my art making.

Video / re-enactment and the experience of 'looking at'

My video montages enact the experience gained in the neuroscience laboratory and the studio space by working with memory and its process as a mechanism for thinking. Video captures a different sense of self from that of the laboratory performance or photograph, and establishes a particular kind of distancing. The screen or projection wall separates the moving images from the spectator's space. It also renders the 'actors' in a variety of scales, points of view or framing (e.g. lower or higher then eye level), thus shifting perceptions of reality.

I am interested in the ways in which the editing process can manipulate and control the representation of the 'actors' in a way that is impossible in witnessed events (i.e. not corresponding to any of the usual views of patient/doctor/researcher, therefore, not part of their autobiographical memories) thus providing an interesting counterpoint to the experience of 'looking at'. Video allows the careful construction of different durations, scales, repetitions and the possibility of juxtaposing one time sequence into another, thus deconstructing the linear notion of time. These qualities enable me to manipulate the aura and charisma of the material examined, alluding to the characteristics of AD patients with the shifted perceptions of reality and their deconstructed and mixed up understanding of time.

In addition, both video and photography establish a critical distance between the spectator and representations of the disease and the patient's body, and can be used to

show how the process of distancing or removing the viewer from an unmediated experience operates. The intensity of these effects is alluring and can significantly ameliorate the repulsive aspects of some procedures and their context, such as blood sampling and other medical procedures. The continuous repetition of sequences creates what could be described as a mesmerizing effect for the spectator, establishing preconditions in which the spectator's attention may be captured.[13] The spectator is caught up in the voyeuristic act of looking at the other, and also at his or her own performance: some parts of the video work suggest games such as spotting a specific letter in patterns of letters in line.

Initially, the video work suggests a seamless narrative quality via the consistency and repetition of the same actions, approximating the way in which the brain deals with memories to assemble coherent narratives. The appearance of certain 'action triggers' such as 'close your eyes!'; 'what day is today?' or the use of different rhythms, however, ruptures this system. Over time, the meaning of the work is shifted by techniques such as looping or continually re-playing the footage, and gradually altering the length of clips or the frame rate. Where the experience of the first performance is initially intriguing and engaging for the audience, this cannot be maintained over an extended time; indeed the effect of the actions may be diminished by over-exposure.

The use of video and photographic[14] material produced by both the scientists and myself acts as a realist dimension that provides associational narratives and histories. It evokes a laboratory diary, referring to the path of my own experience throughout this research. The body of work uses mixed media including photography, cast objects and video drawing in an installation artwork to explore sensual and embodied spatial potential. The aim is to implicate my audience both emotionally and bodily, encouraging them to consider how my experimental and witnessing experience influences their perceptions, and to reflect on their own corporeality and conscious 'time travel' (Tulving's concept). By this, I[15] facilitate a fragmentary and multimodal approach to re-enactment of several possibly related events that informs a fleeting sensual and cognitive experience. This, I feel, should

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[13] It is from this relationship that the conditions for establishing a critical distance are activated.

[14] Susan Sontag argues that the role of the photographic image is not only as an image of the interpretation of reality but also as 'a trace, something directly stencilled of the real, like a footprint or a death mask' (Sontag, 1977: 154). To her, photographs are 'not merely a tool of memory but an invention or a replacement' (1977: 165).

[15] I also hope to dilute the authoritative voice that may result from presenting a personal perspective of my own autobiographical memory.

extend the institutional panoptical gaze on the patient, transforming my personal experience into a complex perceptual and embodied experience that, like autobiographical memory as I understand it, takes place in the present.

Memory and narrative in *The Therapy*

The most recent installation represents a culmination of my thinking about whether the autobiographical memory process can be evoked (Fig. 63). It was realised following discussions, presentations and reflection on previous work alongside studio exploration of therapeutic strategies such as reminiscence therapy. At this point, I consider that the work answers most of the questions raised during my research. It does this by drawing viewers in to become participants in the creation of access to their own experienced and reflective spaces, in which the body, their actions, their attention and their memory are acknowledged. The complicity of spectators is a necessary condition for my praxis: the work is mediated by the audience, who are thus introducing consciously their own actions and reactions to the experience.[16]

The spectator enters *The Therapy* at an arbitrary point in the video sequence and may leave at will. I chose to do this rather than having a clear starting and finishing point in order to empower the audience's role in the meaning of the work. The spectator[17] must decide the appropriate duration of the piece and ensure that the whole montage has been seen. The indeterminate duration also negates the possibility of a fixed narrative sequence. Narrative structures in stories we tell, are told, or witness – and apparently in the way our memory operates – traditionally function as a guide to a sequence of events, often with the expectation that it will follow a path and offer a degree of closure. In denying such a sequential structure, I encourage the audience to construct its own meaning from the footage, based on the fragments of data available. I also aim to reinforce the importance of the formal aspects of the work to bring complexity to the issue of the representational strategies it uses. To achieve this the viewer must be drawn

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[16] My aim, as in a therapeutic approach, is to provide the props and prompts that promote audience compliance.

[17] I suggest that through the construction of the therapy installation environment, using elements of narrative in a non-linear play by repetition in parallel with objects, I am able to create this space of action for the participant, thus approaching the subjective, permanently constructed zone. My installation work is more than an idea of my own story within laboratorial exploration; it is an invitation to the observer to participate, and to explore a specific environment and therapeutic strategies, through processes more or less conducive to supporting the unfolding of an approach to my understanding of autobiographical memory.

into a self-reflexive engagement with how they come to define these parameters. The work attempts to make spectators aware that their conceptions and operation of memory are always contingent and that this divide is never fixed but subject to continual modification. Only by allowing the audience to engage and disengage with the science/art dyad is it possible to destabilise and bridge this 'divide'.

There is a compulsion to resist absence by seeking presence; for example, by keeping personal photographs or objects that invoke the presence of a loved one. Process, artefact and object-making could be seen as part of a common attempt to mitigate loss and attachment. Some exercises were carried out in a transitional material such as wax, plasticine, crayon on paper, talcum powder or ink (Indian ink or scientific dyes for histology procedures) that has a limited life; as object it acts as a metaphor for the subtle and decaying nature of memory. Its malleability allows it to be used to illustrate and express ideas and convey meaning in multiple ways that can easily be reused and transformed. In these temporary and constructed spaces, a narrative about absence, loss and memory can be written.

My prime concern is to create new language relationships via a process of ordering the visual through archival strategies, montage and juxtaposition. The aim is to generate a dialectical experience in which new meanings and resonances emerge from the aggregation of several series of works. This uses multiple vocabularies and voices, just as in the patient-specific therapy sessions. Repetitions represent both memory and my own working methods, as well as the institutional nature of neuroscience protocols. Materials such as chalkboards, chalked text and drawings allude to school, where primary and fundamental knowledge attainment is achieved, including learning about self and identity. That it represents an earlier time alludes to the suffering of Alzheimer's patients who may forget recent events, but for a time are able to recall events in the distant past such as childhood rhymes and songs.

Narrative can be as intangible as memory: its implied or subsidiary references suggest a propagation of reinterpretations, renewals and ruptures. Selection, both in the memory process and in my work, involves discarding quantities of pre-recorded data. The editing of a vast intractable flow of information results in a constructed sequence of time and places (in this specific context in my own mind

of experiences), or a fabrication of the experience of the present.[18] Memory selects what perception and attention have already selected leaving only fragments of the initial experience. The meaning of the content of any artwork or text may be intimately connected to a network of associations, the consequence of countless acts brought directly or indirectly into the scope of past experience, to be reconstructed as a form of present past. In my work, in which I refer to photographs, drawings and cast objects, the slippage between memory and oblivion stresses the dichotomy between archive and potential loss of image. This led to the discovery of versions of records that were slightly altered through acts of disintegration and fading. In developing these ideas about art and memory, my view chimes with that of psychologists and neuroscientists who believe that memory is influenced by subjective considerations that affect the ability to reference past or present[19] experience.

Affect and effect

The Therapy explores transience and reconstruction, appropriation and repetition as I contend with patients' feeble or fading memories. The concept of unbecoming – or something similar relating to neurodegenerative disease – is purely theoretical; I believe its embodied reality goes beyond words and images. Representations of absence and invisibility are incomplete, fragmentary and limited. Despite this, we are motivated to make forms of *memento mori*, memorials and rituals, compelled by the desire to hold on to something to prevent its absence. From this perspective my research, which deliberately re-enacts the traces of a previous presence of something or someone, is an act of homage to those who are fading into absence. Matters and objects are fundamental to our personal process of becoming, remembering and forgetting: they

[18] The ideas I explore in my creative work, most notably *The Therapy*, are closely related to the concept of memory. These include unreliability, personal experience and rearranged subjective narratives as well as space, time and the immediate context. Rosen (1998), Sutton (2004) and Nunes (2008) claim that memory is alterable and susceptible to objective thinking, unlike a video/photographic image or other relatively immutable object. An image, however, may trigger a recollection of another time and place, which may be re-edited and combined with other events. Recollections are vulnerable to degradation and diminish gradually with time, yet the photographic image that evoked them may remain relatively unaltered: a moment permanently captured in time. The original recordings are shattered but the storage devices – my archival strategies – that were created originally to recreate audio-visual experiences and objects become instruments.

[19] The present is marked by a predisposition to re-enact some events. Memories may not be perfect reproductions of experience, but are a consequence of the effects of time and experience that follow interaction between the original experience and its recall in the present. Memory is thus both a creator and an archive, which is altered whenever it is expressed or recalled.

transfer affect and allow us to perform 'who we are'.

The inscriptive devices of the laboratories, patients and research staff, the source site, the video clips captured in the laboratories, the photographs, the texts, the presentational sites, the spectator, and myself have all been regarded as 'actors', producing traces of association (Latour, 2005: 71). Latour's term is an element that acts upon, affects and is affected. The installation *The Therapy* explores not the dislocation of the action but the affect and effect of the network of traces joined by the viewer in a dialectical process. The spectator is the site of the production of meaning; the one who engages in the bridging of the art/science discourse and who also observes his or her own actions. The spectator moves through the exhibition space re-enacting their feelings and memories; in this movement or dislocation meaning is reformulated, reconstructed, and renewed. These events as practice could be understood as multi-modal re-enactments[20] or performances of autobiographical memory, which according to Foucault exercises a form of self-control.

This work is an examination of memory and how we process 'time travel' or autonoetic awareness (Tulving, 1972). The memory or witnessed events accelerate, the frame rate increases, time shifts, and reality gives way to memory. When we witness and recall an event we operate in a similar way. What we quantify as time, exact minutes and seconds, is displaced once it is recalled from our organic memory bank. Places, spaces and memories are not static, concrete objects but areas with a distinctive reference to each and every individual.

By inserting repeated sections of video performance, my own work explores an immediate reaction to space, place and how this sensory data from our surroundings is interpreted and affected by past memories. The looped sequences, with the subtle changes signalling a return to a future previous action, repeat endlessly until, unlike the drawings, objects and photographs that exist materially in the work, the light that constructs the image reminds the viewer of cinema and television. Image as light, producing representations of space and also of time, enables and re-emphasises this disappearance of the referents and their representations. Spectators entering the

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[20] Re-enactment differs from the original event, but it may presume or critique the authentic nature of its referent. Access to its referent is mediated through memory traces, which inevitably form an incomplete and untrustworthy model for its restaging. It therefore becomes what those re-enacting it want it to be.

exhibition space find themselves in a real space[21] that may be shared with other people and objects, and in a personal affective space of interaction with the artwork.

Reflection on *The Therapy*

The culminating exhibition *The Therapy* is perhaps the work that epitomises the connection between my previous works and my ideas (Fig. 64). As a new media installation it opens itself to many potential entries and engagements with multiple flows of light, sound, space, surface, touch, perception, such that the body of the viewers and the body of the work can occupy shared time-space. Shown in Lisbon's Museu da Ciência e da História Natural, in an exhibition titled *uma coisa entre muitas,* it presented previous works whose history has been 'mapped' (*The Approach* and *The Archive,* reinvented as different archives); four collage/drawings,[22] and two sculptural forms comprising blackboards with inserted LCD screens presenting different video sequences. This final work consists of a rambling model of multiple montages embedded with four LCD screens showing videos of different 'actors' performing various activities. It may be compared metaphorically to a brain in a multimodal systematic working when involved in autobiographical memory. The light in the gallery emanating from the videos and a few spotlights offers objects and drawings to the gaze and simultaneously prevents the whole scene being shown at once, compelling the observer to interact with the space shared by the objects, images and other potential observers.

As an approach using reminiscence therapeutically, *The Therapy* maps the development of the body of work via a making process that consisted of a series of experiments, directions, decisions and responses, including the meetings between opportunity and agency that became available in the work. It also functions as a reflection on the previous installation work and data gathered in the laboratories. In documenting to some

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[21] Video makes the scale of the elements of space an important element of the creation of an aesthetic experience. The artwork embraces an articulated personal space as well as the technologies and forms necessary for institutional archiving space, assessment and therapeutic strategies.

[22] The drawings were specifically made for this exhibition and were constructed as a therapeutic activity of copying the visual forms of the ADAS – Cog examination into a large collage as a puzzle. The small pieces of tinted paper were made by placing handmade paper in neuropathology dyes (coloured, ionising, aromatic organic compounds) used for histological purposes. I used eosin, Hematoxylin, orange gelb, neutral red, luxol fast blue, EA 50, and light green.

extent its development – the story of my residency and studio research – *The Therapy* extends access to the work by revealing the layers of its processes, and showing glimpses of moments outside the work that became present within it. It thus plays between the apparent opposites of visibility/invisibility and remembering/forgetting.

As an exploration of memory *The Therapy* has shown me the potential of productive remembrance, which moves, sees and transforms by ordering the visual in a permanent montage of the archival condition to which we belong. My artworks can evoke but not describe memory, because memory depends on such a personal process of reconstruction. Rather, my artworks are tangible manifestations of change and reconstruction that conceal re-enactment and memory. Juxtaposition and montage techniques and processes render the video image unstable, layered, and ambiguous. Image data still carries a residue of my bodily presence, creating an affinity with viewers because it holds a metonymic relationship to their own body. I exploit the material quality of the real brain disappearing by experimenting with the vanishing, dissolution and perpetual becoming of the image through deliberate out of focus effects and/or digital manipulation. This, as observed by Casini (2008: 193) with reference to Marc Didou's artwork,[23] entails 'a temporal dimension of displacement rather than a mere spatial one'.

Through the production of this work I investigated my methods, such as the compositions of repetitions, rhythms and durations. I also investigated my own understanding of autobiographical memory connected to image, place and time. Memories, maintained through objects, texts and images, are the physical reminders and remainders of the intangible and provide a temporary place for the containment of our individual experience. In my arts practice the material of the objects has a function in a working through process. The process of repeating the same type of guided exercises was tedious but became obsessive, compelling me to analyse my mnemonic capacities and memory faults. I developed ritualistic working methods such as drawing following the guidelines but using a different type of paper each time. I also began looking speculatively at the texts I was reading (patients' responses and laboratory research

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[23] Marc Didou is a Breton sculptor who works with traditional sculpture materials such as metal and stone, and explores ancient enlargement drawing techniques as anamorphosis. He also appropriates medical representational strategies, such as CAT scans and MRI, exploring the transparency and slicing technology behind the construction of those medical images to conceive figurative and abstract solid layered sculptures. His work provides a case study in Silvia Casini's (2008) PhD *The Aesthetics of Magnetic Resonance Imaging (MRI): from the Scientific Laboratory to a Work of Art.*

publications), mindful of the patients' apparently-poetic sentences in the midst of the highly specialized and hermetic discourse of the scientific archive. I began to see the act of copying those 'call out' sentences as a possible approach to a therapeutic strategy in a visual aesthetic domain. The aesthetic and formal property transformed the repetitive and ritual process of the making. I realised that my aim was not to aestheticize the disease or the science but to find an equivalent form to the experience of the therapy and in this evoke the functioning of memory itself.[24]

Responses to the images produced in the enactment of the archive reveal affective experiences. My aim is to preserve the impact in order to provide a moment for affective encounter on the part of the viewer that extends the implicit drama of Alzheimer's disease and explores other narratives besides those directly implicated in the image source. I consider that affective responses precede and/or are a substitute for cognition and representation. As Latour argues, it is not just individuals that act and affect; inanimate objects as actors also act in forming social contexts for 'the type of agencies participating in interaction seems to remain wide open' (Latour 2005: 22 and 236). Objects, drawings and video sequences do not exist as artworks independent of a selected presentational context in which they are presented. On a desk in a neuroscience laboratory the images/objects resonate with the neurological research subject and appear as metaphors, inspecting tools, or therapeutic devices, as well as, in Latour's terms, inscriptive translational exchange materials. Sometimes the visual forms appear to represent emotive subjects that produce fear or compassion, but this is experienced through reasoning rather than viscerally in the moment of confrontation. Ultimately, and as an autobiographical memory process, it is in the subject's body[25] rather than in the artwork that affective traces can be found.

Because re-enactments perform previous events, traces play a dominant role in enhancing the relationship between technical reproducibility, time and reference. Re-enactment of the archive cannot be understood outside of its mediation and its relationship with time, identifying transformations that continue to take place as a result of its incorporation in different forms of technical media. *The Therapy* as a re-enactment incorporates a reflexive approach, making theoretical enquiry essential for

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[24] Inevitably, this last art project evolved in the direction of my own 'art therapy'.
[25] Encouraged by an encounter with the installation, observers might re-experience a previously affecting situation, in a way that is close to the experience of involuntary memory triggered by some unexpected occurrence.

critical practice. Reflexivity involves questioning critically our assumptions. Discussing reflective practice, Donald Schön (1984) proposes storytelling as an effective genre for the translation of research back into practice. Storytelling discloses relevant themes, and facilitates and stimulates transformation of the theme of autobiographical memory into a specific situational context.[26]

I decided on a complex and ambiguous approach to storytelling/presentation, feeling that a 'truthful' representation of my practice needed to present multiple bodies of work, to explore multiple materials, to collide and juxtapose. I created several parallel experiences of linear, mechanical time passing, but at a different rate from that of the original action and with juxtaposed storylines in an altered order, in tandem with fleeting chalking inscriptions on the supporting black boards. This allows an observer to engage with the tension between performance and repetition, event and memory that is central to the re-enactment as a representational form. I addressed and explored ways in which recordings and projection (enactment and re-enactment of the archive), both as a concept and as an artistic method can replicate and extend the medical gaze. I also, in the context of my research, followed the path taken by a patient when approaching the institution (*The Approach, The Assessment, The Archive* and *The Therapy*) so that my installations may be understood as an alternative to the representational process of research into, and treatment of, Alzheimer's disease. This creates the potential for an agency to approximate the functioning of autobiographical memory. It is my contention that the work is enriched and given additional resonance through such an approach, and that it is a comprehensive account of a research process.

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[26] I examined the methods of self-presentation in the stories I so often tell about myself and how I present what I do, and began to question how these concerns might affect notions of memory. Thinking about the re-enactment as a representational form, which puts the re-enactment to work as a self-reflexive form of repetition, opened up questions about the relationship between temporality, performance and referent in video and photography when re-enactments are not anchored by their external referents.

Conclusion

The journey through the archives

This practice-led enquiry has explored the dynamics of the encounter between diseased bodies, institutionalised scientific practices and diagnostic images, focusing on the enactment and re-enactment of the originating performances, their experiential sensory qualities and their power to address the subject of memory. These findings have been extended into cultural, social and political contexts by contrasting them with other 'realities' and private/public cultural practices.

The project has shown that our fragmented memories, body and relationship to objects, language and knowledge are characterised by paradox, fluidity and challenge in a permanent search for meaning. As a result, it is possible to address the notion of wholeness via an installation that is presented to the viewer as a new network of potential narratives about autobiographical memory, language, knowledge and self. These elements are connected within neuroscientific studies of Alzheimer's disease, the patient, and my art practice, but their relationship cannot be comprehensively defined. In contemporary understanding, memory is a constant reconstructive subjective process, as are the scenarios depicted in the installations. These may be summarised as the re-privileging of the aesthetic experience of memory, framed within the matrices of both an innovative art/science collaborative model and the evolving process of practice-based research in the visual arts, in order to generate fluid, hybrid outcomes.

The four parts of the project's conceptual framework are associated with the development of the chapters: *The Approach*; *The Archive*; *The Assessment* and *The Therapy*. The aim was to mimic the path followed by the patient during his or her experience of illness and to exhibit to a wide range of audiences. The installations and the 'virtual' archival spaces – the Patient, the Studio, the Dementia Research Laboratory and the Molecular Research Laboratory – have followed this four-part theme.

Chapter One: The Approach

The field of Alzheimer's studies was introduced, with a brief overview of the relation between Alzheimer's and dementia. Various theories surrounding the interpretation of the functioning of memory systems were approached, as part of an identified need to

further explore the complexity of the field and its associated terminology. The assessment of autobiographical memory was expanded to examine how sensual details of context and time – the experience or duration of memory, for whatever reason – interfere with the process, reinforcing the notion of memory as an activity of constant construction and reconstruction. A need to clarify technological developments in the production of scientific and medical images was identified; the co-dependency between the models and techniques, scientific discoveries, and cultural modes of seeing, were understood as part of the process.

An examination of the empirical nature of my interpretation of the diverse models extracted from theory and practice was conducted, and expanded to introduce the possibility of emotional tension. The ethical implications of meeting the patient, carers and medical staff simultaneously in their different enacting roles were also considered.

Words and concepts became part of the representational strategies that have circulated throughout the thesis, and key concepts, including 'the visual', order, archive and montage were reinforced. The artwork of Suzanne Anker was analysed in order to demonstrate her experience of interlacing the discourse and materials of art with scientific imagery, and emphasis was placed on her methods and developments in an attempt to underline the richness of the molecular understanding of the world and body. This was in contrast with my first outcome and installation *The Approach*. An expanded approach to Anker's working methods was used alongside my own in order to construct a bridge between the abstraction and fragmentation that may be seen in the representational strategies of the scientific research and the multi-layered, diverse and complex cultural and historical domain of art.

Chapter Two: The Archive

Foucault's work on the archive, and other discussion surrounding the concept of archiving and its dependence on movement and circulation was examined, in order to develop a theoretical design framework for the concepts and production of my second installation *The Archive*. This chapter is central to the thesis, in that it clarifies the four-part structure and methods of enacting and re-enacting the archive. In the practical domain, the primary variation from my original intention was that I had hoped to produce a single archival structure that was capable of accepting more and

more data relating to the development of the research. Eventually, however, separate works were produced for different venues, under the premise of the archive. These are considered to be a networked installation that encompasses sculpture, video, drawing and performance. The resulting works were produced with regard to notions of bodies, fragments and reconstitution, drawing on Foucault's theories of clinical manipulation of records and surveillance, and Mark Dion's art-related strategies which include re-enactment and critiquing of both the scientific and the artistic processes of cataloguing, archiving and display.

Chapter Three: The Assessment

The work developed in this chapter resulted from the progressive investigations of *The Approach* and *The Archive*. It attempted to encapsulate the ideas framed by Latour and Chadwick and examine the interplay between presence and absence, stressing the relational quality of both memory and my own art practice. Chadwick's works were examined and contrasted with my own. Further emphasis was placed on the tensions between the real, material, subjective patient and other bodies that circulate within the laboratories, and the anonymised and fragmentary versions of these that appear in the scientific archive and ultimately in my work.

Earlier chapters had discussed my knowledge base of ideas and reviewed the practices of case study artists and their influence on my worldview. The selected artists have experimented in various ways with scientific processes and biotechnology. This discussion allowed me to contextualise my own research via an analysis of perceived differences and similarities between their processes and outcomes and my own. The process of contrasting my work with the output and methodology of Anker, Dion and Chadwick revealed the potential of my methodology[1] to strengthen and forge new connections between different fields of practice. The sensual reading of scientific experience was a deliberate revisiting of the Baroque era's subversion of the dominant visual order of scientific reason in favour of the celebration of the confusing interplays between form and chaos, surface and depth, and transparency and obscurity. In weaving together the dialectical and unexpected, via experimental methods and presentational

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[1] While this uncovered apparent similarities between their work, the work of others in the field, and my own, subtle differences in our respective intentions and approaches were also revealed.

devices, or by inserting novel inscriptions and signs into existing modes of practice, I was able to communicate effectively with audiences that were responsive to the signs employed and/or the surfacing subject matter.

Chapter Four: The Therapy

This chapter investigated the repetitive nature of memory, the narrative structure of autobiographical memory and the nature of Alzheimer's disease, and the rehearsal and relational nature of therapies such as cognitive stimulation. The exploration of both the archived video data and the possible installation format – including reminiscences of the research path – became close to art therapy.

Under the research framework that was initially approved for this thesis, the aim was to follow patients during their therapeutic sessions. When this became impossible for reasons that have been explained earlier, I was compelled to rethink the process. Adopting the primary criterion of therapy, flexibility, I decided to switch to an approach that encompassed psychology guidelines and my own studio performance. This allowed me to focus my studio activities on objects and materials produced according to therapeutic guidelines for Alzheimer's patients. These included cognitive stimulation strategies designed to enhance attention and memory by the use of repetition, copying and external aids, via a project that was essentially a process. The result was a reflexive tool that allowed me to return full-time to this archival place and conclude the practice-based research.

The adoption of this new methodology also returned my investigation to the studio space, which allowed me to revisit the unexpected and unpredicted when performing the re-enactments. As a consequence, I explored the use of video and photography as strategies by which to simultaneously enhance distance from the subject and explore plasticity in the repetition process, thus resembling the multimodal human brain. This strategic shift emphasised re-enactment of the archive and montage as process.

The main aim of the project, to evoke autobiographical memory with the circulation of scientific representational strategies, became the networked final installation. This encompasses sculpture, video, drawing and performance and an emphatic conclusion to both the written and practical work in an object that is both practical and provocative, uses therapy skills to gain attention, and employs different neural rhythms.

Reflecting on the journey

The representational strategies used in this research have not been limited to the visual, but included anything that could be viewed as a conduit for a message including images: elements of language; objects; protocols; location and moments in time (Fig. 65). The project has been conveyed through a range of case studies and my own praxis: its premise is that art practices can include the use and manipulation of scientific practices, codes and images to produce effects and affects. It engages discursively with some of the multiple factors that influence both the neuroscientific study of Alzheimer's disease and artistic production.

Within and across the scientific field, images, gestures and objects require labels and instructions for use, in the form of explanatory or contextual text. These are usually archived and transferred with related images or other visual representations, fundamental epistemic elements in the scientific network. In contrast, as demonstrated throughout this thesis and revealed in the works of Anker, Dion and Chadwick, the circulation of images from science into other spheres follows the rules and guidelines specific to those spheres. When deprived of their associations, however, inscriptions become iconised or recontextualised in novel ways.

My work has moved towards an evocation of the mechanisms of memory, and indeed memory itself, as productive and transformative. It owes a significant debt to theorists including Foucault and Latour. In my research, notions of heterotopia, the panoptic and the actor-network theory are intertwined with my circulation and reflection about bodies and institutional spaces. These ideas have helped me to recognise and enhance the ways in which elements such as movement, spatiality, temporality, archiving, montage and enactment work together in my art-making. Foucault's use of the heterotopia metaphor/process of 'opening and closing', and 'ritual and crisis' resonated deeply, offering me ways by which to conceptualise and articulate complex embodied relationships in my artistic residency and practice. His writings on the medical gaze, control and the panoptic clearly informed the development of my video work as a metaphoric encounter that played on the dialectics of the visible/absent and a temporal event.

Within this research, the explorations in my practice involved setting up possibilities, negotiations and conditions under which to initiate and determine directions, as well

as addressing questions that arose from my experiments and making new connections between concepts, strategies, material production and experiences. As these processes are not linear or sequential, they were regarded as a series of mapping strategies each of which made use of techniques and concepts of juxtaposition and montage. In terms of archiving strategies, data collection was categorised as 'visual' or 'order' depending on function, inscriptive devices and space, or my strategic division into the four virtual archival spaces.

The starting point for the visual vocabulary used for the projects was the circulation in the virtual archival spaces and the observation of neuroscientific guidelines, protocols, methods of archiving and practices such as the neuropsychological assessment of patients and refrigeration facilities in the molecular laboratory (Fig. 66). The method devised facilitated the introduction of my own experience beyond the 'third person' observer of the traditional ethnographer. A language and methodology was developed that differed from most of my other previous works, even those relating to previous art/science residencies and collaborations undertaken during the thesis research period. For a description of the works and concepts explored see appendix II (b).

My method and the resulting installations, which reveal some of the inescapable complexities and irrational aspects of memory and neuroscience, have elicited a wide spectrum of responses from the various people who have experienced them. During my various presentations I have encountered a degree of apprehension from those who were unfamiliar with the language of installation, media arts or of the scientific signs used. When, however, I explained that I was conducting a research project involving Alzheimer's disease, many of these people engaged with the project and asked questions. In terms of the scientific community, reactions have been interesting and diverse. I have presented my research plan during a hospital meeting with the neuroscience research teams, and shown its outcomes to scientists in different situations ranging from conferences such as Crest or ISEA to exhibitions and the performance at IMM. Some of these professionals, notably certain members of the Dementia Research Group, reacted enthusiastically, while others reacted defensively or suspiciously.[2]

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[2] Some may have been unwilling to let go of their rigidly empirical stance, or may simply have been reluctant to try to understand why anyone wanted metaphorically to 'reshuffle the cards' that they had just taken the time to separate into pairs of numbers.

This exploration has a particularly personal significance because of my predisposition to adopt my own body image, performance and unrehearsed flaws in my art practice. Through the self-examination and montage strategies required by this research project, I developed the ability to identify certain almost-universal human flaws and slippages, and recognised memory's powerful association with attention, narrative and habit. I have also gained a deeper understanding of the implications and possibilities that surround the acquisition and maintenance of memory and the potential function of exercise, training, discipline and external aids. As a consequence, my development of strategies by which to preserve and nourish my own autobiographical memory has been enhanced. As a whole, the research process has been a humbling experience.

This exegesis has become a valued personal document that is partly a map but more importantly is in itself a montage of a process of exploration with no ending but many beginnings, revisitings and openings into other archives, juxtapositions and narratives. The research process has enabled me to explore aspects of reflexivity in my own personality and to subvert tendencies toward self-censoring and defensiveness in my art-making. I now value more deeply each pleasant feeling and am more able to construct a solid self-narrative: my own myth of myself.

Alzheimer's disease reveals itself in a slow process, which can reside in people for many years without any evident symptoms. Patients develop a build-up of a type of plaque between neurons; this initially slows and then degrades, thus destroying neural pathways. Observation of the thesis process in terms of both the installations and the written component reveals a similar effect in that it is gradually affecting rather than something that is seen immediately. It has also become clear, over the period of practice-based research, that the visual interpretations of this thesis cannot be encapsulated in a single final exhibition or as a sustained written argument. Instead, they have been realised via the agency of experiential development, in both the enactment and the re-enactment of the archive. This has resulted in several presentations, publications and exhibitions, documented visually as DVD-Rom material.

What remains unclear is whether the work that I am making is straightforward and accessible or overly hermetic and mystifying. While treading the line between revelation and concealment I aim to be authentic about my intentions and my aim of

bridging the gap between the fields of neuroscience and art practice. At present, there seem to be too many overlaps: what I initially believed was a fine line separating the domains has expanded into an invisible network of people, actions, time and context. As a result, I now feel that the only appropriate method of presenting the juxtaposed and multimodal construction seen in the installations is the montage as a process. Because the margins overlap, I no longer need a bridge but a code – which may be turn out to be the passage of time plus a predisposition to an open heart – by which to gain meaning and be moved (Fig. 67).

Meaning and knowledge, sometimes as memory, seem to originate in a place that consciousness would like to disown. Thoughts and memories do not always present themselves as helpful to the daily projects of life or science, so are disregarded. If it were possible to archive rather than to discard these random connections and impulses, they might offer an interesting insight into other ways of conceiving memory and identity: as glimpsed fragments of how things could be and as images that touch us briefly and find an understanding and reaction.

Collaborative futures

By their generosity in allowing me into their research environment, the dementia research neuroscientists have embraced the non-logical, intuitive, humorous and poetic aspects of their tradition. They have also shown a willingness to explore the associative and poetic forms of logic that my artistic process implies by supporting my intention to submit a bid for a future joint research project. It is therefore possible that science within the field of this disease may evolve in unexpected ways that are allied to greater awareness of philosophical, cultural and historical factors and the myriad possibilities of finding and expressing knowledge. In time, scientists may come to believe that art practice can be a powerful form of research that is complementary to the scientific pursuit of knowledge, and derive examples and practical advantages from this.

As an artist I close the loop by feeding back into the wider culture – if not with an explicit revelation of the kind for which scientists strive, at least with a willingness to contemplate new forms of knowledge. This is to be achieved using visual and sound languages that are not explicitly bound by the laws of empiricism and logic, but are

rather strategies that emphasise play, dialectics, drama, humour, and ambiguity as paths to evoke autobiographical memory. There is encouraging evidence that scientific researchers are also attempting to open up dialogues and collaborate with artists in order to build on and share knowledge and cast a new light on their own work. This became evident during my diverse public presentations.

Outcomes of the research

This project takes the form of practical and theoretical investigations into Alzheimer's and the scientific research into the disease, and is framed within the matrices of both an innovative collaborative art/science research model and the evolving process of practice-based arts research. The exploratory research is discursively located within the paradigms of autobiographical memory, neuroscience and the visual. This allows the boundaries between the philosophic and scientific disciplines of epistemology, ethics and aesthetics, clinical neurology, molecular biology and technology to become central in a relational network associated with remembering and forgetting, presence/absence, and concepts of identity.

The human brain is a kind of archive that retains traces of our experience of the past, yet is often unreliable and arbitrary when we attempt to gain access to it. The images and experiences we retain, the places we have known and the feelings we have experienced tend to become fragmented and reorganised when our brain attempts to recall them. The result is a collection of subjective adapted recollections as, in the process of evoking past experience, our memory reconstructs, converts and updates it.

Throughout the research, the initial idea of the laboratory as a heterotopia associated with the ritual performance of aseptic practices and protocols became indistinct from the heterotopic category of confined chaos and crisis. The visits to the hospital and laboratories allowed for a direct engagement with the 'crisis-ridden' and 'disordered' world of neuroscience and the rituals and protocols associated with those actions. The re-enactment of the archive allowed the 'chaotic' and 'disordered' actions of the laboratory work and studio practice to be recovered, as a reintroduction of the process of remembering (reconstruction, update and conversion). The studio work that was produced was intended to be a basis by which to test ideas, while archival artworks,

drawing, and digital imagery were starting points for subsequent projects. The artefacts and installations presented in the exhibitions were mostly devoid of textual explanation and commentary, with the aim of emphasising direct sensory experience; however, throughout the written component (exegesis), I have taken the creative liberty of including textual fragments, repetitions and other visual elements as a means of suggesting that a form of fragmentation, reorganization or slippage and breakdown in our reconstructive capacity has taken place.

My aim throughout the project has been to create participatory spaces in which to open a dialogue between artist and viewer/participant, in order to enable a re-evaluation of the role and potential of the art installation to evoke the nature of autobiographical memory. The positive outcomes from this research journey included the hope of an extension of myself in terms of my practice and my ability to move beyond the short art/science residency activities I have previously experienced. Graeme Sullivan (2005) said:

> The experience of the artist is the core element in the creation of new knowledge and the potential for new understanding is further enhanced through research projects that may take varied forms such as exhibitions, performances, and publications (Sullivan, 2005: 191).

Relationship between theory and practice

Throughout this project there has been a constant interchange between the visual manifestations of my research and the written exploration, and between the problem-solving strategies and the practical outcomes. I therefore had to consider and weave together the material of my subject, method and the form of my process. The method I have explored is drawn directly from my practice, and my aim has been to achieve a coherent methodology that links theory-based research, laboratory observation, ethnographic practice and studio praxis. As the focus of this thesis shifted from the case studies in both science and art, to the production of the studio work, it became increasingly difficult to separate the personal from the scholarly. In an attempt to document this journey of discovery I have explored strategies by which I have been able to integrate the personal voice in the text when appropriate: in some instances the personal voice insists on making its visual and autobiographical mark.

The process of researching, writing and rewriting this inquiry has been complex and has been enriched by a series of concerns and real-life contingencies that seem to require

integration as part of my strategy at each revision. Further, the ethical dimension of the research demands a considerable amount of time for recording sessions and the archiving and editing of collected data, as well as for the working process, appropriated discourse and written reflections.

Contribution to knowledge, potential benefits and applications

As an artist, I am anxious to address people outside the visual arts in some way. As an artist in residence I may not be able to exert substantial influence, but the challenge to expose concerns to a broad audience is a major motivational factor in the production of this research. Using the guidelines of neuropsychological assessment as a focus for performance and personal change, in the context of reflection and art installation, I have produced a strategy by which to elicit a change of attitude in an audience. Nevertheless, I am aware that my evaluation of the research outcomes is necessarily subjective in that it is based on the responses of my supervisors, peers, friends and other participants, as well as self-critical reflection.

My practice involved a sense of method, of planning the direction of the making, and of following strategies of mimicking or using assessment guides, but my process unfolds via the cultivation of a sense of openness and readiness to respond to expressive material elements, framing, time and space as they arise during the making and montage process. I have found Foucault's and Latour's work especially helpful in clarifying and articulating my studio methodology, because their deployment of ideas about the medical gaze and scientific processes of inscription, notions of control and the process of making networks provided me with the means by which to interpret, theorise and describe how my work unfolds in the spaces of its making. Their attention to the exercise and construction of power and knowledge is reflected in my installations, which explore scientific and institutional power as it is embedded and experienced in locations, visualising and inscriptive scientific technologies, archiving practices and ritualistic crafts. The thinking on the juxtaposition and montage aesthetic that runs through my practice, a method that continually opens out through my use of video installation, can usefully find expression in their emphasis on the strategic importance of simultaneity. This is manifested by my sometimes-puzzling installations of drawings, photographs, objects and choreographed multiple projections in which the camera scrutinises machines,

spaces and gestures, observing details of backgrounded structures and practices that refer to ideological and institutionalised structures. I have long preferred to work using archival connections and montage to create simultaneous narratives, as is evident in my body of work of photographic collages, mixed media drawings and video.

This research project contributes to the art/science field through practice and reflection, by constructing connections between neuroscience and arts practice and research, using scientific material and theories to inform and guide both the practical work and the reflective practice in order to expand scientific views in diverse ways:

1. New and useful connections have been made to my practice as research, and to its broader contribution to the interdisciplinary field, by engaging with practice and theory as process and strategy rather than paradigm, and with the works of other artists whose thinking has helped me to articulate this approach.

2. The innovative structure of the thesis and the resulting works constitute a unique process that connects the subject and object of study and embeds them in the method, also touching the experience of the human being.

3. The installations engage artists, scientists and members of the public, thereby raising awareness of the scientific approach to Alzheimer's disease and leading to my interpretation of their practice via an experiential body of work.

4. My practice develops a new direction for artists in terms of the type of issue addressed (autobiographical memory and representational strategies on Alzheimer's research), and the visual strategies employed, for example my own submission to neuropsychological testing.

5. The processes of documentation and reflection involved in both the practical work and the written approach present ethical, formal and technical comparisons with the strategies of peer researchers such as Anker, Dion, and Chadwick. My process also highlights personal decisions encountered and documented in reflexive writings and archives.

The work as a whole may constitute a valuable resource for practitioners and theoreticians engaged in examining representational strategies in art/science connections or in Alzheimer's disease. The unique method, process and structure of the

thesis presents an innovative holistic model for practice-based research: negotiating the interests of the involved institutions, schedules, bureaucracies, funding, and most of all the time frame of the patient, became a fundamental part of this system. My work brings together understandings of the institutional and cultural framing of visual strategies, archiving, assessment methods and therapies. It also interrogates the possible application of neuroscientific practice and inscriptions in a different, more subjective and visual discourse on memory. In comparing elements produced by different patients (such as their written sentences) and in detecting a certain naive happiness in their personal voices, my work bring to the surface a new perspective on AD, including a productive and empowered position towards a degenerative disease and the medical and scientific system that studies and treats it.

It is possible to speculate that the extended body of work will produce several results:

a) My artistic practice may be of direct benefit to scientific investigation; which, though not a direct aim, is almost always an implicit aim when approaching a field such as medicine and health-related science. The creative methods of this research may inspire production of novel models for scientific investigation on autobiographical memory and AD.

b) The work may enhance the metaphysical understanding of science by certain scientists via closer contact with art processes, whether by daily contact, by exposure to performances at IMM or at scientific conferences and/or meetings, or even by attending exhibitions of the work. It is possible that as a result of direct contact with art or the artist, scientists, patients and their relatives may feel that they are more able to discuss their professional culture. This seems to be confirmed by invitations I have received to exhibit work at a national meeting of the Study Group on Brain Ageing and Dementia and to attend a meeting to discuss a joint funding application for the development of an arts-based method for detecting and following up Mild Cognitive Impairment in Alzheimer patients (Fig. 68). I have also been invited to redesign a visually based test illustrating idiomatic expressions to be inserted in a neuropsychology research project and qualified as a toolkit for scientific assessment. These proposals result directly from my encounters with

the Dementia Research study group and the effects of my research methods and criticism of certain representational strategies.

c) The significance of the study lay in the re-privileging of the aesthetic experience of juxtaposition and duration in the discourses surrounding neuroscientific studies of memory loss. The issue of the loss of self, and of transparency/invisibility, was a focus of cultural critique throughout the series of installations; explored through the practical outcomes of my aesthetic enquiries into the relationship and implications of medical and molecular expressions and representations of memory loss.

The DVD-Roms that will accompany the written component are integral to the thesis. They present a memory of my body of work and methods, as an example of contemporary art/science practice that can be re-appropriated, re-enacted and re-contextualised by other viewers and readers. For example, readers may use the video self-assessment guide, in which I have edited a series of neuropsychological sessions to guide my own self-assessment in the studio, to test their own cognitive capacity. Taken as a whole, the range of analyses and methods in which this thesis engages should offer a coherent body of work that aims to contribute in diverse ways. I emphasize that the resulting installation work embodies the power to communicate complex scientific and human concerns through art, and demonstrates the strength of using aesthetic strategies to present complex notions of disease, memory, archiving, clinic diagnostic and treatment or therapies.

Concluding speculations

In this research project I have explored actions and re-enactments, of which the main outcomes are a body of creative art works presented in the form of an installation, and a written work – presented in fragments at several conferences – which explores the methods and critical context for the praxis. This exegesis, like the doctoral project itself, is recurrent; following the intertwined processes of theory and practice through which the implications of the core research issues for the hybrid interdisciplinary art/science

practice are explored. It echoes the personal artistic research methodology used throughout the project, which aimed to overcome the third person perspective through such strategies as self-assessment, performance, and complex interactive installations creating an affective relationship between each participant and the artwork completed through emotional and phenomenological engagement.

Only when I commenced my doctoral collaboration and faced the ethical committees and the patients did I realise that, not just in practice but also conceptually, I was dealing with pioneering scientific research that was fraught with serious social issues and ethical[3] and biological complexities. The serious implications of these epistemological and ontological complexities encouraged me toward an increased focus on the impact of the medical and biological trials data itself as a site for identification and empathy between the research material and the viewer.

My contention is that it is possible to engender affect through our generic characteristics of identity and memory, and that the audience participant may be drawn to engage with underlying issues such as self and autobiographical memory, through their individual responses to the visual data. My work became more socially engaged and caring as a result of responses to my presentations. This observation emphasised my developing responses and sensitivities to the emotional appeal of my experiences and observations in the laboratories.

Working in this holistic and fragile system where negotiation of the impact of ethical dimensions and boundaries required a constant adaptation, I had to transform barriers and impediments into creative tools and strategies, which produced certain effects and affects without invoking direct compassion.

The significance of the study lies in the re-privileging of the aesthetic experience of personal memory in the discourses surrounding neuroscientific investigation. The plight of the patient in controlled crisis was a focus of cultural critique throughout the chapters and was explored through the practical outcomes of my aesthetic enquiries into the relationship and implications of scientific research on expressions and representations of memory. This discussion of the practical discourses within the pertinent theoretical framework of my research has led to the conclusion that the innovative impact of my

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[3] Namely, the revolutionary capacity to manipulate the fate of adults carrying a lethal disease who were given the opportunity to take a cutting-edge trial medication that could lead to a health improvement and the delay of symptoms, but could also mean a faster deterioration of their condition if they were given the placebo.

experimental research practice is of consequence because it cannot be effectively incorporated within the boundaries of any current practical discourse. It oscillates constantly within the parameters of these essential constructs: an original model of art/science collaboration; a practice-based research in the visual arts; the location of artist as both witness, researcher and researched object; the reinterpretation of so-called 'objective' scientific research data; the fact that there is no permanent tangible object as outcome in acknowledgement of specificity of the nature of the installation; the non-authorial voice and the collaborative contribution of the public to the final results.

The research undertaken throughout the thesis has stimulated more questions than answers and has created a desire to continue to produce work that addresses these concepts and ideas beyond the conclusion of this text. The generosity of my supervisors, the scientists, the University for the Creative Arts' research environment and my editors in their response and critical feedback aided and enriched the moments of production and presentation. The artefacts expand on processes and methods previously established in my artistic practice, which depends on an aesthetic that is informed by aspects of technology, the life sciences and medical research. The success and significance of this large body of work depends on whether new meanings can be found in their intertwined conversations, and the discovery of new insights into the ways in which we see and think.

Key to my practice is reflection on my own subject position, my ethical stance in terms of the practices of others and the ordering of the past and its actors, as articulated in my research questions and aims. The process of mapping and archiving and its reconstitution in the form of traces placed me, as an academic, outside the frame of my enquiry. I was never a disinterested researcher, however, because I had envisioned the method of subjecting myself to the same assessment performances undergone by an institutionalised patient. I chose to analyse my responses to the laboratories and patients through the processes of my practice as they emerged, in order to elucidate my own subject position. During the analysis of my case studies I also scrutinized and examined my actions, thoughts, decisions and interpretations and built insights into my practice and relationship with the context of my research. By introducing myself in the frame of the research and subjecting myself to becoming an object of study I achieved a kind of invisibility, as do

patients during the representational strategies that substitute their presence. I found that I became as (un) present in the works as the patients, except in the performance.

My subject position and the conditions of my own assessing strategies have raised implications both for my use of 'looking at' as a method of research, recording and mimicking, and in terms of the development of a subjective practice, incorporating viewing technologies and interpretation. All these reinforce the theory that looking and remembering are never neutral activities.

In the absence of intentional acts of remembering, and irrespective of the expanding scenario of the communication of science and its publications, neuroscientific representational strategies on loss of memory are inert materialities within the scientific universe. It has been demonstrated that, when re-enacted through art practice, these objects become able actively to evoke the way in which memory functions and is subjectively experienced. Ultimately, we as subjects are presented with an endless network of possible narratives about our relationship to memory, language and knowledge. There is no closure, only the continual process of rewriting the self through autobiographical memory.

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Filmography and television

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Appendices

Guidance notes

Appendix I provides a collection of the images/illustrations referred to during the written thesis and drawn on in developing my work. Figure numbers throughout the text refer to the order of images in Appendix 1.

Appendix II documents the progression of the project by providing the context. Part (a) includes research journal reflections and notes on the ethical framework and production constraints. Part (b) includes images relating to the design of the proposed thesis, documents concerning ethics approval and informed consent forms, assessment and therapy guidelines, details of complementary exhibitions, and a list of papers and presentations developed during my candidacy.

Appendix I

Illustrations

Fig. 1. Maria Manuela Lopes, 2009. 'The four virtual archival spaces.'

Fig. 2. Maria Manuela Lopes, 2009. 'The four virtual archival spaces.'

Fig. 3. Alois Alzheimer, 1901, notes about Auguste D. Findings on her hospital admission of November 26. Source: Konrad, M. (2006), p. 22.

Fig. 4. Portrait of Auguste D. aged 51. The first case of what became known as Alzheimer's disease. Source: Konrad, M. (2006), p. 21.

Fig. 5. Sheet of paper showing attempts by Auguste D. to write her name ('Frau Auguste D.') and the name of the city she lived in ('Frankfurt'). At the top, Alzheimer annotated the sheet with the date, name of the patient and place. Source: Dahm, Ralf (2006), p. 41.

Fig. 6. Alois Alzheimer, 1906, Histological examination of Auguste D.'s brain showing neurofibrillary tangles and amyloid plaques. Source: Konrad, M. (2006), p. 33.

Normal **Mild Alzheimer's**

Moderate Alzheimer's **Severe Alzheimer's**

Fig. 7. Magnetic Resonance Images presenting four different people with differently sized and shaped brains. The spreading grooves and fissures of the cerebral cortex indicate progressively severe brain atrophy and loss of brain mass, characteristic of Alzheimer's disease. Source: Mayo Foundation for Medical Education and Research, (1998-2012).

°° Plaques

•° Tangles

1. Plaques and tangles develop in entorhinal cortex.
2. Over time they spread into the hippocampus.
3. Finally, the plaques and tangles reach the top of the brain, the neocortex.

Fig. 8. Dana Guide Illustration presenting the plaques and tangles affecting progressively several areas of the brain. Source: The Dana Guide to Brain Health website (2007).

Fig. 9. Maria Manuela Lopes, 2009, *The Approach*. Exhibition *A Arte do Cérebro,* Centro Cultural da Figueira da Foz.

Fig. 10. Maria Manuela Lopes, 2009, *The Approach*. Detail of photographic montages. Exhibition *A Arte do Cérebro,* Centro Cultural da Figueira da Foz
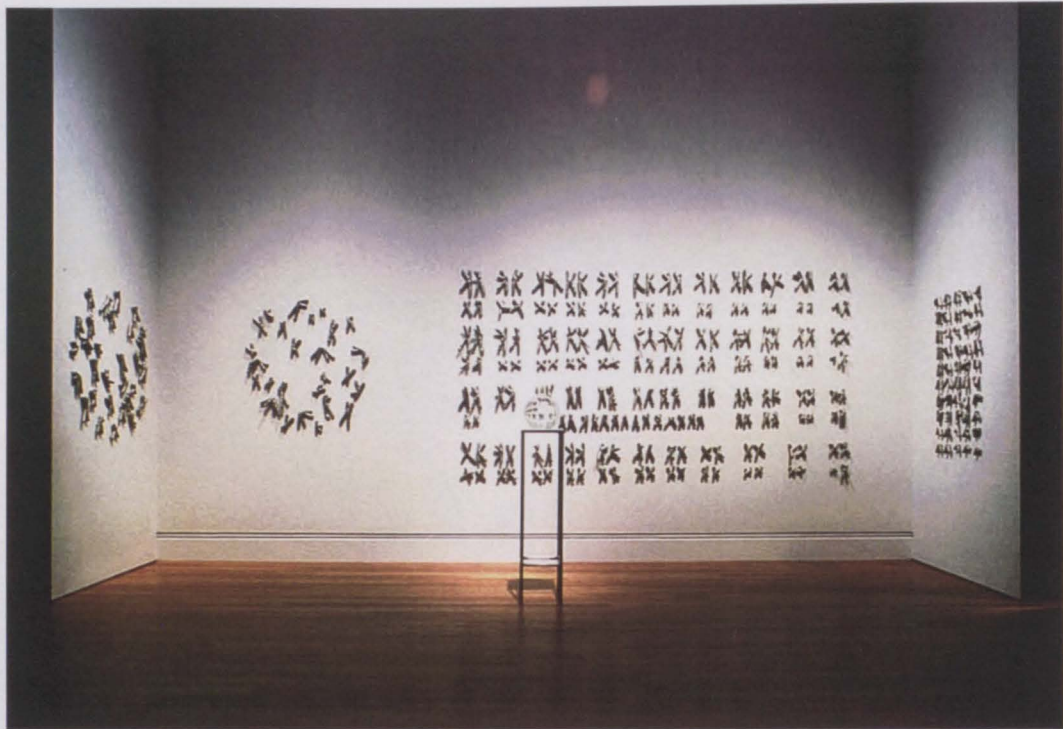
Fig. 11. Suzanne Anker, 2001, *Zoosemiotics*. Installation views at *Devices of Wonder* exhibition, The Getty Museum, Los Angeles. Source: Anker, S. (2012), artist website.

Fig. 12. Suzanne Anker, 2001, *Zoosemiotics*. Installation views at *Devices of Wonder* exhibition, The Getty Museum, Los Angeles. Source: Anker, S. (2012), artist website.
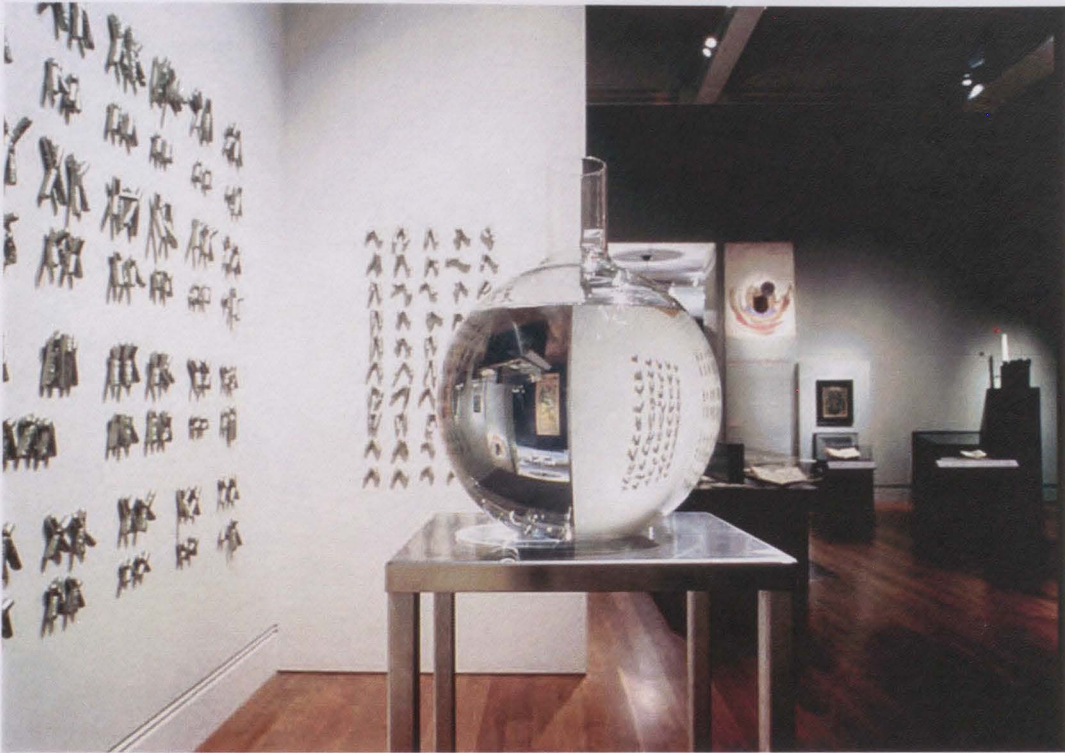
Fig. 13. Suzanne Anker, 2001, *Zoosemiotics.* Installation views at *Devices of Wonder* exhibition, The Getty Museum, Los Angeles. Source: Anker, S. (2012), artist website.

Fig. 14. Suzanne Anker, 1993-1999, *Zoosemiotics: Fruit Bat.* Hydrocal and pigment, 29 x 55 x 4″. Source: Anker, S. (2012), artist website.
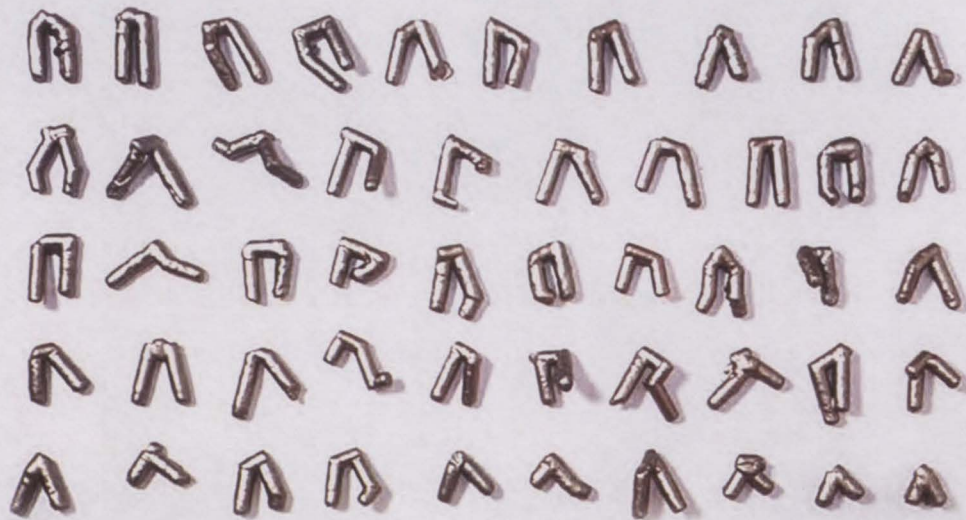
Fig. 15. Suzanne Anker, *1993, Zoosemiotics*: *Fish*. Hydrocal and pigment, 36 x 65 x 4".
Source: Anker, S. (2012), artist website.

Fig. 16. Suzanne Anker, 1993, *Zoosemiotics*: *Primates* (reflection). Glass, steel, and water.
Source: Anker, S. (2012), artist website.

Fig. 17. Suzanne Anker, 2006, *Laboratory Life (Jump Cut)*. Inkjet print on watercolour paper, 24 x 36". Source: Anker, S. (2012), artist website.

Fig. 18. Suzanne Anker, 2007, *Laboratory Life (Bugeye)*. Inkjet print on watercolour paper. Source: Anker, S. (2012), artist website.
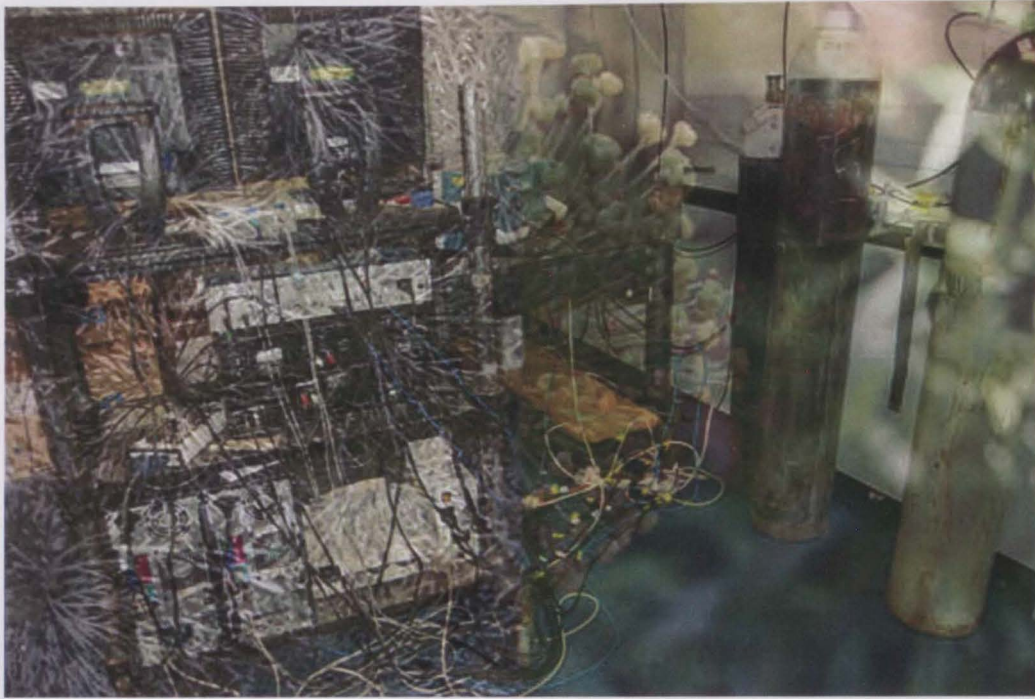
Fig. 19. Suzanne Anker, 2007, *Laboratory Life (Allium)*, Inkjet print on watercolour paper.
Source: Anker, S. (2012), artist website.

Fig. 20. Suzanne Anker, 2007, *Laboratory Life (Snowman)*. Inkjet print on watercolour
paper. Source: Anker, S. (2012), artist website.

Fig. 21. Suzanne Anker, 2007, *Laboratory Life.* 6 inkjet prints on watercolour paper. Source: Anker, S. (2012), artist website.

Fig. 22. Suzanne Anker, 2002, *Butterfly in the Brain.* Wall drawing, digital prints, plexiglass vitrines, rapid prototype sculpture, plaster, resin, cast bronze, cast wax, dimensions variable. Source: Anker, S. (2012), artist website.

Fig. 23. Suzanne Anker, 2002, *Butterfly in the Brain*. Wall drawing, digital prints, plexi-glass vitrines, rapid prototype sculpture, plaster, resin, cast bronze, cast wax, dimensions variable. Installation view at *Butterfly in the Brain* exhibition, Universal Concepts Unlimited, New York. Source: Anker, S. (2012), artist website.

Fig. 24. Suzanne Anker, 2002, *Butterfly in the Brain*. Wall drawing, digital prints. Source: Anker, S. (2012), artist website.

Fig. 25. Suzanne Anker, 2007, *Butterfly in the Brain - Engram Series*. 12 inkjet prints on watercolour paper, 25.5 x 44″ approx. (8.5 x 11″ each). Source: Anker, S. (2012), artist website.

Fig. 26. Suzanne Anker, 2002, *Butterfly in the Brain*. Wall drawing, digital prints, bronze, cast wax dimensions variable. Installation view at *Butterfly in the Brain* exhibition, Universal Concepts Unlimited, New York. Source: Anker, S. (2012), artist website.

Fig. 27. Suzanne Anker, 2002, *Butterfly in the Brain - Engram Series.* 12 inkjet prints on watercolour paper, 25.5 x 44" approx. (8.5 x 11" each). Source: Anker, S. (2012), artist website.

Fig. 28. Suzanne Anker, 2002, *Butterfly in the Brain - Engram Series.* Inkjet print on watercolour paper, 8.5 x 11". Source: Anker, S. (2012), artist website.

Fig. 29. Maria Manuela Lopes, 2009. 'The four virtual archival spaces.'

Fig. 30. Mark Dion, 1991, *On Tropical Nature*. Detail from table of collected objects in a museum gallery in Venezuela. Includes insect pins, chemicals, animal traps, fishing tackle, butterfly collection, specimens, etc. Source: Corrin, L. G., et al. (1997), p.21.

Fig. 31. Mark Dion, 1991, *On Tropical Nature*. Detail of table of collected objects including collector's equipment, rope, string, field glasses, clothes, plant press, killing jars, etc. Source: Corrin, L. G., et al. (1997), p. 21.

Fig. 32. Mark Dion, 1991, *On Tropical Nature*. Artist in Venezuelan rainforest, collecting specimens for the project. Source: Corrin, L. G., et al. (1997), p. 63.

Fig. 33. Mark Dion, 1991, *On Tropical Nature*. Table of collected objects in a museum gallery in Venezuela. Source: Sheehy, Colleen J. (2006), p. 7.

Fig. 34. Mark Dion, 1991, *On Tropical Nature*. Table of collected objects in a museum gallery in Venezuela. Source: Corrin, L. G., et al. (1997), p. 20.

Fig. 35. Mark Dion, 1991, *On Tropical Nature*. Table of collected objects including collector's equipment. Source: Corrin, L. G., et al. (1997), p. 20.

Fig. 36. Mark Dion, 1991, *On Tropical Nature*. The second of four weeks in the Orinoco River basin, Venezuela. Source: Corrin, L. G., et al. (1997), p. 20.

Naomi Beckwith Field Centre Manager	**Lenka Clayton** Field Centre Manager	**Mark Dion** Artist	**Robert Foot** Dig Team	**Adrian George** Publicity Department
Bego Garcia Camera Crew	**Joan Godfrey** Dig Team	**Alexis Holley** Dig Team	**Caro Howell** Education Department	**Abdul Jalloh** Dig Team
Mandy Kowalewski Dig Team	**Gulcan Mahmut** Dig Team	**Steve Mallaghan** Film Crew	**Fahima Matin** Dig Team	**Sophie McKinlay** Curator

Fig. 37. Mark Dion, 1999, *Tate Thames Dig*, Tate Modern. Source: Tate Gallery (2012).

Fig. 38. Mark Dion, 1999, *Tate Thames Dig* – detail, Tate Modern. Source: Coles, A. and Dion, M. (eds.), (1999), p. 93.

Fig. 39. Mark Dion, 1999, *Tate Thames Dig*, Bankside site – detail, Tate Modern. Source: Coles, A. and Dion, M. (eds.), (1999), p. 91.

Fig. 40. Mark Dion, 1999, *Tate Thames Dig*, Millbank site, Tate Modern. Source: Coles, A. and Dion, M. (eds.), (1999), p. 85.

Fig. 41. Mark Dion, 1999, *Tate Thames Dig*. Dion, Simon Upton, and volunteers at the Tate, working with bones. Source: Juarez, Kristin and Wolf, Alana (2011).

Fig. 42. Mark Dion, 1999, *Tate Thames Dig*. Dion beachcombing on London's Foreshore, Site I, Tate Modern. Source: Coles, A. and Dion, M. (eds.), (1999), p. 77.

Fig. 43. Mark Dion, 1999, *Tate Thames Dig*. Classified objects in the resituated Thames field laboratory. Source: Felton, Nicholas (2010).

Fig. 44. Mark Dion, 1999, *Tate Thames Dig*. Classified objects in the resituated Thames field laboratory. Source: Renfrew, C. (2003), p. 85.

Fig. 45. Mark Dion, 1999, *Tate Thames Dig*, Wooden cabinet, porcelain, earthenware, metal, animal bones, glass and two maps. Dimensions unconfirmed: 2660 x 3700 x 1260 mm., Collection Tate. Source: Tate online catalogue (2012).

Fig. 46. Mark Dion, 1999, *Tate Thames Dig*. 'Teeth from Bankside'. In: Coles, A and Dion, M (eds), (1999), p. 95.

Fig. 47. Maria Manuela Lopes, 2010, *The Archive – Do Not Allow me to Forget About Me.*
Exhibition *Cabinet D'Amateur,* Museu Nacional de Historia Natural e da Ciencia, Lisbon.

Fig. 48. Maria Manuela Lopes, 2010, *The Archive – Do Not Allow me to Forget About Me.*
Video stills *Remember – Knowing Being.* Exhibition *Cabinet D'Amateur,* Museu Nacional
de Historia Natural e da Ciência, Lisbon.

Fig. 49. Maria Manuela Lopes, 2011, *The Archive –Drawing the invisible*. Video stills, Exhibition *CorpoImagem*. Pavilhão do Conhecimento-Ciência Viva. Lisbon.

Fig. 50. Maria Manuela Lopes, 2011, *The Archive – Lost Words: Retracings*. Exhibition *Concept and Context in Practice*, James Hockey Gallery, Farnham.

Fig. 51. Maria Manuela Lopes, 2011, *The Archive: Enactment/Re-Enactment of the Archive.*
Performance at IMM (Instituto de Medicina Molecular), 18–25 March, Lisbon.

Fig. 52. Helen Chadwick, 1991, *Self-Portrait.* 1200 × 1126 cm. Leeds Museums & Galleries
(Henry Moore Institute Archive). Source: Henry Moore Institute, (2012).

Fig. 53. Helen Chadwick, 1986, *Of Mutability, The Oval Court* and *Carcass*, Photocopies on paper, organic matter and glass. As installed at the Institute of Contemporary Arts, London. Source: Jukes, Heather (2011).

Fig. 54. Helen Chadwick, 1986, *Of Mutability, Carcass*, 1986, organic matter and glass, 291 x 61cm. As installed at the Institute of Contemporary Arts, London. Source: Jukes, Heather (2011).

Fig. 55. Helen Chadwick, 1986, *Of Mutability*. Centrepiece in her installation featuring life-size photocopies of dead animals and her own body. Source: Photobucket (2012).

Fig. 56. Helen Chadwick, 1986, *Of Mutability*. Detail of life-size photocopies of dead animals and her own body. Source: Flickr (2012).

Fig. 57. Helen Chadwick, 1986, *Of Mutability*. Detail of life-size photocopies of dead animals and her own body. Source: Flickr (2012).

Fig. 58. Helen Chadwick, 1991, *Self-Portrait*. Source: National Galleries of Scotland website (2012).

Fig. 59. Maria Manuela Lopes, 2011/12, *The Assessment*. Installation trailer. Video stills.

Fig. 60. Maria Manuela Lopes, 2011/12, *The Assessment*. Installation trailer. Video stills.

Fig. 61. Maria Manuela Lopes, 2011/12, *The Assessment*. Installation trailer. Video stills.

Fig. 62. Maria Manuela Lopes, 2011/12, *The Assessment*. Installation trailer. Video stills.

Fig. 63. Maria Manuela Lopes, 20112, *The Therapy*. Exhibition *Uma coisa entre muitas.* Museu Nacional de Historia Natural e da Ciência, Lisbon.

Fig. 64. Maria Manuela Lopes, 20112, *The Therapy*. Exhibition *Uma coisa entre muitas.* Museu Nacional de Historia Natural e da Ciência, Lisbon.

Fig. 65. Maria Manuela Lopes, 2009. 'The four virtual archival spaces.' Detail of representational strategies as assessing practices.
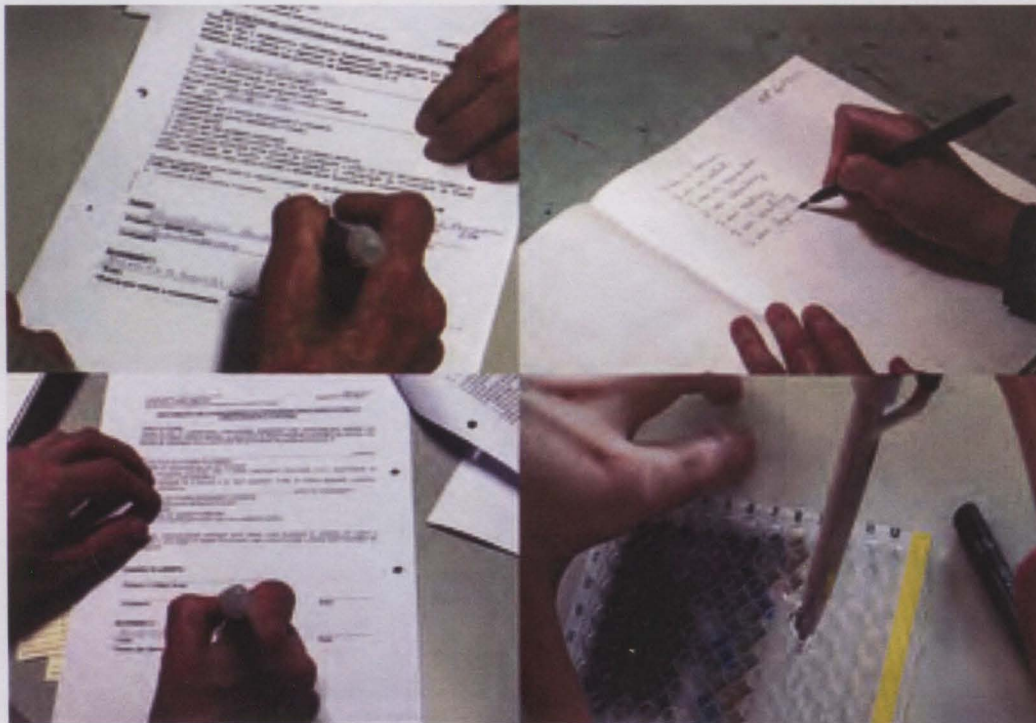
Fig. 66. Maria Manuela Lopes, 2009. 'The four virtual archival spaces.' Detail of representational strategies as assessing practices.
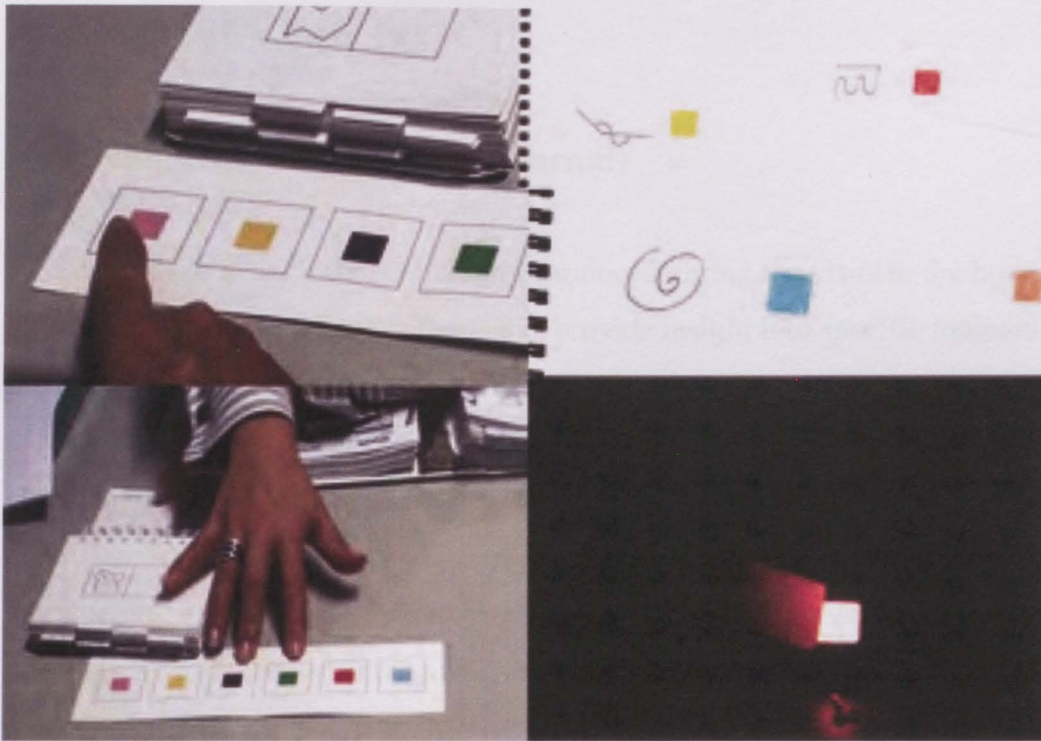
Fig. 67. Maria Manuela Lopes, 2009. 'The four virtual archival spaces.' Detail of representational strategies as assessing practices.
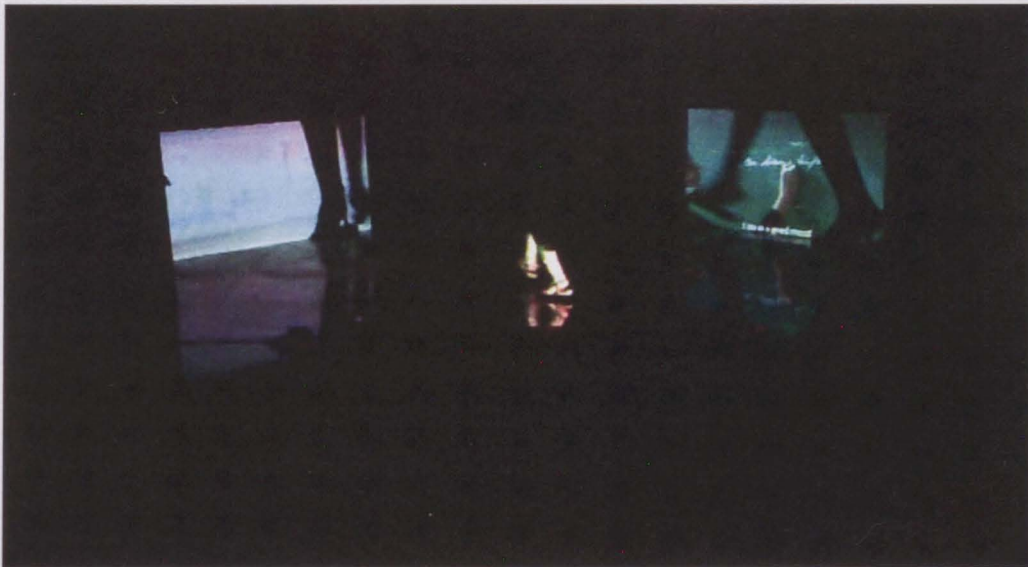
Fig. 68. Maria Manuela Lopes, 2011, *The Archive.* Exhibition *National meeting of the Study Group on Brain Ageing and Dementia*, Tomar.
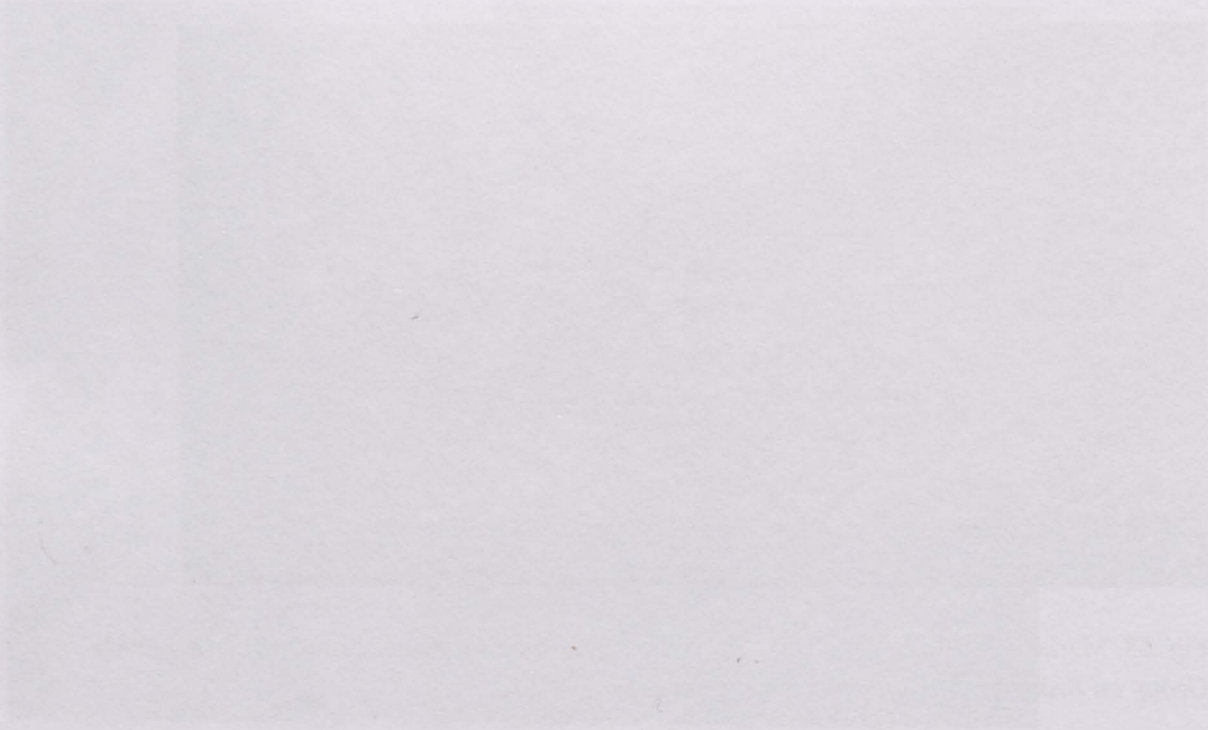
Appendix II – Part (a)

Reflection (from the research journal)

This consists of a collection of thoughts produced during the visits to the hospital and the laboratories. These diverse fragments provide insight into specific moments which, though not directly referred to in the thesis, were important to the context of my thoughts and seemed to offer an enriching set of traces for the reader. The different nature and dates of the extracts correspond to the circulation in different locations and dimensions of the scientific studies on AD, and somehow map the process of research. They belong to my notebooks as a personal subjective engagement outside a mode of scholarly investigation, and they are part of the materiality and process of production.

In the waiting room

These extracts from my research journal reflect on the condition of waiting and simultaneously express, as a complement to the episodes of neuropathology and undergoing an MRI scan, the complexities of attempting to understand how memory and the brain operate and are studied. The narratives unfold in a non-linear or intentional path and incorporate errors, imprecision and indecision constituting the stream of consciousness the unfolding of events propelled me to.

In the neuropathology area: brain dissection

I first encountered pathology (neuropathology) in April 2009. These extracts from six A4 pages of handwritten notes made immediately after the session describe my emotional and physical experience.

Undergoing an MRI scan

In March 2011 I underwent an MRI scan in Lisbon as a volunteer for a large research project on epilepsy. I was included as a control subject, having been excluded from direct contribution to AD research by the age threshold of the survey. The agreement was for some psychological examination and the scanning process. The examination was as close as possible to that undergone by an Alzheimer's patient in the trial, except that for them it took place every six weeks while for me it was a once-only experience.

In the waiting room

In this room the heat, a lot of people and some tension. Mainly older people, whose life sorrow appears to be readable in the face. Most are couples or sons/daughter/parents. Embarrassed looks intersect during the long waiting times. The pain is shared, but hope floats in the air; perhaps some new drugs will be available, or some innovative clinical trials. I watch the repetitive gestures of those who wait. Unidentifiable noises and fragments of conversation filter through the glass doors (consultation rooms have frosted glass doors). Occasionally a nurse or doctor in blue and white crosses the waiting room. Files, papers and some instruments circulate – the pathologies and prognoses seem varied!

Going up to the sixth floor I near my goal. It is cooler and less noisy, more like a study centre than a consulting area. The days I sat on the red leather sofa, with embedded stories and lost memories, correspond to the days of studying Alzheimer's. The frosted glass doors separate me from the universe of the clinical gaze; the sounds are muted, muffled. I see only shadows that allude to the Platonic universe and prevent me from achieving the true essence of thickness and texture. Permission to pass to the world of 3-D shapes and sounds depends on the response of the ethics committee. I am approaching... I wait....

Down seven floors and through a maze of different hospital areas, which reinforces the feeling of emotional tension chaotically orchestrated to 'work' for the patient. The proximity to Foucault's concept of crisis heterotopia seems to be reflected in these confined moves within the maze. In crisis heterotopia temporary exclusions are almost always due to situations that do not fit in with normal social standards, such as puberty or insanity. In the scenario I have explored most of the people seem to be in temporary crisis and the building, with its many non-accessible routes, seems only to be directing the flow of possible moves; concern and speed encompasses boredom and pain...

My position here is an awkward one... I am not a medical student, a patient, a carer ... just an artist in the waiting room. What am I waiting for? I feel as though I am 'waiting for Godot'... as though enduring will bring me some insight into the workings of, or the studies of the mind... I wonder what my role is in this scenario. I am not commissioned to illustrate the scientific procedures or the maladies of AD. I do not intend to criticize the medical structure of searching for knowledge (how could I?), though I mistrust the reductionist understanding of the body as machine defended by Descartes and Bacon which apparently still underpins the major discourse of scientific research and clinical practice. I wish I could do more; everybody seems unhappy. A second look seems to reveal some signs of indifference or hope ... I wait! (Research Journal, 2009)

In the neuropathology area: brain dissection

It takes our words away... there is how I feel now... a need not to say or tell anyone about it, but at the same time my stomach and hands tremble, I feel it is a researcher's duty to try to let my emotions flow into words...

I am amazed, exhilarated and disturbed. I saw two brains being handled, touched, cut, inspected, photographed, catalogued and archived ... I want to see what's next. Professor Pimentel (directing the Neuropathology scene) mentioned colouring, archiving and three more days of inspection...

The female brains belonged to previous patients and their names were mentioned several times. Their identities and diagnosis were well known in the doctor's main group... most of them tried to help the living people the brains belonged to and now they offered their body part to be read. It was to me a solemn moment.../

Was it a body part or a brain without a body... a brain without a mind... a treasure chest filled with all the love, hope, fears, memories and sense of self of someone gone? ...the feeling I had was that in the curves, colours and shadows of that complex, intricate organ one could see a reflection of an entire life; its intensity, the genetic heritage, the biological programme and the treatment undergone by the patient for her cerebral lesions ... really, a wonderful diary of clinical history ...

It looked like a puzzle in the end as much as at beginning. A circle of special absorbent paper covered the workbench. We wore white lab coats, except for the neuropathologist who wore a green/blue coat with thick gloves and sleeve protectors. After an initial touching session and visual analysis of the exterior of the brain, data was recorded: appearance, weight, diagnosis and therapy. Most of the doctors were curious but not excited as if they were not supposed to be. Some young doctors asked too many questions, which made me think that this was their first observation of a 'nearly living' brain ... Something kept my attention, a dispute on the information provided by an MRI scan and the physical lesion in the brain tissue... unsolved but archived ...

The choreography of the event had a hierarchy: the one in a blue coat, then those in white coats, those with two gloves, those with single gloves, those without gloves... their gestures were choreographed, precise, changing blades according to the dimensions of the tissue removed ... a continuous front to back movement...

A green/blue cloth was opened on top of the paper circle. I kept thinking of Helen Chadwick's self-portrait with the oval shape and the human brain. The cloth was folded in four parts with some wrinkles and provided a visual contrast with the flesh colour ... it was mended using white stitches, not hiding their presence. I liked that moment, it contrasted the lab procedures with the

constant waste, and it seemed a humanized action and a symbol of care, almost caressing the brain tissue...

Some labels were needed and were made during the procedures. A number was hand written ... later two arrows were drawn with a felt pen and cut using scissors... they were placed on top of the brain slices for immediate photography sessions... it all looked so 'crafty' and almost surreal...

Every time a slice of brain tissue was handled the doctors had to obey the dance choreography established by the pathologist: they had to flip, twist and place them down on the cloth by the proper order. In the end ten pieces of brain were organized on the rectangular cloth....

I feel as if the outer world has changed. I notice my awareness of specific patterns, such as the stone on the hospital floor with all the line drawings and cut in squares from the original stone. (Research Journal, 2009).

Undergoing an MRI scan

Here I am set up in my beautiful patient gown and already feeling at a disadvantage... the idea of surveillance is intertwined in the fear and excitement of the experience. I am thrilled, as though climbing a roller-coaster, simultaneously curious and terrified. I know the drill: lie down, stay still, quiet, and with eyes closed... I am ready to follow the instructions; I am willing to be guided by 'the voice'. On the other side of the mesh window (the control tower) they are anxious too; the doctor in charge remarks that it is not often that they can inspect inside an artist's mind... as if! Somehow this comment kept coming to my mind and directed the course of the time spent under the magnetized field. MRI captures cross-sectional image slices of the human body, not truly rendering the anatomy but translating and interpreting according to pre-established coordinates the reactions of the body tissues to the scanner's magnetic field.

I know the building, but from the central room alongside the researchers and radiologists. From the control room which opens on to two different scanning rooms I was not aware of the proximity to the idea of panoptic. Now that I am under the bright light I feel exposed to visibility – under surveillance from several simultaneously inspecting agents: the machine; the clinical staff, and myself... I become a patient trapped in the inscriptive domain of the medical archive and subject to the clinical gaze. 'Am I becoming transparent?' I wonder, as the table moves and sucks me into the confined area of the scanner. I am immobilized as required and my eyes are closed...

I feel I am in the theatre, in a concert in a darkened room ... an unfamiliar experience, a mixture of cool breeze (air coming from the scanner to help the patient's breathing and avoid claustrophobic sensations) and orchestrated loud noises coming from the machine... my fear is gone, at least for a while until I realise that the computers are translating numbers and sound into pictures of 'myself'... though the mechanism is not the same I feel that I am being photographed, and experience I usually dislike; I hardly ever find myself in images of my body... this is probably why I use it so much in my work. I demand professional standards of myself as a control, whatever that might truly be, so I keep still. I do not want artefacts in the final results. (Research journal, 2011)

Strange discoveries about myself are emerging. One, very much related to the research, is the search for order and patterns in the apparently repeated sounds around me. Some people recall association of words to the repeated sounds when experiencing MRIs. Justine Cooper (2006, cited in Casini, 2008: 96) describes 'aural hallucinations' in the form of 'dogs barking, Gregorian chanting, whispers, etc.'.

I wonder if the neuropsychology assessment and therapy training is translating into something physical inscribed in my brain and becoming visible on the constructing images. I question to what extent I am conditioned by the later months of searching for patterns and numbers, drawing symmetries repeating what I had for breakfast or lunch, where I am, drawing by numbers, etc. Was I freer before to dive into 'happy places'; just to feel relaxed and comforted in strange or scarring situations like this one ... Now I am trying to follow patterns and associate them to known rhythms of classical music. I have the strange feeling that I can but it is all simply inside my head... I decide to go under meditation and somehow expect that quietness to be present in the later results. (Research journal, 2011)

Another discovery was associated to my own hearing impairment:

The sensations of the MRI are of sound through the body, reverberation and rhythms from the loud noises echo inside our bodies and come to us through the table, headphones and unspecific hearing. I experience a different kind of hearing closer to the ideas of synaesthesia. My eyes are closed, my body is immobilized and I can hear more than ever. I have been hearing-impaired (100% right side) since I was two years old, so most of the time I experience hearing as a mono-sensation. Only in rare situations of loud noise such as in a disco, at the movies or in a clinical setting when undergoing assessment of my hearing status have I experienced the sensation of 'full' hearing capacity. This must be a deception; someone with intact hearing capacity inside the machine must experience it differently. I have the sensation of trans-cranial hearing and bone vibration. The fact that I cannot see my body (if I open my eyes I can indirectly see a fragment of

it through a little mirror reflection) and cannot move, but can hear more, gives
me a kind of affective disorientation of the eye/body/sound coordination that
places me in a new questioning of my sense of self. (Research journal, 2011)

Though I had permission to record audiovisual data and to keep some of the recorded scientific data I decided not to analyse this, because I wanted to include only my first-hand experience of an MRI scan, not the re-enactment of the lived event or the moment of the 'shock of recognition'. During my life I had already had many parts of my body scanned or inspected by different visualization systems, and part of my DNA had been analysed and translated into graphical and letter-based diagrams. I recognize some similarity between MRI scanning and antenatal ultrasounds and 3-D foetal imaging, though the process is inverted. The image in this case comes after the personality: I recognized physical traits. Memories precede data and construct new memories. I wondered what I would do next; perhaps move towards a whole new project.

I was even more aware of the courage of the patients under clinical trials who subject themselves to the challenge of lying still for approximately 40 minutes in the confined and claustrophobic scanner, surrounded by this intrusive loud noise. An even bigger mystery was where these patients go: if they are trapped inside their minds and these minds are fragmented, can they float free from their memories and metaphoric 'safe' places towards the real place where their bodies are located, and comprehend the need to stay still? They have to be reminded often of the need to be quiet.

The noise stops: apparently, it is just inside my head as an echo. The table moves.
I open my eyes but I do not see… I need time to adjust to this new light and
feeling. I wait! (Research journal, 2011)

Ethics

In order to record patients, ethics approval was required from both institutions involved, following the generic principles of arts and humanities research and considering legal liability, honest and open practice and moral responsibility. In order to conduct my research at PhD level, and as part of a bid to establish the validity of fine art research alongside scientific knowledge, it was necessary to bridge ethical chasms between different scientific and artistic disciplines and external research and funding centres.

The ethics committee of the Faculdade de Medicina da Universidade de Lisboa is focused on health and biological research, and my intentions went beyond anything previously authorised. Brighton University and UCA are unused to dealing with ethics outside the domain of arts, and the panel also asked me to address and explain some ambiguity in the scope of my project. As a result, I worked with my leading supervisor, online and in consultation with other researchers and institutions, to define the main ethical dimensions of my research explicitly. We dealt with specific codes of ethics that had to be considered and managed in tandem, and addressed the location of the research in a broader social and cultural context than the more usual one of the gallery and art world. It was concluded that the process-driven method, with its emerging ethical considerations, was feasible given careful management by the candidate and monitoring by the cross-disciplinary supervisory team. These considerations helped to construct a clear definition of the project's methods and aims. These were translated from English to Portuguese (and into simple terms) in order to be explained to patients and their families, which further emphasised the importance of context in the definition. The need to respond to commentary on the project and amend my initial ideas gave me a wider understanding of the possible reach of the research, thus further contextualizing my practice. To that end I became more familiar with aspects of this type of obligation when carrying out cross-disciplinary art practice and research, which included not only biological material (with which I had experimented in previous residency programmes) but also institutionalised patients and clinical trial protocols. This was a time-consuming but enriching experience as an artist and academic who was jointly responsible for two artistic residency programmes – domains wherein I aim to expand the lessons learnt during my PhD.

Ethics Approval forms for UCA and Faculdade de Medicina da Universidade de Lisboa and respective consent forms are attached in Appendix II (b).

Constraints and practicalities

In gaining ethics approval I felt I had overcome the first barrier: the physical problem of gaining regular access to an actual laboratory facility (in this case also a hospital) to conduct the research. I had also gained access to guidance and collaboration.

Despite the practice-based nature of my project, Fundação para a Ciência e Tecnologia (FCT) was able to provide funding only for my basic research needs, i.e. fees and living costs. I was strongly aware that, in contrast, the nature of health-related and biological research invariably involves funding at levels that artists in Portugal in particular can only dream off. The course of the project was therefore limited by available funding and further restrictions associated with it (expertise, physical space and time in the laboratory). After deciding on a more observational and ethnographical approach to the scientific work I faced other constraints:

- My study involved many participants, and employed a variety of data collection methods, including direct observation, video recording, photography, and analysis of research articles. The use of digital technologies for the collection, storage and manipulation of data shaped the process of ethnographic research.

- Capturing images of representational strategies from both the laboratories and the studio required shooting with still and video cameras simultaneously thereby enabling a library of digital data to be accumulated.

- I spent a great deal of time filling notebooks, planning, making and collecting images towards the creation of the re-enactment of the archives. These fragments and clues to the research process provided interesting exhibition material, which is why some of these are included in the appendices and on DVD 2.

- The processing of images was influenced by considerations including scale, cost and impact on resources. I produced only certain images as prints and on video and kept others as digital files for reference and future work. This decision mirrors my commitment to emphasising the process and evolution of the installations: the artwork provides new ways in which to consider issues of the constructive and fluid nature of memory.

- As an ethnographer I immersed myself and participated in a scientific world while simultaneously trying not to interfere with group behaviour. Conducting research within the labs/hospital required a particular type of sensitivity, including the use of small portable recording devices, covering the recorder light with tape, avoiding the use of flash, and trying to remain quiet and almost invisible, while at the same time being kind and willing to reply repeatedly to the same questions from patients.

The project might have benefited from better equipment and more ideal conditions for filming: the poorly lit locations and noisy conditions compromised the image/sound quality. The fast pace of the events (e.g. in assessment sessions, molecular lab procedures and clinical consultation) and the crowding of people in tight spaces was not always favourable to audiovisual recording. This is reflected in the trace quality and documentary quality of the video work, though these restrictions or limitations became part of the nature of the work itself.

On an epistemological level, the bridging and reciprocity between science and art and interdisciplinary practice-based research projects may contribute to the introduction of a more open research paradigm in contemporary research. Nevertheless, the practicalities are complex and depend on financial factors such as the need for support through scientific research grants compounded by the disadvantages of under-funded artists attempting to develop research collaborations.

It is hard to be objective after such an intense psychological immersion, an exhausting and technically difficult hang, and the physical and mental demands of so many presentations, travelling and sometimes self-curated and self-mounted shows. My own assessment is that my approach has been achieved as an evolving four-part installation; the work transcends the sum of its many component parts.

Appendix II – Part (b)

Proposed design for the final bound thesis
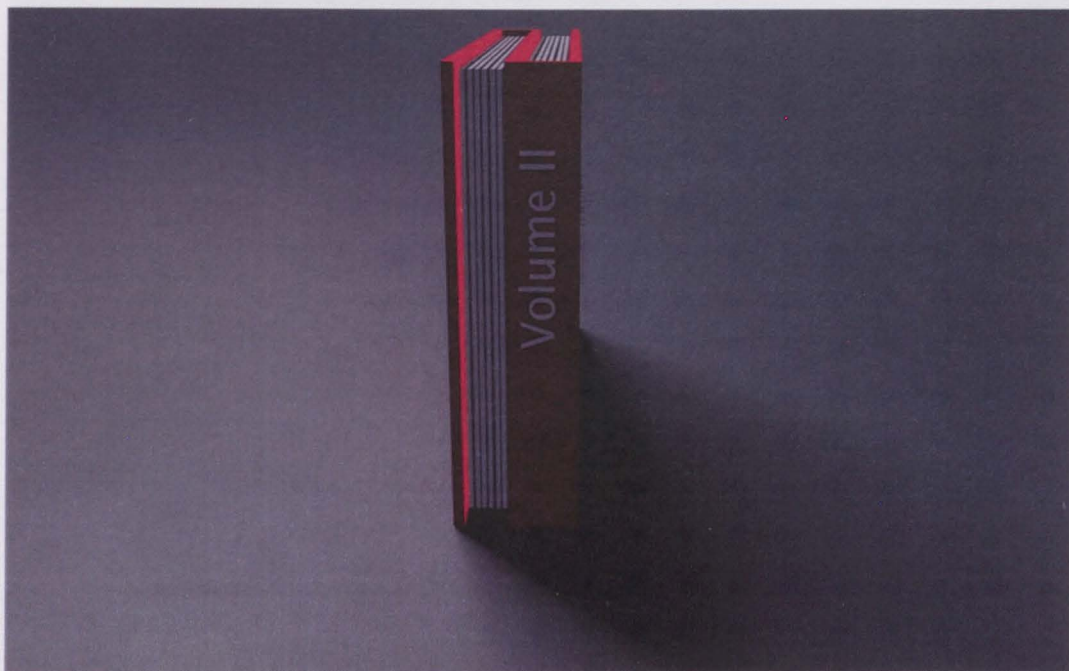
Fig. 69. Maria Manuela Lopes, 2012. 'Proposed design for the final bound thesis.'
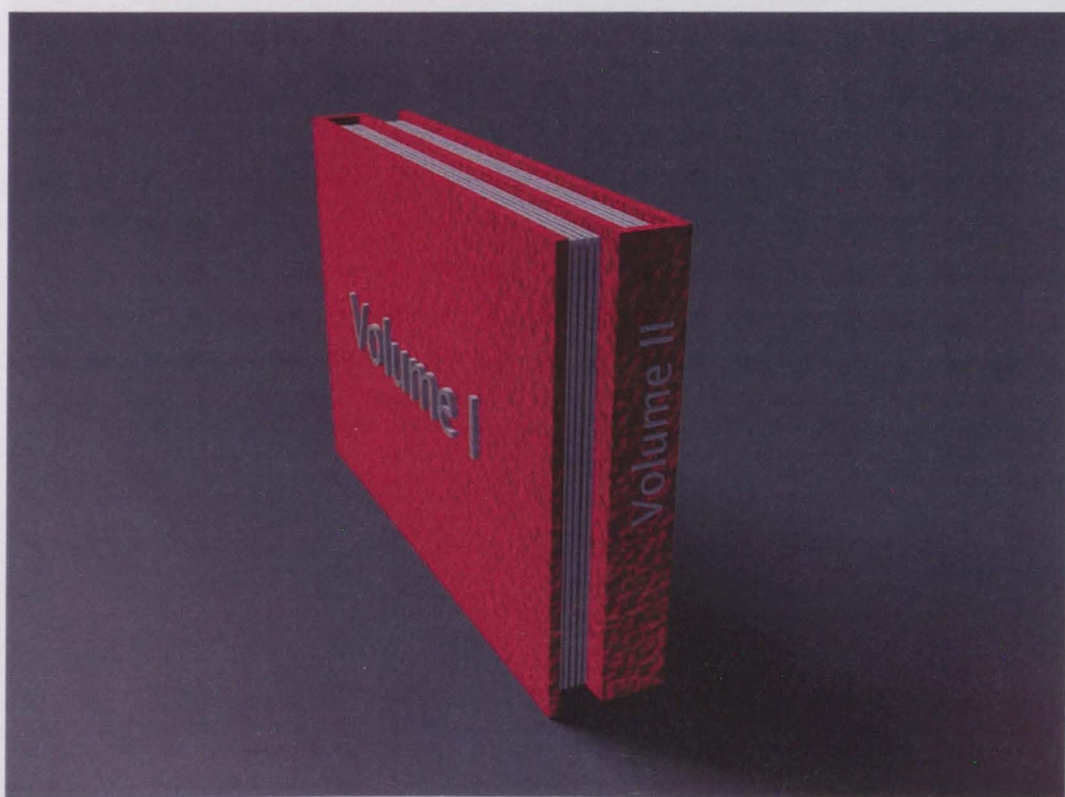
Fig. 70. Maria Manuela Lopes, 2012. 'Proposed design for the final bound thesis.'
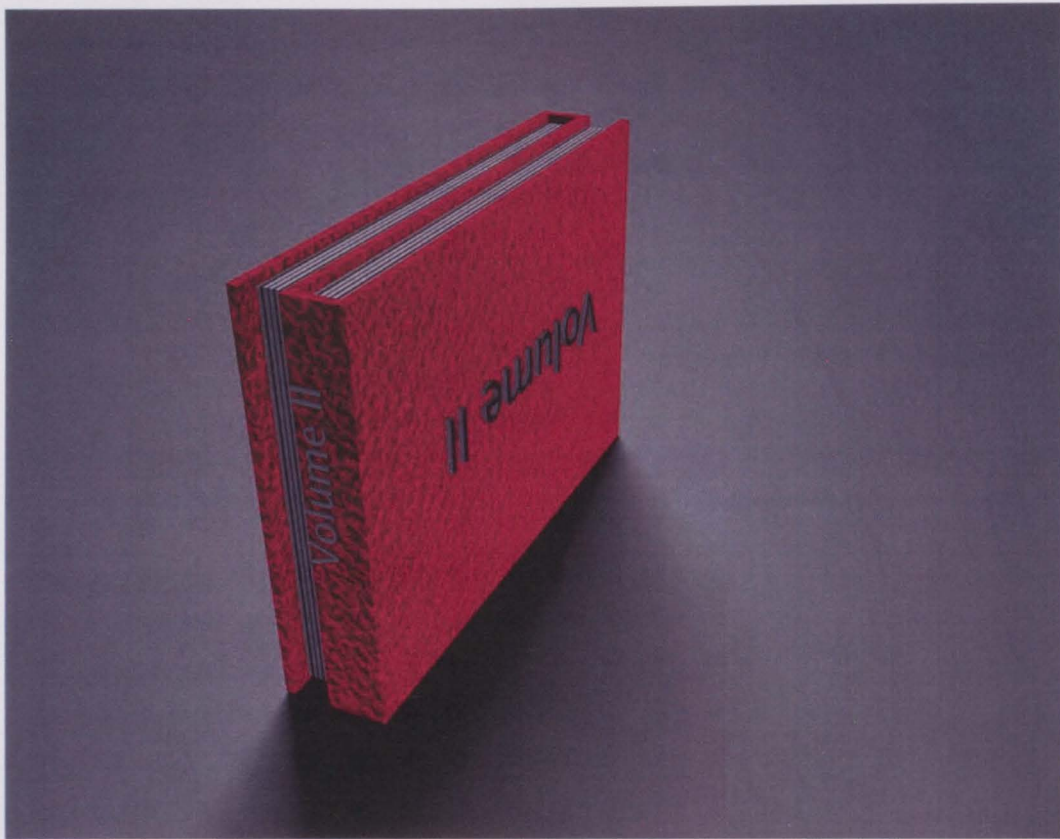
Fig. 71. Maria Manuela Lopes, 2012. 'Proposed design for the final bound thesis.'
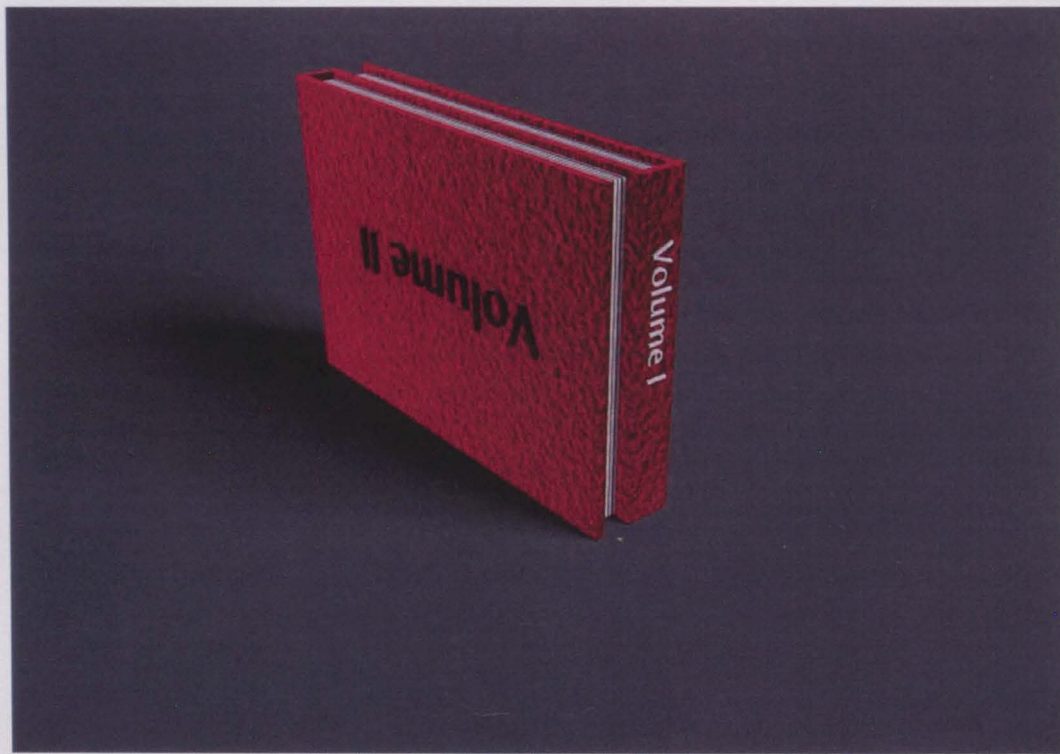
Fig. 72. Maria Manuela Lopes, 2012. 'Proposed design for the final bound thesis.'

Fig. 73. Maria Manuela Lopes, 2012. 'Proposed design for the final bound thesis.'
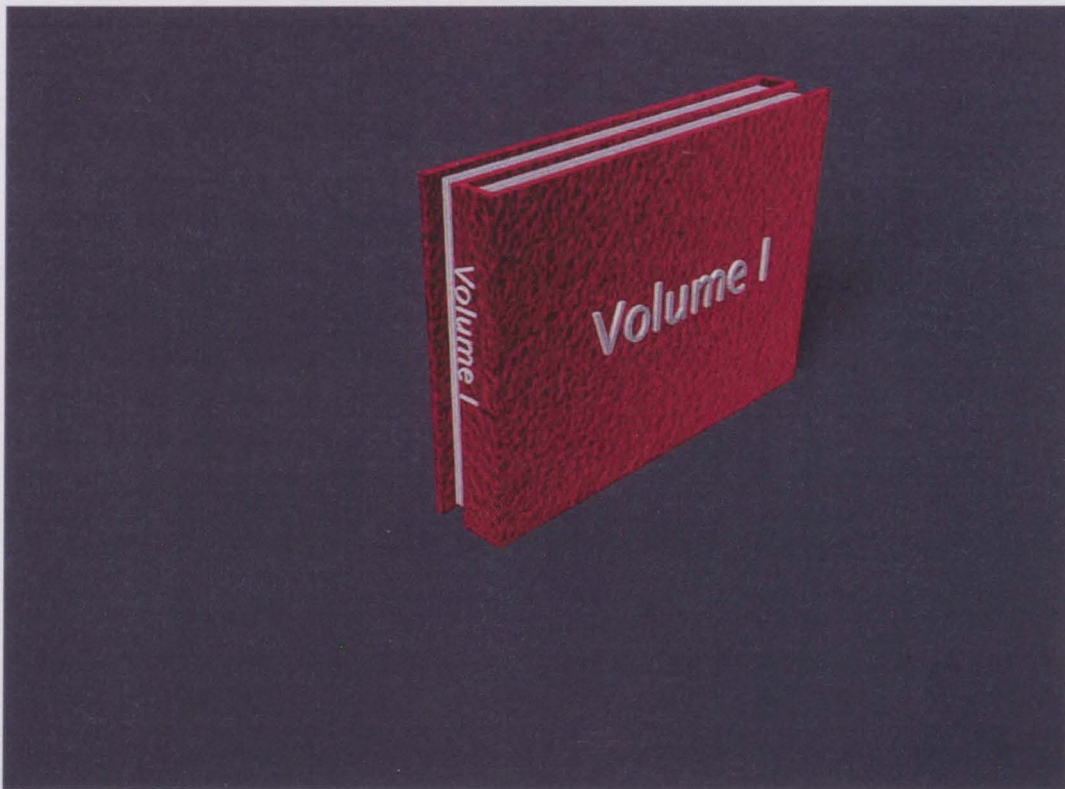
Fig. 74. Maria Manuela Lopes, 2012. 'Proposed design for the final bound thesis.'
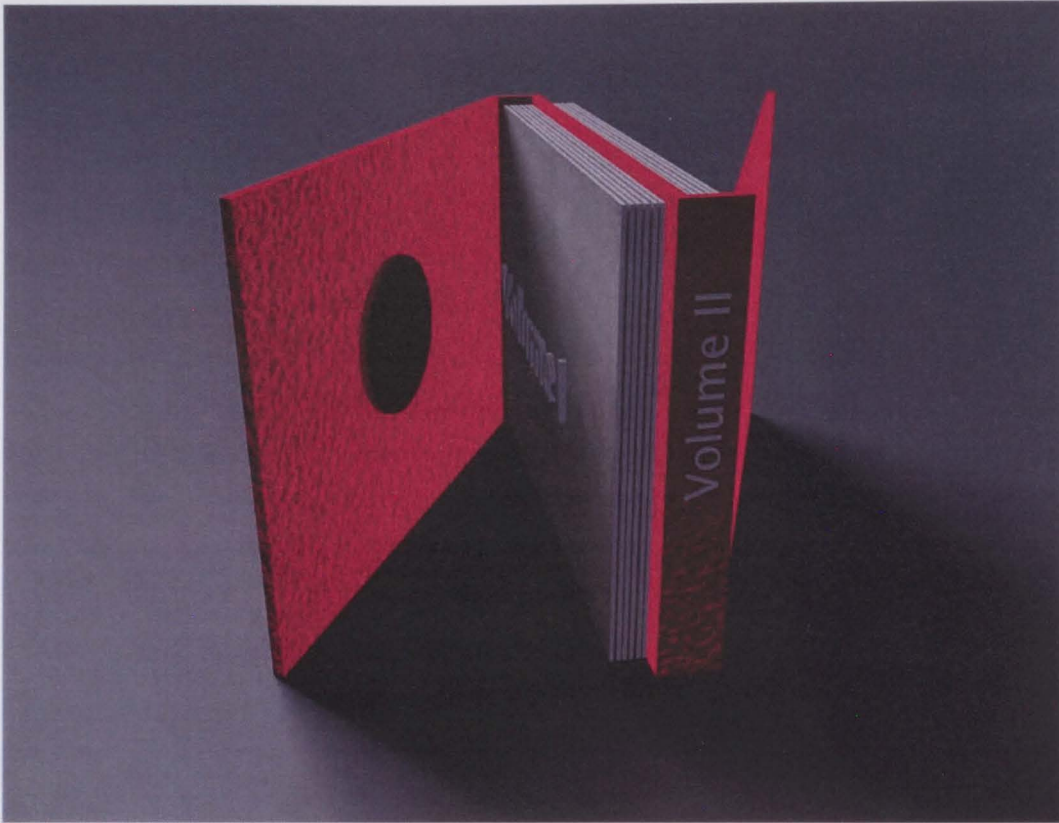
Fig. 75. Maria Manuela Lopes, 2012. 'Proposed design for the final bound thesis.'
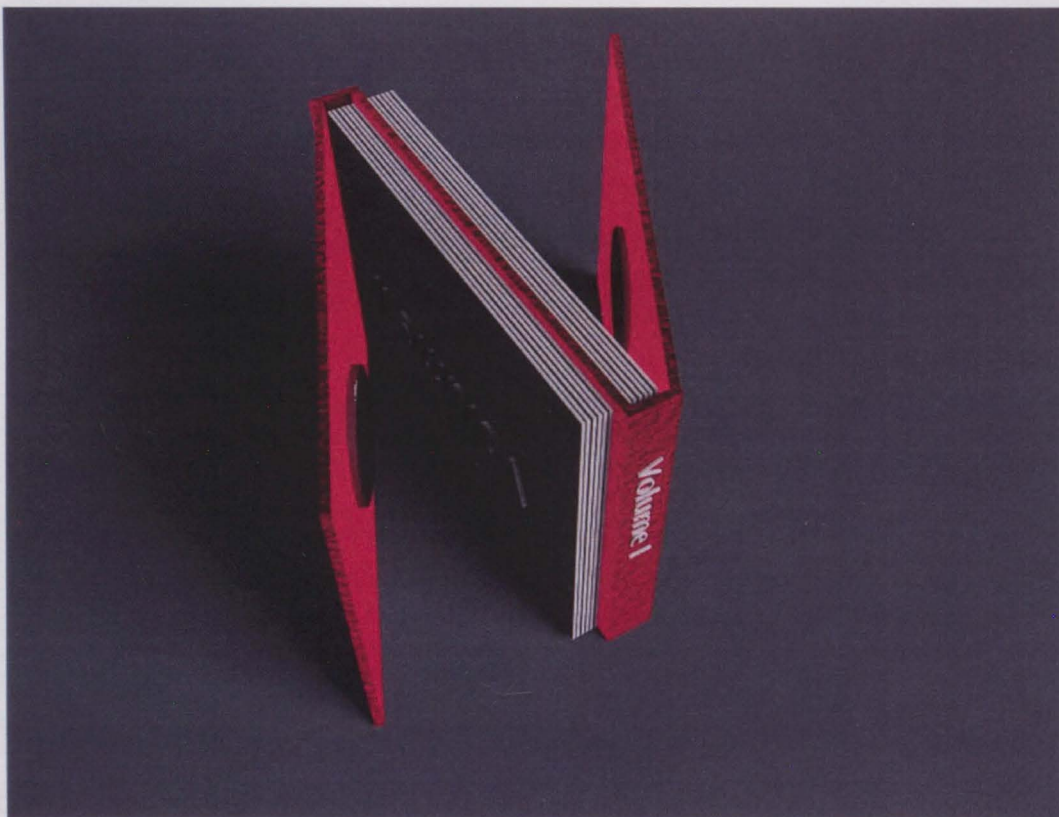
Fig. 76. Maria Manuela Lopes, 2012. 'Proposed design for the final bound thesis.'

Examples of assessment guidelines

All examples are taken from Mendonça, Alexandre de, and Guerreiro, Manuela (coordination) (2008), *Escalas e Testes na Demência*. GEECD (Grupo de Estudos de Envelhecimento Cerebral e Demência), Lisbon.

AVALIAÇÃO BREVE DO ESTADO MENTAL

ORGANIZAÇÃO E AFERIÇÃO

Grupo de Estudos de Envelhecimento Cerebral e Demências
Manuela Guerreiro, Ana Paula Silva, Maria Amália Botelho,
Olívia Leitão, Alexandre Castro Caldas, Carlos Garcia
mguerreiro@netcabo.pt

AVALIAÇÃO BREVE DO ESTADO MENTAL

I. ORIENTAÇÃO

"Vou fazer-lhe algumas perguntas. A maior parte delas são fáceis. Tente responder o melhor que for capaz". (Dar 1 ponto por cada resposta correcta)

1. Em que ano estamos? _____
2. Em que mês estamos? _____
3. Em que dia do mês estamos? (Quantos são hoje?) _____
4. Em que estação do ano estamos? _____
5. Em que dia da semana estamos? (Que dia da semana é hoje?) _____
6. Em que País estamos? (Como se chama o nosso país?) _____
7. Em que Distrito vive? _____
8. Em que Terra vive? _____
9. Em que casa estamos? (Como se chama esta casa onde estamos?) _____
10. Em que andar estamos? _____

                                                        NOTA _____

II. RETENÇÃO

"Vou dizer-lhe três palavras. Queria que as repetisse e que procurasse decorá-las porque dentro de alguns minutos vou pedir-lhe que me diga essas três palavras".

As palavras são:

<div align="center">

PERA   GATO   BOLA

</div>

"Repita as três palavras".

(Dar 1 ponto por cada resposta correcta).

PERA _____ GATO _____ BOLA _____   NOTA _____

III. ATENÇÃO E CÁLCULO

"Agora peço-lhe que me diga quantos são **30** menos **3** e que ao número encontrado volte a subtrair 3 até eu lhe dizer para parar."

(Dar 1 ponto por cada resposta correcta. Parar ao fim de 5 respostas. Se fizer um erro na subtracção, mas continuando a subtrair correctamente a partir do erro, conta-se como um único erro).

(30)   (27)   (24)   (21)   (18)   (15)   **NOTA** _____

IV. EVOCAÇÃO

(Só se efectua no caso do sujeito ter apreendido as três palavras referidas na prova de retenção).
"Agora veja se me consegue dizer quais foram as três palavras que lhe pedi há pouco para repetir".
(Dar 1 ponto por cada resposta correcta)

PERA _____ GATO _____ BOLA _____   NOTA _____

V. LINGUAGEM

(Dar 1 ponto por cada resposta correcta)

a) Mostrar o relógio de pulso.

"Como se chama isto?" _____   NOTA _____

b) Mostrar um lápis.

"Como se chama isto?" _____   NOTA _____

c) Repetir a frase :

"O rato rói a rolha" _____   NOTA _____

d) "Vou dar-lhe uma folha de papel. Quando eu lhe entregar o papel, pegue nele com a sua mão direita, dobre-o ao meio e coloque-o no chão" (ou: "coloque-o aqui em cima da secretária/mesa" – indicar o local onde o papel deve ser colocado).

(Dar 1 ponto por cada etapa bem executada. A pontuação máxima é de 3 pontos).

• Pega no papel com a mão direita _____

• Dobra o papel ao meio _____

• Coloca o papel no chão _____
  (ou no local indicado)   NOTA _____

e) "Leia e cumpra o que diz neste cartão".
(Mostrar o cartão com a frase: **"FECHE OS OLHOS"**
Se o sujeito for analfabeto o examinador deverá ler-lhe a frase).
(Dar 1 ponto por cada realização correcta).   NOTA _____

f) "Escreva uma frase".
(A frase deve ter sujeito, verbo e ter sentido para ser
pontuada com 1 ponto. Erros gramaticais ou de troca de letras
não contam como erros).   NOTA _____
A frase deve ser escrita numa folha em branco(se o sujeito for
analfabeto este ponto não é realizado)

g) "Copie o desenho que lhe vou mostrar" .
(Mostrar o desenho num cartão ou na folha)
(os 10 ângulos devem estar presentes e 2 deles devem estar intersectados
para pontuar 1 ponto. Tremor e erros de rotação não são valorizados).   NOTA _____

NOTA TOTAL _____

FECHE OS OLHOS
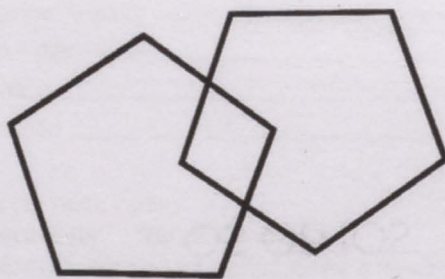
BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

A escala é constituída pelos seguintes componentes:

1. Escala de Memória de Wechsler-Revista (WMS-R) – Aprendizagem Associativa de Pares Visuais - Evocação Imediata
2. Escala de Memória de Wechsler-Revista (WMS-R) – Aprendizagem Associativa de Pares de Palavras - Evocação Imediata
3. Teste de Aprendizagem Verbal Auditiva de Rey - Evocação Imediata
4. Escala de Memória de Wechsler-Revista (WMS-R) – Memória de Dígitos
.5. Teste de Associação Controlada de Palavras Orais (COWAT) - Teste de Fluência Verbal Fonológica
6. Teste de Fluência Verbal Semântica - Evocação Categorial
7. Escala de Memória de Wechsler-Revista (WMS-R) – Aprendizagem Associativa de Pares Visuais - Evocação Diferida
8. Escala de Memória de Wechsler-Revista (WMS-R) – Aprendizagem Associativa de Pares de Palavras - Evocação Diferida.
9. Teste de Aprendizagem Verbal de Rey – Evocação Diferida.

Consulte por favor, o manual de administração complementar do NTB.

BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

1. WMS-R APRENDIZAGEM ASSOCIATIVA DE PARES VISUAIS I - EVOCAÇÃO IMEDIATA

Tempo administrado

Relógio de 24 hr

Dê as instruções ao doente da seguinte forma:

"Vou mostrar-lhe algumas figuras, cada uma associada a uma cor diferente. *Quando olhar para as figuras, tente lembrar-se da cc que corresponde a cada figura. Depois de eu lhe ter mostrado as figuras com as cores, irei mostrar-lhe as figuras sozinhas, e, para cada figura, irei pedir-lhe para indicar a cor certa neste folheto."*

APRENDIZAGEM ASSOCIATIVA DE PARES VISUAIS I	Se o examinando responder de forma correcta a todos os seis itens do Grupo III, suspenda o sub teste. Por outro lado, apresente os Grupos IV, V, e VI até todos os seis itens estarem correctos.

GRUPO I				GRUPO II				GRUPO III			
Item	Chave	Resposta	Pontuação de 1 ou 0	Item	Chave	Resposta	Pontuação de 1 ou 0	Item	Chave	Resposta	Pontuação de 1 ou 0
1	V			1	Am			1	Az.		
2	Pu			2	E			2	V		
3	E			3	Az.			3	Pu		
4	Am			4	Pu			4	R		
5	R			5	V			5	Am		
6	Az.			6	R			6	E		
Total do Grupo I				Total do Grupo II				Total do Grupo III			

Máx. = 18
Total dos Grupos I—III

GRUPO IV				GRUPO V				GRUPO VI			
Item	Chave	Resposta	Pontuação de 1 ou 0	Item	Chave	Resposta	Pontuação de 1 ou 0	Item	Chave	Resposta	Pontuação de 1 ou 0
1	V			1	Pu			1	V		
2	Pu			2	Az.			2	Am		
3	E			3	Am			3	Az.		
4	Am			4	R			4	E		
5	R			5	E			5	Pu		
6	Az.			6	V			6	R		
Total do Grupo IV				Total do Grupo V				Total do Grupo VI			

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2. WMS-R APRENDIZAGEM ASSOCIATIVA DE PARES DE PALAVRAS - EVOCAÇÃO IMEDIATA

Tempo administrado

Relógio de 24 hr

Dê as instruções ao doente da seguinte forma:

"Eu vou ler-lhe uma lista de palavras, duas de cada vez. Ouça com atenção porque depois de eu acabar de as dizer, vou pedir-lhe que me diga quais as palavras que estão associadas. Por exemplo, se as palavras fossem Este-Oeste, Ouro-Passeio, então quando eu dissesse a palavra Este, iria responder Oeste. E quando eu dissesse a palavra Ouro, iria responder Passeio. Está a compreender? Agora ouça com atenção a lista que lhe vou ler."

Assim que o teste estiver terminado, ou for suspenso, diga:

"Óptimo. Mais tarde, eu irei perguntar-lhe as palavras de novo, por isso tente lembrar-se delas agora."

APRENDIZAGEM ASSOCIATIVA DE PARES DE PALAVRAS I	Se o examinando responder de forma correcta a todos os oito itens do terceiro Grupo, suspenda o sub teste. Por outro lado, apresente os Grupos IV, V, e VI até todos os oito itens estarem correctos.

Grupo I	Recordar	Fácil	Difícil	Grupo IV	Recordar	Fácil	Difícil
Metal—Ferro	Fruta	___		Colisão—Escuro	Escola		___
Bebé—Chora	Obedecer		___	Couve—Caneta	Metal	___	
Colisão—Escuro	Rosa	___		Fruta—Maçã	Obedecer		___
Escola—Mercearia	Bebé	___		Obedecer—Polegada	Colisão		___
Rosa—Flor	Couve		___	Bebé—Chora	Fruta	___	
Obedecer—Polegada	Metal	___		Rosa—Flor	Bebé	___	
Fruta—Maçã	Escola		___	Metal—Ferro	Couve		___
Couve—Caneta	Colisão		___	Escola—Mercearia	Rosa	___	
Total		___	___	Total		___	___

Grupo II	Recordar	Fácil	Difícil	Grupo V	Recordar	Fácil	Difícil
Rosa—Flor	Couve		___	Fruta—Maçã	Rosa	___	
Couve—Caneta	Bebé	___		Escola—Mercearia	Colisão		___
Obedecer—Polegada	Metal	___		Rosa—Flor	Bebé	___	
Fruta—Maçã	Escola		___	Couve—Caneta	Metal	___	
Escola—Mercearia	Rosa	___		Metal—Ferro	Obedecer		___
Metal—Ferro	Colisão		___	Colisão—Escuro	Couve		___
Colisão—Escuro	Fruta	___		Bebé—Chora	Escola	___	
Bebé—Chora	Obedecer		___	Obedecer—Polegada	Fruta	___	
Total		___	___	Total		___	___

Grupo III	Recordar	Fácil	Difícil	Grupo VI	Recordar	Fácil	Difícil
Bebé—Chora	Obedecer		___	Metal—Ferro	Bebé	___	
Colisão—Escuro	Fruta	___		Rosa—Flor	Fruta	___	
Escola—Mercearia	Bebé	___		Colisão—Escuro	Couve		___
Rosa—Flor	Metal	___		Bebé—Chora	Rosa	___	
Couve—Caneta	Colisão		___	Obedecer—Polegada	Escola		___
Fruta—Maçã	Escola		___	Fruta—Maçã	Obedecer		___
Obedecer—Polegada	Rosa	___		Couve—Caneta	Colisão		___
Metal—Ferro	Couve		___	Escola—Mercearia	Metal		___
Total		___	___	Total		___	___

Total dos Grupos I-III	Fácil (máx.12)	Difícil (máx. 12)	Total (máx. 24)

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3. TESTE DE APRENDIZAGEM VERBAL AUDITIVA DE REY (RAVLT)

PARTE I

Dê as instruções ao doente da seguinte forma:

"Vou ler-lhe uma lista de palavras. Ouça com atenção, para que quando eu parar me diga de todas as palavras que conseguir lembrar-se. Não interessa a ordem em que as diz. Tente apenas lembrar-se do máximo de palavras que conseguir."

Leia a seguinte lista de palavras ao doente e assinale cada item como e quando o doente o recordar correctamente.

Tambor	☐	Cortina	☐	Campainha	☐
Café	☐	Escola	☐	Pais	☐
Lua	☐	Jardim	☐	Chapéu	☐
Agricultor	☐	Nariz	☐	Peru	☐
Cor	☐	Casa	☐	Rio	☐

TOTAL RECORDADO (0—15) [ ]

PARTE 2

Dê as instruções ao doente da seguinte forma:

"Agora vou ler-lhe novamente a mesma lista de palavras e, mais uma vez, quando eu parar, quero que me diga tantas palavras quantas se conseguir lembrar, incluindo as palavras que já disse da primeira vez. A ordem em que as diz não é importante. Diga apenas o máximo de palavras que conseguir lembrar-se, quer já as tenha ou não dito antes."

Leia a seguinte lista de palavras ao doente e assinale cada item como e quando o doente o recordar correctamente.

Tambor	☐	Cortina	☐	Campainha	☐
Café	☐	Escola	☐	Pais	☐
Lua	☐	Jardim	☐	Chapéu	☐
Agricultor	☐	Nariz	☐	Peru	☐
Cor	☐	Casa	☐	Rio	☐

TOTAL RECORDADO (0—15) [ ]

PARTE 3

Dê as instruções ao doente da seguinte forma:

"Agora vou ler-lhe novamnete a mesma lista de palavra, e, mais uma vez, quando eu parar, quero que me diga as palavras que conseguir lembrar-se, incluindo as palavras que já disse antes. A ordem em que as diz não é importante. Diga o máximo de palavras que conseguir lembrar-se, quer já as tenha ou não dito antes."

Leia a seguinte lista de palavras ao doente e assinale cada item como e quando o doente o recordar correctamente.

Tambor	☐	Cortina	☐	Campainha	☐
Café	☐	Escola	☐	Pais	☐
Lua	☐	Jardim	☐	Chapéu	☐
Agricultor	☐	Nariz	☐	Peru	☐
Cor	☐	Casa	☐	Rio	☐

TOTAL RECORDADO (0—15) [ ]

Teste de Aprendizagem Verbal Auditiva de Rey. Adaptado de Taylor, E.M. (1959). A Avaliação de Crianças com Défices Cerebrais. Cambridge, MA: Imprensa da Universidade de Harvard, e Lezak, M.D. (1983) Avaliações Neuropsicológicas (2ª. ed.). Nova Iorque: Imprensa da Universidade de Oxford

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3. TESTE DE APRENDIZAGEM VERBAL AUDITIVA DE REY (RAVLT) (continuação)

PARTE 4

Dê as instruções ao doente da seguinte forma:

"Agora vou ler-lhe, novamente,a mesma lista de palavrs e, mais uma vez, quando eu parar, quero que me diga tantas palavras quantas se conseguir lembrar, incluindo as palavras que já disse antes. A ordem em que as diz não é importante. Diga apenas tantas palavras quantas se conseguir lembrar, quer já as tenha ou não dito antes."

Leia a seguinte lista de palavras ao doente e assinale cada item como e quando o doente o recordar correctamente.

Tambor	☐	Cortina	☐	Campainha	☐
Café	☐	Escola	☐	Pais	☐
Lua	☐	Jardim	☐	Chapéu	☐
Agricultor	☐	Nariz	☐	Peru	☐
Cor	☐	Casa	☐	Rio	☐
			TOTAL RECORDADO (0—15)	☐	

PARTE 5

Dê as instruções ao doente da seguinte forma:

"Agora vou ler-lhe novamente a mesma lista de palavras e, mais uma vez, quando eu parar, quero que me diga tantas palavras quantas se conseguir lembrar, incluindo as palavras que já disse antes. A ordem em que as diz não é importante. Diga apenas tantas palavras quantas se conseguir lembrar, quer já as tenha ou não dito antes."

Leia a seguinte lista de palavras ao doente e assinale cada item como e quando o doente o recordar correctamente.

Tambor	☐	Cortina	☐	Campainha	☐
Café	☐	Escola	☐	Pais	☐
Lua	☐	Jardim	☐	Chapéu	☐
Agricultor	☐	Nariz	☐	Peru	☐
Cor	☐	Casa	☐	Rio	☐
			TOTAL RECORDADO (0—15)	☐	

PARTE 6A   Tempo administrado ☐☐☐☐
Relógio de 24 hr

Dê as instruções ao doente da seguinte forma:

"Agora vou ler-lhe uma segunda lista de palavras. De novo, vai dizer novamente tantas palavras desta segunda lista quantas se conseguir lembrar. Tal como antes, a ordem em que diz as palavras não é importante. Tente apenas lembrar-se do máximo de palavras que conseguir."

Leia a seguinte lista de palavras ao doente e assinale cada item como e quando o doente o recordar correctamente.

Secretária	☐	Guarda-Florestal	☐	Pássaro	☐
Sapato	☐	Fogão	☐	Montanha	☐
Óculos	☐	Toalha	☐	Nuvem	☐
Barco	☐	Cordeiro	☐	Arma	☐
Lápis	☐	Igreja	☐	Peixe	☐
			TOTAL RECORDADO (0—15)	☐	

BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

3. TESTE DE APRENDIZAGEM VERBAL AUDITIVA DE REY (RAVLT) (continuação)

PARTE 6B

Dê as instruções ao doente da seguinte forma:

"Agora gostaria que me dissesse tantas palavras quantas se conseguir lembrar da PRIMEIRA lista de palavras que eu lhe li. De novo, a ordem em que diz as palavras não é importante. Tente apenas lembrar-se do máximo de palavras que conseguir."

Assinale cada item como e quando o doente o recordar correctamente.

Tambor	☐	Cortina	☐	Campainha	☐
Café	☐	Escola	☐	Pais	☐
Lua	☐	Jardim	☐	Chapéu	☐
Agricultor	☐	Nariz	☐	Peru	☐
Cor	☐	Casa	☐	Rio	☐
				TOTAL RECORDADO (0—15)	

Teste de Aprendizagem Verbal Auditiva de Rey. Adaptado de Taylor, E.M. (1959). A Avaliação de Crianças com Défices Cerebrais. Cambridge, MA: Imprensa da Universidade de Harvard, e Lezak, M.D. (1983) Avaliações Neuropsicológicas (2ª. ed.). Nova Iorque: Imprensa da Universidade de Oxford

BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

4. WMS-R MEMÓRIA DE DIGITOS

PARTE 1. DIGITOS DIRECTOS

Dê as instruções ao doente da seguinte forma:

"Eu vou dizer-lhe alguns números. Ouça com atenção, e quando eu tiver acabado diga-os de novo."

Leia os dígitos a uma velocidade de um dígito por segundo e, administre ambas as tentativas em cada item. Suspenda após falha em ambas as tentativas de qualquer item.

Item	Tentativa 1	Passou-Falhou	Tentativa 2	Passou-Falhou	Pontuação 2, 1, ou 0 (Números em que passou)
1	6—2—9		3—7—5		
2	5—4—1—7		8—3—9—6		
3	3—6—9—2—5		6—9—4—7—1		
4	9—1—8—4—2—7		6—3—5—4—8—2		
5	1—2—8—5—3—4—6		2—8—1—4—9—7—5		
6	3—8—2—9—5—1—7—4		5—9—1—8—2—6—4—7		
			TOTAL (0—12)		

PARTE 2. DIGITOS INVERTIDOS

Dê as instruções ao doente da seguinte forma:

"Agora vou dizer-lhe mais alguns número mas, desta vez, quando eu parar, quero que os diga pela ordem inversa. Por exemplo, se eu disser 2—8—3, o que iria dizer?"

Se estiver correcto, diga:
"Está certo. Agora ouça estes números e lembre-se que vai dizê-los pela ordem inversa."

Se estiver incorrecto, diga:
"Não, eu disse 2—8—3, por isso para os dizer pela ordem inversa, teria de dizer 3—8—2. Agora tente estes números. Lembre-se que vai dizê-los pela ordem inversa." Preparado? 1—5—8."

Item	TENTATIVA 1	Passou-Falhou	TENTATIVA 2	Passou-Falhou	Pontuação 2, 1, ou 0 (Números em que passou)
1	5—1		3—8		
2	4—9—3		5—2—6		
3	3—8—1—4		1—7—9—5		
4	6—2—9—7—2		4—8—5—2—7		
5	7—1—5—2—8—6		8—3—1—9—6—4		
6	4—7—3—9—1—2—8		8—1—2—9—3—6—5		
			TOTAL (0—12)		

BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

5. Teste de Associação Controlada de Palavras Orais (COWAT) - **TESTE DE FLUÊNCIA VERBAL FONOLÓGICA (Letra F)**

Dê as instruções ao doente da seguinte forma:

"Quero ver quantas palavras consegue dizer num minuto, começando com uma determinada letra. Não diga nomes próprios ou números, ou a mesma palavra com uma terminação diferente, e tente não se repetir. A letra é 'F', comece."

Registe a resposta do doente na seguinte tabela.

	Aceitável		Aceitável
1.	☐	23.	☐
2.	☐	24.	☐
3.	☐	25.	☐
4.	☐	26.	☐
5.	☐	27.	☐
6.	☐	28.	☐
7.	☐	29.	☐
8.	☐	30.	☐
9.	☐	31.	☐
10.	☐	32.	☐
11.	☐	33.	☐
12.	☐	34.	☐
13.	☐	35.	☐
14.	☐	36.	☐
15.	☐	37.	☐
16.	☐	38.	☐
17.	☐	39.	☐
18.	☐	40.	☐
19.	☐	41.	☐
20.	☐	42.	☐
21.	☐	43.	☐
22.	☐	44.	☐

Total de palavras criadas: ☐

Total de palavras válidas: ☐

5. Teste de Associação Controlada de Palavras Orais (COWAT) - TESTE DE FLUÊNCIA VERBAL FONOLÓGICA (continuação) (Letra A)

Dê as instruções ao doente da seguinte forma:

"Óptimo. Desta vez, quero ver quantas palavras consegue dizer num minuto, começando com uma letra diferente. De novo, não diga nomes próprios ou números, ou a mesma palavra com uma terminação diferente, e tente não se repetir. Desta vez a letra é 'A', comece."

Registe a resposta do doente na seguinte tabela.

	Aceitável		Aceitável
1.	☐	23.	☐
2.	☐	24.	☐
3.	☐	25.	☐
4.	☐	26.	☐
5.	☐	27.	☐
6.	☐	28.	☐
7.	☐	29.	☐
8.	☐	30.	☐
9.	☐	31.	☐
10.	☐	32.	☐
11.	☐	33.	☐
12.	☐	34.	☐
13.	☐	35.	☐
14.	☐	36.	☐
15.	☐	37.	☐
16.	☐	38.	☐
17.	☐	39.	☐
18.	☐	40.	☐
19.	☐	41.	☐
20.	☐	42.	☐
21.	☐	43.	☐
22.	☐	44.	☐

Total de palavras criadas:

Total de palavras válidas:

BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

5. CONTROLLED ORAL WORD ASSOCIATION TEST (COWAT) TESTE DE FLUÊNCIA VERBAL FONOLÓGICA (continuação) (Letra S)

Dê as instruções ao doente da seguinte forma:

"Óptimo. Desta vez, quero ver quantas palavras consegue dizer num minuto, começadas com uma letra diferente. De novo, não diga nomes próprios ou números, ou a mesma palavra com uma terminação diferente, e tente não se repetir. Desta vez a letra é 'S', comece"

Registe a resposta do doente na seguinte tabela.

	Aceitável		Aceitável
1.	☐	23.	☐
2.	☐	24.	☐
3.	☐	25.	☐
4.	☐	26.	☐
5.	☐	27.	☐
6.	☐	28.	☐
7.	☐	29.	☐
8.	☐	30.	☐
9.	☐	31.	☐
10.	☐	32.	☐
11.	☐	33.	☐
12.	☐	34.	☐
13.	☐	35.	☐
14.	☐	36.	☐
15.	☐	37.	☐
16.	☐	38.	☐
17.	☐	39.	☐
18.	☐	40.	☐
19.	☐	41.	☐
20.	☐	42.	☐
21.	☐	43.	☐
22.	☐	44.	☐

Total de palavras criadas: ☐

Total de palavras válidas: ☐

BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

6. TESTE DE FLUÊNCIA VERBAL SEMÂNTICA - EVOCAÇÃO CATEGORIAL (Nomes de animais)

Dê as instruções ao doente da seguinte forma:

"Quero ver quantos animais diferentes consegue dizer num minuto. Tente não se repetir. Comece!"

Registe a resposta do participante na seguinte tabela.

	Aceitável		Aceitável		Aceitável
1.	☐	15.	☐	29.	☐
2.	☐	16.	☐	30.	☐
3.	☐	17.	☐	31.	☐
4.	☐	18.	☐	32.	☐
5.	☐	19.	☐	33.	☐
6.	☐	20.	☐	34.	☐
7.	☐	21.	☐	35.	☐
8.	☐	22.	☐	36.	☐
9.	☐	23.	☐	37.	☐
10.	☐	24.	☐	38.	☐
11.	☐	25.	☐	39.	☐
12.	☐	26.	☐	40.	☐
13.	☐	27.	☐	41.	☐
14.	☐	28.	☐	42.	☐

Total de palavras criadas:

Total de palavras válidas:

BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

7. WMS-R APRENDIZAGEM ASSOCIATIVA DE PARES VISUAIS II - EVOCAÇÃO DIFERIDA

Tempo administrado

Relógio de 24 hr

NOVO TESTE: Para ser administrado **30** minutos após a administração inicial.

Dê as instruções ao doente da seguinte forma:

"Há pouco tempo atrás mostrei-lhe algumas figuras, cada uma associada a uma cor diferente. Estas eram as cores. Agora vou mostrar-lhe as figuras novamente e vai tentar lembrar-se a cor que correspondia a cada figura."

APRENDIZAGEM ASSOCIATIVA DE PARES VISUAIS II

Item	Chave	Resposta	Pontuação de 1 ou 0
1	R		
2	E		
3	V		
4	Az.		
5	Am		
6	Pu		
		Máx. = 6 Total	

BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

8. WMS-R APRENDIZAGEM ASSOCIATIVA DE PARES DE PALAVRAS – EVOCAÇÃO DIFERIDA

Tempo administrado

Relógio de 24 hr

NOVO TESTE: para ser administrado **30** minutos após a administração inicial.

Dê as instruções ao doente da seguinte forma:

"Há pouco tempo atrás eu li-lhe uma lista de palavras, duas de cada vez. Depois li-lhe a primeira palavra de cada par, e disse-me a outra palavra que lhe correspondia. Por exemplo, se as palavras fossem Este-Oeste, e eu dissesse a palavra Este, teria de me responder Oeste. Lembra-se? Agora quero que tente lembrar-se bem dos pares de palavras. Vou ler uma das palavras e vai dizer-me a outra palavra que lhe corresponde..

APRENDIZAGEM ASSOCIATIVA DE PARES DE PALAVRAS II		
Palavra Estímulo (e resposta correcta)	Resposta	
	Fácil	Difícil
ROSA—(Flor)	_____	
METAL—(Ferro)	_____	
ESCOLA—(Mercearia)		_____
COUVE—(Caneta)		_____
BEBÉ—(Chora)	_____	
COLISÃO—(Escuro)		_____
OBEDECER—(Polegada)		_____
FRUTA—(Maçã)	_____	
Total	Máx. = 4	Máx. = 4

BATERIA DE AVALIAÇÃO NEUROPSICOLÓGICA (NTB)

9. APRENDIZAGEM VERBAL AUDITIVA DE REY (RAVLT) - EVOCAÇÃO DIFERIDA

PARTE 7   Tempo administrado [ ][ ][ ][ ]

Relógio de 24 hr

NOVO TESTE: Para ser administrado **30** minutos após a administração da parte 6B.

Dê as instruções ao doente da seguinte forma:

"Há pouco tempo atrás eu li-lhe uma lista de palavras cinco vezes e solicitei-lhe que se lembrasse das palavras, de modo que as pudesse repetir de novo. Agora gostaria que me dissesse o máximo possível dessas palavras. A ordem em que as diz não é importante".

Assinale cada item como e quando o doente o recordar correctamente.

Tambor	☐	Cortina	☐	Campainha	☐
Café	☐	Escola	☐	Pais	☐
Lua	☐	Jardim	☐	Chapéu	☐
Agricultor	☐	Nariz	☐	Peru	☐
Cor	☐	Casa	☐	Rio	☐

TOTAL RECORDADO (0—15) [ ]

PARTE 8.

Dê as instruções ao doente da seguinte forma:

"Há pouco tempo atrás eu li-lhe uma lista de palavras cinco vezes e solicitei-lhe que se lembrasse das palavras, de modo que as pudesse repetir de novo. Agora gostaria que olhasse com atenção para esta lista de palavras e me dissesse de que palavras se consegue lembrar dessa primeira lista. A ordem em que as diz não é importante".

Mostre o cartão que possui a seguinte lista de palavras, e assinale cada item quando o doente o reconhecer.

Professor	☐	Beterraba	☐	**Nariz**	☐
Rio	☐	**Cortina**	☐	**Escola**	☐
Ponte	☐	Chão	☐	**Campainha**	☐
Agricultor	☐	Soldado	☐	Cara	☐
Caneta	☐	**Tambor**	☐	**Jardim**	☐
Testa	☐	**Café**	☐	Aula	☐
Lenço	☐	Estrada	☐	**Pais**	☐
Casa	☐	**Chapéu**	☐	Crianças	☐
Lua	☐	**Peru**	☐	Cabo	☐
Cor	☐	Minuto	☐	Água	☐

TOTAL RECONHECIDO CORRECTAMENTE (ITENS ASSINALADOS A NEGRITO) (0-15)	
TOTAL RECONHECIDO INCORRECTAMENTE (ITENS NÃO ASSINALADOS A NEGRITO) (0-15)	

ESCALA DE AVALIAÇÃO DA DOENÇA DE ALZHEIMER

ALZHEIMER DISEASE ASSESSMENT SCALE – ADAS

TRADUÇÃO EM PORTUGUÊS, ORGANIZAÇÃO E AFERIÇÃO

Grupo de Estudos de Envelhecimento Cerebral e Demências
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ADAS COGNITIVA (ADAS – Cog)

1. Tarefa de evocação de palavras

Nesta prova são efectuadas três tentativas para aprender uma lista de 10 palavras de alta frequência (e altamente visualizáveis). As dez palavras impressas em cartões, são apresentadas, uma a uma, pelo observador durante dois segundos cada. Na primeira tentativa o observador fornece a seguinte instrução: "Vou mostrar-lhe cartões com palavras, um de cada vez. Leia cada palavra em voz alta e tente memorizá-la, porque mais tarde vou pedir--lhe para recordar todas as palavras que lhe mostrei". Depois da apresentação de todas as palavras, o observador pede ao sujeito para tentar recordar o maior número possível de palavras. Fazem-se mais duas aplicações de leitura e evocação.

NOTA: Para sujeitos analfabetos as palavras são lidas em voz alta pelo observador em vez de apresentadas em cartões.

PONTUAÇÃO: Atribui-se 1 ponto a cada resposta errada. Soma-se e divide-se por três, arredondando para o n.º inteiro mais próximo.

1.ª Tentativa	Recordada	N/Recordada	2.ª Tentativa	Recordada	N/Recordada	3.ª Tentativa	Recordada	N/Recordada
Casa	☐	☐	Criança	☐	☐	Saia	☐	☐
Barco	☐	☐	Mão	☐	☐	Pente	☐	☐
Saia	☐	☐	Carro	☐	☐	Pão	☐	☐
Mão	☐	☐	Médico	☐	☐	Escola	☐	☐
Escola	☐	☐	Casa	☐	☐	Carro	☐	☐
Pão	☐	☐	Pente	☐	☐	Mão	☐	☐
Criança	☐	☐	Saia	☐	☐	Barco	☐	☐
Médico	☐	☐	Pão	☐	☐	Criança	☐	☐
Carro	☐	☐	Barco	☐	☐	Casa	☐	☐
Pente	☐	☐	Escola	☐	☐	Médico	☐	☐
Total =			Total =			Total =		

Pontuação = _____
(pontuação máxima de 10)

2. Nomeação de objectos e dedos

Nesta prova pede-se ao sujeito para dizer o nome de doze objectos reais, de alta, média e baixa frequência, apresentados aleatoriamente. A instrução deve ser: **"Como se chama isto? ou Qual é o nome deste objecto?"** Se o sujeito não responde, então o observador deve dar ajuda semântica para o objecto; se o sujeito continua sem responder ou comete erros, o observador deve passar para o objecto seguinte.

Em seguida, pede-se ao sujeito para dizer os nomes dos dedos da mão dominante pela seguinte ordem: polegar, mínimo, indicador, médio e anelar.

Objectos	Pistas dadas quando há dificuldade	Correcto	Incorrecto
Alfinete	Para prender, era usado nas fraldas dos bébés	☐	☐
Caneta	Para escrever	☐	☐
Bola	Para jogar e pode ser um brinquedo	☐	☐
Prego	Para fixar (pendurar)	☐	☐
Cigarro	Para fumar	☐	☐
Copo	Por onde bebemos	☐	☐
Tesoura	Para cortar	☐	☐
Colher	Para comer a sopa	☐	☐
Selo	Para colar nas cartas	☐	☐
Óculos	Para ver melhor	☐	☐
Relógio	Para ver as horas	☐	☐
Anel	Para usar nos dedos	☐	☐

Dedos: Deve nomear os dedos da mão dominante

	Resposta	Correcto	Incorrecto
Polegar		☐	☐
Indicador		☐	☐
Médio		☐	☐
Anelar		☐	☐
Mínimo		☐	☐

Total = _____

Pontuação (itens – nomes de objectos e dedos):

0 = 2 itens incorrectamente nomeados
1 = 3 - 5 itens incorrectamente nomeados
2 = 6 – 8 itens incorrectamente nomeados
3 = 9 – 11 itens incorrectamente nomeados
4 = 12 – 14 itens incorrectamente nomeados
5 = 15 – 17 itens incorrectamente nomeados

Pontuação = _____
(pontuação máxima de 5)

3. Compreensão de ordens

Nesta prova avalia-se a compreensão da linguagem oral em função da capacidade do sujeito para executar 5 ordens. Cada ordem só pode ser repetida uma vez. Se o sujeito não responde ou comete erros à primeira instrução, o observador deve dar a ordem mais uma vez, e passa à próxima ordem. Devem ser aplicadas todas as ordens. As ordens só são consideradas correctas se executadas na totalidade.

Ordens	Correcto	Incorrecto
1. "Feche a mão".	☐	☐
2. "Aponte para o tecto e depois para o chão".	☐	☐
Coloca-se em linha um lápis, um relógio e um cartão		
3. "Ponha o <u>lápis em cima do cartão</u> e depois volte a colocá-lo no <u>lugar onde estava</u>".	☐	☐
4. "Ponha o <u>relógio</u> do <u>outro lado do lápis</u> e depois <u>vire o cartão</u>".	☐	☐
5. "Bata <u>duas vezes em cada um dos seus ombros com dois dedos</u> e <u>com os olhos fechados</u>".	☐	☐
Nota: Os elementos sublinhados representam etapas únicas, mas cada ordem é cotada como um todo.		

Pontuação (itens – nomes de objectos e dedos):

0 = 0 Erros, 5 ordens correctas
1 = 1 Ordem incorrecta, 4 ordens correctas
2 = 2 Ordens incorrectas, 3 ordens correctas
3 = 3 Ordens incorrectas, 2 ordens correctas
4 = 4 Ordens incorrectas, 1 ordem correcta
5 = 5 Ordens incorrectas

Pontuação = _____
(pontuação máxima de 5)

4. Capacidade Construtiva

Esta prova avalia a capacidade de copiar quatro figuras geométricas que vão deste um figura simples (um círculo) até uma mais complexa (um cubo). As formas devem ser apresentadas individualmente, em folhas de papel planas e brancas (na metade superior de uma folha A4).

O observador deve dar ao sujeito um lápis antes de lhe entregar a 1.ª forma. As instruções fornecidas são: **"Nesta folha está uma figura. Tente desenhar uma figura parecida, em qualquer parte da folha"**. São permitidas duas tentativas. Se o sujeito não consegue reproduzir a figura em duas tentativas passa para a figura seguinte. O desenho é cotado como correcto se o sujeito reproduzir todas as características geométricas do original. As diferenças no tamanho não são cotadas como erro, assim como pequenas falhas entre as linhas, desde que a forma esteja bem reproduzida (ver exemplos a seguir).

NOTA: O uso de borracha não é permitido.

Critérios de pontuação para cada forma

1. Círculo – Curva fechada.

2. Dois rectângulos sobrepostos – Cada rectângulo deve ter quatro lados e a sobreposição deve ser igual à forma apresentada.

3. Losango – A figura deve ter quatro lados oblíquos e todos os lados devem ser aproximadamente iguais em comprimento.

4. Cubo – A forma deve estar em perspectiva, com a face anterior correctamente orientada, as linhas internas correctamente desenhadas entre os cantos.

Correcto	Incorrecto	Correcto	Incorrecto	Correcto	Incorrecto
2		3		4	

Registo	Correcto	Incorrecto
□ Círculo	□	□
□ Dois rectângulos sobrepostos	□	□
□ Losango	□	□
□ Cubo	□	□

Pontuação:
0 = 4 desenhos correctos
1 = 1 desenho incorrecto
2 = 2 desenhos incorrectos
3 = 3 desenhos incorrectos
4 = 4 desenhos incorrectos
5 = Nenhuma forma, partes da forma, ou palavras em vez de desenho

Pontuação = _____
(pontuação máxima de 5)

4. Capacidade Construtiva

Desenho 1
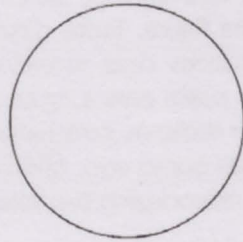
4. Capacidade Construtiva

Desenho 2
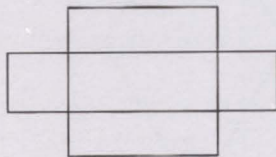
4. Capacidade Construtiva

Desenho 3
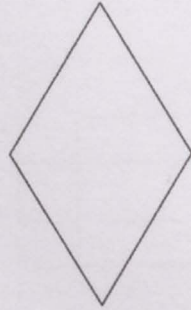
4. Capacidade Construtiva

Desenho 4
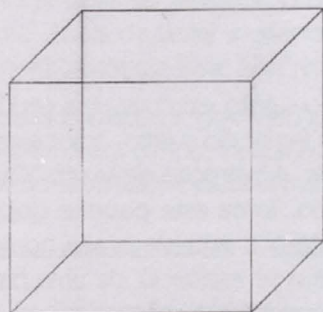
5. Praxia Ideativa

Esta prova avalia a capacidade de o sujeito executar uma sequência de acções complexas e familiares. Em cima da mesa e em frente do sujeito, coloca-se simultaneamente, uma folha de papel A 4 e um envelope grande. A instrução deve ser: **"Quero que faça de conta que está a enviar uma carta a si próprio. Tome este papel e <u>dobre-o</u> de maneira que <u>caiba dentro do envelope</u>, depois <u>feche-o</u> e <u>escreva o seu nome, a sua morada</u> e indique onde <u>colocaria o selo</u>"**. Se o sujeito se esquecer de uma parte do exercício ou se tiver dificuldades, o observador deve repetir a instrução.

NOTA: Só é considerada alteração neste item, quando este reflecte apenas dificuldade na execução duma tarefa conhecida e não alterações da memória.

Componentes	Correcto	Incorrecto
1. Dobrar a carta	☐	☐
2. Pôr a carta dentro do envelope	☐	☐
3. Fechar o envelope	☐	☐
4. Endereçar o envelope	☐	☐
5. Indicar o local do selo	☐	☐

Pontuação:

0 = Todas as etapas executadas
1 = 1 etapa não executada
2 = 2 etapas não executadas
3 = 3 etapas não executadas
4 = 4 etapas não executadas
5 = Todas as etapas não executadas

Pontuação = _____

(pontuação máxima de 5)

6. Orientação

As componentes da orientação são: nome, ano, mês, dia, dia da semana, estação do ano, local e hora (8 itens). Para o local deve ser indicado o nome do local onde o sujeito se encontra no momento presente. Antes de testar a orientação, o observador deve ter em atenção as pistas periféricas no ambiente do teste (Ex.: relógio, calendário).

NOTA: Aceitam-se como respostas correctas a indicação do primeiro e último nome, + / - 1 h para as horas, nome incompleto para o local, indicação da próxima estação do ano, no período de uma semana antes do seu início, e duas semanas depois do seu fim.

Item	Correcto	Incorrecto
1. Nome completo	☐	☐
2. Ano	☐	☐
3. Mês	☐	☐
4. Dia	☐	☐
5. Dia da semana	☐	☐
6. Estação do ano	☐	☐
7. Local	☐	☐
8. Hora	☐	☐

Pontuação = _____
(pontuação máxima de 8)

7. Reconhecimento de palavras

Nesta prova são efectuadas três tentativas para aprender uma lista de 12 palavras. Em cada tentativa, pede-se ao sujeito para ler em voz alta 12 palavras apresentadas em cartões e para as memorizar. Depois estas palavras são misturadas com 12 palavras semelhantes na frequência e na imagiabilidade, e pede-se ao sujeito para decidir se cada uma dessas palavras fazia ou não parte da lista inicial que ouviu . No princípio de cada tentativa, o observador fornece a seguinte instrução: **"Vou mostrar-lhe alguns cartões com palavras. Quero que as leia em voz alta e que as tente memorizar"**. No fim de cada prova de aprendizagem o observador deve fornecer a seguinte instrução: **"Agora vou mostrar-lhe um novo conjunto de palavras. Algumas destas palavras faziam parte da lista inicial que viu, outras são novas. Para cada palavra, quero que me diga se essa palavra é nova ou se já a mostrei antes"**. O observador mostra a primeira palavra e diz: **"Esta palavra é alguma das que lhe mostrei antes, sim ou não?"**. As instruções são iguais para as duas primeiras palavras de cada tentativa. Para as restantes palavras da prova o observador deve dizer: **"E agora esta?"**. Se o sujeito não responde ou não compreendeu a tarefa, o observador deve repetir a instrução e anotar o n.º de vezes em que repetiu a instrução (subteste 8).

Nota: Para sujeitos analfabetos as palavras são ditas em voz alta pelo observador, em vez do sujeito as ler.

7. Reconhecimento de palavras

As palavras a negrito são as palavras da lista inicial. Os círculos representam as respostas incorrectas e os quadrados as respostas correctas.

1.ª Tentativa	Sim	Não	Rec	2.ª Tentativa	Sim	Não	Rec	3.ª Tentativa	Sim	Não	Rec
Beijo	○	☐	☐	**Festa**	☐	○	☐	Dança	○	☐	☐
Papa	○	☐	☐	Abraço	○	☐	☐	**Festa**	☐	○	☐
Livro	○	☐	☐	Talho	○	☐	☐	Passeio	○	☐	☐
Festa	☐	○	☐	**Praia**	☐	○	☐	**Praia**	☐	○	☐
Mão	○	☐	☐	**Carta**	☐	○	☐	**Carta**	☐	○	☐
Feira	○	☐	☐	**Braço**	☐	○	☐	Jardim	○	☐	☐
Praia	☐	○	☐	Rua	○	☐	☐	**Braço**	☐	○	☐
Carta	☐	○	☐	Pé	○	☐	☐	Perna	○	☐	☐
Braço	☐	○	☐	Teatro	○	☐	☐	**Museu**	☐	○	☐
Queijo	○	☐	☐	**Museu**	☐	○	☐	Loja	○	☐	☐
Chuva	○	☐	☐	**Sol**	☐	○	☐	Bife	○	☐	☐
Museu	☐	○	☐	Teatro	○	☐	☐	Água	○	☐	☐
Sol	☐	○	☐	**Manteiga**	☐	○	☐	**Sol**	☐	○	☐
Manteiga	☐	○	☐	**Milho**	☐	○	☐	**Manteiga**	☐	○	☐
Semente	○	☐	☐	**Chapéu**	☐	○	☐	Padre	○	☐	☐
Gravata	○	☐	☐	Café	○	☐	☐	**Milho**	☐	○	☐
Parque	○	☐	☐	Avião	○	☐	☐	**Chapéu**	☐	○	☐
Milho	☐	○	☐	**Rio**	☐	○	☐	**Rio**	☐	○	☐
Chapéu	☐	○	☐	Vinho	○	☐	☐	Vestido	○	☐	☐
Parque	○	☐	☐	**Pérola**	☐	○	☐	Polícia	○	☐	☐
Rio	☐	○	☐	Lenço	○	☐	☐	**Pérola**	☐	○	☐
Pérola	☐	○	☐	Cão	☐	○	☐	Gato	○	☐	☐
Cão	☐	○	☐	Vaca	○	☐	☐	**Cão**	☐	○	☐
Cavalo	○	☐	☐	Tinta	○	☐	☐	Corda	○	☐	☐

Total de respostas incorrectas = _____

Total Rec = _____

NOTA: Rec = Recordação da instrução.

Para a pontuação somam-se as respostas incorrectas de cada tentativa, divide-se esse n.º por três e arredonda-se para o n.º inteiro mais próximo.

Pontuação = _____
(pontuação máxima de 10)

Examples of therapy exercises

All examples are taken from Nunes, Belina and Pais, Joana (2006). *Doença de Alzheimer – Exercícios de Estimulação* vols. 1–II, Lidel Edições Técnicas, Lisbon.

ATENÇÃO

EXERCÍCIO 1

INSTRUÇÕES: pedir ao seu familiar que procure e assinale o **algarismo 2**.

1	2	5	8	2
8	3	2	6	6
3	6	3	1	3
9	7	0	3	7
1	8	5	3	4

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Doença de Alzheimer – Exercícios de Estimulação

INSTRUÇÕES: pedir ao seu familiar que procure e assinale as **estrelas brancas**.
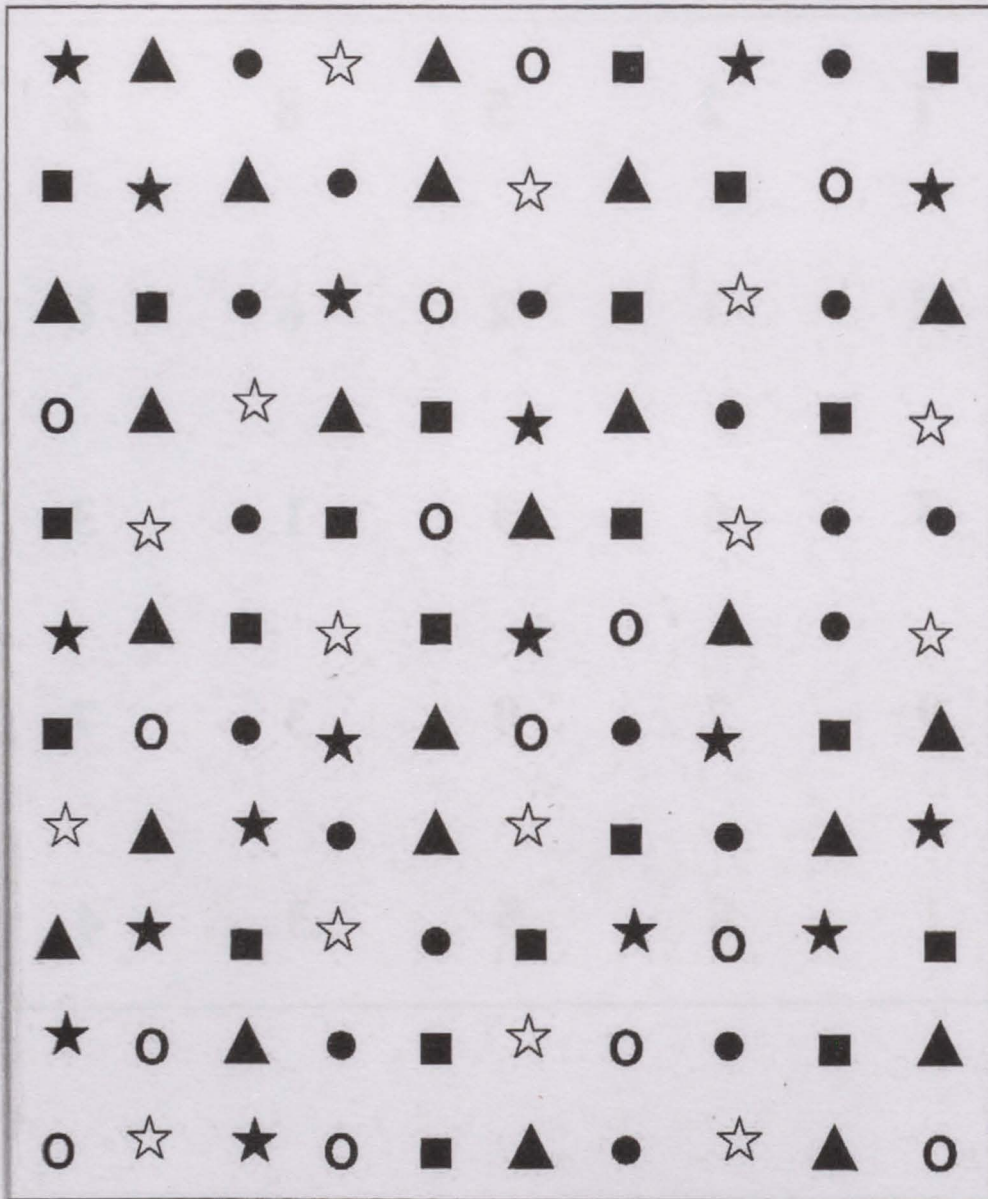
ATENÇÃO

EXERCÍCIO 51

INSTRUÇÕES: pedir ao seu familiar que compare as duas colunas e assinale as diferenças na coluna da direita.
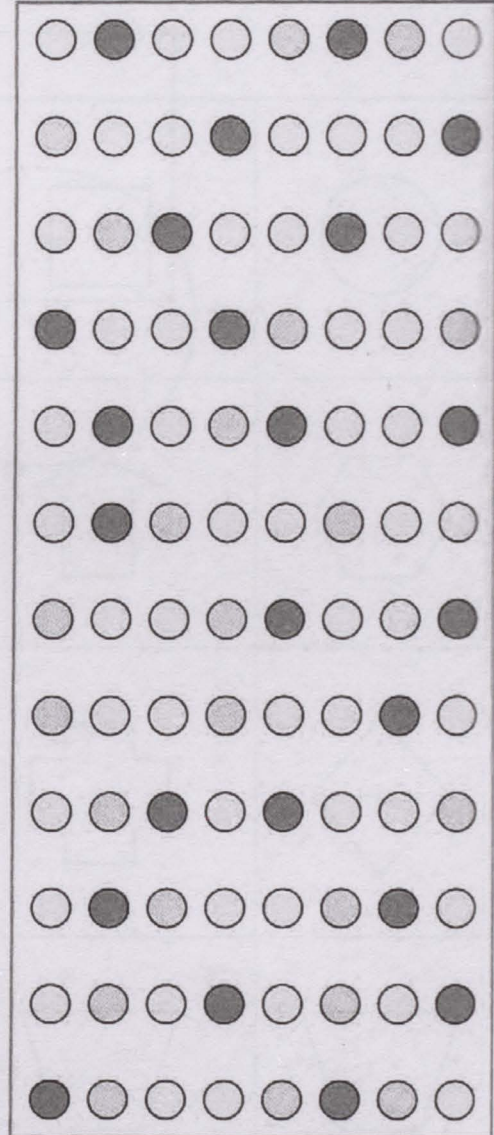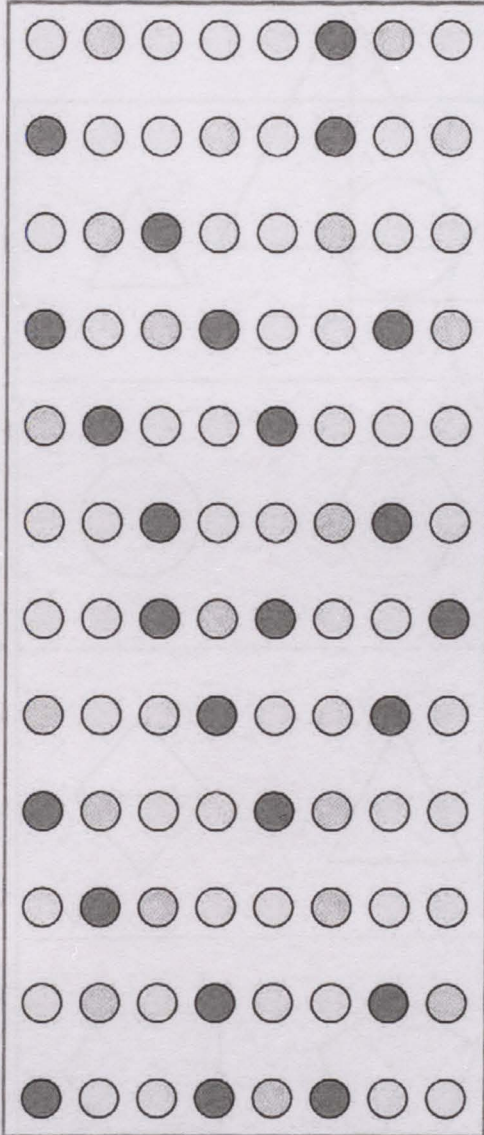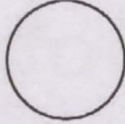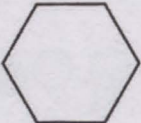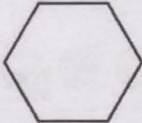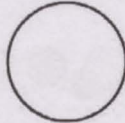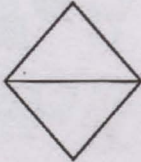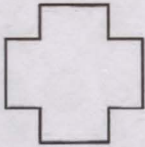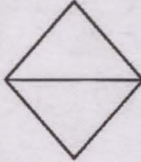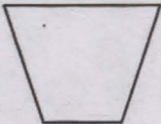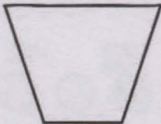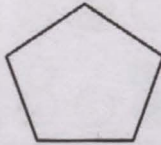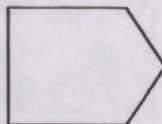
RECONHECIMENTO VISUAL

INSTRUÇÕES: pedir ao seu familiar que assinale à direita a **figura** que é igual à da esquerda.

RECONHECIMENTO VISUAL

INSTRUÇÕES: pedir ao seu familiar que contorne as várias figuras sobrepostas de diferentes cores.

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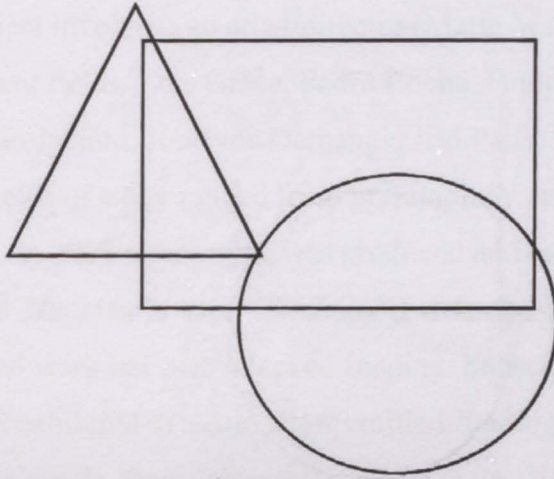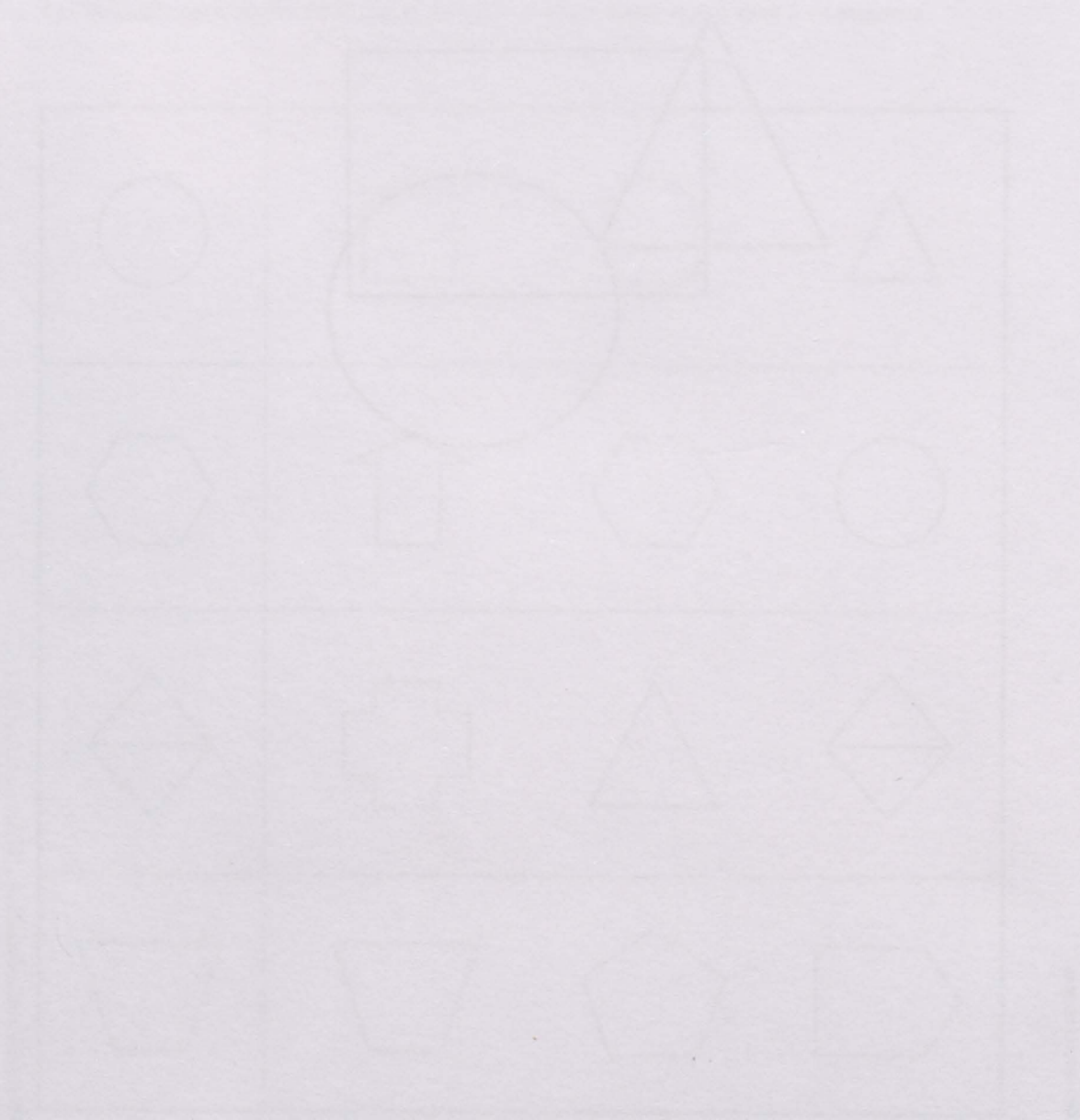
Complementary work / exhibitions

Ethology I

Ethology I resulted from an artistic residency at Ectopia – Experimental Art Laboratory at IGC (Instituto Gulbenkian de Ciência), and was conceived as a collaborative transdisciplinary project involving an artist/director (Maria Manuela Lopes) and several scientists from different fields. Luis Graça, Pedro Rocha, Paulo Urbano, Jorge Carneiro, Luis Quintais, Antonio Jacinto, Jocelyne Demangio and Paulo Bernardino, constituted the group and their fields of study ranged from immunology and molecular biology to artificial intelligence. In 2008 a prototype was produced and exhibited in two conferences (*Isea* and *MutaMorphosis: Challenging Arts and Sciences*), but never evolved into a finished work because it lacked funding. Subsequently a multiform work was produced for and exhibited in a solo show entitled *Ethology I* at Fundação D. Luis I, Centro Cultural de Cascais, from January 25 to March 26, 2008. It was also partially exhibited at an international exhibition entitled, *hYbrid: Reflections on Science and Art* at Museu Nacional de Soares dos Reis from May 29 to June 4, 2009. In 2012 the project had another public viewing at an international experimental art exhibition *Emergências 2012*, held at Fabrica da Asa, Guimarães, European Capital of Culture 2012.

In order to further explain how the project is constituted I will present an extract from the catalogue of *Emergências 2012*.

> Ethology as influential behaviour: Symbiosis; Metamorphosis; Presence; Memory; Space; Place; Identity; Self; Other.
>
> *Ethology I* is a continuing collaborative project based on the location of the dialectical relationship between the self and the non-self. It examines, at a symbolic level, the workings of the immune system via its capacity for learning and memory, its intrinsic relationship with the brain and the boundaries of the 'fields of self'. It looks at notions of specificity and location as complex systems, and explores the domains of the visible and the material against the almost imperceptible/chemical transformation of the biological and subjective world.
>
> The installation – almost a living organism – is a subtle, interactive ground that examines visible physical phenomena including evaporation, condensation and chemical and biological transformation, via the growth of fungi and bacteria on the agar surface. It also explores the invisible, virtual 'mind world' reaction – affect and effect – to the installation.

Ethology I explores the location of ethological relationships by seeking to show how external social relationships mimic biological systems; the physical construct of the prototype is based on the diversity, fluidity and dynamics of the immune system. It explores how the biological process may help to locate the dialectic relationships between nature/culture and dislocation/location that are found symbolically in the immune system.
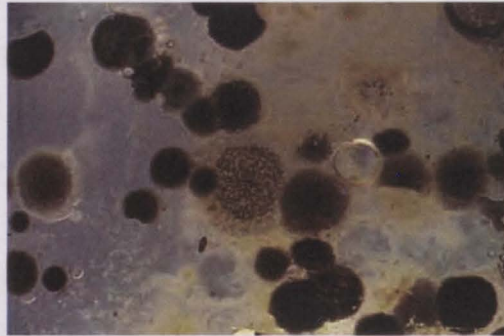

Fig. 77. Maria Manuela Lopes, 2008, *Ethology I.* Exhibition *Ethology I* at Fundação D. Luis I – Centro Cultural de Cascais, Cascais.
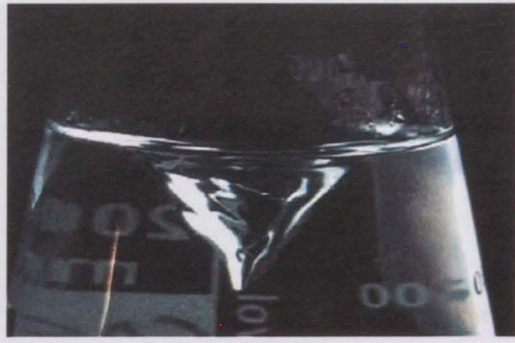
Fig. 78. Maria Manuela Lopes, 2008, *Ethology I*, Exhibition *Ethology I* at Fundação D. Luis I –
Centro Cultural de Cascais, Cascais.
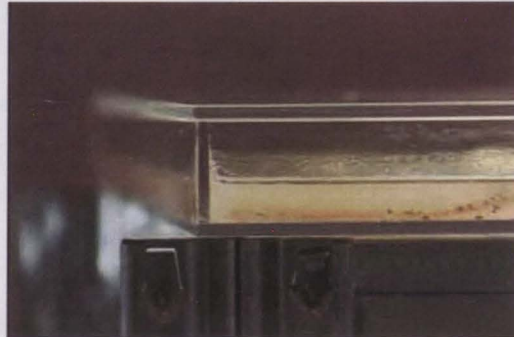
Fig. 79. Maria Manuela Lopes, 2012, *Ethology I,* at *Emergências 2012*, Fabrica da Asa.
Guimarães.
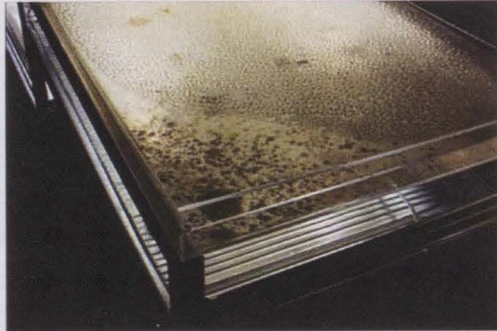
Fig. 80. Maria Manuela Lopes, 2012, *Ethology I*, at *Emergências 2012*, Fabrica da Asa. Guimarães.

Cage SSI

Cage SSI was developed with scientist Alexande do Carmo and with the technical collaboration of Mario Vairinhos and Paulo Bernardino. It resulted from an artistic residency at IBMC (Institute for Molecular and Cell Biology) at a group entitled CAGE (Cell Activation and Gene Expression). The residency was part of *The Residences Network Programme: Art/Science/Technology Experimentation*, a cooperation between Ciência Viva and Direcção-Geral das Artes (DGartes)/Ministry of Culture, Portugal. *Cage SSI* uses biotechnology and immunology to consider site-specific issues and symbiotic relations. The resulting interactive installation, with four superimposed video projections, is inspired by the mechanics and dynamics of the immune system, using bench work and immunological synapses as the foundation for video microscopy. It also appropriates scenes from *Akira Kurosawa's* film *Ikiru*. Sensors track visitors in space and trigger their reactions to various videos presented.

The cells for the videos used in the project were treated with fluorescent marker to give them a basic colour/light quality. Cells seen with the naked eye under the light of a microscope, or as here under camera surveillance, usually appear either transparent or tinged pink by the medium used for the cultures. Technology mediated what was there but required enhancement and techniques of exploring separation and isolation to make reality visible and comprehensible. My task was to regain visibility, to reconfigure a strategy for an installation that could return to the embodied condition of the viewer and recapture throughout the experience of the work a sense of wholeness and questioning of the independence of the self.

The project *Cage SSI* was presented at Fnac, Cascais, March 15, 2008 and exhibited at *Exposição Experimentação: Arte/Ciência e Technologia*, Pavilhão do Conhecimento, Lisbon, June–September 2008.
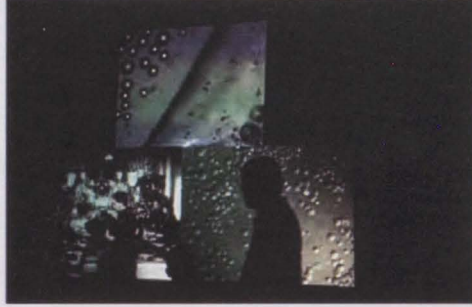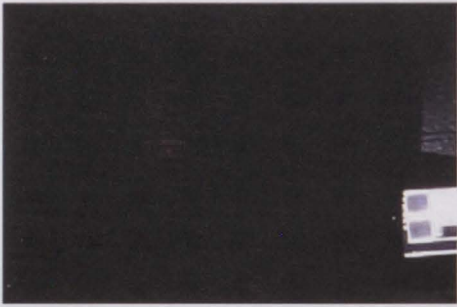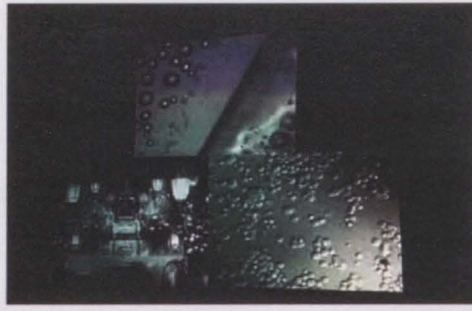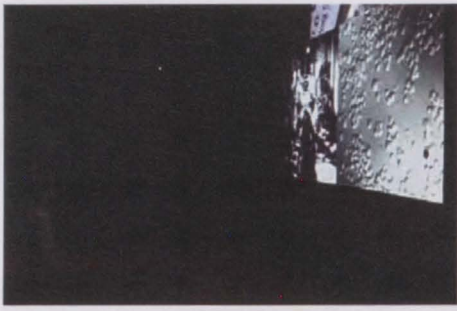
Fig. 81. Maria Manuela Lopes, 2008, *CAGE SSI,* at *Exposição Experimentação: Arte|Ciência e Tecnologia,* Pavilhão do Conhecimento - Ciência Viva, Lisbon.

Tetrahymena

Art project by Maria Manuela Lopes and Marta de Menezes in collaboration with scientist Isabel Gordo within Evolutionary Biology and Population Genetics research group. *Tetrahymena* resulted from a residency period at Ectopia – Experimental Art Laboratory at IGC (Instituto Gulbenkian de Ciência).

Tetrahymena are free-living ciliate protozoa common in fresh water that can switch from commensalistic to pathogenic modes of survival. Two species are used as model organisms in biomedical research. The project examines the ambiguous relationship between the observer and the observed in constructing a common meaning. The discovery of multiple gender possibilities – in this case seven – in this biological organism led us to imagine new conceptual possibilities including instability, mutancy, the sensible, the enthusiastic, the context-dependent and representational. This collaborative exercise selected (or was faced with the possibility of) the organism in which the first synchronization of cell division took place, inducing the study of cell cycle control mechanism to experiment and present a synchronized creative relationship. It is about gaze and liminality, identity as a co-constructed and affirmed possibility, and the rules of the biological game predisposed in this construction. Expectancy, ambiguity, sincerity, and indeterminacy might be characteristic of a 'liminal' state, allowing the flow from within to be expressed and to become visible. Viewers are encouraged to take time to move around an installation space and hold themselves in the gaze, yet always with the possibility of moving outside the frame and recognizing the transition.

Tetrahymena was exhibited at the *Key of Life* festival, Leiden, October 2009, *Festa da Primavera* (Spring Exhibition), at Cultivamos Cultura– Associação Cultural, São Luis, Portugal, March 2010 and also at *BioartCamp*, Banff, 2011. *Tetrahymena* was invited to enter the Prix Ars Electronica 2010, but was not nominated for a prize.
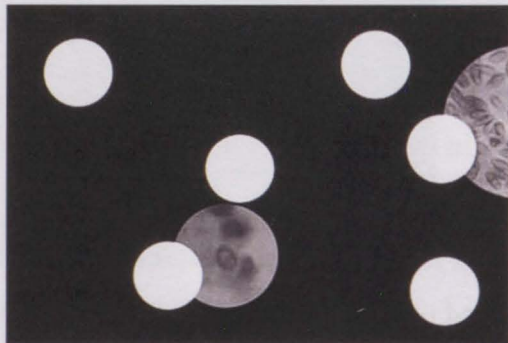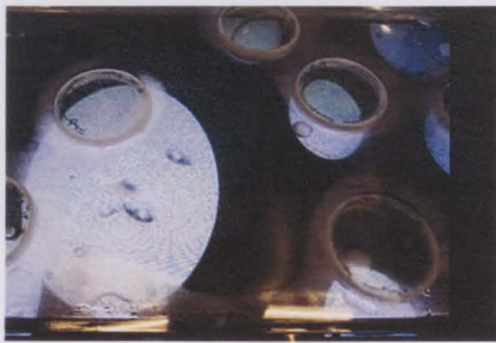
Fig. 82. Maria Manuela Lopes + Marta de Menezes, 2009, *Tetrahymena I*, at IGC and *Key of Life* Festival, Leiden.

Affective Reframing

Art project by Maria Manuela Lopes and Paulo Bernardino for the EPAC (European Public Art Center) contest promoted in Portugal by Ectopia – Experimental Art Laboratory. The work was custom-made for display in a glass box that was supplied. Residency at Cultivamos Cultura – Associação Cultural, São Luis, Portugal.

The installation consisted of a modelled and cast blue rubber female chimpanzee 'glued' to the glass surface and looking outside the box. The figure was seated on a heated water-bed that produced condensation, thus preventing viewers from seeing inside the box. A multidirectional distance sensor detected the approach of would-be viewers and activated a wiper blade that cleared a section of the glass behind the exhibit. Thus, when approaching from any position, the viewer is led to peer inside the box at the chimpanzee's rear. The view is thus subverted from the apparent front to the rear of the box; further the exhibit's position in relation to observers/participants inverts and parodies the subjection of the artwork to the public gaze, virtually transforming the observer into the observed. The work was not yet shown publicly because it did not pass the final selection.
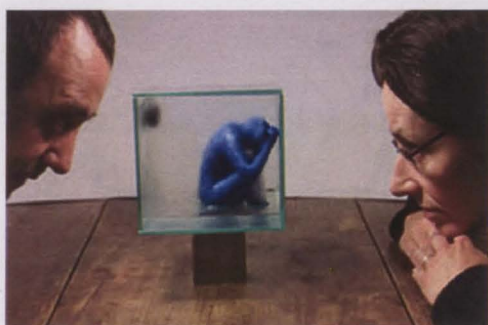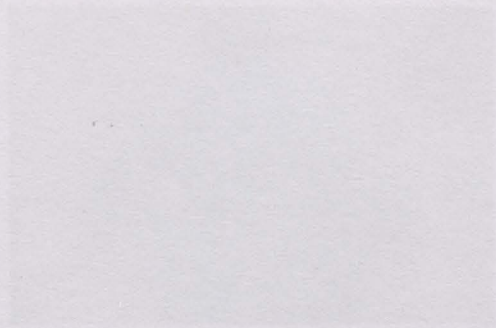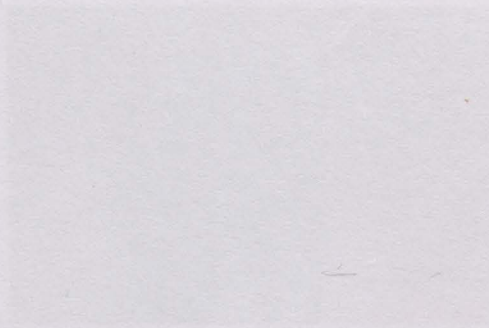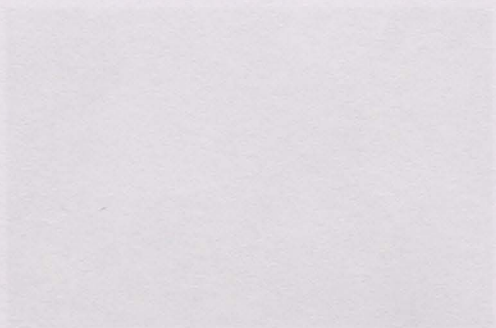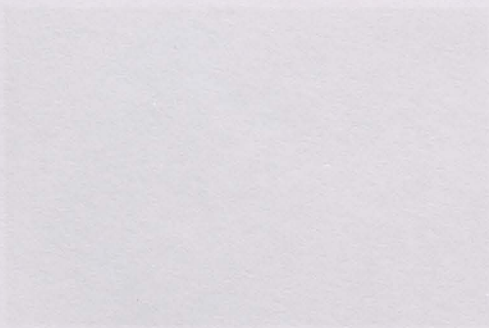

Fig. 83. Maria Manuela Lopes + Paulo Bernardino, 2011, *Affective Reframing*. Ectopia – Experimental Art Laboratory, Lisbon.

Conferences and presentations

Each chapter corresponds to the production of an installation and exhibition moments, punctuated by a series of attended and presented conferences.

Conferences attended

2009

I International Conference Art Research, Fundação Calouste Gubenkian, Lisbon, 18–19 May.

SOWOHLALSAUCH ArtScience festival, TAGC, University of Leiden, Leiden, 29 June.

Mediated Memories and Biodigital Archives, Journal of Media Practice Symposium, Centre for Material Digital Culture, University of Sussex, Brighton, 13 July.

Digital and Biodigital Lives Conference, Centre for Life History and Life Writing Research, EDB, University of Sussex, Brighton, 14 July.

2010

Art and Medicine Symposium, Medical School, Universities of Brighton and Sussex, Brighton, 28 May.

'Taking it in Trust' in Images of Nature, Martin Kemp, *Crossings*, Calouste Gulbenkian Foundation, Lisbon, 17 November.

Doença de Alzheimer: A Caminho de uma Política Integrada? at Calouste Gulbenkian Foundation, Lisbon, 9–10 December.

2011

Revisiting Time: The Renegotiation of Time through Time-Based Art, Boris Groys, *Crossings*, Calouste Gulbenkian Foundation, Lisbon, 19 January.

Functional Images of the Brain: Beauty, Bounty, and Beyond, Judy Illes, *Crossings*, Calouste Gulbenkian Foundation, Lisbon, 2 February.

Image in Science and Art International Colloquium, Calouste Gulbenkian Foundation, Lisbon, 17–19 February.

2012

O Mundo é Feito Por Nós? Questionar A Arte e a Ciência Em Tempo de Crise, Casa Museu Abel Salazar, Porto, 18 May.

Conferences presented

I have given the predetermined work-in-progress seminars and progress review panel's presentations in the course of the MPhil/PhD programme at UCA, and also additional related to the research presentations at:

2007

Site Specificity and the Interactive Space of the Human Body – Ethology I – Immune System, at *Technart, International Conference on Art & Technology*, Bilbao, 24 April.

Site Specificity and the Interactive Space of the Human Body – Ethology I – Immune System, extra panel presentation inserted by invitation of moderator Luis Graça as an example in session *Inside & Outside: from Perception to Immunity* at *MutaMorphosis: Challenging Arts and Sciences*, Prague, 9 November.

2008

Knowing through Re-Making, at *Knowing through Making*, Practice-based Doctoral Conference, University for the Creative Arts, Epsom, 10 October.

Ethology I, at *Isea, International Symposium on Electronic Art*, Singapore, 26 July.

Art Practice in a Scientific Lab, video conference with Kilpisjärvi Biological Station, curated by Ulla Taipale, Capsula Barcelona, as part of the *Bioart Festival*, 30 May.

Ethology I, Hybrid 07: *Reflections on Science and Art*, IBMC and Museu Nacional de Soares dos Reis (MNSR), Porto, 31 May.

CAGE SSI Fnac, with Alexandre do Carmo, *The Residences Network Programme: Art/Science/Technology Experimentation*. Fnac Centre, Cascais. 15 March.

Uma Artista Plástica num Laboratório Científico, MCAC (Master Program Contemporary Art Studies), Aveiro University, visiting artists' conferences, Aveiro, 17 March.

2009

Presentation at the meeting of New Representational Spaces, Investigations of Interactions Between and Intersections of Art and Genomics, TAGC, University of Leiden, Netherlands, 3 March.

Uma Artista Plástica Num Laboratório De Neurociência, at *Talks on Art and the Brain,* Science Museum, Universidade de Coimbra, Coimbra, 17 March.

Representational Strategies on the Connection Between Memory and Identity as an Art Practice-based Research in a Neuroscience Laboratory, at UNIC Neuroscience Research groups meeting, Hospital Santa Maria, Lisbon, 27 March.

Re-Presentations, Art Practice as Residencies on Scientific Ground, at *The Images with which Science is Made,* Philosophy of Science Research Group, Faculdade de Ciências da Universidade de Lisboa, Lisbon, 25 May.

Notes on a Video Art Practice: From Autobiographical Memory to a Journey in a Neuroscience Lab, Masters Programme Contemporary Art Production, DECA Universidade de Aveiro, Aveiro, 29 May.

Representational Strategies on the Connection Between Memory and Identity as an Art Practice-based Research in a Neuroscience, at New Representational Spaces, Investigations of Interactions Between and Intersections of Art and Genomics, TAGC, University of Leiden, The Netherlands, 18 June.

Mapping the Mind: Collaborative Creativity as Alternative Transformative Practice, (co-author Paulo Bernardino), at *Isea – International Symposium on Electronic Art,* Belfast, 29 August.

2010

Art Creativity and the Brain, Round table session integrated on the European Week of the Brain, Pavilhão do Conhecimento – Ciencia Viva, Lisbon, 19 March.

Chadwick's Self-Portrait: Novas Abordagens, at *CSO' 2010 – Criadores sobre outras obras,* I Internacional Congress, Faculdade Belas Artes Universidade, Lisbon, 28 March.

The Approach – Arte e Neurociência a Memória como Reconstrução, at *ARTECH,* 5th International Conference on Digital Arts, Guimarães, 22 April.

Pecha Kuka presentation, UCA 2010 Staff Research Conference – *Interdisciplinarity in the Creative Arts,* Wellcome Trust, London, 23 April.

A Path in the LAB, Masterclass with Rosana Monteiro and Herviw Turk, Philosophy of Sciences Center, Faculdade de Ciências da Universidade de Lisboa, Lisbon, 18 May.

Looking Down, Across and Beyond, Art in the Age of Technoscience, Masterclass With Rosana H. Monteiro, Masters Programme Contemporary Art Production, DECA Universidade de Aveiro, Aveiro, 27 May.

Representational Strategies On Alzheimer's Studies: A Practice-Based Art Research In A Neuroscience Laboratory, at the First Annual Research Symposium for the Consortium for Research Excellence, Support and Training (CREST), Park Crescent Conference Centre, London, 5 July.

Re-containing Memory: Observing The Process Of Unbecoming A Self. The Contained Memory Conference, Wellington, New Zealand, 9–11 December (paper selected but not presented due lack of funding).

2011

Intersection of the New Technologies in the Creation of Images (fine art) at the end of XX century (second author), at *Vizuality 2011: Interconnections of Creativity and Images,* Vilnius, Lithuania, 8 April.

Re-enacting the Self in the Archive, at *Concept and Context in Practice,* student research conference, University for the Creative Arts, Farnham, 16 March.

Re-enacting the Self in the Archive: Memory, Art, and Neuroscience. At *Isea – International Symposium on Electronic Art,* Istanbul, 16 September.

2012

Class at the PhD degree in Fine Arts/Design course Sciences of the Arts, by invitation of Professor Cristina Tavares, Faculty of Fine Arts, Lisbon University, Lisbon, 28 April,

Suzanne Anker – Memória Autobiográfica no Estúdio e no Laboratório Científico, CSO'2010 Criadores sobre outras obras, IV Internacional Congress, Faculty of Fine Arts, Lisbon University, Lisbon, 1 April.

Workshop on *Autobiographical Memory, Re-enactment and Visualization technologies,* Centro Cultural de Vila Flor, Guimarães, 19–20 May.

Invited presentation at the Dementia Research Centre at Centro de Dia para Doentes de Alzheimer e outras Demências São João de Deus, Porto, 6 June.

Contest, Critique and Explore Loss of Identity Through Art: A Practice-Based Art Research in a Neuroscience Laboratory, 6th International Symposium: *Identity and Multicultural Politics.* Alternative Academia, Montreal, 30 October 2012 (not presented due to impossibility of traveling caused by unexpected natural events – Hurricane Sandy).

Technologies and the Creative Act: Intersection through the Image (co-authored Paulo Bernardino Bastos), at 1st International Symposium: *Representations – Struggles For Reality,* Alternative Academia, Montreal, 03 November 2012.

Note: All the conferences and international presentations have their online or published proceedings. Furthermore, part of Chapter Two of this thesis, The Archive, became a book chapter entitled 'Performando o "Self" no Arquivo', pp. 95–122 in Junior, Wellington, ed. (2011). *O Corpo Implicado: Leituras Sobre Corpo e Performance na Contemporaneidade.* Expressão Gráfica e Editora, Fortaleza: Brasil.

Presentations / exhibitions

Exhibition of installation *The Approach:*

The Approach, exhibition *A Arte do Cérebro,* Centro Cultural da Figueira da Foz. Figueira da Foz – Portugal, 1–31 May, 2009.

Exhibitions of installation *The Archive* (different venues with distinct video, objects and drawings, all part of the multiform larger installation project):

1) *Do Not Allow Me to Forget About Me*, at *Cabinet d'Amateur*, Museu Nacional de História Natural e da Ciência, Lisbon, July–Oct 2010.

2) *Drawing the Invisible*, at *CorpoImagem*, Pavilhão do Conhecimento - Ciência Viva, Lisbon, February–March 2011.

3) *The Archive: Lost Words – Retracing*, at *Concept & Context in Practice*. James Hockey & Foyer Galleries, UCA Farnham 16–26 March, 2011.

4) *Enactment/Re-enactment of the Archive,* performance installation integrated into the European Week of the Brain, Instituto de Medicina Molecular, Lisbon, 18–25 March, 2011.

5) *Lost Words – Retracing* (further associated work in progress for *The Assessment* project). 25th National Meeting Grupo de Estudo de Envelhecimento Cerebral e Demências, http://www.geecd.org/ Tomar. 3–4 June, 2011.

Exhibition of installation *The Assessment*: this project, although presented as work in progress at the 25th National Meeting Grupo de Estudo de Envelhecimento Cerebral e Demências, has never yet been publicly presented as a whole finished video installation.

Exhibition of installation *The Therapy:*

The Therapy, at *Uma coisa entre muitas,* Museu Nacional de História Natural e da Ciência, Lisbon, 5–31 July, 2012.

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