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Abstract

This practice-led research will be accompanied by a dissertation which describes the research process and discusses the research questions and outcomes generated by the practice process. From an initial stage of laboratory and workshop experimentation with recycling High Density Polyethylene (HDPE) and General Purpose Polystyrene (GPPS), to a conclusion which brings experimental design practice to serve the needs of a specific user group, this research aims to show that the role of the designer in material-based research is multiple and complex. The significance of emotional experience is discovered to be of central importance to both material experimentation and the design for a specific user group.

The initial context of sustainability becomes reframed through work with a community of residents, staff and relatives associated with a care home for the aged. From addressing the needs of a twenty-first century demographic challenge the designer finds complex meaning in the ecological, ethical and political agendas of sustainability. I employed a range of research methods in this project and conclude that qualitative research practice demands the integration of technical skills, sociological enquiry and an investigation into the 'tacit knowledge' of craftsmanship.

I investigated the design potential of combining traditional craft and industrial technology to address the challenge of a future society and through this research into recycling plastics, polymers, textiles and other materials propose that material and meaning are closely interrelated. In my work the relationship between the visible traces of tactile sense and the presence of the hand is explored as a sign of 'contact' and transmission of emotion.

The encasement and display of fibre, textile and personal objects in the plastic tiles is deployed as a medium of interior architecture with the potential to represent the meaning of the experience of end-of-life wellbeing. In this way the designer can make materials which encapsulate the sense of transition, departure, memory, presence and continuity for the old, their relatives and carers. Considering the principle of 'Emotionally Durable Design', this research finds new uses for old material.

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AUTHOR'S DECLARATION

During the period of registered study in which this thesis was prepared the author has not been registered for any other academic award or qualification.

The material included in this thesis has not been submitted wholly or in part for any academic award or qualification other than that for which it is now submitted.

J. Behseta

March 2013

Introduction

Attending the conference ‘Designing Cost-effective Care for Older People: how Technology Can Make a Difference’, organised by the Royal Academy of Engineering’s Panel for Biomedical Engineering and Age UK, in May 2012,¹ I was shocked to find that the preferred terminology for describing the older generation is one that rejects the euphemisms of ‘senior citizen’, ‘the elderly’ or ‘the third age’ in favour of the term ‘old’. In order to confront the challenge of new demographics of western societies, where the old will soon outnumber the working-age population, euphemism is of no use and may be misleading in its wish to soften the reality. The engineers’ rejection of euphemism is analogous to the aesthetic and form of my practice which deploys a truth to materials in order to frame the meaning, truth and beauty of the aged, and the function of this within the process of transformation and recycling of matter.

As I entered the Alexandra House Care Home to meet the family of Mrs C, I wondered about their complex experiences in relation to the institutional care of their mother.

I wonder about how Mrs C feels at her place in the care home. I wonder how her relatives feel. I wonder about the thoughts and concerns of the care staff in the home. The cultural expectation that we should all be able to resolve difficulties by ‘talking about it’ seems curiously inappropriate here. The facts of the residents’ material needs, medical care, financial circumstances and physical needs can be, and are, specified through discussion. There remains the question of the thoughts and feelings that are less readily put into words, which need to find other forms of communication and transmission. If old age is accompanied by progressive, degenerative neurological conditions such as dementia and Alzheimer’s disease, words may be even further from reach and grasp. I started to consider how the physical acts of working together with materials may offer a form of shared encounters, communicated and transmitted through artefacts produced by the care home community itself.

I have been working with the Alexandra House Care Home (AHCH), based at the Princess Alexandra Hospital in Harlow, Essex, since May 2011, arriving each week with some basic

¹‘Designing Cost-effective Care for Older People: how Technology can Make a Difference’ [conference], Royal Academy of Engineering Panel for Biomedical Engineering and Age UK, Electric Works, Sheffield Digital Centre, Sheffield, 16 May 2012, http://www.raeng.org.uk/events/pdf/ageing_population_conference.pdf . [accessed 7 February 2013]

materials and tools to organise workshops for residents and their families. This is not only at the request of the AHCH, as a means of meeting the demands of the Care Quality Commission audit report², but also as part of my own research project to test the potential uses of recycled High Density Polyethylene (HDPE) and General Purpose Polystyrene (GPPS) for discovering the meaning of the sustainability agenda in materials design. When the AHCH received a CQC report (CQC 2011) suggesting that the visual quality of the residents' living environment was 'sadly bare, neutral, boring, antiseptic', it confirmed my own feelings that the concern for hygiene, uniformity, safety and cleanliness in many institutions has, in recent decades, resulted in the aesthetic convention of a visual culture of bare, anonymised white-painted walls, over-lit interiors, empty corridors and uniform, untextured, smooth surfaces, which now represent 'safety' and shout 'institution'. That these visual environments might generate distress, anxiety or even despair is rarely explored. Is the absence of texture the design equivalent of the idea that nothing happens in the care home, as the old simply wait for the end of life? Is the absence of detail an emotional equivalent of the denial of the importance of old people's feelings about being close to death? Is the end of life in a care home an experience of stillness, absence and emptiness? Is there a place for a visually active environment, generated by residents and their families? What might be the role of the designer in bringing about such change?

I wondered about the way that Mrs C meets her blank environment, but unfortunately this is not an answerable question, as Mrs C does not even know where she is and why she is there.

These questions are part of my method as a researcher who is conducting a form of 'user-led', or participatory, design. The process of wondering about others' experiences, and the development of this process of personal intuition into a more systematic form of enquiry, is now the leading aspect of my research method. This is a qualitative approach to design research, which does not rest on the collection, calibration or analysis and assessment of numerical data alone, but depends more extensively on the information drawn from long-term relationships with service users.

The methodological aspects of this research project include a discussion of how the way in which I worked as a designer in laboratory and workshop contexts changed when I took on a

² Care Quality Commission, 'Alexandra House – Harlow', Inspection report, July 4 2011, <http://www.cqc.org.uk/directory/1-131481935> [accessed 30 January 2013]

specific project which enabled me to test the new functionalities of recycled polymers for a specific user group. Until 2011 my method was an essentially quantitative, empirical, approach to the laboratory testing of materials and their potential.

For five years I have been experimenting with recycling used plastics at the London Metropolitan Polymer Centre, (LMPC) using a wide variety of machines (a hydraulic hand compressor, a Blackfriars granulating machine, and an Extu/Brabender 336 extruder machine) which allow researchers to modify industrial processes to make hand-controlled and individually selected changes. I use domestic and consumer waste, such as drink and milk bottles, to make new polymers and find, weave or make textiles to encase within the hand-sized tiles. The range of sizes available for making tiles from recycled plastics is great, and I have experimented with the full range, from tiny 'tessera'-sized pieces to larger sheets. The scale of the hand is significant in my practice. The choice of size, of tiles that suggest that they might be, potentially, held in the hand is important. The presence of touch is crucial within the process and aesthetic of this experimentation. The traces of unravelled fibres, yarns, and woven fabrics and cloth fragments become encased within the transparent or translucent plastic medium, generating a specific aesthetic and meaning: a beauty of the old and discarded immortalised within a new and functional material. This presence of the hand within an industrial process which is used to display the act of regeneration seems to me to have profound symbolism. It seems to have been meaningful to others, too, although this is difficult to record or 'prove' in any quantitative way.

The process involves hands-on participation combined with industrial technology, regrinding everyday household plastic waste such as HDPE and GPPS and industrial waste; the recycling entails extruding a plastic yarn which can then be woven with the reused material and encapsulated with a bespoke application, resulting in a versatile material. When the textiles and plastics are combined and woven together using a thermodynamic process a chemical reaction takes place, creating a unique aesthetic that echoes the alchemical origins of modern chemistry in a poetics of new matter. My research method, despite being one of testing the results of variations in the settings and processes of manufacture, was one which was strongly informed by a 'poetics' of practice.

The experimental approach of 'breaking the rules' of conventional industrial and laboratory processes has been a stepping-stone towards gaining new knowledge and reaching new frontiers, one that was only possible through dedicated and systematic, but also intuitive,

trials. When the boundaries and matrices are expanded, and the journey goes beyond the specific accuracy of time, heat and other variables, there is, my research suggests, 'room for' advancement, development and space for something new and original. The characteristic experimentative nature of the workshop methods used in research at the RCA enables designers such as myself to take risks and chances that manufacturers are unwilling to engage in, due to the constraints of economic, cultural and social factors. Not only are the economic dictates of the profit motive an obstacle to creative experimentation, but the culture of functionality and instrumentality of purpose also inhibit makers from doing something 'differently', for its own sake. To see what happens, what 'gives', allows for the development of new knowledge. The London Metropolitan Polymer Centre enables researchers to conduct workshop experimentation at an industrial level of production, using smaller-scale quantities and unorthodox, artisanal, processes. The laboratory method of systematic trials can be combined with the studio pursuit of a feeling, a style, an aesthetic judgement of quality or meaning. Crucial in this process of making and assessing the result of what was made was the sense that it combined technological knowledge of 'skills' (such as those I had developed as a laboratory technician earlier in my career), and a different kind of 'know-how'. The enquiry into the difference between these two different kinds of knowledge and data led to an enquiry into the concept of 'tacit knowledge'. I began to collect notes from past sketchbooks, notebooks and diaries to inform the research method. It was suggested that the processes of working in a laboratory and with a usergroup both used aspects of design research methodology known as the 'iterative process'. The iterative process is an unfolding of intuition, tested in materials, which results in a transformation of initial ideas through the repeated integration of what is 'known' and what is 'learned' from experience.

Notes from my diaries state:

'creating new pieces which explores the reuse of otherwise waste material, and results in creating new/value from the old/waste and disregarded. There is a continuous clash, between environmental concepts which is forcing us to be aware of the final destruction of our planet and depleting its resources through consumerism and the throw away culture, and the economic growth ideology embedded in our political systems with its existence linked to profitability and materialism. The contradiction between them makes it an impossible task to find an

easy solution to the problem. Unless there is a drastic change in the culture and the way we treat materials and our resource management. The core of this work is circumvented around the concept of sustainability, and the contributions that can be made towards it. In order to understand this, there must be an approach towards interconnection between skills, knowledge and development from old to new (waste minimisation). The work intends to encourage, communal thinking, collective learning, deter waste from landfills as well as development of emotionally durable designs.

The inspiration for this work has been from the whole sense and desire for being at one with yourself and nature. It is the aim of this work to enhance the awareness of translating the feelings of the designer, the maker and the end user into the product, giving it a sense of belonging, that's not easily discarded and forgotten, and replaced by another mass produced item.

In order to interconnect these ideas, this work started to gather old and discarded materials in particular the groups of plastics from the polymer family in conjunction with textiles and weave design, craft and hand manipulation, give it a sense of feeling and rebirth. Experimentation in laboratory and the reaction of plastics to different variables and settings, producing a much desirable, durable and aesthetically pleasing new materials was observed.

In conjunction to this with the final user in mind, a certain group was chosen which included the elderly, and those with Alzheimer's to resemble and link the two together, the old discarded forgotten material and the old forgotten groups waiting the terminal moments at the nursing home. A series of practical hands on workshops were held at the care home with direct involvement of the elderly. The idea for this was based on stimulation, memories thoughts and feelings, and inclusion within the process of making.'

The research, which originated as a 'quantitative' project, i.e. a systematic, laboratory process of testing the effects of varying levels of heat, pressure and process on the outcome of the qualities of HDPE/GPPS polymers and the potential for plastics to be cast in a variety of forms that would 'encapsulate' other materials, began to generate 'qualitative' research questions, about the meaning of textures as humanising an industrial process. Might texture, and specifically textile textures, either tactile or visual, allow for more connection between

technology and body, mind and material, contributing to new developments in materials for ambient assisted living? The 'academic' research which originated in the context of studio and workshop culture has developed into a complex transaction between the designer, the outside world, the needs of a specific user group and the residents, staff, family and institutional authorities of a care home for old people. I am indebted to sponsorship by Runwood Homes plc., and also for the partnership with EXILICA, a manufacturer of materials with sensory properties. The redefinition of a designer's role in relation to the working context which includes a number of different stakeholders requires that the agenda for 'sustainability' in textile design must become more complex and relational (enabling groups of people to interact with informed sensitivity to each other's needs) in ways that demand renewed respect for the subjectivity of the designer. How can the designer's subjectivity be used as a research method to expand and inform the other methods more traditionally used in design practice research? Is this quality of being alive to the 'relational' aspects of a design context something that is informed by the researcher's cultural, gendered, social specificity? How can this method be mapped and documented in ways that are useful for future researchers? These are some of the questions that have emerged from my primary research question of investigating how recycled HDPE/GPPS and textiles might offer new insights into the policies, practices and theories of sustainability.



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CHAPTER 1 SUSTAINABILITY

There is wide concern regarding the excessive use of plastic and the environmental deterioration associated with it.³In traditional landfill the degradation period may last for decades, whilst the 'loop recycling' system offers an alternative. The project looks at sustainability using a 'recycled Closed Loop' method, as well as the potential of attachment through aesthetic qualities, where the manipulation of materials and technology by hand could lead threads, woven textiles, and plastics to a tactile through visual (haptic) expression of comfort and familiarity.

The Slow Movement, and with it the idea of recycling, is gradually becoming a representation of a whole new way of thinking and a response to the ready-made fast-paced, disconnected world we live in today, a 'throw-away', disposable society which is fast outgrowing available resources. The core values of this movement are morally-oriented, involving a respect for nature and tradition and an understanding of the value of where and how an object is made, used and disposed of.

The problems of environmental sustainability and resource depletion are closely related to population growth and poverty in developing countries, and to the often wasteful consumption habits of rich nations. Major lifestyle changes will be essential in both these contexts to successfully address the problem of environmental sustainability in the transition through the twenty-first century. Changes are taking effect, along with concerns about the global environment: for example, changes in climate and sea levels and the relationship between global and local economic activity are associated with the economic phenomenon of globalisation. Countries continue to collaborate, and debate takes place with the intention of resolving the problems, but to little avail to date.

In 1992, representatives from more than 190 nations gathered in Rio de Janeiro for the United Nations (UN) Earth Summit to discuss the global environment,⁴ but it took until the 2008 UN Earth Summit, in the same city, for widespread recognition of the criticality of the situation to

³ Waste campaigning and resource efficiency organization WRAP has been prominent in this issue: www.wrap.org.uk [accessed 4 February 2013]

⁴ Alastair Fuad-Luke, *Design Activism: Beautiful Strangeness for a Sustainable World* (London: Earthscan, 2009)

develop.⁵ Over these decades rates of consumption have increased due to the growing world population: from 6 billion in 2000 to 6.7 billion in 2008, increasing to 7 billion in 2012,⁶ mainly due to the phenomenal economic growth in India, China and Asia generally. Changes are needed for longer-term social, political, economic and environmental stability. As things stand we are running out of fossil-fuel energy sources (coal, gas and oil) that have, literally, fuelled the last hundred years of the industrial and consumer revolutions. All designers are implicit in resource use, and thus have a key role and responsibility to play in averting resource depletion.⁷

Concern for the environment in the twenty-first century has led to much media coverage, such as the BBC series *Planet Earth* and *The Wonders of the Universe* programmes in which Professor Brian Cox, a physicist explains how the earth and humans are made of the same material: ninety-two elements in all, just put together differently. Consequently there is a greater awareness of natural resources and their importance within our own existence. There is now an appreciation of the limits that the regenerative capacity of natural ecosystems impose on human activities, as well as the dangers of the uncontrolled exploitation of natural resources such as the sea, forests, land and rivers, and from overloading the capacity of the earth to absorb waste (air and water pollution, acid rain, toxic and nuclear waste). The 1980s witnessed the emergence of truly global environmental problems, such as the depletion of the ozone layer and global warming, which underscored the possibility that unforeseen ecological instabilities could cause irreversible environmental damage.⁸

As a result, some industrialised countries – notably Japan and Germany – are positioning themselves to compete in what will be one of the most dynamic markets of the future: that of environmentally sound technologies, capable of delivering ‘green’ technological solutions,

⁵ Alastair Fuad-Luke, *Design Activism: Beautiful Strangeness for a Sustainable World* (London: Earthscan, 2009)

⁶ <http://www.worldometers.info/world-population/>; <http://www.census.gov/main/www/popclock.html> [accessed 8 February 2013]

⁷ Alastair Fuad-Luke, 2009, p.56

⁸ International Development Research Centre (IDRC), <http://www.idrc.ca/EN/Pages/default.aspx> [accessed 20 Dec. 2012]

which could soon become a source of competitive advantage in the global search for new markets.⁹

In terms of the use of finite natural resources being exploited, to take crude oil as an example, which is now at 83 dollars a barrel (January 2009 figures), nowadays oil being a limited resource it is otherwise known as ‘peak oil’, the price of a barrel doubling within the last year alone. There are concerns about how long this flow of oil will last with its present rate of use. According to Sabine Philipp, of the major chemical company BASF, ‘Plastic has become more expensive: everything that is based on oil will have to become more expensive, in the end, all consumers and processors who are working with plastics will have to accept that.’¹⁰

This state of affairs in the modern world raises the question of whether the conditions that we have created support our wellbeing. The answer is simply no, as we are living in a world of cumulative collapse. How did it all begin? The answer to this is found in the theories which are the bedrock of our current economic regime. John Locke, in his *Two Treatises of Government* (originally published 1689) introduced the concept of the right to ownership of property and money to buy the labour that goes with it.¹¹

This rush towards extermination has put every level of the system supporting life into a state of decline and crisis. There is no single aspect of life which is not endangered; we do not want to face the cause and the mechanism associated with it, and we prefer to be in a state of denial: a case of ‘out of sight, out of mind’.¹² (See appendices1, p147)

The current economic system appears to be based on the adage that ‘nothing produced can be allowed to maintain a lifespan longer than what can be endured in order to continue cyclical consumption’, i.e. it is critical for stuff to break down, fail or expire within a certain length of

⁹ Justin McGuirk, ‘Don’t worry about oil running out’, *ICON/EYE* 064 (2008), <http://www.iconeye.com/read-previous-issues/icon-064-%7C-october-2008/don-t-worry-about-oil-running-out> [accessed 30 Jan. 2013]

¹⁰ibid

¹¹John Locke, *Two Treatises of Government*. (1689), ed. Peter Laslett (Cambridge: Cambridge University Press, 1988), p.137

¹²*Designing out Landfill* (conference), The Institute of Materials, Minerals & Mining, London, 15 June 2009, <http://www.iom3.org/events/designing-out-landfill> [accessed 6 February 2013].

time: this is what is known as 'planned obsolescence'. In other words, product sustainability is inversely proportional to economic growth.

The economic system cannot allow the most sustainable and efficient goods to be produced, as this means that it would have to operate in another way altogether. In order for corporations to survive, and maintain their productivity, they need to produce inferior quality goods; this is because they must be cost-efficient in all aspects, from the cost of labour to raw material, in order to stay competitive. This is applied across the board; hence they all produce an inferior product.

To reflect back on Brian Cox's words, and glancing at the mass of landfill sites spreading across the world, one can only conclude that in reality planned obsolescence spells trouble: cheaply-made mobile phones, computers and other technological products, containing numerous precious resources such as gold, copper, and so on, are rotting in vast piles, due to their obsolescence or the failure of a minor part which in a conservationist society should be fixed or updated, and the life of the product extended. In other words, efficiency, sustainability and preservation are the enemies of our economic system.

The sad reality, according to this system, is that the curing of the sick and the abolition of crime, terrorism and war are all detrimental to the wellbeing of our economic system. These factors all contribute to the employment of vast number of people, and extend the life of the system. War, and the production of weapons of mass destruction, are seen as good: a huge amount of resources are dedicated to this sector alone, with the favourite approach being to blow things up so that they can be re-constructed for profit.

The reality is that negative social activities are positively rewarded; advertising is used as a tool to promote the creation of brands which are sold for thousands of pounds, whilst the cost of their manufacture in China, India and other countries where cheap labour is plentiful is next to nothing. Hijacking the media enables the economic system to brainwash the public, and further promote the addiction to consumerism and impulse-buying.

This discussion brings us back to the subject of oil again: all our activities on the planet, and everything we do, from eating to wearing our clothes, are oil-related. Oil's arrival as a cheap

source of energy has drastically changed the face of the world, according to the latest statistics on carbon emissions worldwide.¹³

Ironically, with the reality of the extinction of this resource in a not too distant future, our economic needs and addiction to consumption and growth dictate an increasing production of high-powered vehicles, and gas-guzzling machines. The reason for not pursuing the path of substituting alternative energy is simply the lack of profitability and a monetary incentive. This rule is applied to all other resources, from water to food and clean air. At the current rate of consumption it is estimated that we require two planets the size of Earth to satisfy our basic needs, as mentioned in the discussion programme *Out of this World*,¹⁴ in which Mark Miodownik, an engineer and materials scientist, discussed the depletion of materials: unfortunately today there is a fear of running out of fossil fuel reserves, especially crude oil, as mentioned earlier known these days as 'peak oil' due to the fear of depletion, as well as other materials.

Oil is the main raw ingredient for materials such as synthetic plastic, and is one of the key natural resources on earth, with four per cent being fragmented into plastic, the material which is the basis of the fast, disposable consumer lifestyle which contemporary society has chosen to adopt. This situation is accompanied by the economic incompetency of many countries around the globe and the default in their debt payments, which will eventually generate a state of crisis and social unrest, with today's high unemployment rate becoming a normal phenomenon, due to the technological advancements which will eliminate the need for manual labour. This is necessary in order to maintain the cost-cutting efficiency programmes needed for growth in consumption.

It is possible to break the spiral of depleting natural resources, of wastage and of pollution, according to Michael Braungart and William McDonough's groundbreaking book *Cradle to Cradle: Remaking the Way We Make Things*,¹⁵ in which the authors argue in favour of a completely new premise for the design and development of products based on safe and fully reusable raw materials, in which waste can provide resources in an endless loop.

¹³ US Energy Information Administration, *International Energy Statistics*, 2010 (11/02/2010) <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8> [accessed 30 January 2013]

¹⁴ *Out of this World*, BBC Radio 4, broadcast 11 February 2010.

¹⁵ Michael Braungart and William McDonough, *Cradle to Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002).

Braungart and McDonough explain how products can be designed right from the start so that after their useful life has ended they can serve as ‘food’ for new products: they suggest that it must be possible for Cradle to Cradle(C2C) products, once they are scrapped, to be fully dismantled so that their elements can be returned to biological or technical metabolisms.C2C design thinking suggests that waste = food¹⁶

1.1 The ethics of respect and morality in the politics of sustainability

What is sustainability? What is meant by ‘sustainable’? The past decade has witnessed significant growth in public awareness of ecological issues and the sustainability agenda. In 2010 the UK elected its first Green Party MP, indicating the rise of ecological politics as mainstream, rather than marginal politics.The Oxford English Dictionary definition of ‘sustainable’ is as follows: ‘able to be maintained at a certain rate or level; conserving an ecological balance by avoiding depletion of natural resources.’¹⁷

From thinking deeply, researching the literature and maintaining a constant awareness of mass media responses to this concept it became apparent to me that two quite different definitions of the word sustainable are possible. For example, Stuart Walker, Professor of Sustainable Design at Lancaster University, divides the concept into two parts, ‘inner’ and ‘outer’.

His research also focuses on product aesthetics and meaning, and practice-based research that explores and expresses human values and notions of spirituality. Thus in a similar way he discusses quality versus quantity, and a more balanced approach to design which allows us to consider both the quantitative and qualitative aspects of material goods in relation to an inner/outer accord.¹⁸ As Walker suggests, it is the teaching of many traditions that need, not greed, is more beneficial, and that the accumulation of too many material goods can distract us from inner attention.¹⁹

The philosophical tradition which informs this humanist version of the sustainability agenda can be found in Richard Sylvan and David Bennett’s *The Greening of Ethics*²⁰ and the

¹⁶ Ibid.

¹⁷ <http://oxforddictionaries.com/definition/english/sustainable> [accessed 29 January 2013]

¹⁸ Stuart Walker, *Sustainable By Design* (Sterling, VA: London: Earthscan, 2006),p.65

¹⁹ Ibid.

²⁰ Richard Sylvan and David Bennett, *The Greening of Ethics* (Cambridge; Tuscon, AZ; White Horse Press, University of Arizona Press, 1994)

writings of eighteenth-century American author Ralph Waldo Emerson, particularly his essay 'Nature'²¹. To quote from *The Greening of Ethics*:

The authors describe the term 'ethic(s)' as signifying both

- 'An ethical system, a morality or substitute therefore a scheme for generating such, covering the whole of life, or specific parts of and activities within life (a 'normative ethic' from an insider's or adherent's viewpoint)' and
- 'The science or study of some or all such systems or features thereof, analytic or descriptive (a 'metaethic' or 'descriptive ethic', depending on the investigation, from an outsider's standpoint).'²²

The Greening of Ethics refers to deep ecology, which not only looks at human ethics but everything on the planet, the showing of respect for everything. As explained earlier, the non-human can be seen as the inside, working and thinking beneficially from nature, the natural, landscapes, rivers, mountains, forests, oceans and so on, and the human as the outside: the man-made, technology, mass-production. *The Greening of Ethics* goes on to say that in most of Western philosophy humans have been the sole objects of positive moral concern, the non-human world, in the form of the afore mentioned natural elements, and others, addressed only as the property of humans or organisations of humans, such as the state, or because of their human interest.²³ Is what is being said that the humans have no concern for the morality of things, and the reason could be one of many? At the beginning of *The Greening of Ethics* Aristotle's view on the notion that the non-human world could be part of human-centred ethics is discussed, and it is concluded that Aristotle rejected the idea.

As seen in the work of American writer Ralph Waldo Emerson (1803-82), whenever nature is considered things seem to become circular, with many references to God and what his intentions were, or were not. This may be due to the fact that during his lifetime Emerson was a pastor, as was his father before him, but after a disagreement with his congregation resigned from his position, which left him with the belief that:

²¹ Ralph Waldo Emerson, 'Nature' and *Selected Essays*, ed. Larzer Ziff (London: Penguin, 2003).

²² *The Greening of Ethics*.p.3

²³ *ibid*, p7

‘The intuitive spiritual experience of the individual is more important than any church.’²⁴

Emerson has been described thus:

‘A liberal idealist with a gift for communication, he had no philosophical system; that was part of his strength, believing that individualism, a refusal to conform, self-reliance, the acknowledgement of instincts, and the value of optimism were far more easier to understand than any system.’²⁵

I feel the need to note in particular here Emerson’s essay ‘Nature’²⁶, mentioned earlier, as I see so clearly the images from his words, and the fact that his passion is transmitted in the same way as today’s sustainability and design writers, such as Alastair Fuad-Luke, Jonathan Chapman, Stuart Walker, Richard Sennett and Peter Dormer.

1.2 External / Internal

I have experienced my relationship to the ethics and politics of sustainability as generated by forces and systems that are either ‘external’ or ‘internal’. External forces include economic, political, social and cultural systems such as the media. Social pressure is generated by government policies, consumer ethics and designers’ knowledge, and can exert significant influence on the sustainability agenda.

External

In 1999 M&S discontinued orders to certain clothing suppliers, putting 900 jobs at risk:

‘Marks and Spencer has axed another of its clothing suppliers in a move that threatens a further 900 jobs. M&S has "de-listed" Richard Roberts, a privately-owned Leicestershire company, which makes knitwear for the struggling retailer.

The move follows M&S's recent decisions to axe William Baird and Daks-Simpson from its supplier list, threatening more than 5,000 textile jobs

A fourth supplier is also believed to be on the verge of having its M&S contract terminated. The cuts are part of a plan by M&S to reduce its supply chain costs by £450m by buying

²⁴Michael Stapleton, *The Cambridge Guide to English Literature* (Cambridge: Cambridge University Press, 1983), p.277-8.

²⁵ibid.

²⁶Ralph Waldo Emerson, *'Nature' and Selected Essays*, ed. Larzer Ziff (London: Penguin, 2003).

more of its goods from cheaper manufacturers overseas. The fallen giant announced a halving of interim profits this week.’²⁷

In January 2007 Marks and Spencer completed a full ‘U-turn’ when they introduced ‘Plan A’, a bold statement about the company’s intentions in five key areas of environmental and ethical policy over a five-year period.²⁸ A close look at the ‘Plan A’ magazine and in-store environmentally-oriented propaganda showed true concern towards green issues; for example, the 350,000 garments Marks & Spencer sells each year now caution users to wash at 30 degrees Centigrade. This alone would cut carbon dioxide emissions by 25,000 tonnes a year.²⁹

Scepticism about this kind of activity remains, though. The following was circulated on the website of Labour Behind the Label, an organisation supporting garment workers worldwide:

‘ “Taking Liberties: the Story behind the UK High Street” investigates the lives of workers from Gorgon, India, producing for respected high-street brands M&S, Debenhams and Next, Workers, the report reveals, suffer long hours in sweltering temperatures, verbal and physical abuse, unsafe water and poor sanitation. Life is lived in slum housing, and affording enough food is a trial. A climate of fear and insecurity is an everyday reality, where workers’ choices are limited by the contractors, factory owners, landlords and authorities who control their lives.’³⁰

A full report can be found on the website of the campaigning organisation Fashioning an Ethical Industry³¹: this issue on its own would be sufficient for a thesis.

The research questions deriving from this case relate to my experience of mapping the politics of sustainability onto my ‘personal’ experience of a commitment to, and understanding of, my studio and workshop practice as a designer. The designer must be informed by knowledge of ‘external’ forces such as employment law, government policies, strategic pressure groups, independent research and other social and political structures. My

²⁷ Nigel Cope (1999) ‘M&S axes clothing supplier putting 900 jobs at risk,’ *The Independent Business News*, November 6 1999

²⁸ Sandy Black, *Eco-Chic: The Fashion Paradox* (London: Black Dog, 2008), p29

²⁹ Marks and Spencer, ‘Plan A’, in-house magazine, (London: Marks and Spencer, 2008)

³⁰ ‘Taking Liberties: the story behind the UK high-street’, (Bristol: Labour Behind the Label/Clean Clothes Campaign, 2010)

³¹ <http://www.fashioninganethicalindustry.org> [accessed 1 February 2013]

method of research has included participation in the Slow Textiles Group, which maintains contact with current research in textiles sustainability and discusses the experience of individual designers. This is discussed later: see Chapter 1.5

Internal

Is it possible to differentiate ‘internal’ forces and structures from the ‘external’ ones? Cultural theory attempts to describe the complex interaction between internal and external forces and their effects. What can the politics of sustainability learn from the cultural debates on the differences between ‘internal’ and ‘external’ structures? If subjectivity is classed as an ‘internal’ world, can the thoughts and feelings of the subjective be realised as significant for the sustainability agenda?

Sustainability has been understood, also, as a ‘natural’ process. For example, James Lovelock, originator of the ‘Gaia hypothesis’ in the 1960s, offered an early politics of ecology in the mid-twentieth century, suggesting that the earth had a ‘natural’ tendency to re-establish balance. The ‘external’ can be seen as the ‘human’ way. One could believe the external aspect of the term ‘sustainable’ is the human justification. Both meanings coming from different ends of the spectrum, but should be working as one if sustainability is to work as a whole.

As with life in general, the only way to make things work is to work together. Richard Sennett’s book *Together: the Rituals, Pleasures and Politics of Cooperation* explores the theory of cooperation as a working model of what society can learn from craftsmanship, referencing the fear that John Ruskin and William Morris had in the nineteenth century of losing the role of handcrafted goods to the mass production of machine and industry, in this case handcraft being internal and machine-made being external. Somehow the external always seems to be more highly valued, authoritative and powerful. Has this been because of the power of the machine to manufacture speedily and efficiently, therefore increasing profit for capitalist entrepreneurs who have therefore considered this as ‘progress’?

The former, (the working with materials by hand, together) is finding it hard to sustain its position in contemporary society. Are humans classified as ‘raw material’? One could say that the human species is in just as much fear of becoming extinct or within the realm of depletion as any other resource. Looking at the word ‘sustainable’, and how it applies to our own existence, in looking at the human as a sustainable material are we depleting our own

existence? If the population is increasing, is the quality of human life increasing? Or is it merely the privileged and the rich whose comfort and well-being are increasing?

Could the internal, emotional, meaning of 'sustainable' be a new model for the old religious or spiritual idea of reincarnation? Throughout history the question of reincarnation and scepticism about it has been apparent, from classical antiquity to the nineteenth-century philosophers, as shown here:

1. 'It is a secret of the world that all things subsist and so not die, but only retire a little from sight and afterwards return again... Nothing is dead; men feign themselves dead, and endure mock funerals and mournful obituaries, and there they stand looking out of the window, sound and well, in some new and strange disguise.'³²

(Ralph Waldo Emerson)

2. 'The soul comes from without into the human body, as into a temporary abode, and it goes out of it anew... it passes into other habitations, for the soul is immortal.'³³

(Ralph Waldo Emerson)

3. 'We all have some experience of a feeling, that comes over us occasionally, of what we are saying and doing having been said and done before, in a remote time - of our having been surrounded, dim ages ago, by the same faces, objects, and circumstances.'

(Charles Dickens, *David Copperfield*)³⁴

³²Ralph Waldo Emerson, *Selected Writings of Ralph Waldo Emerson* (New York: Random House, 1950)

³³ *ibid*

³⁴Charles Dickens, *David Copperfield*(1850), (London: Penguin Classics,1996)

Table 1. Comparison between ‘External/Internal factors for research method.

External	Internal
Environment	Nature
Objectivity-Rationality	Subjectivity-Emotion
Machine	Hand

1.3. Consequences of the concept of ‘External/Internal’ for my research.

Considering the internal takes the whole research design process back to the very beginning of the project, in 2009, when I wrote about connections between tacit, *deep* knowledge:

Materials through the work speak, but not in written words, but through the material allowing the haptic and tactile feel through the visual, but it is the material working and entwining together speaking there words. The look, feel, touch, smell of the materials alert all the senses and speak for themselves, thus through the combination of materials, technology, craft and science, letting the flow continue as the creativity of building, putting into place, making one whole from different limbs allows the progression of tacit knowledge, to grow.

How can one transfer tacit knowledge that is alive from within, almost as though one would now call it (deep tacit) meaning the deeper sense of tacit, tacit being the surface, (deep tacit) being the unconscious, allowing light into the dark.

My subjective experience of the design process as an emotional response to material transformations left me wondering how this process might be understood as a theory of sustainability. I was convinced that the internal, subjective or emotional factors of design were being misunderstood and undervalued. Emotions were even discouraged as an unnecessary complication of ‘sensible’ and rational research projects. Yet I understood emotions (my own and others) as the ‘raw material’ of new functionality, quite as much as the chemistry of polymers. In fact, the endless recombination of long chain molecules in polymer chemistry seemed to me to be a deep metaphor for the emotional bonds that keep individuals together within a society. Just as the traditional metaphors of reincarnation may offer new meaning for the concept of recycling materials, so the science of polymers may offer deep metaphors for the power and pleasure of cooperation and bonding.

I then found the theories of Jonathan Chapman, who writes, ‘Sustainable design is not a set of neatly arranged and predefined formula or legislation-driven principles, but a critical and

provocative debate surrounding the way one intends to live with this fragile earth'.³⁵ As Chapman suggests, 'sustainable design is most certainly unresolved and must continue to be developed further to the very root of human consciousness, as this could be where both the problem and the solution lie.'³⁶

Similarly, Braungart and McDonough questioned the current model of fossil fuel-based manufacture and industrial growth, taking resources out of the ground that are then 'concentrated, altered, and synthesized into vast quantities of material that cannot be safely returned to the soil.'³⁷

Braungart also suggests the idea of making a product from a material enriched with small amounts of nitrogen (potentially retrieved from automotive systems) that, for instance, could be thrown from the window of a train into the countryside and would be perfectly harmless to the environment.³⁸ Is this suggestion a means of harnessing 'bad habits' such as careless littering, in the service of sustainability? Encouraging signs of 'Please Litter' might enable the sustainability agenda to dissociate itself from being the concerns of the 'righteous'. Throwing seeds by hand is in the tradition of the pre-industrial agriculture of farming, when sowing seed with hand gestures, 'dropping' matter on the earth's surface, was a powerful and useful act. Many cities now offer the public a range of 'dustbins' which ask us to operate a conceptual triage of our 'waste', with colour-coded receptacles for paper, metal, plastic and perishables. This is evidence of local authorities recycling materials in line with government goals for ecological progress.

My research is informed by a range of definitions, theories and authors relating to the sustainability agenda, and I use Braungart's Cradle To Cradle (C2C) design policy as one example, but also by using a 'recycled Closed Loop' method, allowing for a process to be continued time after time, maintaining the reprocessing of the same material, giving second, third or fourth life to material. Plastics, however, cannot be infinitely recycled, as the material loses quality with each level of recycling; however, this is a true and valid problem if it connects with functional properties, e.g. strength, which is not as critical for my project as the aesthetics and poetics of process.

³⁵ Jonathan Chapman, *Emotionally Durable Design* (London: Earthscan, 2005), p.166

³⁶ *ibid.*, p174

³⁷ Braungart and McDonough, 2009, p.92

³⁸ *ibid.*, p140

‘Designing with waste’, an article in *Made* magazine, describes the views of Keith Freegard of Axion Polymers:

‘all too often, looking at new products, sees opportunities that have been missed where a recycled material would have done the job just as well, yet for some reason it hasn’t happened.’³⁹

Is this due to design thinking, economy, politics or social anxiety about status? Anxiety surrounding social status is one emotional and ‘internal’ factor that, as Alain de Botton suggests, is a way in which people feel inferior and suffer a crisis of status failure, which suggests, maybe, that recycled products hold connotations of lower quality than that of products made from virgin material. New ways of defining recycled products as ‘pre-loved’, or as ‘gifted’/‘passed on’, are becoming more evident at retail outlets. However, the rise in poverty which fuels the increased use of charity shops and second-hand stores, a product of the contemporary economic austerity for the majority of the British population, also affects the meaning of commodities which are not ‘new’.

My research practice has led me to experiment with the meanings of ‘old’ textiles encased in recycled HDPE/GPPS polymer tiles. I have experimented with a number of encapsulating forms, including plates, bowls and larger-format sheets of material. I chose to use the hand-sized tile format for my final project, as this size of tile offers users an object or environment at a pocket-sized scale, which emphasizes the human and subjective aspects of its meaning. I want to create an environment for the old which will not overwhelm, intimidate or physically ‘belittle’ them. I want to make items that will empower their relationship to their own subjectivity through the formal properties of the material, as well as the ‘content’ of the material.

Using recycled textiles as the ‘content’ of the tiles was an experimental step I made early in the research. Preliminary responses from colleagues, friends and tutors varied greatly: some found the aesthetic too ‘dirty’, ‘amateurish’ or ‘rough’, others appreciate the aesthetic style as ‘sublime’ (having meanings of great darkness and great achievement). Recycled matter was used as both the ‘form’ and the ‘content’ of the works, thus making it possible for the tiles to be a frame for the meaning of recycling itself. When the case study of the Alexandra House Care Home was decided on (in early 2011), the recycling metaphor of reincarnation became

³⁹ ‘Designing with waste’, *Made* magazine, 1.11 (2009), p. 33

more evident, in view of the context of end-of-life care and the palliative nursing practices found in the home. The recycling practice, my research showed, was operating on a profoundly emotional, not rational, level of communication and meaning. This suggested that Chapman may be right when he suggests that the way sustainability can be effective is not through convincing people of the 'rational' reasons for undertaking this practice, but by means of personal 'feel', ethics or aesthetics.

1.4 Sustainability and design.

Designers continually search for new ideas, methods and materials. In some cases innovation is unnecessary, as the solutions are already there but forgotten (see Tom Kirkwood's remarks, Chapter 3). Recycling, before becoming a design theme of current practice, has existed as cultures of reuse. Before mass production, textiles were hand-made and clothing costly: reused clothes were ubiquitous, and dressmakers would often, for example, leave off cuts on a tray outside for someone else to use.

After World War II, pre-fabricated homes were erected using the remnants of aircraft wings, built to last six months, although some were still standing sixty years later; the 'Bubble car' was made from the cockpit of a Heinkel aircraft, and post-war prams were designed with suspension developed in World War II aircraft. Wartime austerity cultures of 'make-do and mend' have recently been revived at department stores such as John Lewis (2011). The 'rag and bone man' immortalized in the BBC comedy TV series *Steptoe and Son* prefigures the current trade in second-hand metals, cables and roof cladding. From a culture of reuse springing from poverty and austerity to a politics of sustainability to preserve scarce sources of raw materials the traditional techniques of salvage and reuse have become integrated into new cultures of sustainability.

Within the textile field, charitable organizations such as Textile Recycling for Aid and International Development (TRAID), using the label TRAIID remade, employs teams of innovative designers who reconstruct, reshape and remodel second-hand garments, transforming them into one-off, hand-finished, unique fashion garments.⁴⁰ The work of Textiles, Environment, Design (TED)⁴¹ was inspired by the environmental design writer T. E. Graedel's research showing that if designers make informed and appropriate design decisions

⁴⁰<http://www.traidremade.com/> [accessed 30 December 2012]

⁴¹<http://www.tedresearch.net> [accessed 30 December 2012]

at the beginning of the production chain, then the environmental performance of any product can be improved by eighty to ninety per cent.⁴²

It is suggested that designers who not only think about the product but also consider and, even more importantly, include or involve the end-user, are thus likely to give longevity and attachment to the product.

Tom Dixon is an example of a designer taking this concept and putting it into practice in his introduction of an injection moulding machine to the Selfridges store in Oxford Street, London, from 19-30 September 2005: the designer combined manufacturing with a retail environment by sitting an ARBURG 35-tonne injection moulding machine in the shop. His aim was to integrate the eventual customer and the retailer into the manufacturing stages of the design process. Customers were invited to watch the creation of Dixon's Snap Light, and take part in the assembly process.

Dixon's project was not unlike ones discussed by American industrial designer Henry Dreyfuss, where the designer, engineers, artist and product buyer worked together collaboratively, although this was often suggested it was very rarely seen through: the designer seemed to take charge of all aspects, whereas Dixon actually successfully brought together the manufacturing and retail contexts with the aim of integrating the end consumer and the retailer in the manufacturing stages of the design process, encouraging the creation of unique made-to-order products with a mass-production manufacturing technique.

Projects such as Dixon's enlighten the consumer about the processes that take place in design and manufacturing, enabling more of an understanding into the time, energy and thought that goes into processing a product, but on the other hand the question still remains: was this action carried out for the right reasons? Each customer was invited to watch the creation of a plastic product, as well as taking part in the assembly of a new Tom Dixon light, the Snap Light -which snapped together to create a multifunctional light, sold exclusively in Selfridges!

This method, it could be suggested, was about consumer participation, which obviously increased sales during the period of the offer of customer participation.

Most designers' projects that include recycled plastic tend to lead towards the production of mass-produced items, or use advanced technology, as the following examples show:

⁴²T.E. Graedel et al., 'Green product design', *AT&T Technical Journal*, November 1995, p.17. See also: Becky Earley, *Ever & Again: Experimental Recycled Textiles* (London: Textiles Environment Design, 2007).

Richard Liddle.

A sustainable designer, Liddle set up Cohda Design in 2006 and has worked on projects for clients including the UK Design Council, also collaborating with Tom Dixon. RD ('Roughly Drawn') is his term for his method of extruding plastic over a chair frame, manipulating the flow of the hot molten plastic; this then fuses together, making no adhesives or additional fixings necessary⁴³ (see appendices 1, p.149). At that time they are individually made, but Liddle is collaborating with a Japanese company to put them into mass production.⁴⁴ Another example of environmentally-conscious design leading to mass production: will this once again not bring a quickly-made, disposable product to the market?

Jane Atfield

Atfield is a designer of sustainable products (see appendices 1, p.149) who recycles plastic and is looking at the exploration of material for commercial application using post-consumer recycled plastic. This project, too, works towards mass-market production. It seems that the overall picture is aimed at the macro market with no thought for the micro market: a process that does not involve any manipulation of mixed material. My research project, on the other hand, is not for profit, it is for people.

Natalie Woolf

Lines of Desire: Illuminated Trace Tile

Woolf's illuminated trace tile is a floor or wall tile that lights up in response to touch. The tiles use an electronic system with 'smart sensor' technology and LED light sources: my research uses no electronic systems, but collects energy during the day, storing and emitting it at night.

In these projects there is not much research into the life cycle and what happens to the materials after their lifespan.

Richard Liddle, Jane Atfield and Natalie Woolf have all concentrated on plastic production, but they have not furthered the enquiry or created new knowledge about the product's life

⁴³ Jessica Salter, Richard Liddle, The Sustainable Designer, (*Telegraph*, April 2010) [accessed 3 January 2013]

⁴⁴ *ibid*

cycle, such as giving longevity to the product by the inclusion of familiarity, connectedness, emotion or poetics in helping to create a sustainable object-user relationship.

1.5 Case studies of sustainable design

Slow Textiles

Another example of ethics and politics in relation to sustainable materials is found in the Slow Textiles group. The founder, artist, lecturer and researcher Emma Neuberg, graduated from the RCA specialising in plastics and synthetics, and set up a space for a dedicated group to meet together on the first Saturday of each month. The aim is to improve environmental awareness through sharing academic, personal, and professional development and outcomes in design, and taking time to re-think design approaches by slowing down the design process. The ethos of slow textiles is developed through workshops based around finding new way of addressing design methods. Looking at textiles and more general design disciplines, and aiming at extending product life through applying new techniques of working with traditional and emerging technologies, the twelve or so members have shared the experimental process. During the first years of Slow Textiles the meetings were mostly hands-on, using sewing, embroidery, textiles, fragments of cloth, threads, embroidery hoops, etc. (see fig 1, p34) One of the focuses within the group was on satisfying real needs rather than transient fashionable or market-driven needs, all of which contribute to our fast-paced commodity throw-away, disposable culture. Neuberg explains:

‘Slow design outcomes also encourage a reduction in economic, industrial and urban metabolisms, and hence consumption, by: serving basic human needs; creating moments to savour and enjoy the (human) senses; designing for space to think, react, dream, and muse; designing for people first, commercialization second; balancing the local with the global and the social with the environmental; demystifying and democratizing design by re-awakening the individual’s own design potential; and catalyzing social transformation towards a less materialistic way of living.’⁴⁵

Neuberg has also said that ‘the aims were to promote zero waste, environmental awareness, well-being theory and sustainability, immaterial elements that would be gained through

⁴⁵ Slow Textiles Workshop 2010, available at: <http://slowtextiles.blogspot.co.uk/>[accessed 25 January 2013]

sharing and connecting.’⁴⁶ The workshops provided mental and physical space to practise and disseminate skills. With members of the group coming from a wide range of different backgrounds it has helped the thinking process around various problems within the 'slow' ethos. Each participant seems to embrace and debate Neuberg's theory and philosophy, connecting with the thoughts and feelings around 'slow', and the 'extended life' of textile through different techniques. Jonathan Chapman suggests that a designer's role could be to provide material artefacts that provoke some kind of emotional response from the user, as users will ultimately project their own personality onto the object as long as it continues to stimulate a response.⁴⁷ The issue then becomes the sustainability, or life cycle, of that crucial emotional response. My pattern of thought was along these lines: manipulation of materials takes place with a hands-on approach to embellishment and structural techniques, using the materials provided for the workshop. 'Exploring Chinoiserie: Practise the Skills, Understand the Symbols' was one of several workshops offered by Slow Textiles. Topics addressed here included:

- Prioritization of immaterial needs
- Waste minimization
- Designing out of waste by Extended Life Techniques
- Identifying and addressing non-relational activity and divisive language and thinking
- The cloth as container for the practitioner
- Ritual characteristics of cloth
- The marking of rites of passage
- Memories contained within the cloth
- Cloth as symbol of the memory and Object Relations; Marriage, Fertility, Dowry gifts.⁴⁸

⁴⁶ *ibid.*

⁴⁷ Jonathan Chapman, *Emotionally Durable Design*, (London: Earthscan, 2005), p101

⁴⁸ Slow Textiles Workshop 9 (2010), available at: <http://slowtextiles.blogspot.co.uk/> [accessed 10 December 2010]

The thoughts and feelings around ‘slow’ and the Slow Textiles Group’s ‘Extended Life Textiles Techniques’ and the effects, nature and impact of the thought process of putting slow approaches and re-thinking into practice, developing the craft of the practical/theoretical into a normal way of thinking, is something that most of the group was already taking into consideration. Learning how others approached putting ‘slow’ into practice and the exchange and sharing of knowledge was fruitful.

Workshop 10, ‘1960s, Appliqué Art-Taking Inspiration from British Textile Designer Christine Risley’ In this session we looked at 1960s illustration, integrating stylistic ideas and images into visual research and development: the path was to find new ways, through manipulation of the material and a hands-on approach, in creating a romantic, lyrical or fabric-based narrative aesthetic. This approach for me is in contrast to the way I work: the above is an overview of the workshop, and outlines Neuberg’s proposed possible outcome; in relation to this, when I am working I do not think I must create a romantic or lyrical narrative, for it would not happen in this way; I see the fabric, which stimulates and excites, then engage with the material and let my hands take over. From the choosing of fabric, the thread and colour, the narrative has already begun without prior thought of what will make it romantic or lyrical. Following the workshops was a discussion on how this process may inspire emotionally engaging material stories.



Fig. 1 The Slow Textiles Group (2010). Photograph by Emma Neuberg

1.6 Co-Design ‘An Introduction to Postmodernism & Textiles’ The V&A Digital Studio, the People’s Print and the Slow Textiles Group.

The Victoria and Albert Museum’s workshop ‘Born to be Wild: the People’s Print Project’ included people from a range of different backgrounds and professions. The feeling was that

of being quite nervous, as stepping out of one's comfort zone into the digital design world again was daunting. We experimented first with slow, traditional, hand processes, combining old with new, tradition with digital technology. The project was to create a collection of co-design (swatches) see Figs,4-6, p.37, of Postmodernist patterns using hand (slow) and digital (fast) methods: an inspirational collection of motifs, layers, textures, repeats and techniques were growing as the group exchanged knowledge and information about each other and their work, which ranged from freelance design, academic research and teaching. We scanned the traditional hand-made work onto the computers, which enabled us within no time at all to magically transform them into digital patterns. As Melanie Bowles, tutor at Chelsea School of Art and Design and author of *Digital Textile Design*⁴⁹, who ran the project with Emma Neuberg, described it, it involved 'contextualising the handmade processes by using a series of techniques based around photomontage, typography and found materials.'

Slow Textiles' first workshops and activity was something that was done by hand alone, and all the work was individual, whereas co-design can involve another design approach which looks at collaborative work between designers; I also thought the idea could be beneficial in introducing similar working methods with my own workshops held at the Alexandra House Care Home, developing a new, hybrid design process. In the introduction to co-design it was emphasised that it is about communicating as a group of designers. Each designer showed the group their favourite designs so far. All participants learn from each other in this context and start to identify points of meeting, difference and alignments. This marked the starting point for a sense of group identity, which took place in a variety of ways, through aesthetic feel, style, vision, sensibility, etc.

Melanie Bowles suggests honing in on digital design skills to the point of craft. Once confident in digital techniques, group members choose how they may wish to start to feel the craft of working digitally, for, despite the wholly digital approach, there is a sense of flow and autonomy when using vector- and pixel-based tools that is little different from the tacit knowledge needed to use any tool.⁵⁰

⁴⁹Melanie Bowles, *Digital Textile Design* (London: Laurence King, 2009).

⁵⁰ Melanie Bowles and Emma Neuburg, *Born to be Wild: the People's Print Project*, (London: V&A, 2011)

Examples below of co-design below are later extended in the outcomes, which were taken from Slow Textiles' *Look Book*⁵¹, which gives a full report on the workshop activities.



Fig.2 Workshop activities, Slow Textiles



Fig. 3 Digital workshop, People's Print project

⁵¹*Look Book*, Slow Textiles, 2011 <http://issuu.com/emmaneuberg/docs/lookbookbest> [accessed January 16 2013]



Fig. 4



Fig. 5

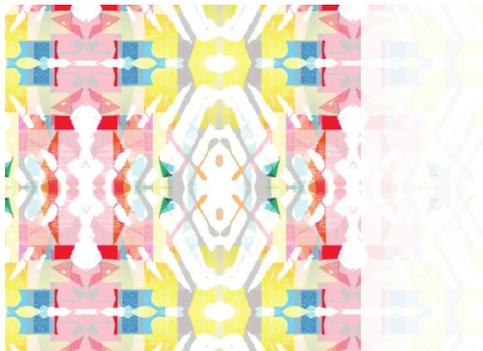


Fig. 6

Co-designed digital prints. Julie Behseta, Melanie Bowles and Geraldine Peclard. (2012)

The People's Print project gave copyright privileges to each of the participants.

Although it wasn't appropriate to introduce computer-based work to the residents at Alexandra House Care Home, I still used the concept of co-design with the residents by making it fun, explaining to them that we were going to work on each other's pieces.



Fig. 7



Fig. 8 Residents Co-designing at Alexandra House Care Home (2012)

CHAPTER 2. THE JOURNEY OF PLASTICS

In this chapter I explore the idea of a journey as a narrative of transformation. The history of plastic through the twentieth century is well documented, as a new and democratic material enabling billions of people to own lightweight, portable, coloured, inexpensive objects. I also consider the idea of the journey as a metaphor for the process of molecular recombination which is characteristic of plastic materials.

The history of plastic demonstrates many trends and unexpected developments. Plastic as a material tends to be undervalued, often referred to as being cheap-looking, shiny, bland and new, an inferior substitute for other synthetic and natural materials of a far superior status.⁵² Roland Barthes' essay on plastic in *Mythologies*⁵³ suggests that in the 1950s plastic was considered an almost magical material, but was disdained by the bourgeoisie for its popularity.

Stephen Fenichell, in his book *Plastics: the Making of a Synthetic Century* notes that the future of plastics could be:

'to dismiss it out of hand as an alien substance foisted upon us by unscrupulous manufacturers with an eye toward cutting corners. If not strictly emblematic of all that is fake and wrong with the modern material world, at least an uninvited guest at a party,'⁵⁴

Furthermore he went on to say that in a materialistic world people grow attached to objects that with age tend to crack, erode, wither, fade, rust, and mellow. Plastic holds none of these pleasing characteristics.

Jonathan Chapman, in *Emotionally Durable Design*, suggests that people become attached to visual objects that hold a familiarity,⁵⁵ but as plastic holds no emotional attachment once it has served its purpose, due to its bland, glossy appearance, one will discard or dispose of it with little or no sentiment, disregarding the fact that plastic as a material holds within itself a refusal to die.

⁵²Stephen Fenichell, *Plastics: the Making of a Synthetic Century* (New York: HarperCollins, 1996), p4

⁵³Roland Barthes, 'Plastic', in: *Mythologies*, selected and trans. by Annette Lavers (London: Granada, 1973), pp.97-9.

⁵⁴Fenichell, 1996, p3.

⁵⁵Jonathan Chapman, *Emotionally Durable Design* (London: Earthscan, 2005), p101

Plastic has become recognised as having the characteristics of a disposable, cheap-looking artificial substitute—which may be due to many of its fundamental and utilitarian applications. Unfortunately the ‘miraculous’ aspects of plastic have been buried beneath a superficial veneer of glamour and gloss.⁵⁶ (See appendices 1, p.148)

In 1979, the global volume of plastics production outstripped that of steel.⁵⁷ This point in the industrial era is often noted as the beginning of the ‘Plastic Age’. Plastics have certainly become more and more a part of life, whether visible or invisible, in homes, cars, offices, and fashion (See appendices 1, p.148) and even in the repair of the human body. For example, one of the exhibitors at the fourth Industrial Trust/Drapers’ Company Technical Textiles Awards,⁵⁸ November 2009, displayed a method of repair for a hip joint which combined a woven piece of textile connected to a moulded plastic. This is merely one example of plastic’s potential capabilities.

Bernadette Bensaude-Vincent, a philosopher and historian of science at the Université Paris-X Nanterre, in her paper ‘Plastics and materials thinking’ at the 2011 symposium ‘Accumulation: the Material Ecologies and Economies of Plastic’ held at Goldsmiths College, London, described plastic as a wonder material which was replacing heavy metal materials in application in helicopters and buildings.⁵⁹

Plasticity: 100 Years of Making Plastic, an exhibition at the Science Museum, London, curated by materials scientist Dr Susan Mossman, gave a comprehensive overview of plastic, from the first man-made material to new inventions.⁶⁰ One of the first discoveries in the plastics field was made accidentally by Leo Baekland in 1907, leading to the production of Bakelite (named after Baekland), which was more electrically-resistant than porcelain or mica, more chemically stable than rubber, more heat-resistant than shellac and less liable to shatter than glass or ceramic material. In addition, it would neither crack, fade, crease, nor

⁵⁶Fenichell, 1996, p.5

⁵⁷ Ibid., p.5

⁵⁸ S. Kettle [et al.], *Fourth Annual Industrial Trust/Drapers’ Company Technical Textiles Awards and Reception Ceremony, The Industrial Trust, Drapers’ Hall, London, 10 November 2009* (London: the Industrial Trust).

⁵⁹Bernadette Bensaude-Vincent, ‘Plastics and material thinking’, in: *Accumulation: the Material Ecologies and Economies of Plastic* [conference], 21 June 2011, Goldsmiths College, London.

⁶⁰*Plasticity: 100 Years of Making Plastic* [exhibition], Science Museum, London, 22 May 2007 – 21 August 2011.

discolour under sunlight, dampness, or salt air; it was impervious to ozone and contained no sulphur to cause 'greening' (degradation over time).⁶¹

The invention was responsible for a wide range of products in the early decades of the twentieth century, from toothbrush handles and telephones to false gums, and had become the quintessential modern material. Bakelite became the defining medium of the Art Deco movement, then at the height of its popularity. Plastic has also been a key influence on the work of product designers, resulting in objects such as French designer Philippe Starck's quirky toilet brushes.

In Africa, where half the population is of adolescent age, plastic has been literally a life-saver: 'the plastic bucket revolutionized the lives of Africans: having to carry water long distances, the polythene bucket is lighter, cheaper and far more durable where usually water was carried in very heavy clay or stone vats; the revolution of the plastic bucket (see appendices 1, p.138) meant it could be made in different sizes, allowing smaller ones to be carried by children.'⁶²

Most of plastics production is on a mass scale, therefore creating thousands of identical objects; very little, if any, developments investigating the creation of more meaningful, unique objects have occurred to date. We may reflect here on nineteenth-century art and design theorists William Morris & John Ruskin's doubts concerning the relationship between the industrial and machine-made and traditional craft skills: they believed and feared that the machine would take over and that the craftsman's position would be precarious; they believed that mass production was far inferior to craftsmanship.⁶³ Ruskin critiqued the poor quality of the industrial goods on display at the 1851 Great Exhibition and Morris and his colleagues extolled the virtues of the idea of craft as a means to promote social cohesion. They encouraged artists to get out of the academy and immerse themselves in more prosaic production.⁶⁴

The industrial mass production of plastics aims at abundance, with each item exactly the same as the last: the combination of handicraft and technology is unlikely to be found, products usually being either hand-made or mass-produced, made with either synthetic or

⁶¹Stephen Fenichell,, 1996, p.91

⁶²ibid., p.9

⁶³Alastair Fuad-Luke,2009, p.37

⁶⁴ ibid.

natural polymers, and not usually both. There is little to be found in mass production that compares with the aesthetic quality of the hand-made or the craftsmanship associated with the other applied arts of ceramics, metalwork and glass. The same applies to interdisciplinary cooperation, although the Bauhaus approach encouraged the use of different methods, combinations of materials, and experimentation; but again, to date not much has been developed in this way in relation to plastics and most institutions still class each discipline as separate, thus discouraging any advancement of this kind. For example, the conservator of paper materials at the Victoria and Albert Museum, London, was, in 2005, disconcerted to find that the museum did not have a collection of plastic artefacts as such, although it acquired objects for the twentieth-century design collections, such as many Bauhaus works which had plastic components. The result was the inauguration of a new museum and archive at University of the Arts Bournemouth, the Museum of Design in Plastic (MoDiP) in 2007.

Table2. Crafted versus mass-produced

CRAFT	MASS-PRODUCED
Expensive	Inexpensive
Precious	Disposable
Rare	Mainstream

The historical journey of plastics from being a new ‘wonder’ material from the laboratories of modernity and science to having a lowly status as the material of merchandised toys and disposable detritus, and now to a material with the capacity for recycling, offers us a new way to imagine the material. The new functionalities of plastics create new narratives in the journey of plastic. The polymeric molecular structures of plastic equip it with the power to take on the symbolic, imaginative and emotional meaning of the miracle of ‘reincarnation’, and thereby to offer a secular spirituality to design for end-of-life care.

2.1 Differences between plastics and polymer

The New Oxford English Dictionary defines polymers as long chains of molecules, a group of many units, linked etymologically to the Greek ‘poly’ (meaning ‘many’) and meros (meaning ‘parts’ or ‘units’)⁶⁵.

The term ‘polymer’ is often used as a synonym for plastic, but many other molecules, both biological and inorganic, are also polymeric. While all plastics are polymers, not all polymers are plastic.⁶⁶

Characteristics of plastics

Plastics can be divided into two types: thermoset and thermoplastic. The structure and properties of the two types differ as explained below.

Thermoplastic

The majority of plastic milk cartons are thermoplastic, meaning that once the plastic is formed it can be heated and re-formed repeatedly. The structure of thermoplastic polymers is referred to as ‘linear’, without cross-links, as shown in Fig 9. This structure permits the chains of molecules to move readily past one another and hence facilitates both processing and recycling. Examples of thermoplastic polymers include polyvinyl ethylene, polystyrene and poly(methyl methacrylate).

Thermoset

The second type of plastics is thermoset, defined as a material which, once shaped, cannot be re-melted (heated) without permanent chemical degradation. During the production process, crosslinks are introduced between the molecules which make up the basic resin or plastic: it is these crosslinks which make the core material insoluble and infusible, as they stop the chains of molecules slipping past each other, and thus prevent re-moulding:⁶⁷ once these plastics are formed, reheating will cause the material to decompose, rather than melt. Bakelite is an example of a thermoset plastic.

⁶⁵<http://oxforddictionaries.com/definition/english/polymer>, [accessed 9 February 2013]

⁶⁶ Lotfi, Ahmad. *Plastic Recycling*<http://www.lotfi.net/recycle/plastic.html>[accessed 23 March 2011]

⁶⁷ Tony Whelan and John Goff, *Moulding of Thermosetting Plastics*(London: The authors, 1987).

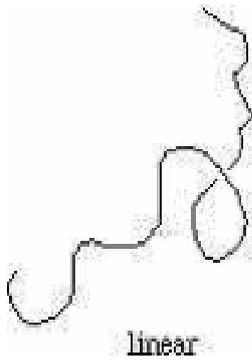


Fig. 9 Linear structure

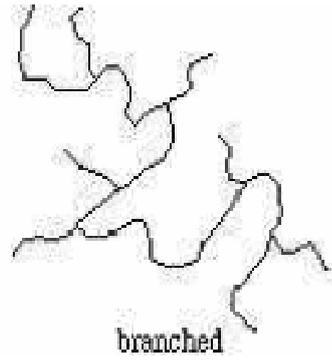


Fig. 10 Branched structure

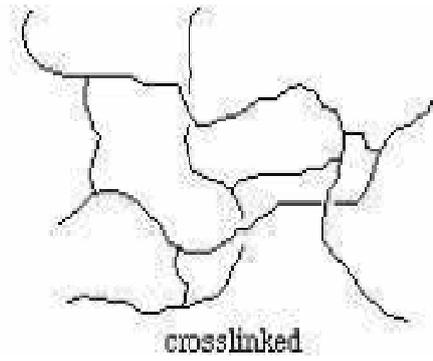


Fig. 11 Crosslinked structure

2.2 General attributes of thermoplastics.

Plastics have certain characteristics that make them an ideal multipurpose material. These include:

- Resistance to chemicals: plastics are an ideal material to be used within domestic or commercial surroundings.
- Thermal and electrical insulation capacity: allowing for a variety of end applications
- Light in weight: a good alternative to glass or ceramic.

2.3 The journey of the hands-on process

The journey of the hands-on process was an experience which involved a series of processes, including collection, sorting, decontamination and drying.

- Collection:
Plastic packaging was collected from local households.
- Sorting:
Following collection all plastics had to be organised and sorted into their respective families: High Density Polyethylene (HDPE), Polyethylene terephthalate (PET), Polypropylene, (PP) and General Purpose Polystyrene (GPPS). Codes (see matrix of symbols page 32) and colour were used for this.
- Decontamination:

This part of the work involves washing, cleaning and removing any unwanted labelling.

- Drying:

In commercial recycling, the drying process would employ industrial dryers, etc. Due to the small quantities involved there was no necessity to do this; also, the added process defeats the object, and excessive use of energy was not needed. Consequently the materials were left to dry naturally.

In a presentation of my project, during the audience question & answer session, someone asked:

‘Why don’t you just simply buy the recycled polymer ready to work with?’

At the time my mind was blank, nothing would come forward, but since then I have revisited the question several times in my head, asking ‘why’? Did the answer relate to going through the process with the material, from visits to Express Recycling where industrial waste ends up, to the collection of household waste? I gained a full understanding of the processes by being involved through a hands-on experience. Furthermore, I not only benefited by having a deeper understanding of the process but can fully relate to, and have total empathy with, the material, machine, hand and industrial technology. To feel, smell and touch the material at each stage of the process makes one become part of the material and process.

This suggests that there is a lack of empathy with the material and process which could indeed affect the outcome. This is supported by facts from the seminar. Thus my belief is that there is a gap where industry and the craftsperson could collaborate. This can be explained by documenting the seminars I attended :

2.4 Seminar 1:

‘Composite Compositions: How Composite Materials Inspire Innovation Design’: 18 November 2010, Institute of Materials, Minerals and Mining (IOM), London.

‘Composite Materials are becoming ever more diverse, and the design possibilities almost limitless. However they are still seen as complex and complicated materials, more difficult to teach about, and are often marginalised in the further and higher education mainstream curriculum. This often leaves designers and engineers to learn about them only after they have qualified, and risks a great proportion of our home-grown talent missing out on the

fabulous design flexibility that composites offer, and on the real possibilities of ‘having a go’ within a college or FE timeframe.’⁶⁸.

I realized that the need is there and is almost untapped, as the depth of possibilities within material processes, composite materials and compatibilization within materials is vast, and yet to be explored. I believe advances may develop by combining industrial technology with the craftsperson (maker), material scientists with designers, thus bringing together awareness, exchange and collaboration, all working as one.

2.5 Seminar 2:

‘Plastic Product Design’, 10-11 May 2010, Smithers Rapra, Shrewsbury, Shropshire.

It is apparent there is a gap between industry, craft and design, yet in a two-day seminar it was clearly emphasised that the designer should be provided with the exact formulae, correct temperatures, materials and specifications before work can begin: i.e. the engineer and designer must have a close relationship.

The seminar covered how to:

- Construct a basic polymer product design specification
- Design a basic polymer product from first principles
- Understand the influence of polymer shaping methods and polymer properties upon design
- Plan, manage and cost a basic polymer product development project
- Understanding basic product conformance and health/safety requirements⁶⁹

Having attended the full two-day seminar, taking notes on the above, I realized that neither experimentation nor development and natural creativity was allowed for at all, yet the fact that the processed polymer was lacking in aesthetic qualities was mentioned on more than one occasion. This again confirms the need and the gap which should be filled.

⁶⁸ Institute of Materials, Minerals and Mining, ‘Composite Compositions: How Composite Materials Inspire Innovation Design’, <http://www.iom3.org/events/composite-compositions> [accessed 2 February 2013]

⁶⁹ Plastic Product Design, SmithersRapra, Shrewsbury, <http://info.smithersrapra.com/short-courses/yplprd/plastic-product-design>, [accessed 3 February 2013]

2.6 Seminar 3:

‘Technology, Digital Economy and Services Innovation’, Imperial College Business School, London, 13 October 2009.

Dr. Irving Wladawasky-Berger, former Chief Technology Officer at IBM, in his seminar, mentioned the gap and need for research into, as he put it, ‘how to apply science engineering technology and innovative thinking which never had to be done before.’⁷⁰

This is a way forward by means of more collaboration between disciplines, which seems to be an ongoing statement, repeated time and again.

2.7 Closed Loop Recycling, Dagenham recycling plant

A new process is now being used at the Closed Loop Recycling plant, Dagenham, Essex, which opened in 2008, and is one of the few UK producers to work with mixed polymers HDPE & PET post-consumer waste plastic bottles, collecting up to 35,000 tonnes and turning it back into material for new food packaging.⁷¹ The plant manages to divert a significant amount of waste from both landfill and export and saves up to 52,500 tonnes of CO₂ per annum, based on 1.5 tonnes CO₂ equivalent per tonne of plastic bottles recycled, it is reported.⁷² (See appendices 2, p.150)

Process 1.

The process below is the one used at Dagenham:

The reground plastic flakes require a coating of caustic soda, which is followed by placing them in a kiln where the chemical will crystallise and peel away the top layer of polymer. The bottles are sorted twice: once by optical sort, then again by manual checkers. Then the bottles are shredded, washed, and decontaminated in a 200^oc kiln and sorted once again by laser before ending up as pure flakes of PET or pellets of HDPE, which will then be supplied to customers who mix them with virgin plastic: if more than fifty per cent of the material used is recycled it could be detrimental to the outcome, compromising the strength of the bottle

⁷⁰Irving Wladawasky-Berger, ‘Technology, Digital Economy and Services Innovation’, Imperial College Business School, London, 13 October 2009.

⁷¹ Christine Jeavans (26.06.2008) *Plastic Recycling Comes Full Circle*, BBC News, 26 June 2008, <http://news.bbc.co.uk/1/hi/magazine/7470662.stm> [accessed February 1 2013]

⁷² *ibid.*

and also possibly a discolouring of the material, yellowing, may occur.⁷³ The process may be summarised as follows:

1. Bottles are de-baled and then sieved in a trommel, which spins them and shakes off dirt and some of the caps. A magnet removes ferrous metals and an electrical current gets rid of other metals, such as aluminium.
2. An optical sorter shines a beam of light at the bottles and sensors determine whether they are HDPE, PET or "other".
3. A team of manual checkers carries out another sorting process.
4. The sorted bottles are ground into flakes.
5. The flakes are hot-washed for an hour.
6. PET is decontaminated by covering the flakes with caustic soda and then putting them into a kiln where the chemical crystallises and peels away the top layer of the polymer. HDPE is melted, sieved and turned into pellets.

2.8 Open to recycled Closed Loop

Process 2

Process used in research project.

1. Collection, all plastic packaging from local households.
2. Sorting Manually.
3. Decontamination Washing, removing any labels.
4. Drying

To compare the two processes it can be seen that Process 2 cuts out:

1. The magnetic removal of ferrous metals and the electrical current which gets rid of metals such as aluminium.
2. Optical and sensory sorting
3. The requirement to be hot-washed for an hour

⁷³ *ibid.*

4. Covering with caustic soda

As the recycled material is not being used for food packaging, as seen in Process 1, some of the stages involved are no longer necessary. I am taking from an open loop and creating a sustainable recycled closed loop.

Closed/Open Loop Recycling

A product that is being recycled to the same product (bottle to bottle) or to other products, the first process is called Closed Loop recycling and poses little, if any, methodological problems, whereas the second, open-loop recycling, refers to a situation in which a product A, after being used, serves for the production of another product, B. I am using an 'open to closed recycled loop' system, using the Closed Loop scenario not only for HDPE & PET, as does the Dagenham plant, but also to include any of the polymers with which I am working (HDPE-PET-GPPS-PP), using the new design process for all polymers. Examples of these can be seen during the viva, along with experimentation to determine how many times is it possible to keep grinding the same material down and reusing it.

2.9 Matrix of symbols

In the 1980s plastics were given a series of codes introducing a numbering system and symbols for packaging so that consumers could easily distinguish the differences between each kind of plastic waste, making recycling an easier process.

Various forms of plastic are ubiquitous in modern life. Unfortunately, discarded plastic is also a major environmental problem: the latest figures for 2012 show that sixty per cent of plastic does not make it to the recycling process, with non-biodegradable plastics choking waterways, polluting streets and taking up precious space in landfill sites. More detail can be seen (appendices 2, p150) in the 2011 annual report by RECOUP (RECYcling Of Used Plastics)

Table 3 RECOUP Matrix of symbols⁷⁴

	PET	Polyethylene terephthalate - Fizzy drinks bottles and oven-ready meal trays.
	HDPE	High-density polyethylene - Bottles for milk and washing-up liquids.
	PVC	Polyvinyl chloride - Food trays, cling film, bottles for squash, mineral water and shampoo.
	LDPE	Low-density polyethylene - Carrier bags and bin liners.
	PP	Polypropylene - Margarine tubs, microwaveable meal trays.
	PS	Polystyrene - Yoghurt pots, foam meat or fish trays, hamburger boxes and egg cartons, vending cups, plastic cutlery, protective packaging for electronic goods and toys.
	OTHER	Any other plastics that do not fall into any of the above categories. An example is melamine, which is often used in plastic plates and cups.

⁷⁴<http://www.recoup.org>

2.10 Material for Recycled Tiles

Plastic Regrind

Plastic regrind is any polymer material that has already been through at least one processing method, i.e., injection moulding or extrusion. Rejected parts produced by the moulding process were collected for reuse in making the tiles. The waste test pieces/ materials were ground down to smaller-sized pellets and recycled. The regrind used was post-industrial or pre-consumer waste. The process of using post-industrial and post-consumer waste will, it is hoped, significantly help with the financial cost and also help towards the addressing of environmental considerations.



Fig. 12 Waste collected from experimental sampling at the London Polymer Centre

HDPE waste test pieces collected for regrind and used for making tiles

2.11 Plastic regrinding

- A size-reduction process into pellet or flakes
- Sizes varying from 3mm to 20mm.
- Reduction from post-consumer waste, test pieces and household waste.
- The resulting particles are termed 'regrind'



Fig. 13 Regrinding household waste

2.12 Extrusion

Plastic pellets or flakes were first loaded into a hopper, which fed into an extruder. The extruder is a long heated chamber through which the flakes were moved by the action of a continuously revolving screw. The plastic was then melted with a combination of heat from the mechanical work and the hot metal. At the end of the extruder, the molten plastic was forced out through a size 154 nozzle to shape the finished product. As the plastic extruded from the nozzle, it was cooled by air or water. The extrudate was wound like a ball of wool ready for manipulation into woven constructed forms.

Several attempts of trial and error were required before the desired effect was achieved. Due to the high temperature a melt blockage sometimes occurred, requiring the extruder to be purged to fully clear all the backlog of plastic, which, with the heating and cooling, made it a very time-consuming process.



Fig. 14 Extruder above used for all plastic yarns, which were then woven

The colours and their codes, which I related to the plastic yarn, are presented in Table 4. The material and quantities used is given in Table 5.

Table 4. Colour and codes

COLOUR FOR REFERENCE	CODES
Satin White	OMO448
Honey Beige	OM88723
Dewdrop	OM66301
Onyx	OM0093
Copper	OM0567
Yellowy/Green	OM0484
Mid-Blue	OM5011
Purple	OM55094

Table 5. Material and quantity for colour =2% master batch to every 500 grams polymer

MATERIAL	QUANTITY
Polymer	500grams
Master Batch	10grams
Extruded yarn	1 meter

Dimensions of 30.5cm x 40.5cm or 15.3cm x 15.3cm were produced by compression moulding. All the equipment used is specified in table 6 and the moulding machine as Fig.15.

Table 6 Equipment used for compression moulding.

MOULD	30.5cm x40.5cm	MOULD	15.3cm x 15.3cm
CHROME PLATES	x 2	STEEL PLATES	x 2
MELAMINE SHEETS	x 2	MELAMINE SHEETS	x 2
WEIGHING SCALE		WEIGHING SCALE	
FILE		FILE	
STANLEY KNIFE		STANLEY KNIFE	
METAL SCRAPER		METAL SCRAPER	
INDUSTRIALGLOVES		INDUSTRIAL GLOVES	



Fig. 15 Hydraulic Hand Compression Moulding Machine.

The various stages in moulding a tile are presented below:

Heat machine while preparing work

Place the steel plate on the workbench

Place melamine sheet (to prevent sticking)

Put mould in place

Add a layer of HDPE

Place the used foil

Layer of GPPS & HDPE

Cover with woven textile

Sheet of melamine

Place a metal plate on top

Once the compression machine has reached required temperature dependent on which effect is required, the plates are placed into the compression machine

Leave for 20minutes, which again can vary according to the required effect.

Turn off temperature

Release water tap

Cool for up to 20mins

Turn off water supply

Release the pressure

Remove

Cost Per Unit:

The economics of the production of an artefact must always be considered. My account of the cost per unit is presented in Table 7. The unit costs are exclusive of the textile cost; the major element in the costing would be the labour charges, as the production of these tiles are labour-intensive and I have not included this.

Table 7 Cost per unit of tiles

GPPS	Master Batch	GPPS	Master Batch	Illuminant	3 Phase electricity	6x 6ins (140g)	16 x 18ins (315g)
500g	10g	£1.36/kg	£11/Kg	£350/Kg	50p per 11 Kwh	24pence Per unit	51 pence Per unit

2.13 Extruding R&D

Below are illustrations of four experiments taken place at the laboratory. To gain a textured finish (shark skin) the pressure of the extruder must be high, reaching barrel temperatures:

190⁰c - 190⁰c - 190⁰c - 190⁰c and for a smooth finish 170⁰c - 170⁰c- 180⁰c- 180⁰c.



Fig. 16 Illustration of extruded plastic yarns

The textured extruded plastic yarn can then be woven on its own or with recycled textiles encapsulated within the polymers. Transparent yard, which is a yarn with no coloured master batch add is of a great advantage when layered underneath a colour as it gives a shadow, thus the three-dimensional visual qualities are enhanced. Transparency allows the pieces to be viewed not only from around the surface but also inside and behind. See example below:



Fig. 17 Example of shadowing.

Due to experimentation the applied heating cycle has drastically been reduced. This reduction in heating time and temperature has resulted in a more efficient use of energy consumption. Time setting of; pre-heat 15mins, heating 5mins, cooling 5mins, (see appendices 3, p.151) this was the shortest time settings which was for the combination of HDPE combined with PET with a 50-50% ratio.

Table 8. Applied heating and cooling temperatures.

Technical Data:

			Mins.	Mins.	Mins.	Mins.
Pre-Heat Time			45	45	30	20
Heating Time			25	50	40	30
Cooling Time			20	20	20	15
Machine Temperature			°C	°C	°C	°C
			160	210	190	250
Granule Quantity used			Grams	Grams	Grams	Grams
GPPS			1,320	985		
PET					20	
HDPE			10	5	1,200	255
PP						

13.11.2009

Temp 250^oc
Material 1st Layer GPPS 240 grams
Heat 20 min



Fig. 18

Material percentages

Recycled 5%

Virgin 95%

13.11.2009

Temp 250^oc
Material 1st Layer GPPS 240 grams
Heat 20 min



Fig. 19

Material percentages

Recycled 5%

Virgin 95%

13.11.2009

Temp 250⁰c

Material 1st Layer GPPS 240 grams

Heat 20 min

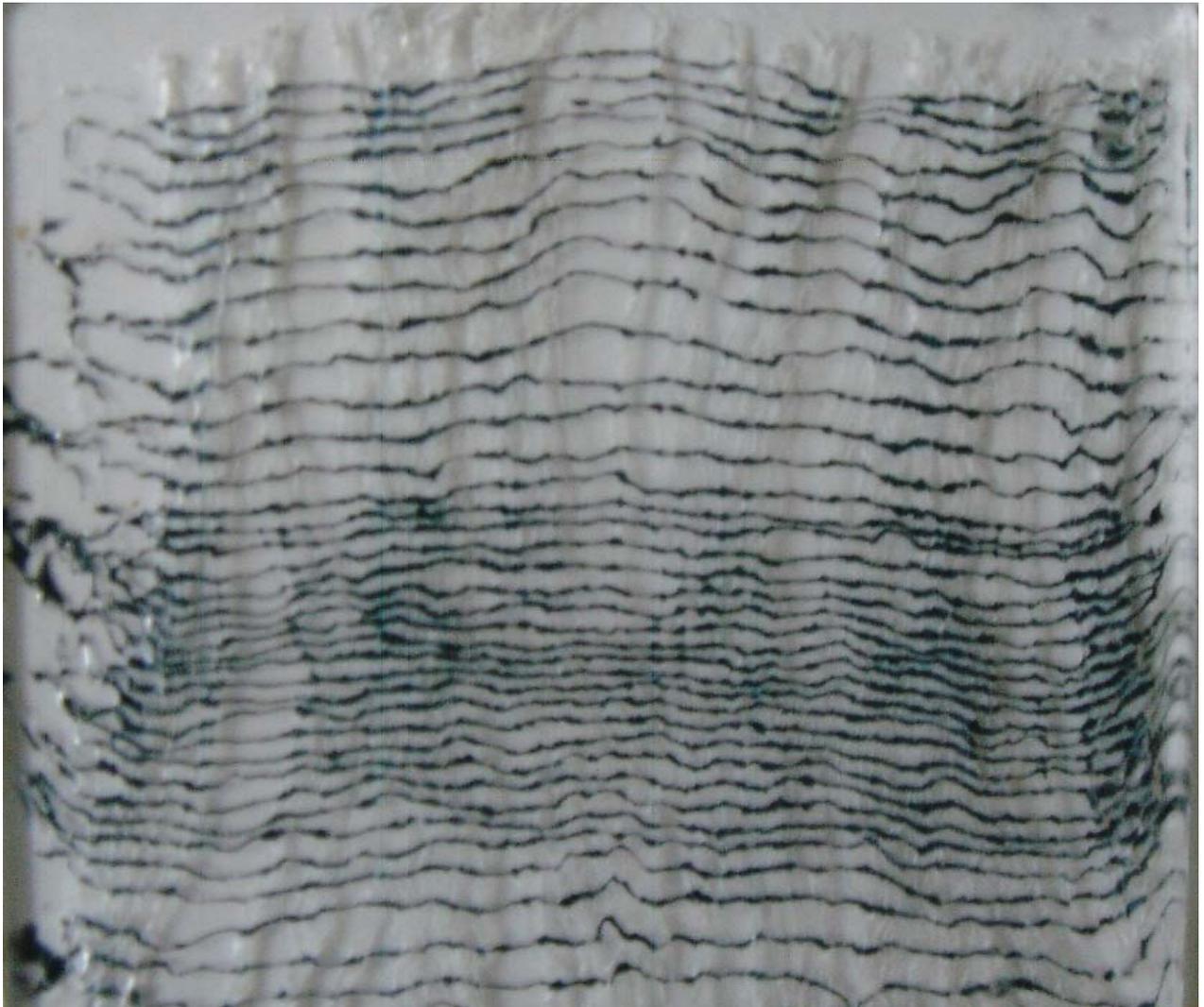


Fig. 20

Material percentages

Recycled 5%

Virgin 95%

13.11.2009

Temp	250 ⁰ c
Material	1 st Layer GPPS 240 grams
Heat	20 min



Fig. 21

Material percentages

Recycled	5%
----------	----

Virgin	95%
--------	-----

30.08.2009

Temp 250⁰c

Material 1st Layer GPPS 100 grams

2nd Layer PP 140grams Mixed colour

3rd Lay Colour White

Code OM0448

Heat 15 min



Fig. 22

Material percentages

Recycled 58.3%

Virgin 41.7%

30.08.2009

Temp 220⁰c

Material 1st Layer HDPE 100 grams + Woven Threads

2nd Layer PP 20 grams

3rd Layer GPPS 120 grams

Heat 20 min

This sample is double sided, although the threads are not visible on both sides making the tile almost mono on one side and the coloured woven structure on the back shown in next page.



Fig. 23

Material percentages

Recycled 50%

Virgin 50%

30.08.2009

Temp 220⁰c

Material 1st Layer HDPE 100 grams + Woven Threads

2nd Layer PP 20 grams

3rd Layer GPPS 120 grams

Heat 20 min



Fig. 23 Reverse side

Material percentages

Recycled 50%

Virgin 50%

06.08.2009

Temp	250 ⁰ c		
Material	1 st Layer	GPPS	100 grams + Extruded plastic
Colour	Copper		
Code	OM66301 + Craft wire		
	2 nd Layer	PET 40 gram	3rd Lay GPPS 100 grams
Heat	20 min		

The mix of transparent and opaque entwined with the woven textile adds depth.



Fig. 24

Material percentages

Recycled 16.7

Virgin 83.3%

01.07.2009

Temp 250⁰c

Material 1st Layer HDPE 80 grams + 85 grams GPPS

2nd Layer PET 25 grams

3rd Lay GPPS 100 grams

Heat 20 min

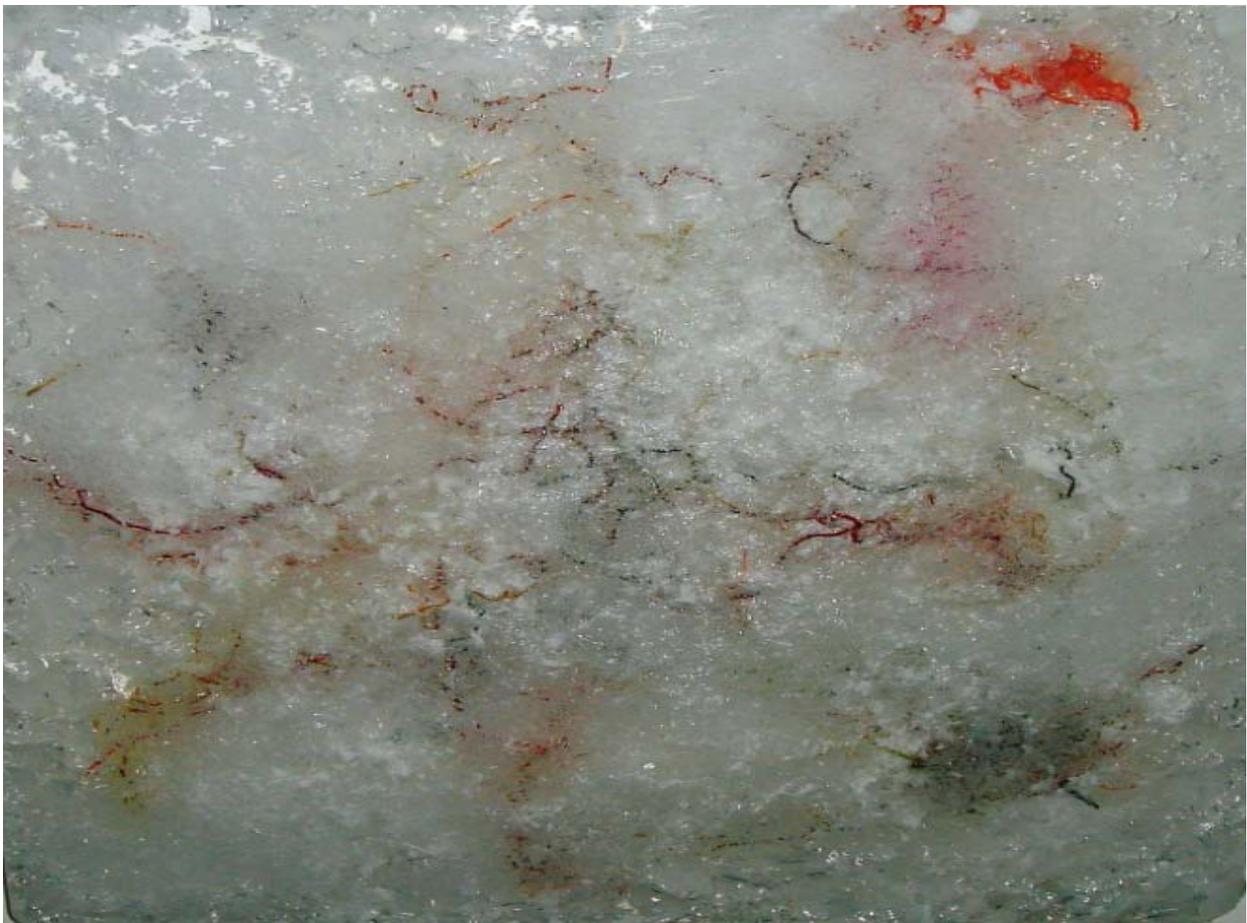


Fig. 25

Material percentages

Recycled 36.2%

Virgin 63.8%

01.07.2009

Temp	250 ⁰ c
Material	1 st Layer HDPE 210 gram
	2 nd Layer HDPE Woven
Colour	Onyx
Code	OM0093
Heat	20 min



Fig. 26

Materials

Recycled 100%

13.11.2009

Temp	250 ⁰ c		
Material	1 st Layer	GPPS	250 grams
2 nd Layer	PET	25 grams	
3 rd Lay	Recycled fruit sack with interwoven extruded plastic		
Colour	Onyx		
Code	OM0093		
Heat	20 min		



Fig. 27

Material percentages

Recycled 9%

Virgin 91%

20.01.2010

Temp	160 ⁰ c		
Material	1 st Layer	GPPS	1290 grams
	2 nd Layer	PET	50 grams
3 rd Lay	Recycled onion sack with interwoven extruded plastic		
Colour	Onyx OM0093	White OM0448	
Heat	1 Hour 10 min		
Size	45cm x 46cm		



Fig. 28

Material percentages

Recycled 3.7%

Virgin 96.3%

29.01.2010

Temp 160⁰c

Material 1st Layer GPPS 650 grams

2nd Layer HDPE 920grams

3rd Lay Woven recycled fragments and yarns

Heat 1 Hour 10 min

Size 45cm x 46cm



Fig. 29

Material percentages

Recycled 58.6%

Virgin 41.4%

23.03.2010

Temp 160⁰c

Material 1st Layer GPPS 1265 grams

2nd Layer Woven plastic with threads and yarn

Colour Onyx Code OM0093

Heat 1 Hour

Size 45cm x 46cm



Fig. 30

Material percentages

Virgin 100%

23.03.2010

Temp 160⁰c

Material 1st Layer GPPS 1290 grams + PET 50 grams
2nd Layer extruded plastic woven with yarn

Colour White

Code OM0448

Heat 1 Hour 10 min

Size 45cm x 46cm



Fig. 31

Material percentages

Recycled 3.7%

Virgin 96.3%

29.01.2010

Temp 160⁰c
Material 1st Layer HDPE + PET 1570 grams
Heat 1 Hour
Size 45cm x 46cm



Fig. 32

Material percentages

Recycled 100%

Presented below a process for compression moulding using recycled woven onion sack combined with used cooking foil.

Heat Temperature	260c
Pre Heat	15 min
Compression	20 min
Cooling	20 min
Mould	15.3cm x 15.3cm
Steel Plates	x2
Melamine Sheet	x 2



Fig. 33

MATERIAL

GPPS/ HDPE



Fig. 33

Illustration after thermodynamic process.

Mixed Samples



Fig. 34 Mixed samples using HDPE, GPPS, PP, PET

Experimentation with the namely thermoset and thermoplastic process took place so I could put into prospective the difference between the two classifications. The manipulation of materials, threads, weave were applied and, through experimentation, it was found that thermoplastic softened when heated and was moulded with successful outcome, but thermosets would only decompose when reheated, not melt. This is in agreement with the general definitions of thermoset and thermoplastics given earlier in chapter 2. The following pages will show illustrations of some thermoset work carried out.

Thermoset process

10.09.2010

Temp 160⁰c

Material 90 gram melamine

Heating time 90 s

Pressure 50 Tons-Force (tnf) = 444822.1615 Newtons (N)



Fig.35

Material percentages

Recycled 5%

Virgin 95%

10.09.2010

Temp 160⁰c

Material 90 gram melamine

Heating time 90 s

Pressure 50 Tons-Force (tnf) = 444822.1615 Newtons (N)



Fig.36

Material percentages

Recycled 5%

Virgin 95%

10.09.2010

Temp 160⁰c

Material 90 gram melamine

Heating time 90 s

Pressure 50 Tons-Force (tnf) = 444822.1615 Newtons (N)



Fig.37

Material percentages

Recycled 5%

Virgin 95%

10.09.2010

Temp	160 ⁰ c
Material	90 gram melamine
Heating time	90 s
Pressure	50 Tons-Force (tnf) = 444822.1615 Newtons (N)



Fig.38

Material percentages

Recycled 5%

Virgin 95%

13.09.2010

Temp 170⁰c

Material 110 gram melamine

Heating time 2 min

Pressure 50 Tons-Force (tnf) = 444822.1615 Newtons (N)



Fig.39

Material percentages

Recycled 5%

Virgin 95%

13.09.2010

Temp 170⁰c

Material 110 gram melamine

Heat 2 min

Pressure 50 Tons-Force (tnf) = 444822.1615 Newtons (N)



Fig.40

Material percentages

Recycled 5%

Virgin 95%

13.09.2010

Temp 170⁰c

Material 110 gram melamine

Heat 2 min

Pressure 50 Tons-Force (tnf) = 444822.1615 Newtons (N)



Fig.41

Material percentages

Recycled 5%

Virgin 95%

13.09.2010

Temp 170⁰c

Material 110 gram melamine

Heat 2 min

Pressure 50 Tons-Force (tnf) = 444822.1615 Newtons (N)



Fig.42

Material percentages

Recycled .5%

Virgin 95.5%

CROSS WORD

TEXTILE TACTILE TACIT HAPTIC

H
D G P P S
P E T
E

P
G P P S
H D P
H D P E
S E

Polymers

- are macromolecules
- are classified according to
 - synthetic
 - such as cellulose, rubber, wood
 - natural
- are made by
 - side groups
 - cross-links
- are affected by
 - chain length
 - chain topology
- is made by
 - amorphous, non-melting
- characterized by
 - glass transition temperature
 - melting point
 - degree of crystallinity
- include
 - thermoplastic
 - thermoset
- can be
 - of one kind (homopolymers)
 - of more than one kind (heteropolymers, copolymers)
- that can be
 - monomers
- composed of many joined
- chemical composition and structure
- applications
 - such as sheets, molded objects, elastomers, adhesives, coatings, fibers/yarns

COLLECTION + STORAGE = EMIT

NIGHT TIME
DAY TIME

The image shows handwritten notes on a piece of paper. At the top left, there's a section titled 'CROSS WORD' with a grid of letters: H, D, G, P, P, S, P, E, T, E. To the right, there's a list of words: TEXTILE, TACTILE, TACIT, HAPTIC. Below this is a detailed mind map about 'Polymers'. The mind map branches into several categories: 'are macromolecules', 'are classified according to' (synthetic and natural), 'are made by' (side groups, cross-links), 'are affected by' (chain length, chain topology), 'is made by' (amorphous, non-melting), 'characterized by' (glass transition temperature, melting point, degree of crystallinity), 'include' (thermoplastic, thermoset), 'can be' (of one kind (homopolymers), of more than one kind (heteropolymers, copolymers)), 'that can be' (monomers), 'composed of many joined', 'chemical composition and structure', and 'applications' (such as sheets, molded objects, elastomers, adhesives, coatings, fibers/yarns). Below the mind map, there's a diagram showing 'COLLECTION + STORAGE = EMIT'. Under 'EMIT', there are two rows of small diagrams representing wave patterns, labeled 'NIGHT TIME' and 'DAY TIME'. The top row shows a smooth wave, and the bottom row shows a more jagged wave.

Fig.43 Developing the process and energy efficiency for illuminate tiles.

29.06.2010

Temp 160^oc

Material 1st Layer Blk Plastic weave GPPS 450 grams

2nd Layer Silk face up HDPE 720 grams

3rd Lay Illumine 10 grams

Heat 1 Hour 10 min

Size 30.5cm x 30.5cm



Fig.44 Thermoplastic including illuminescence

29.06.2010

Temp		160 ^o c		
Material	1 st Layer	Blk Plastic weave	GPPS	450 grams
	2 nd Layer	Silk face up	HDPE	720 grams
	3 rd Lay		Illumin	10 grams
Heat		1 Hour	10 mins	
Size		30.5cm x 30.5cm		



Fig.44 Reverse side

29.06.2010

Temp 160⁰c

Material 1st Layer GPPS 1500 grams

2nd Layer illumin 10 grams

3rd Lay Woven recycled fragments and yarns

Heat 1 Hour 10mins

Size 40.5cm x 46cm



Fig.45

29.06.2010

Temp 160⁰c

Material 1st Layer GPPS 1500 grams

2nd Layer illumin 10 grams

3rd Lay Woven recycled fragments and yarns

Heat 1 Hour 10mins

Size 40.5cm x 46cm

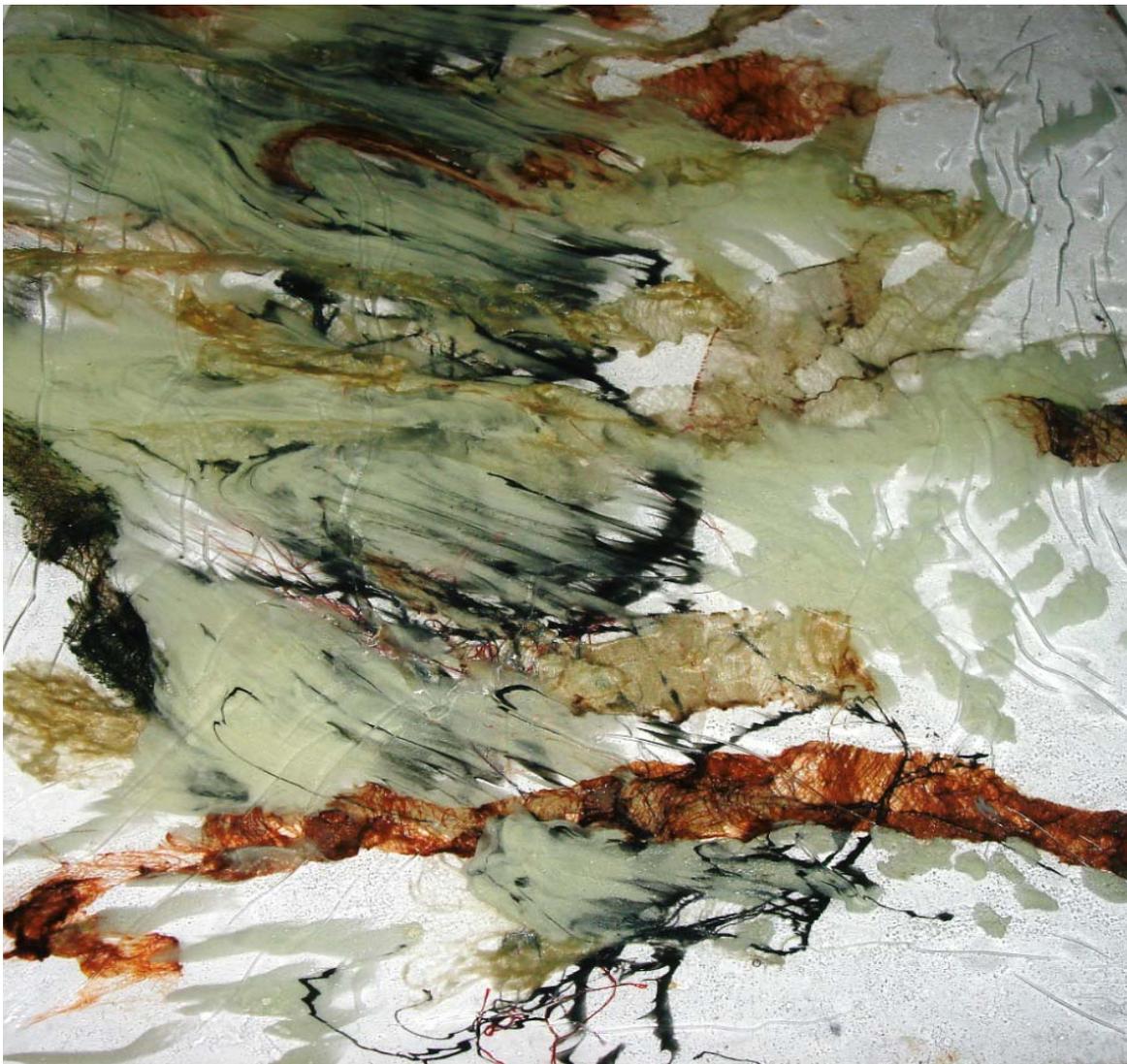


Fig.45 Reverse side

29.06.2010

Temp 260⁰c

Material 1st Layer ill 5 gram Woven plastic- silk waste - GPPS 140grams

Heat 20 min

Cool 10 min

Size W13cm x L10cm D1cm



Fig.46

Material percentages

Recycled 20%

Virgin 80%

29.06.2010

Temp 260⁰c

Material 1st Layer Woven plastic- fabric
GPPS 120 grams
HDPE 20 grams
ILLIMIN 5 grams

Heat 20 min

Cool 10 min

Size W13cm x L10cm D1cm



Fig.47

06.07.2010

Temp 260⁰c

Material 1st Layer Woven plastic- fabric

GPPS 140 grams

ILLIMIN 5 gram -

Heat 20 min

Cool 10 min

Size W13cm x L10cm D1cm



Fig.48

06.07.2010

Temp 260⁰c

Material 1st Layer Woven plastic- fabric
GPPS 140 grams
ILLIMIN 5 gram

Heat 20 min

Cool 10 min

Size W13cm x L10cm D1cm



Fig.48 Reverse side

21.09.2010

Temp 200⁰c

Material 1st Layer Woven plastic- threads-silk

GPPS 120 grams

HDPE 20 grams

ILLIMIN 5 gram -

Heat 15 min

Cool 10 min

Size W13cm x 10cm D1cm



Fig. 49

Material percentages

Recycled 5%

Virgin 95%

15.12.2010

Temp 250⁰c

Material 1st Layer Woven plastic- threads-yarn

GPPS 130 grams

ILLIMIN 5 grams

Heat 15 min

Cool 10 min

Size W13cm x L10cm D-1cm



Fig.50 Daytime collection /storage/night time emits

15.12.2010

Temp 250⁰c

Material 1st Layer Woven plastic- threads-yarn

GPPS 130 grams

ILLIMIN 5 grams

Heat 15 min

Cool 10 min

Size W13cm x L10cm D1cm

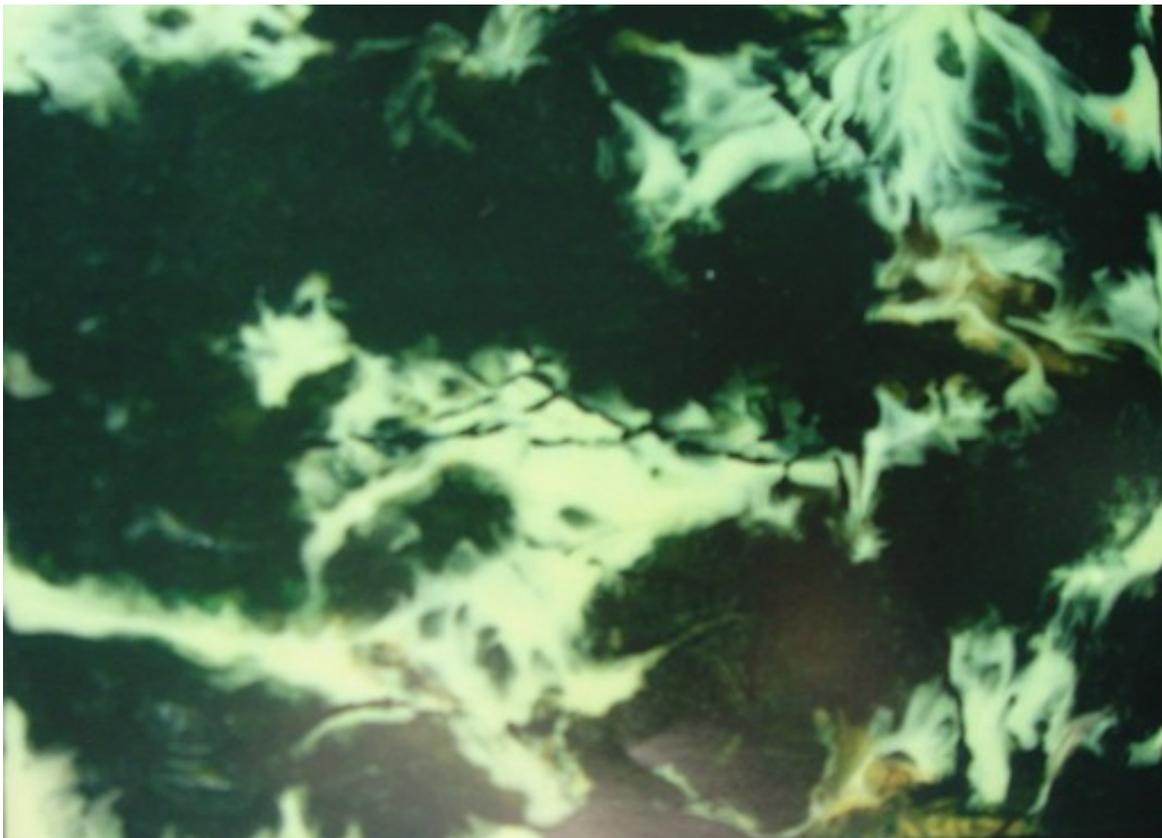


Fig.50 Night time emit

15.12.2010

Temp 250⁰c

Material 1st Layer Woven plastic- threads- silk

GPPS 130 grams

ILLIMIN 5 grams

Heat 15 min

Cool 10 min

Size W13cm x L10cm D1cm



Fig. 51 Day time

15.12.2010

Temp 250⁰c

Material 1st Layer Woven plastic- threads-yarn

GPPS 130 grams

ILLIMIN 5 grams

Heat 15 min

Cool 10 min

Size W13cm x L10cm D1cm



Fig.51 Night emit

15.12.2010

Temp 250⁰c

Material 1st Layer Woven plastic- threads-yarn

GPPS 130 grams

ILLIMIN 5 grams

Heat 15 min

Cool 10 min

Size W13cm x L10cm D1cm



Fig.52 Day time

25.01.2011

Temp 170^oc

Material 1st Layer Silk Hanky Threads ILL

GPPS 150 grams

ILLIMIN 5 grams

Heating Time 10 min

Cool 5 min

Measurements W15.3cm x L18cm D.3cm



Fig.53

01.02.2011

Temp 170⁰c

Material 1st Layer Silk Hanky Threads III

Heating Time 10 min

Cool 5min

Measurements W15.3cm x L18cm D.3cm

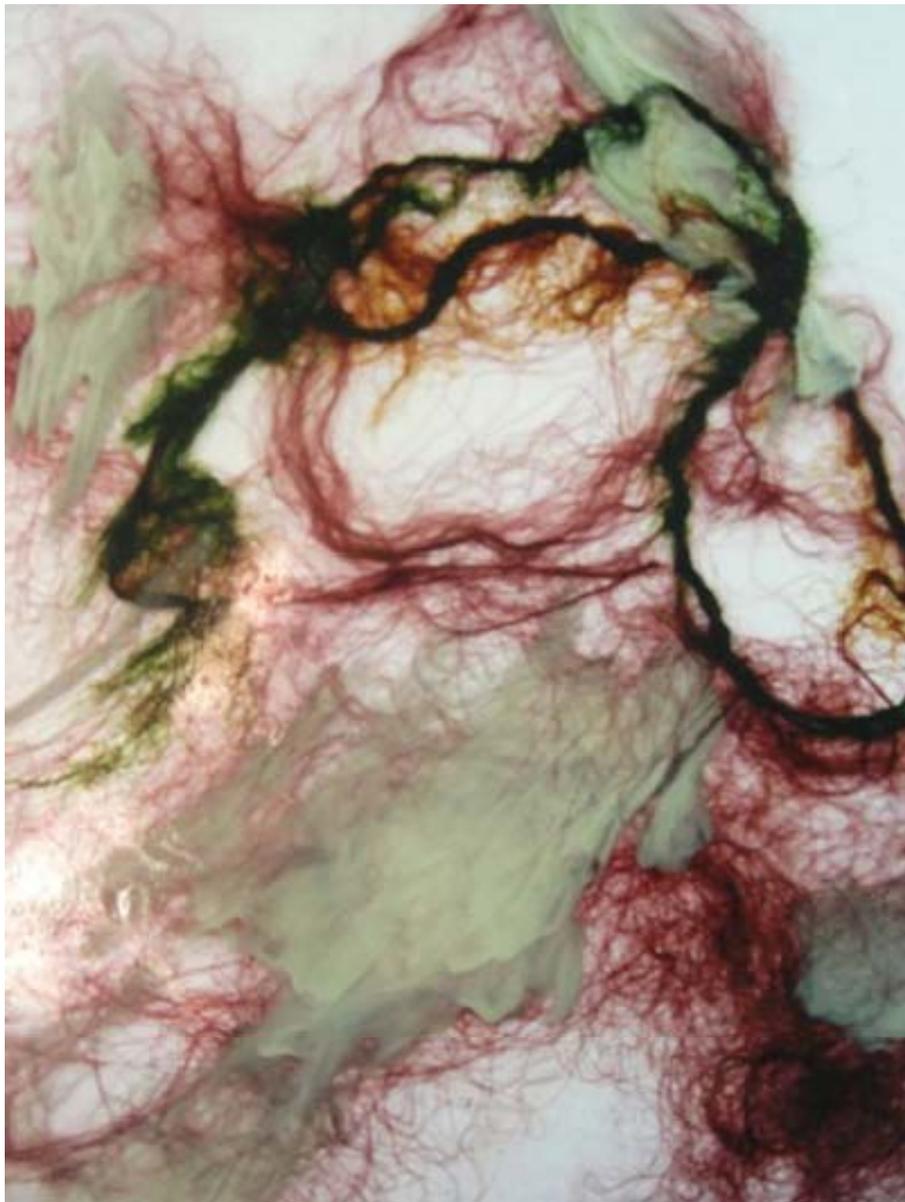


Fig.54

CHAPTER 3 TACIT KNOWLEDGE

The methodological aspect of this research integrates several different approaches and concepts. It is multidisciplinary, using a number of different methods together. It uses science to describe the qualities and properties of plastics, but also uses theories of sustainability to describe plastics as ecological materials. Further to these objective forms of quantitative research methods, this research uses the concept of emotional, subjective experience as a crucial aspect of the designer's data. Whilst it may be evident that the designer needs to use her sensitivity when collaborating with nurses, staff, family and residents of a care home for the old, it is claimed that the designer needs to use her subjectivity as the most important part of understanding the process of 'tacit knowledge'. This chapter explores the methodology which includes the subjectivity and emotional experience of the researcher, and suggests that this method is best described as a form of 'tacit knowledge'. Some of the knowledge being explored is 'knowledge about' (the chemical properties of plastics and polymers, for example); some of the knowledge being proposed as innovative is a form of 'know-how'. The difference between these two types of knowledge is often described as the difference between 'explicit' knowledge, which can be put into words, and 'tacit' knowledge, which is often described through 'poetics'.

Anyone can learn any skill, according to new research which proposes that it takes 10,000 hours of practice to attain mastery of any craft.⁷⁵ Art critic Clement Greenberg suggested in the mid-twentieth century that,

'Conception (intuition/inspiration) alone belongs to individuals; everything else, including skill, can now be acquired by anyone and inspiration is the only factor that cannot be copied'.⁷⁶

Perhaps the most extreme example of the opposition between empirical 'objective' knowledge being valued above the subjective is to be found in philosopher David Hume's depiction of poets as 'professional liars'.⁷⁷ For theorists of tacit knowledge, such as Michael Polanyi, Peter Dormer and Richard Sennett, the tacit cannot be entirely captured within

⁷⁵Richard Sennett, 2012

⁷⁶ Clement Greenberg, 'After abstract expressionism', *Art International* VI:8 (1962), pp.24-32,

⁷⁷ Laurel Richardson, 'Writing: a method of inquiry', in: *Collecting and Interpreting Qualitative Materials*, ed. Norman K. Denzin and Yvonna S. Lincoln (Thousand Oaks, CA: Sage, 2003), p.925

language and rationalist discourse, but is best depicted through poetics of matter. A good example of this would be Polanyi's suggestion that:

‘‘The scientist’s ‘‘hunches’’ may be based to a greater part on conception, and just as a keen eyesight enables one to discriminate objects that others cannot see, so does a gift of scientific discovery reveal natural laws in a scientific experience, which signifies nothing to others not so gifted. Those who insist on finding a formal procedure of induction would reject the acknowledgement of such powers of discovery as mystery-mongering. Yet these powers are not more mysterious than our powers of perception but, of course, not less mysterious, either.’’⁷⁸

The evidence for skill and talent being not only tacitly learned and communicated in some people, but actually also innate in others, can be found in many examples. Some of these are given in both Sennett’s 2008 book *The Craftsman*,⁷⁹ and in many professional practices such as music and other manual talents, where nurses, musicians, and people of different professions relate to the observations of unexplainable tacit knowledge. The key 1988 conference ‘Culture, Language and Artificial intelligence’, organised by the Swedish Arbetslivscentrum in Stockholm, explored the concept of these professions as based on tacit knowledge.⁸⁰

Peter Dormer, in *The Art of the Maker*, suggests that:⁸¹

‘Both senses of the word ‘Tacit’ are relevant:

- 1) Implied without direct expression, understood
- 2) Silent ’

Hungarian scientist and philosopher Michael Polanyi (1891-1976) devised a series of experimental observations of infant attention to visual objects, and found that infants can be said to ‘attend from’ a given template of knowledge or perception. Discussing the human capacity for innate knowledge of facial recognition, Polanyi discovered that we do not ‘attend to’ external objects, but ‘attend from’ prior knowledge. This internal knowledge is described

⁷⁸ Polanyi, Michael, (2010) *Tacit Knowing: Its Bearing on Some Problems of Philosophy*, <<http://faculty.uml.edu/rinnis/45.301%20Ways%20of%20Knowi...>> (Part 11: Indwelling, 608 index, 1962) p16 [accessed 3 January 2013]

⁷⁹ Richard Sennett, *The Craftsman* (London: Allen Lane, 2008).

⁸⁰ Papers from this conference published under the title *Artificial Intelligence, Culture and Language: On Education and Work*, ed. B. Goranzon and M. Flavin (Berlin; Heidelberg: Springer-Verlag, 1990).

⁸¹ Dormer Peter, *The Art of the Maker* (London: Thames and Hudson, 1994), p.13.

by Polanyi as ‘tacit’, and is differentiated from explicit, or verbalised knowledge. In 1953 Polanyi left the Hungarian state science community and emigrated to the United States, where he wrote on the philosophy of science, including his best-known book *The Tacit Dimension*, in which he states: ‘We should start from the fact that ‘we can know more than we can tell’; he termed this pre-logical phase of knowing as ‘tacit knowledge’.⁸²

It is suggested that skill can be learnt by a number of forms of transmission of knowledge, including display, imitation, observation, repetition, intuition and, mysteriously, by innate gift. In contrast to intellectual learning, rational systematisation or verbalized competence, the learning of ‘tacit’ knowledge is understood as a competence that arises from forms of human intelligence that are less well understood in academic conceptualisation. Tacit knowledge may be a reaction between the thoughts, material and hands. The way in which one translates words through materials is not something that can be learnt explicitly, although it can be shared. This may be called a ‘gift’, where the materials ‘do the talking’ through the hands, or where the material is used in ways which affect viewers as being especially ‘eloquent’, or ‘moving’ or ‘powerful’, as evocative of another’s experience. The connection is created between mind, hand and material, all working as one. Thoughts, feeling, emotions, senses from childhood are awakened as if the thought is already lying in wait within the unconscious. John Ruskin described this as the connection between ‘the head, the hand and the heart’, a formulation much used by the Arts and Crafts movement and their heirs, including researchers engaged in practice-led research, who strive to integrate the emotional dimension of making into the more conceptual vocabularies of thesis-writing.

Nowhere is this disjunction between intellectual and emotional skills more evident than in textiles practice, where the quality of textile materials, associated with the domestic sphere of home, the feminine and childhood experiences, are all the more difficult to grasp within the language of the rational world of adulthood and what I have defined as ‘external reality’. For example, the feel of wool, silk yarns, memories of grandmother, mother, crochet, knitting, sewing and making patchwork, all produce feelings of softness and bonding together. Smell is especially poignant as a sense which has direct physical and bodily associations. Whereas images and sight offer us the experience of mastery and dominance, the acoustic sense of hearing is associated with language, which is the most powerful medium of meaning in our culture; however, the sense of touch and smell remain embodied in a ‘close up’ relationship

⁸² Mark K. Smith, ‘Michael Polanyi and tacit knowledge,’ in: *The Encyclopedia of Informal Education*, 2003, www.infed.org/thinkers/polanyi.htm. [accessed 10 December 2012]

between self and other, becoming a conduit between ‘external’ and ‘internal’ realities. In my diary I noted *‘smell muses memories that almost allow one to see colour, when the rain hits the grass and the trees in the woods, it gives a certain smell that almost allow the seeing of colour and image’*.

Aware but unaware of the textures of materials being wound around the palms of the hand as mother converts father’s old jumper into new wool ready for the next life.’

One can be taught to sew, weave, knit or draw nowadays, but these were first developed into skills through thought, mind, hand and materials, in a very natural process. Then came the development into coverings for the body and decoration: thus we can see that the natural response and reaction to the materials was established first, with application and functionality following.

Words were spoken through the unspoken. Why is justification necessary, when some of the first human communication was drawn, woven or sewn, and being ‘crafty’, using whatever is at hand, making do, have all been discussed in the context of the literature on the notion of ‘the bricoleur’.

The ‘bricolage’ theory of knowledge invites an interesting alternative to the over-valuation of rationalist, explicit, knowledge. Anthropologist Claude Lévi-Strauss, son of a musician, understood culture as a vast series of musical structures such as the symphony. When applying Western concepts of society to interpret other societies, such as those in South America, where he carried out his fieldwork, he used ‘scientific’ concepts of ‘kinship’, ‘descent’ and ‘consanguinity’ when communicating his data, but he did not consider the myths of the South American native peoples to be ‘inferior’ to his own ‘scientific’ interpretations. Instead, he described the mythic thinking as bricolage, a sort of ‘do-it-yourself’ explanation which can be compared usefully to the ‘engineering’ referred to in Western social sciences. The term bricolage has come to be used, in a cultural studies context, as a way of describing the mythic thinking, storytelling, fantasy and poetry of everyday life and popular culture. It has also been suggested that practice-led research in design may operate through a system of bricolage in which the maker uses thoughts, reminiscences, quotations, poems and drawings to create a textual equivalent that may cast some light on the process by which the practice, ‘studio’ work is produced.⁸³

⁸³*Handbook of Qualitative Research*, ed. Norman K. Denzin and Yvonna S. Lincoln (London: Sage, 1994)

One thought from my own notebooks comes to mind: how would the Biblical narrative of Adam and the fig leaf be defined within this framework?

Reflecting on my own personal research, once the hands start working, as described earlier, their activity comes from within tacit or, as I suggest we call it, *deep tacit* knowledge, which flows freely as though within the unconscious lie in wait memories, images and feelings which, once brought to the surface, run in a completely fluid way. All the tacit knowledge is already embedded within; to dig deeper (*deep tacit*) is what I call ‘the gift’: in these cases such complexity is combined with the eclectic. The brain starts searching, shuffling ideas, digging deep, playing with a variety of thoughts which produces almost a meditative state with everything being moved around in the mind.

The working-out always takes time, but before the head and the hand start working together most, if not all, the qualitative work has already been done and written in the mind. Not that this is possible, or even necessary, to put in the form of written words, for it is done by ‘writing’ with materials, and constitutes the explicit knowledge which emerges from tacit knowledge.

We may all well be blessed with a gift, but few have the ability of storing ideas and bringing them to the surface when meditation or deep thought takes place. Those who have the power of the mastery of language may have no need to be ‘gifted’. Is gifting a synonym for those with ‘special’ needs? The viewer of a piece of work by an artist, designer, maker or entrepreneur may make a connection which one could define as the viewer having a gift, but one which they choose not to use in the way others such as artists and musicians would use it. Craft anthropologist Tim Ingold describes craft activity as a precursor of rational thought, exploring the co-evolution of language and craftsmanship, but he is not an advocate of understanding ‘tacit’ knowledge in connection with the unconscious.⁸⁴ Richard Sennett, on the other hand, makes a strong connection between ‘tacit knowledge’ and what the psychoanalyst D.W. Winnicott (1896-1971) calls ‘holding’ and ‘containment’.⁸⁵

For the maker, joining ‘tacit’ knowledge is ‘the haptic’— a sense of the tactile through visual contact, which correlates to the difference between the written and the unwritten, the sense of tactility not by touch but through the eye. Touch, like smell, is strongly associated with physical presence, and I use the way that materials have tactile meaning as a means to display

⁸⁴Tim Ingold, *Lines: a Brief History* (London: Routledge, 2007)

⁸⁵Sennett, *The Craftsman*.

the power of communication as a form of connection between makers and users. I have been especially aware of the way that textile materials, such as yarns, weaves and knits, in their unravelled threads, can encapsulate, hold and convey the complex emotions that are entwined in the memories of past relationships. Textiles, with their capacity to have a kind of ‘touch’ through their texture and haptic associations, and can ‘hold’ meanings from earliest life: the deepest feelings that are part of infancy and may be revisited in old age.

In many senses, plastic is a material which holds a refusal of death, as it takes several thousands of years to degrade. It is a challenge to bring plastic at the end of its normal life into a second life through the haptic, and give a new life to what would have been discarded and buried.

Familiarity and comfort may thus be found by accessing the unconscious where images, feelings, emotions are buried, which may come to the surface through certain objects, colours, texture: it could be one of many things. Once a connection has been made an attachment can grow, thus gaining attachment through the unattached⁸⁶ by the imparting of hapticity through visualisation a response of this kind could take place. Each viewer can gaze at these pieces differently, reading them uniquely, and reflecting their tacit, *deep tacit* knowledge.

In terms of the relationship between explicit knowledge and the ‘journeyman’, who was traditionally a skilled craftsmen who had completed his apprenticeship, for me it all happened in reverse, working in the opposite direction: I travelled and gained knowledge first. Thus knowledge transfer occurred by my being a journeyman, gaining the knowledge through travel and not using this knowledge until a later date, all an integral part of tacit knowledge.

Knowledge questions and answers

Believing the master knows all

No one really knows, or has the answers

To think you know everything

Is when in reality you know nothing

⁸⁶ Julie Behseta, Attachment through the unattached [paper]
<http://www.modip.ac.uk/resources/seminars/futureproof-plastics/speakers>, Conference Centre, Museum of design in plastics, (MoDip), Arts University College at Bournemouth.(18 May 2011)

No explicit end

Even the end will be the beginning⁸⁷

A couplet inscription on a famous Persian carpet, the Ardabil, on display in the Victoria & Albert Museum, London, is the beginning of a poem by the famous Persian poet Hafiz, which in itself is a self-identification through time and space. It is a representation, a life force connecting the individual with his or her history and culture through time and space.⁸⁸ The Orient, with its poetry, its atmosphere, and possibilities, was represented by poets such as Hafiz.⁸⁹

This example is also a particularly poignant textile metaphor for the obscure place of tacit knowledge in Western society. The Victoria and Albert Museum Asian collections have especially fine carpets. In fact Oriental was almost synonymous with carpets for many Europeans in nineteenth-century Europe. The carpet has a strange place in our lives, both precious and invisible, offering comfort and luxury by being walked on. This strange, luminal role of textiles in Western modern life is a good metaphor for the silent wisdom of tacit knowledge. At one end of the Ardabil carpet, a cartouche contains the aforementioned woven inscription, which has been translated as:

‘I have no refuge in the world other than thy threshold,

There is no place of protection for my head other than this door,

The work of the slave of the threshold, Maqsud of Kashan, in the year 946’

The weaver has given a voice to the inert object of the carpet. By articulating the ‘point of view’ of the object, rather than the human subject, the weaver craftsman invites us to understand the place of the ‘slave’ who ‘stands under’ our feet. The role of textiles as serving the needs of human agency, used almost ruthlessly, like a baby uses its mother, is a deep insight into the power of the textile.

As Edward Said has pointed out in his powerful book *Orientalism*, Western European culture, from colonialism onwards, ceased to understand the Orient as a source of knowledge and their history, but devalued it as a colonial ‘other’, using it as a source of fantasy to bolster

⁸⁷ Author (2010)

⁸⁸ Manuel Castells, *The Power of Identity* (Oxford: Blackwell, 1997), p.7

⁸⁹ Edward Said, *Orientalism* (London: Routledge, 1988), p168

and shore up the narcissism of Western identity as masterful. This is seen in the fact that when poems written by poets such as Hafiz and Omar Khayyam, author of the *Rubaiyat*, are translated and quoted by European writers such as Victor Hugo, Gustave Flaubert and Edward Fitzgerald they impart a sense of both self-fulfilment and fantasy.

From this methodological journey across theory, philosophy, history, poetry and carpets I offer a simple, even simplistic distinction between two types of knowledge. These might be seen as the different parts of my ‘thesis’: one which contains knowledge in material, tacit, form, and the other which is an attempt to find words which are equivalent to the process of making and designing.

- 1) Quantitative (written) (explicit)
- 2) Qualitative (experienced) (implicit/tacit)

3.1 Theory and Practice

By exploring the theory of tacit knowledge in the context of ‘emotionally durable design’, my research suggests that it is important that user groups of a design project be invited to participate in a ‘hands-on,’ embodied interaction with the materials that form the structures and surfaces of their own environment.

The residents of the Alexandra House Care Home (AHCH) were enabled, through the participation of family and friends, to have encounters with the material that became the visual and tactile surfaces of their home. This encounter is to be valued for its quality of activating memories of experiences of tacit knowledge, the ‘know-how’ that is a gift of human experience. The sensory qualities of touch, of colour, and in some cases of smell and scent, formed the basis of the social and emotional bond between residents and workshop group. By working together, in the presence of family, but not necessarily *with* family members, resident participants were enabled to have an experience of being ‘held’ by their attention to materials, an embodied and emotional sense of being held through the act of ‘holding’ and handling textiles and other familiar materials. The quality of textiles as a material associated with the domestic, the maternal and early life care carries memories and associations of contact. Even when language skills are absent or are intermittent, such as in progressive, degenerative conditions as Alzheimer’s and dementia, the communication that occurs through shared tacit knowledge can be a profound source of meaning. This experienced was reached, in my research process, through a number of means, including the

spoken reports of care staff, the testimony of family and visitors, the physical responses of residents, and my own emotional and intellectual responses to the behaviours in the workshops.

It was evident, both to me and to others, when shown the photographic documentation of the workshops, that an encounter was taking place at a level which was significant. The resulting artefacts, tiles for the tactile and optical surfaces of the interiors of the care home space, were, to some extent, able to 'retain' aspects of this experience. The aesthetics of the artefacts have, in form and in content, traces of the process through which participants' experiences are invited, valued, remembered. The 'amateur' quality of the aesthetics make it evident that something of the spontaneous gesture is valued, by the designer, over and above the aesthetic of the uniform, identical, mass-produced and modular. The encapsulation of the 'spontaneous' within the plastic envelope offers something of the sense that recycling is a form of 'reincarnation', where the values of previous lives can be held for the contemplation of future viewers. In a care home, where residents may feel that they are 'waiting to die', it is possible for a designer to use materials in ways which depict the life journey of a material as a metaphor for the journey of a personal experience. The idea proposed in this thesis, that death and departure are experiences to be considered, prepared for, thought about and represented, rather than denied or minimized, is something that the designer can materialize with the use of their subjective and tacit knowledge.

3.2 Silent/written

Through my experience as a technical machine operator in a large automobile factory I realised that although a machine has no senses, the operator of the machine makes a difference to performance. One has to have a certain sensitivity, knowledge and skill in relation to the machine and how it runs for human and machine to work in concert. Through repetition and experience a true understanding can grow, leading to an implicit understanding. Through the feel of the material I could tell when it was time to fill the hopper, the instant change in the smell of the material tells tales of the temperature, thus giving me the ability to customize the speed and heat setting of the process. Results will totally differ from one operator to another, as do works from the hands of different

craftspeople. Examples can be seen in Peter Dormer's *The Art of the Maker*⁹⁰ and Sennett's *The Craftsman*.⁹¹

The operator who understands the machine and its rhythm of working and the novice, someone with no insight into its smooth running, will have different outcomes altogether. Almost like driving a car, each car has its own sensitivities and each owner has enough understanding for the smooth running of the engine; however, when the new owner takes control the engine may stall, and not until a full understanding of the sensitivities of that particular car are fully appreciated will smooth running be possible. This is not something that can be fully explained or taught; one has to sit in the seat and experience it through a hands-on approach.

The same applies to industrial machinery: each has its own sensitivity, and it is only repetition and years of life experience that lead to full empathy between hand and machine working in harmony, the years of repetition allowing for the development of new knowledge, correlated with life experiences (tacit knowledge; *deep tacit knowledge*) and Research & Development leads to new processes becoming apparent.

Concepts like Cradle to Cradle (C2C) have the outlook for the future in mind. The idea of waste equalling food, in the sense of using waste to provide the raw materials for new products, resolves the need for virgin material. In the C2C approach, only products that are fully recyclable are made, and products that can only go through the recycling process once over are dismissed. C2C products are biodegradable, or can be 100% reused as raw materials for new products, in everlasting loops and without loss of quality; 'down-cycling' thus makes way for 'up-cycling' in the C2C approach.⁹²

In contradiction of C2C theory, one was brought up to believe that the pennies make the pounds in life, as in the old saying 'if you look after the pennies, the pounds will look after themselves' whereas C2C theory is more along the lines of: 'Just a little good is not good enough and worthy'

In the context of recycling, one may disagree with the suggestion that if a material (product) is not fully recyclable again and again it is not worth producing:⁹³ with the advances

⁹⁰Dormer, 1994

⁹¹Sennett, 2008.

⁹²Braungart and McDonough, 2009., p.66

⁹³ *ibid.*

associated with today's fast and ever-growing technology, who is to say that an answer to the problem will not be found in the near future? From the first stages of my journey I have not limited myself to one discipline, but crossed over the boundaries between, for example, tradition, the handmade, technology, the machine, research and development which have all worked as one together, with site visits to the recycling plant to gain a full knowledge and understanding of each individual process. I found that the process of collecting general everyday household waste (packaging) from family and friends produced enough material for my work, thus offering evidence of the vast amount of plastic packaging waste is created by everyday use.

CHAPTER 4 RESEARCH BEYOND THE LAB: Working with a specific user group.

In 2011 I transferred from MPhil to PhD research. The MPhil research had been conducted at the London Metropolitan Polymer Centre in order to experiment with technical specifications for the recycling process. The RCA's Research Methods Course offered a range of perspectives on theorizing methods for design research. The comparison of different methods as a methodological study was also an integral part of the research. Essential to this project was the integration of theory and practice. At the transfer exam it was suggested that the doctoral level of the research might focus on working with a specific user group. I would be able to document my changing role as a designer and encounter new theories of design practice. I decided to work with a residential care home for the elderly. This chapter discusses the theory and practice of designing sustainable recycled materials with residents, families and staff of the Alexandra House Care Home. The first part describes my encounter with current theories of design for old age; the second describes the design practices of 'user-led design' developed at RCA Helen Hamlyn Centre for Design and the third describes my encounter with the Alexandra House Care Home.

4.1 The Royal Academy of Engineering / Age UK Conference

As mentioned in the Introduction, in May 2012 The Royal Academy of Engineering Panel for Biomedical Engineering and Age UK held an international conference entitled 'Designing Cost-effective Care for Older People: How Technology Can Make a Difference'.⁹⁴ Attending

⁹⁴Designing Cost-effective Care for Older People: how Technology can Make a Difference' [conference], Royal Academy of Engineering Panel for Biomedical Engineering and Age UK, Electric Works, Sheffield Digital Centre, Sheffield, 16 May 2012, http://www.raeng.org.uk/events/pdf/ageing_population_conference.pdf . [accessed 7 February 2013]

the conference led me to the realisation that continuous attention has been paid to the development of new ideas, materials and objects for the elderly; these include telecare, sensors, pervasive computing, robotics, and lots of gadgets, all of which could send one's head spinning. There is no doubt that these new developments are much needed and very advanced, with sensors and intelligent control systems to assist with the improvement of quality of life for people with Alzheimer's, in particular.

Professor Paul Watson, Director of The Digital Institute, Newcastle University, introduced an example of pervasive computing whereby gadgets are built inside kettles, knives, other kitchen accessories and the floor so that the sensors know when people are using the gadget or not. The purpose of developing such sensors was to spot the occurrence of an unusual event and then prompt a connection with the family so they could instantly be informed if normal daily activity has ceased.

Pam Turpin, a PhD student at University College London, presented her work involving care for older people with dementia. Turpin uses no gadgets within her project; she was looking at how to introduce more familiar surroundings and improve on the clinical look of the interiors of care homes. She showed an example at the conference of where she had made improvements to the bathroom by changing the toilet seat from a white block colour to a blue block colour: although it had moved away from a clinical, all-white appearance it was still lacking in transformation, yielding a cold, empty atmosphere.

Alongside Turpin's presentation there was another, entitled "Social Wellbeing: What the Elderly Love/hate about Technology." It was suggested that once an elderly person had become familiar with a gadget, for instance a TV remote control, they were not afraid to use it, this leading to a 'try before you buy' concept, and prompted questions on why such a situation does not exist. Amongst these interesting topics, there was a key outcome, that the elderly should never be underestimated. Matthew Norton, Social Research Manager, Age UK, pointed out that:

'the old generally know when their blood pressure is high; also, they can give the reasons why. On informing the lady that her blood pressure was high, she replied: "that's because I have been drinking too much coffee".'

This makes me think about how the elderly need to be listened to more and, rather than designing *for* them, we should be designing *with* them. The thought of all these gadgets leaves one thinking about the people themselves and how all this relates to one-to-one, face-to-face interaction. The gadgets are excellent devices, and there is no doubt that they are improving the lives of more vulnerable people. It is suggested that all the aforementioned concepts could lead to people becoming very isolated, because of the advancement of technology and the mechanisation of production, maintenance and repair of all the objects. This has led to an ever-increasing need for personal interaction which is slowly being lost. Professor Tom Kirkwood, CBE, Associate Dean for Ageing at Newcastle University, intrigued the audience with his paper which suggests that ‘instead of changing everything, think creatively, use and manipulate what we already have.’ This automatically makes one think of Lévi-Strauss and his words about the comparison between the bricoleur and the engineer:

‘[He or she] is adept at performing a large number of diverse tasks; but, unlike the engineer, he [or she] does not subordinate each of them to the availability of raw materials and tools conceived and procured for the purpose of the project. His [or her] universe of instruments is closed and the rules of his [or her] game are always to make do with “whatever is at hand,” that is to say with a set of tools and materials which is always finite and is also heterogeneous because what it contains bears no relation to the current project, or indeed to any particular project, but is the contingent result of all the occasions there have been to renew or enrich the stock or to maintain it with the remains of previous constructions or destructions.’⁹⁵

Professor Tom Kirkwood finished with the point that engineers get excited about the technical problems but more information is needed about end-users.

4.2 An ageing population

The ageing of the UK population is becoming more important and of more concern, as Age UK emphasised at the conference. It was noted that the ‘baby boom’ of the 1960s has led to an increase in the ageing population of today and in the future; this is confirmed by the UK Office for National Statistics figures given next page:

⁹⁵ Claude Lévi-Strauss, (1962) *The Savage Mind*(London: Weidenfeld and Nicolson, 1966),p.17

‘During the last century, there were peaks in the numbers of births after both world wars and a longer baby boom during the 1960s. Over the next 25 years people born just after World War II, now aged in their 60s, will continue into the oldest ages, reaching their late 80s by 2035. The 1960s ‘baby boomers’, currently in their mid-40s, will reach their early 60s around 2025, and by 2035 will be in their early 70s. As these birth cohorts age they will contribute to the continuing ageing of the UK population.

‘The fastest population increases have been in the ‘oldest old’ (those aged 85 and over). Between 1985 and 2010 the percentage of the population aged 85 and over increased from 1 per cent to 2 per cent, with the number aged 85 and over more than doubling, from nearly 0.7 million to reach over 1.4 million by 2010. By 2035 it is projected that the number of people aged 85 and over will be almost 2.5 times larger than in 2010, reaching 3.5 million and accounting for 5 per cent of the total UK population.’⁹⁶

With an ageing population comes disease, with one of the most prevalent being dementia. As there are several different forms of dementia this is an umbrella term, used to describe symptoms which can become apparent when the brain becomes affected by disease; one of the most common of these diseases is known as Alzheimer’s, (statistics, see appendices 4, p.190) first identified by the German neurologist Alois Alzheimer (1864-1915).Alzheimer’s affects around 496,000 people in the UK; symptoms include mood swings, memory loss and dysfunctional behaviour, which over time become more severe.

There has been significant interest in this area in design research and collaborative projects with industry and work carried out to improve life; particularly worthy of mention is the work of the Helen Hamlyn Centre for Design (HHCD), at the RCA. It was set up at the RCA in 1999, its mission being to work with designers, graduates and industry, looking at a more socially inclusive approach to design, centring around four social-change themes: age, work, mobility and care, all of which incorporate an approach that involves interdisciplinarity and inclusiveness.

⁹⁶Office for National Statistics,*Population Ageing in the UK, its Constituent Countries and the European Union*, http://www.ons.gov.uk/ons/dcp171776_258607.pdf[accessed 2 February 2012]

4.3 Beyond Technocentric Design

Jonathan Chapman proposes that a new practice of emotionally durable design needs to include a means of challenging a tradition of technocentric thinking.⁹⁷ The technocentric approach to design suffuses all the forms and ethics of design practice, so that the well-intentioned Royal Academy of Engineering/Age UK conference mentioned earlier was, predominantly, a series of propositions on how new technologies can lead thinking to generate cost-effective solutions for meeting the challenge of a new demographics of ageing. Statistics which predict the imminent challenge of an increasingly ageing population in the developed Western world are accompanied by suggestions of highly engineered systems with which to manage this challenge. At the conference it was Tom Kirkwood who proposed an alternative to this technocentrism, and suggested that people need to think more creatively through the technologies and resources at hand and in place, rather than inventing new forms of engineering. Kirkwood works from within the ageing community rather than from within an engineering context. The thinking that emerges from Kirkwood's practice of being with the old is one which maintains a conceptualization of people at the centre of the approach. This enables the quality of empathy to be integrated into the process of thinking, rather than the more utilitarian concept of 'cost-effectiveness' proposed by the title of the Royal Academy of Engineering conference. When considering the doctoral project of designing with a community of elderly people I needed to consider a range of questions that are integral to the project of how sustainable design can be deployed within community practices. The definition of sustainability needed to be centred as much around the process of working with a particular group as it did on working with particular materials and technologies. These questions have, since 1999, been the agenda of the HHCD (formerly the Helen Hamlyn Research Centre), where the practice of 'inclusive design' built on the work of the Design Age action research unit, designing for and with an ageing population. The theme of inclusive design has become the main approach of a research centre which integrates methods and practices across a range of specific projects, funded by specific sponsors. Amongst these is the Centre's methodological explorations into user-led or collaborative design. Sometimes known as co-creation, or participatory design, these practices aim to replace technocentric principles with more creative and collaborative practices.

⁹⁷Chapman, 2005.

The question was not how I might design *for* an ageing community, but how I might rethink the process, before even starting, in order to design *with* them.

4.4 Design for people, by people, with people.

RCA Research delivers a Research Methods Course (RMC) for considering methods and methodology. One of the lectures in this course, ‘User-led theory and methods’, presented by Professor Jeremy Myerson, director of the HHCD, proved to be of great interest to me, so I attended his lecture for a second time in 2012. Myerson began by explaining the three different approaches to design at the HHCD:

- Design for people
- Design by people
- Design with people

Design for people

The work of Henry Dreyfuss (1904-1972) was discussed in this context, and in particular Dreyfuss’s *Designing for People*, originally published in 1955, an autobiography that included the first publication of the ‘Joe’ and ‘Josephine’ anthropological charts. Dreyfuss focused on design problems related to the human figure, working on problems ‘from the inside out’, and believed that machines which were adapted to people’s needs would be the most efficient.⁹⁸

Henry Dreyfuss makes a prophetic statement:

‘Somehow, we must find again our sense of individual values, lost in this century of enormous technological advance. This very freedom that mechanical aids are giving us has welded us into unmanageable megalopolises, where people are anonymous numbers and where communication with our fellow man seems a minus quantity. We must restore the warmth and spirit we had in the smaller community. I hope that in our leisure time we will

⁹⁸Henry Dreyfuss, *Designing for People* (1955; 1967), (New York: Allworth, 2003), p.9

once again know our neighbour and if everyone knows his neighbour and learns to live with him, the entire world will be at peace.’⁹⁹

He refers on several occasions throughout his book to the importance of the designer, and how as a designer one must have empathy and a full understanding of the manufacturing process, consulting closely with the manufacturer, the manufacturer’s engineers, production and sales staff, etc. This approach can be seen in Tom Dixon’s 2005 project (referred to in Chapter 1).

Designing by people

A relevant paper in relation to this issue is Yanki Lee’s paper, based on her work at the HHCD, discussing design participation tactics, ‘The Challenges and New Roles for Designers in the Co-design Process’. The project fills a gap in design participation practice which is the result of the lack of collaboration between scientists and designers: it was based on the idea of ‘Design Your Own Spaces’ (design by ordinary people), encouraging the participation of local people, the designer referring closely to local people within the process of design. Lee based the project in Hong Kong: it involved empowering people, and to some extent letting the people be in control.¹⁰⁰ Addressing these challenges, she states that ‘it is essential to reconsider the roles of designers (design developer, facilitator and generator) in order to achieve user participation in design. However, in order to avoid tokenism, the most important thing is to practise these roles as tactics of design participation’.¹⁰¹ In her conclusion to the project Lee explains that the term ‘design participation tactics’ implies that they are ‘tactics’ rather than ‘strategies’, the difference being that tactics have more to do with the spontaneous and the temporary, and are not necessarily linked to an overall planned outcome. Tactics represent a reflective action. In contrast to strategies, tactics depend more on hands-on experience. Within my own research I would suggest that ‘tactics’ are perhaps ‘tacit’ knowledge coming to the surface: letting the unknown happen, and becoming known, new knowledge.

⁹⁹ *ibid.*

¹⁰⁰ Yanki Lee, ‘The Challenges and New Roles for Designers in the Co-design Process’ (London: Helen Hamlyn Centre for Design, 2008)

¹⁰¹ *Ibid.*

Designing with people

Gianpaolo Fusari and Yusuf Muhammed (2009-2010) in their HHRC project ‘Redesigning the Ambulance: Improving Mobile Emergency Healthcare’¹⁰² report that as a ‘Designing for people’ project it was a ‘learning on the job’ experience, rather than one of extracting information and using that for the design process. An ‘in-situ’ process began, with the researchers joining in the day-to-day activities of the ambulance and the crew to gain a full understanding of the running and needs at firsthand. This led to a redesigned ambulance that was easy to keep clean for pre-hospital care, and which would hopefully replace existing models as they become obsolete. Myerson suggested that this method of designing with people was a more recent shift. Myerson pointed out that unfortunately the project, at the time of writing, in November 2012, is still awaiting funding to proceed further.

Designing with people.

HHRC Research associates Gregor Timlin and Nic Rysenbry produced the report ‘Design for Dementia: Improving Dining and Bedroom Environments for People with Dementia’ (2009-2010), sponsored by Bupa.¹⁰³ In their findings different areas that could be improved came to light, one of them being able to drink and eat with dignity. The residents were found to be using the same plastic cups, saucers and plates as those used by children. With this in mind improvements were made to help maintain eating skills for longer, involving a change in the material used, i.e. ceramic instead of plastic, as it was suggested that plastic was seen as an ugly, unrefined material.¹⁰⁴

Desirable improvements to the interior were also mentioned, such as amendments to the bedroom environment, by implementing room layouts that could be reconfigured as needs change, through the use of rails and hook systems drawn from the retail sector.

4.5 Developing design with the Alexandra House Care Home

The Alexandra House Care Home (AHCH), attached to Princess Alexandra Hospital, in Harlow, Essex, is a local care home which I had carefully selected by reading the relevant

¹⁰²Gianpaolo Fusari and Yusuf Muhammed, ‘Redesigning the Ambulance: Improving Mobile Emergency Healthcare’, London: Helen Hamlyn Centre for Design, 2009-2010, <http://www.hhc.rca.ac.uk/308-3816/all/1/Redesigning-the-Ambulance.aspx> [accessed 5 February 2013]

¹⁰³Gregor Timlin and Nic Rysenbry, ‘Design for Dementia: Improving Dining and Bedroom Environments for People with Dementia’ (London: Helen Hamlyn Centre, Royal College of Art, 2010)

¹⁰⁴Jeremy Myerson, ‘User-led theory and methods’ (lecture, Royal College of Art, 7 November, 2012.)

Care Quality Commission (CQC) report, which performs a similar function to schools' OFSTED reports. CQC reports assess the day-to-day running of care homes and residents' needs and, where necessary, suggest recommendations for improvements in conditions needed within the home. Page 4 of the July 2011 CQC report for the AHCH is quoted below¹⁰⁵.

4.6 Identifying the problem

'Outcome 10:

People should be cared for in safe and accessible surroundings that support their health and welfare.

The provider is compliant with this outcome. People who use the service live in an environment that is comfortable and which meets their needs. However, improvements are required to make the communal bathrooms less clinical in appearance so that people may have a relaxing bathing experience. Consideration should be given to ensuring people live in a more homely environment.'

For relevant pages of the CQC inspection reports from 2009-2011, can be found online at, <http://www.cqc.org.uk/directory/1-131481935>. Example of the Research Ethic consent forms needed to continue with the project and further development work, (see appendices 5, p.191).

The CQC report interested me because of the way that the assessors suggested that improvements were necessary at the level of the interior environment of the residential building. It was clear from the report that the AHCH provided high-level care, and that the residents were receiving good quality medical, social, nutritional care. The deficiency in provision for creative activities and the criticism of the absence of 'liveliness' in the lived environment, interested me very much. It seemed to me to be an invitation to a designer to solve both problems simultaneously, by using collaborative activities of an occupational therapy kind to generate a dynamic and new interior design. This would be 'for, with and by' the residents.

¹⁰⁵ Care Quality Commission, 'Alexandra House – Harlow', Inspection report, July 4 2011, <http://www.cqc.org.uk/directory/1-131481935> [accessed 30 January 2013]

The value of this project for my research was that there could also be an independent, professional assessment of the effectiveness (or failure of) the design project, in the CQC annual report. However I would not delegate the ultimate arbitration of the value of the design or the research outcome to the CQC as the research project requires that a process of self-assessment be conducted to assess the generation of new knowledge within a creative design research field rather than assessing the effect of design on AHCH residents.

The effect of the research on, for and with the residents was of crucial importance to me, but is not the only arbiter of the meaning and quality of the research project. I decided to approach the AHCH to propose a two-year project, discussed in a meeting (documented below) to explore the aims and objectives of the project.

4.7 Discussing the solution

Group Meeting (16.06.2011)

The group meeting consisted of 6 participants;

- Researcher R
- Care Home Manager CM
- Deputy Manager DM
- Care Worker CW
- Financial adviser FA
- Administration staff A

In order to make the meeting as comfortable and free-flowing as possible, with no pressure to give the expected answers to questions that might be asked, a decision was made not to have the meeting taped or recorded.

Researcher

I introduced the project with a brief presentation of my work, explaining that I had now reached the stage at which the project needed collaboration with an 'end-user group' and

would appreciate the possibility of collaborating with the AHCH as end users. I explained that the residents would be invited to make textiles in weekly workshops, and that families would be invited to bring in textile artefacts that might have emotional resonance for residents or themselves. It was explained that the materials made and used for handling, talking and remembering would be used as part of the generation of materials for the interior architecture of the AHCH. Threads, fragments of silk, wool, would all create a tactile and haptic appeal, provoking and stimulating the senses, while participation in the process of making would enable residents, carers, families and staff to create their own aesthetic, with the possibility of the work carried out during the workshops being encapsulated within polymer tiles made from waste products collected within the kitchens of AHCH itself.

Showing the tiles to the group there was a murmur of excitement, with questions.

CM: 'Oh-how do you do this again?';

FA: 'You must be very clever';

DM: 'They are beautiful and also tactile, we could use them in many different ways, as night lights, along the corridors, in the bathrooms,' etc., each contributor suggesting different ideas.

CW: (Holding a tile up against the wall in the manager's office) 'They would look great up here?'

FA: 'We could even sell them at the fairs we hold in summer or at Christmas- think of the money we could bring to the home.'

Not exactly the response I was looking for, but nevertheless encouraging, and then came the manager's response.

CM and DM both agreed that the tiles were wonderful and can be used within the interior, bathrooms, bedrooms and corridors.

DM: 'we have had reports by the Care Quality Commission (CQC) which have noted the need to improve the environment of the home by giving it friendlier, familiar surroundings.'

The CQC report (2010) states that:

'Improvements are needed on units to make a more homely environment as opposed to the overall clinical appearance it currently has'.

'It is a recommendation of good practice that work needs to continue to develop the recreational activity and stimulation provided for people living at the home'.¹⁰⁶

CM: 'So how would we go about this?'

R: 'I think to include the residents in the process of making would be a design approach that can be considered and applied to the above.' At this point leaflets were handed out to the group.

4.8 Design Approach for End User Co-Creation

Following the integration of Chapman's theory of empathy as a medium for design thinking with a specific user group, the staff, families and residents of the AHCH set the parameters for a new application of the experimental methods I had developed within the London Metropolitan Polymer Centre's laboratory. Thinking through the literature on an ageing population, and through the approach of the inclusive design practice developed at the HHCD I was able to consider a range of hybrid methods. My methodology could thus be considered hybrid or heterotopic. It no longer started from the principle of a unitary point of view of the 'designer's' authority, nor from the 'get out of jail free card'¹⁰⁷ of recycling, but needed to start from a relationship of emotional empathy within a complex set of parameters.

4.9 People-Centred

The design approach was concerned to develop ideas to create and promote residents' participation within the process of making, which would also enhance the residents' environment. It was important to ensure that careful consideration was given to an approach which would cause neither over-stimulation nor under-stimulation but find a happy medium, through engaging with the materials and hence provoking the senses in order to recall physical memories of experiences. The act of creating by working with hand-held materials from familiar sources was aimed at exploring the significance of empathy. It was my implicit

¹⁰⁶ Care Quality Commission, Alexandra House Care Home, Harlow, Key Inspection Report, 2010
http://www.cqc.org.uk/sites/default/files/historic_reports/1-102642999_Runwood_Homes_plc_1-131481935_Alexandra_House-Harlow_0000073250_28062010.pdf [accessed 4 February 2013]

¹⁰⁷Chapman, 2005

goal to extend the residents' experience of being immersed in the pleasurable intensity of the workshops' social space into the quality of the artefacts made. If residents had similar responses to those of the workers within the AHCH to the experience of holding and looking at the tiles containing the textile artefacts, then these might make a meaningful, and therefore enlivening, visual and tactile environment within which to live.

4.10 Cognitive Ability

The provision of creative activities within the AHCH is aimed at providing shared activities that bring residents together with visitors and staff to allow for moments of close interaction, reflection and communication. By being engaged in the bodily activity of making, cognitive ability is activated. Cognitive ability may be enhanced by holding workshops that respond to residents' deepest and earliest memories, which may be improved by promoting the use of familiar and recognisable things that may evoke feelings and memories, such as buttons or fragments of a favourite dress, shirt, or handkerchief: 'Senses, touchy, feely, tactile, haptic, colours, smells, tastes and images can create emotions, which in turn trigger similar emotions experienced in the past, elderly people react in present time, the same way they did in the past.'¹⁰⁸This can offer a sense of achievement which relates to that all-important and sometimes elusive feeling of pride, confidence and the gaining of identity and self-worth.

4.11 Social Ability

This is addressed through the design of workshops that create opportunities for residents and staff to interact. The researcher (myself) suggested an introduction and continuation of contact by means of workshops, the first of which should be one of familiarisation with the residents: introducing the research project, showing images of the process and the work involved, and in turn getting to know the residents and their needs. This would be followed by asking family and friends to contribute to the collection of fragments of cloth, threads, yarns, wool, buttons, and zips, anything with associations of personal fondness to manipulate during the hands-on workshops, following the path of recycling and a sustainable ethos.

¹⁰⁸Naomi Feil, "Learn more about Validation", What is Validation, No11 (1992) www.walking-in-their-shoes.com/validation-therapy.html, [accessed 12 February 2013]

R: 'How could we introduce the workshops to family, friends and staff?'

CW: 'We could put a poster in the foyer: when family and friends arrived they would become aware of the event. What would we call the workshops?'

R: 'Sustainable workshop? What do you think, what are your ideas on this?'

CW: 'Yep, that sounds good, I'll get working on that.'

R: 'I've brought along a printout of a brief that I thought could be followed by residents, family and friends so they would have a better idea of what the workshops entailed.' At this point a copy of the brief was passed around the group: (see appendices 7, p.203). As the meeting went on;

R: 'How much waste does the care home produce- does the home have waste such as plastic milk bottles?'

CM: 'Ha, we could keep you going with as much waste as you need, we have a daily supply of milk to the home.'

R: 'Great- that will help with closing the loop within the process, completing the cycle of waste to value.'

CM: 'Just let me know when you would like us to start saving them.'

Following the meeting the Deputy Manager gave me a full tour around the care home. She was very excited about the research project and again mentioned the inspectors' visit and suggested that the home needed some kind of uplift, making the spaces more user-friendly.

As we were touring around it was quite an eerie experience: the whole of the three-floor corridors was bland and bleak, there was a feeling of emptiness, loneliness, a great lack of connectedness; the familiar things that make a home a home were greatly missing. The CQC report made all the more sense, and it could be fully understood why the report criticised the general overall atmosphere. On arriving at the third floor I had a déjà vu experience. I felt that I had been here before, or in a dream; if I shut my eyes I knew the image and even the feel of a long endless corridor, cream white bare walls, nothingness, apart from the interruption of doors, doors, and more doors, all white, all closed, it seemed like there were a

hundred and one doors and a fear could almost be felt as to what lay behind the doors. The bleak cold walls were screaming out for some kind of touchiness, colour, texture, added feeling; once again I thought about the textured wall project mentioned in Chapter 1, realising what a challenge this would be.

The idea of a leader trail, but different to those of Natalie Woolf, whose tiles light up by touch only (see Chapter 1), the tiles that would be used in my project are self light-emitting, using luminescent pigments which collect light energy, storing and emitting light at night. The Care Manager suggested that the hallways of all three storeys, bathrooms and rest areas could all benefit from the tiles. The luminescent tiles could also be installed in bedrooms as nightlights. Following the initial success of this meeting we agreed to proceed. This project would start at the earliest convenience, and would be documented with the explicit permission of the AHCH and its residents.

The Care Home Manager also confirmed a commission for work to be carried out after the completion of the doctoral research project, which I was pleased to accept, as it was a tacit indication that there was more to this project than simple compliance with an academic research scheme for the sake of being 'public-spirited'. I was satisfied that the research project was being developed in a way sufficient for the doctoral research, but more than this I was delighted that the response of the AHCH manager was one of joy. The emotional responses of collaborators are crucial data in the research into design as empathy.

4.12 Validation Theory and Empathy

Alongside the weekly visits to the AHCH and the London Metropolitan Polymer Centre lab I pursued my reading research. This was less familiar to me than the practical aspects of the project, as my dyslexia makes written language difficult to access. During a literature review of research into the elderly with Alzheimer's I came across the work of Naomi Feil. Feil (a Social Work graduate from Columbia University, New York) writes on the care of people with Alzheimer's and has developed Validation Theory, which emerged from working with the care of elderly people with dementia as part of her Master's degree, and was based on her experience that the 'validation' of the feelings of old people, their experiences of disorientation, loss, and confusion, can make significant differences to their sense of

frustration and their behaviour.¹⁰⁹ If validation is not given, through tacit recognition and empathy, disruptive behaviour or withdrawal generally occurs as a sign of frustration and despair. Feil notes that validating includes

‘reflecting a person’s feelings, helping them to express unmet human needs, restoring well-established social roles (which in turn help to motivate expression of social behaviours), facilitating feelings of well-being and stimulating interaction with others.’¹¹⁰

I found the concept of 'validation' to be of immense use in my design of the workshops at AHCH. It seemed to me that this was a 'sensible' alternative to the kind of validation that younger people obtain through conversation and physical interaction, which is less readily available within encounters between old people. Where language falters, in the absence of other forms of 'validation' and tacit agreement, loneliness and frustration can be distressing. The workshops that took place enabled the residents to be part of a new hybrid design process, but during the workshops I found that when engagement with materials took place reminiscence went far back, bringing the residents out of the cold and into the warm. This suggests further work in collaboration with neuroscientists and psycho-geriatricians.

On arrival at the care home ready for the first workshop I had to arrange the furniture and chairs and display books with illustrations of design such as William Morris, Art Nouveau, and Art Deco, together with photocopies of different designs to get inspiration flowing, along with some remnant materials (waste) and all the things for the residents to work with. The collection of odds and ends and fragments of material from the residents’ favourite clothes, buttons from old items of clothing and so on, that their families had contributed were displayed and made available.

Residents were given the option to participate in the workshops; it was totally voluntary. Some residents never volunteered at all, refusing outright, and for others, as participation began, interest in the workshops seem to grow naturally, organically. I soon realised that things never go quite to plan and it is sensible to let things, actions and developments take their own course.

¹⁰⁹ Naomi Feil, ‘Validation therapy with late-onset dementia populations’, in: *Care-giving and Dementia: Research and Applications*, ed. by Gemma M.M. Jones and Bère M.L. Miesen (London: Routledge, 1992), pp. 199-218.

¹¹⁰ *ibid*

For example, the 'design brief' that had been presented at the first meeting presented everything exactly, including a dialogue of events and possible outcomes, but I was soon to realise that to let things happen organically in their own time was the best option. On passing the brief, an A4 booklet with 8 pages to each participant, the residents looked and said things such as 'how nice'; 'what's this for?' and once again the word 'technical' aroused a certain fear of the unknown, as though there was a layer of anxiety in looking between the pages and not understanding what it was all about: this happened when a different approach was introduced, but once again I made it familiar to them, explaining what the workshops (see Fig.55) were about- sharing, having fun, pleasure, reminiscing and letting things happen. This seemed to reassure the residents that all was good and that there were no technicalities involved.

Within a very short length of time it became apparent that timing was something that needed to be reconsidered, as it was something that could not always be specified: due to the differences in people's waking up times, dressing and medical needs and breakfast times, residents arrived at various times according to the different needs of the individual. With this taken into consideration, it was agreed that the residents could arrive any time after 9.30am until lunchtime or until they had had enough and walked away, but to my delight all the residents stayed until the call for lunch was upon us. At this time I was asked if I would like to stay and join everyone for lunch, which brought a friendly feel to the experience, being able to join in not just because of the fact that the workshop was in place, but also because it was a pleasure to be surrounded by such wonderful people.

The people attending the first workshop included: Len, Betty, Eve, Dolly, Alfie, George, Wally, Monica, Christine, and a man in a wheelchair (whose name I didn't know) ten in all. I started by introducing myself explaining who I was and what I was doing at AHCH, thus making the residents feel comfortable. To start the residents' memories and feelings I started by mentioning my own experience of mountain-walking and the feelings of silence, the wind whistling, the tent of clouds, the specks of what felt like icicles as they touched my cheeks, all of which I have included as 'reflection' at the end of this chapter. As a dialogue began to take place, residents participated in the materials selection process, engagement, reminiscence, and memories of family, friends, work: memories of good and bad all came to light.

According to Naomi Feil,¹¹¹ the reasons that underlie the behaviour of disoriented, very old people could involve one or more of the following basic human needs:

- Resolution of unfinished issues, in order to die in peace
- To live in peace
- Need to restore a sense of equilibrium when eyesight, hearing, mobility and memory fail.
- Need to make sense out of an unbearable reality: to find a place that feels comfortable, where one feels in order or in harmony and where relationships are familiar.
- Need for recognition, status, identity and self-worth
- Need to be useful and productive
- Need to be listened to and respected.
- Need to express feelings and be heard.
- Need to be loved and to belong: need for human contact
- Need to be nurtured, feel safe and secure, rather than immobilized and restrained.
- Need for sensory stimulation: tactile, visual, auditory, olfactory, gustatory, as well as sexual expression
- Need to reduce pain and discomfort

And so they are drawn to the past or are pushed from the present in order to satisfy their needs. They: resolve, retreat, relieve, relive, express.¹¹²

Example 1

Christine liked to disrupt the group, and chimed in with: ‘there’s nothing to do here all day but boredom, and what if memories or moments are not happy ones?’ To which I replied ‘that’s ok,’ leaving Christine to come in and out of the workshop as and when she pleased, mumbling and moaning as she went; she never physically participated but liked to wander in and out.

¹¹¹Naomi Feil, 1992.

¹¹² *ibid.*

Example 2

Betty, who had started selecting material and playing with it in her hands, replied: ‘yes, I had a best friend called Betty also; yes, the same name as me, we were known as the two Bettys,’ laughing, went on to say, ‘we would walk through the fields which opened out to the forest -it was so peaceful, with no shame, no naughtiness, that was during the war when most of my friends had been evacuated. Betty loved to sew and seemed to take great pleasure in selecting the bits and pieces from the table. She sewed, still engaging with her memories, chatting along almost as if she was sewing her own narrative. Examples of participants and the textile work created can be seen in Figs. 55-56.

Other writing has been important to me, such as Pamela Valerie Morgan’s thesis ‘The Lilies Yawn, The Tigers Sleep: Towards an Understanding of Subjective and Biographical Knowing’, which gives examples of how the subjective could enhance knowing through the unconscious. Morgan suggests that:

‘The subjective aspect of knowing has been overshadowed by the objective.’¹¹³

Throughout her thesis Morgan tries to explain her thoughts, and emphasizes the paradoxical and relational aspect of knowing. By reading Morgan's research I was able to reflect on my own thoughts in writing. The following is taken from my diary:

‘While the workshops continued the more memory of my own life history comes to light, the memory of the big house which stood in its own grounds, with lots and lots of rooms some we were forbidden to enter as they were seen as unsafe due to repair work that was needed. Upstairs was as such, starting from my room, moving clockwise was grandmothers, mother and fathers, sister, boarding room mother helped offenders during rehabilitation into society, followed by the two rooms which were unsafe, the landing, toilet, bathroom leading back to brothers’ room. As my room was next to grandmother at one side and mother and farther at the other we were sure to hear if needs be.

As my grandmother grow older my mother cared for her, cooking her meals and attending to any day time needs, I remember caring at the night time, undressing my grandmother was a true task there was a petticoat, corset, vest, a dress followed with a

¹¹³Pamela Valerie Morgan, ‘The Lilies Yawn, the Tigers Sleep: Towards an Understanding of Subjective and Biographical Knowing’ (unpublished master’s thesis, Wilfrid Laurier University, Waterloo, Ontario, Canada, 1981), Preface.

cardigan that seemed to have a never ending lots and lots of buttons. She wore a corset what seemed to a child a never ending set of hooks and eyes attached, which started from under her neck to well below her belly button. A layer on top of that which was soft and smooth I think it may have been made out of felt was another garment called a levity bodice which acted as a thermal layer where as the under layer seemed cold with the metal hook, eyes and bones. The contrast of the two materials was quite fascinating as was the end of undoing the fasteners; I couldn't wait to get this part over with as the fun part was to begin.

Grandmother had a round oblong silver in colour cold to touch tin container which was filled with lots of odds and bobs, such as buttons, old coins and bits of haberdashery items which I would empty out and begin my play, from dress making for my dolls, to having a shop.

Memories of the not so good times also come to mind and are awakened, as grandmother got older, reminiscence of being a child sitting at the top of the stairs with my sister, listening as the sound of voices which echoed throughout the house, of disagreements taking place downstairs, staring through the gaps between the stair banister as mother and father had raised voices about grandmothers missing items a recurrence of things going missing. The items eventually being found and grandmother having forgotten that she had moved or put the items where they were found. At this time Alzheimer's was not a frequently diagnosed illness but all the likenesses were apparent. Seeming almost uncanny the way things come to light and things that as a child seemed none understandable.'

4.13 Integrating Touch, sight and smell

What the unconscious also unfolds is the provocation of smell: not smell as a vehicle of attraction, a male / female thing, nor as a perfume, a deodorant, soap, shampoo, but smell as representing time, space, or a valid moment. Smells such as that of damp, moss, wet leaves, the woods, fresh-cut grass, horse manure, the sea; all of these could evoke different moments in a person's past.

Thoughts of life/ death how we treat/respect/disrespect, things or each other.

4.14 Mortal Remains and Up-cycling

Whereas all cultures deploy rites and rituals to mark the end of life, these rituals are very different and varied. Anthropologist Mary Douglas (1921-2007) analysed the rites of taboo and ritual purification that characterize mourning and the end of life. Cremation in public funeral pyres, which is common in Hindu ceremonies, is, in Europe, associated with the ancient rituals of warrior cultures of Anglo Saxon or Viking origin. Archaeologists note that interment and burial in a range of coffins, containers or vessels is the oldest form of European ritual. Both these forms of ritual use the symbolism of a vertical axis, with the idea of a movement taking place from above to below or ascending from below to above. These religious narratives of a life after death, in which the soul is released from material form, or is transformed through rites of separation, is also found in the symbolism of the ethics and politics of sustainability. It may be of symbolic significance to people nearing the end of life to be participating in a form of co-creation in which old matter is being given new 'life' and use. My notes reflect the preoccupations of the members of the AHCH community.

The religious narratives that are used to describe death are powerful, as few secular cultures consider the experience of death and mourning as significant. Medical cultures tend to think of death as a failure, and military and police descriptions use concepts of 'fatalities'. Therapeutic cultures are secular narratives of loss, conclusion, separation and transition, which are experiences considered from the perspective of the living mourners and of those dying or approaching death or terminal illness. Palliative care hospice movements have been developed as collaborations between church and state medical institutions.

Where religion describes death as a journey into darkness and the unknown, this can also symbolize the darkness within the self. The idea of a descent can symbolize the weight and gravity of sadness and pain: it is certainly entirely appropriate for the designer to consider cultural meanings of the treatment of mortal remains, and to consider what this might mean to the imaginations of the elderly.

4.15 Micro-encapsulation

During encapsulation of the handwork carried out by residents at AHCA, the idea arose of the possibility of incorporating smell, which would add to the positive effect of the tiles and also be an aid in reminiscence for the residents. One of the carers, Julia, mentioned that when

certain aromas were apparent one of the residents began a journey of reminiscence. The smell in question was that of burning wood, which brought back memories of home and the open fire. A search began, and I approached one or two companies that I had come across at exhibitions with no response at all. However, eventually Exilica replied with an interest in my project, as the company was at an early stage of development and R&D was still in progress. Incorporated in 2005, Exilica Limited is a company established from a university-related context, set up to develop the production and use of micrometer-sized spherical polymer particles (μ -Sq beads) and sub-micrometer-sized hollow silica shells. Exilica currently produces R&D-scale amounts of its two products and takes part in collaborative projects with major multi-national companies with the aim of developing innovative products that utilise the company's technologic¹¹⁴

The two products mentioned above are micrometer-sized spherical polymer particles, also known as beads, which can be filled with fragrance, and these I took and used within a micro-encapsulation process, using a combination of textile and plastic (See Figs.60-61). The sub-micrometer sized hollow silica shells could also hold anti-bacterial liquid, thus holding possibilities for future work in developing appliances such as light switches, trays and bathrooms, as the CQC report on AHCH suggested that the hoist used for the residents at bath-time was unhygienic.

The Technical Director of Exilica, Daniel Lynch, is a materials chemist and former academic: I spoke to him about my project and ideas. He was very keen to offer a partnership, which worked well for both of us. On receipt of the recipe for the percentage of spherical polymer particles to plastic, and agreement to comply with all the health and safety rules, work began. The results were very pleasing, and Lynch was interested to have the recipe that I used to add to an understanding of the material. Further and future work is to be continued.

¹¹⁴Exilica, <http://www.exilica.co.uk/company.html>[accessed 3 February 2011]

Below a variety of workshops showing the residents engagement with the materials provided.



Fig.55 Residents' participation within the workshops

Hand-work which included sewing, embroidery, knitting, embellishment and fraying.



Fig.56 An example of hand-work carried out by residents at AHCH.

Encapsulation of textiles within plastic.



Fig.57

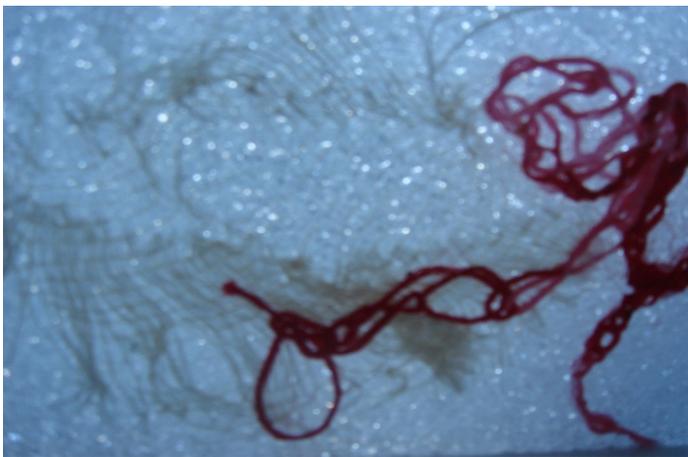


Fig.58

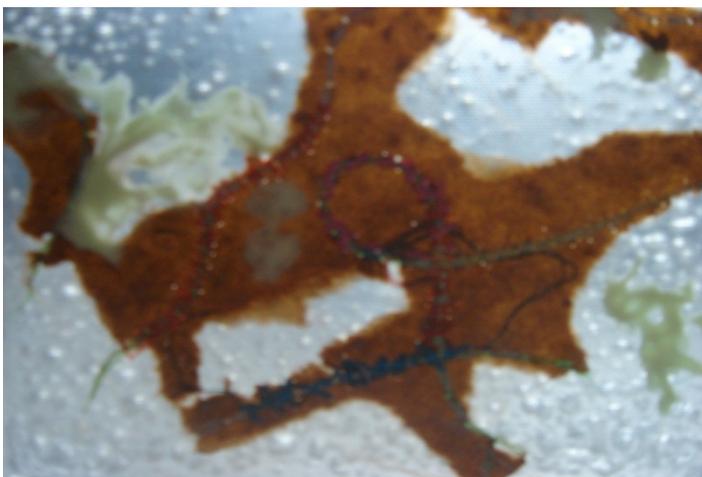


Fig.59 Encapsulation of hand work

Samples of the micro-encapsulation process



Fig.60 Photograph by author (2012)

Micro-encapsulation of μ -Sq beads, with GPPS, and silk textile

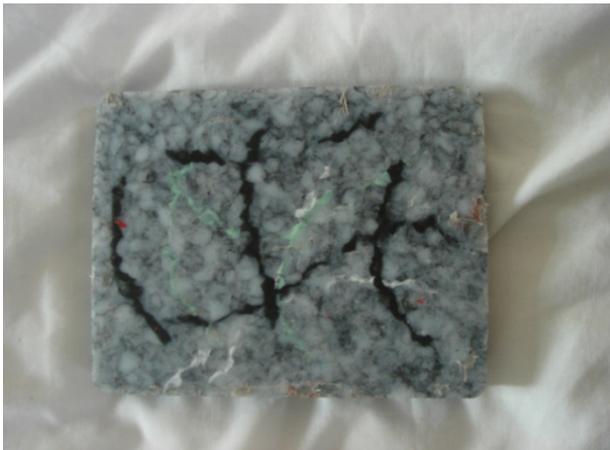


Fig.61 Photograph by author (2012)

Micro-encapsulation of μ -Sq, with HDPE, and extruded plastic yarn.

CONCLUSION

The research project undertaken for this PhD began with the professional experience of employment as a lab technician and my personal concern with politics and ethics of sustainability and design practice that I developed through my undergraduate projects at London Metropolitan University. From experiments with recycling a range of polymer plastics at the laboratory at the London Metropolitan Polymer Centre I had, by 2008, developed a technique of encapsulating textiles within recycled plastic tiles. I experimented with using found textiles, recycled textiles and my own woven and other textiles. My concern was for the integration of an aesthetic of recycled textiles and a technology of recycled plastics.

The aesthetic of using 'old' yarns within 'new' plastics was something that interested me very much. I was interested in the contrast between the monochrome, functional and uniform plastic moulded into utilitarian shapes, and the polychrome, used threads that curled, frayed, and tangled across the plastic sheets. The yarns carried complex associations of domesticity, which was very different from the plastics that were evidently produced in the lab. The experiments with the materials seemed to play with a 'crash' or 'mash' between home and science. The aesthetics of this crash evoked powerful feelings associated with the different cultures of scientific 'technophilia' – the idea that technology will generate an idealized future and the associations of 'care' that infuse the 'homespun' aspect of crafts. Reactions of tutors varied greatly, with some convinced that the old textiles were a 'mistake' which contaminated the 'technomorphic' design of the plastics, and others enjoying the inclusion of the yarn as an aesthetic of the handmade. It was through reading Chapman's theory of 'Emotionally Durable Design'¹¹⁵ that I was able to find a theoretical context for considering the aesthetics of my intuitive practice as part of the politics and ethics of sustainability. Chapman suggests that recycling must not be considered as an unproblematically uncomplicated solution for sustainable design. Many recycling processes can use wasteful amounts of energy and toxic chemicals in preparing old materials for new uses, and other unsustainable processes. But recycling can be seen as one element of a mixed economy of design practices that coexist within the new field of sustainability design. Chapman also notes the aesthetics and ideology

¹¹⁵Chapman, 2005.

of an idealisation of technology, which he contrasts with an ethics of emotional attachment, relationally and in the context of what he terms 'empathy'. Noting that 'ecology' originates from 'oikos' (Ancient Greek: home) the ethics and aesthetics of the ecologist need to find a new recognition of the overlooked 'domestic' values of emotional attachment, and empathy as a design process.

Chapman's theory offered parameters for the development of my experimental lab work, which developed the techniques and aesthetics of the plastic tiles and textiles within a dialectic of form and content. The design labs in the RCA's Helen Hamlyn Centre for Design (HHCD) also offered potential for rethinking the application of this work. HHCD was researching new design principles for 'user-led' design, sometimes called co-creation or 'participatory design', which reconsiders the role of the designer as agent of change. In co-creation the designer becomes a medium for the new interaction between users and materials, enabling new interfaces that have not yet been initiated. This method is innovative in itself, but is more exciting in that it is part of a politics of inclusion. The social inclusion policy of HHCD which generates new techniques of design practice suggested an integral development of the sustainability agenda, when conceived through Chapman's paradigm of 'empathy'.

Moreover, there was an integration of the 'care' of the environment through the politics of ecology. The care of the elderly in end-of-life 'care homes' seemed to me to be intuitively linked. The decision to initiate a commission for a design project for the final stage of my PhD introduced a range of options. I could work with a school and consider the project as educational outreach, or with community projects or with 'high-end' bespoke design specialists, or with a manufacturer of materials to enable them to disseminate their 'code of industrial ethics' research. However, I decided to approach an institution for the residential care of the elderly and people with dementia.

As described in Chapter 4, the Alexandra House Care Home (AHCH) had recently been subject to an official review, which had concluded that the design of the interior was, in the eyes of the professionals, rather 'clinical and cold'. This seemed fortuitous as a context for testing the aesthetics of empathy which I had, intuitively, been developing with the tiles. Moreover, armed with Chapman's theory, the intuition of the designer could now be integrated with the politics and ethics of sustainability. The new dimension of working with old people further enriched the practice.

It was not my intention to enter Alexandra House as a contracted decorator to 'warm up' the interior with my designs, but to develop a workshop practice over a year which would enable the residents, their families, carers, hospital staff and visitors, to work together to make the materials for the interior. The tiles would thus serve as a display medium for the craftwork from the 'occupational therapy' workshop sessions, and the tiles would also serve as an archive of the process of collaborative endeavour of making by hand. The tiles could, because of the plastic medium, preserve the transient materials of thread, textiles and the 'soft stuff' of empathy, into the permanence of a reliant and enduring material. Tiles with vitreous glazing, developed as hygienic surfaces in seventeenth-century Holland,¹¹⁶ could be released from their sad obligation to guarantee hygienic whiteness, and could now 'contain', literally and metaphorically, a world of associations, memories, and feelings. Like a Victorian glass paperweight, the transparent tiles could offer the sense of a micro-encapsulation that invites viewers to hold, think and imagine. There was a sense that the residents were being addressed as people whose own imaginations, feelings, experiences and inner worlds are as important as the hygienic 'care' of their physical and functional needs. This was symbolized, above all, by the materials that they made within the workshops, mostly with fabrics, buttons, familiar textiles and other details of their own 'paraphernalia'.¹¹⁷

Like the transitional objects' of infant attachment studied by psychoanalyst D.W Winnicott, the objects of textiles have a special relationship to embodied experience through touch and smell. I was interested in developing the sense of smell in my work as a powerful agent of memory and experience. Inviting a manufacturer of micro-encapsulation to offer sponsorship in kind, I made some tiles with smell as well as other sensory modalities. The smells offered by the company Exilica are presently those within a genre of 'scents' with associations limited to meanings of grooming and adornment. Smells such as grass, earth, air, rain, tarmac, coffee, bread or others realign, at present, beyond the palette of industrial micro-encapsulation manufacture, but would be wonderful to use as part of the tiles. Smell is as powerful a trigger of experience as colour, touch and texture. All of these sensory modalities are especially powerful sources of meaning as the power of speech diminishes with atrophy of language functions that may develop with the decay of the prefrontal lobes and the neo-cortex in old age.

¹¹⁶As demonstrated in the exhibition 'Dirt: the Filthy Reality of Everyday Life', 24 March – 31 August 2011, The Wellcome Collection, London <http://www.wellcomecollection.org/whats-on/exhibitions/dirt.aspx> [accessed 10 February 2013]

¹¹⁷ Steven Connor, *Paraphernalia: the Curious Lives of Magical Things*(London: Profile, 2011)

The aesthetic of valuing the fragile and ephemeral can be a poetics of the old. Some viewers have experienced the tiles as like 'watercolours' in the celebration of their hand-drawn aspect. As the textiles are considered to be beautiful or valuable as they unravelled and frayed they may enable old people to be less frightened of their own bodies. If the environment is seen to value the aesthetics of the used and worn materials that convey experience rather than 'newness', the residents can consider that their own lives of having served and experienced may also be understood as having value and, therefore, beauty.

My research suggests that the ethics and aesthetics of sustainability must include recycling as a symbolic and poetic statement about the re-evaluation of the role of empathy and relationally. The process of recycling that I have developed is one in which the old is not 'transformed' into an immaculate 'new' material, but maintains and keeps the traces of the old as a valued material. The aesthetics of the process of use and reuse is here celebrated as a means to enable us to reconsider the meaning of 'care'. This is no longer a matter of sentimentality or of the unpaid domestic labour of housewives, mothers or servants, but is now an essential and integral element of a global and industrial agenda for sustainable manufacture.

The new and original contribution of this research is:

1. The saving of energy

By means of a 'Closed Loop Recycling' it enables a continuous life cycle. As the recycling process is not for reuse within the production of food packaging, the need for many of the standard procedures is not necessary, as seen in the example given in Chapter 2 (2.6).

Energy is saved by developing illuminated tiles without the use of added electrical devices, such as the LED used in Natalie Woolf's project (see Chapter 1(1.4)). I have developed a process which collects natural energy from daytime light, stores it, and then emits it at night-time.

2. People-centred design

A design process has evolved which engages with multidisciplinary towards enhancing wellbeing, a process that includes people, machines and the hand. Chapter 1 describes the

research conducted into comparable recycling projects at the RCA and beyond. My research shares some of these techniques but also, crucially, includes:

Attaching an importance and value to the poetics of process/people/material also included the end user in the process, with hands-on participation, giving thought to emotional attachment rather than mass production, adding longevity through the object / user, creating a sustainable relationship.

Note on future developments

The London Metropolitan Polymer Centre aims to sell its machines, so I plan to buy the extruding/moulding machine in order to set up my own studio workshop to become a specialist maker of bespoke recycled polymer tiles for interior and exterior architecture and design materials for a range of potential uses.

Funding for continuation of the commission given to me by AHCH for tiling the walls of all three floors, bed/bathrooms, is being looked into, but cut backs within this area, it is proving to be difficult. New reports such as the Francis report 2013, reporting on how the need to re-think the way people are being treated in hospitals and care homes, it could be suggested changes are about to be made.

Exilica have expressed their desire to continue the partnership as tests that were done with the sq beads furthered their knowledge and understanding. The beads will be supplied and further research and development into smell of the outside world being micro-encapsulated as opposed to the clean and clinical or urinal smells that exist on a day to day basis. Experimentation with the anti- bacterial sq bead, this could be of advantage for light-switches, door handles, toilet seats to micro-encapsulation the bead within the moulds of each, leaving them bacteria free.

Possible post doctorate using PhD as a framework, working within the care home was not to be a measureable process, but to further the enquiry of possible data being collected through the care worker i.e., if workshops take place and is helping the residents well being, could this indirectly have a knock on effect helping take anxiety away from the carers leaving them with a better sense of worth. Teaching the methods used within the workshops to help educate, give an understanding of working spontaneously, organically, letting things happen for both carer and resident.

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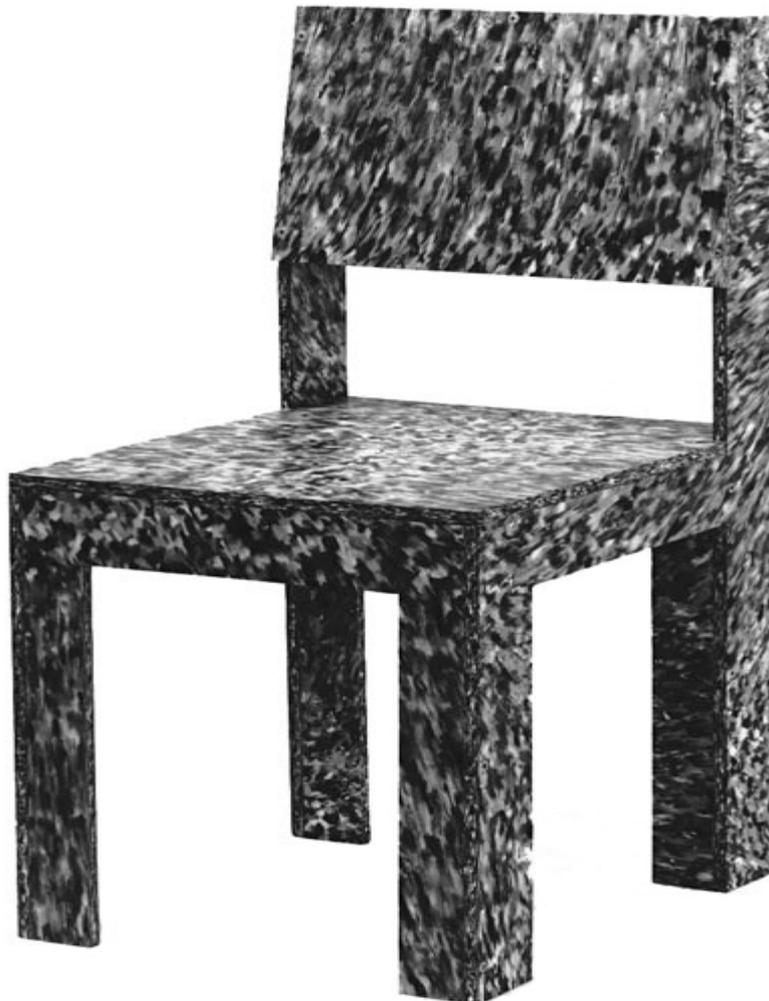
APPENDICES 1**Example of places plastics can end up:**

Top left; Authors visit to Express Recycling Waste Rainham (2009)

Top Right; Garbage Patch, Pacific Ocean. Russell McLendon, <www.mnn.com(Earth Matters), Translating Uncle Sam. [accessed 13 January]

Bottom Left; Mermaids Tears known as (Nurdles) Author collected from the shore Biarritz France (2011)

Bottom Right; Albatross showing plastic in stomach, mistaking it for food. Russell McLendon, <www.mnn.com(Earth Matters), Translating Uncle Sam. [accessed 13 January]



Top: Richard Liddle Cohda project and the RD LEGS chair.

Bottom: 'RCP2' Chair, Jane Atfield, 1992

APPENDICES 2

Recoup Statistics, (2011)

In the UK...

- 6,737 million plastic bottles were recycled in 2011 (306,000 tonnes)
- 52% of household plastic bottles were recycled in 2011
- An estimated 6218 million plastic bottles are disposed of each year
- Plastic bottle kerbside recycling schemes currently operate in almost every local authority area
- Over 21 million households can now participate in kerbside recycling collections that include plastic bottles
- It is estimated that every UK household uses 500 plastic bottles each year
- The 306,000 tonnes of bottles recycled in 2011 saved approximately 459,000 tonnes of carbon.
- There are approx 6,500 bottles in a typical bale weighing approx 250kg
- The majority of plastic bottles are made from PET or HDPE
- The average sales value of sorted baled bottles (PET & HDPE) over the last 5 year period has been £150/tonne.
- 610,000 tonnes of plastics packaging waste were recycled in 2011, around 24% of total arisings. Most of this was commercial films and household plastic bottles.
- 11% of household waste is plastic, 40% of which is plastic bottles
- Reprocessor demand for plastic bottles exceeds supply
- High performing kerbside collection schemes typically generate between 10-15kg plastic bottles per household per year, with some schemes indicating they generate over 20kg/hh/year.

General:

- 1 tonne = 22,000 plastic bottles
- Recycling 1 tonne of plastic bottles save 1.5 tonne of carbon
- 25 recycled PET bottles can be used to make an adults fleece jacket
- Up to 40% less fuel is used to transport drinks in plastic bottles compared to glass bottles

APPENDICES 3. Lab Samples, Comments, Materials HDPE/PET, (pp.153-156)

When testing took place for the bonding of HDPE/PET the temperature setting started normal at 260⁰c reducing 10⁰c each tile reaching a good sample at 170⁰c. When the temp was reduced more the edges around the tile became loose and began to break apart. The addition of woven material and or plastic was not detrimental to the outcome of heat setting. The same method was repeated for heat temperature with findings that a compound of 50% HDPE & 50% PET were computable with a heat timing of 5mins.

HDPE, (pp158-162}

Starting temp at 150⁰c, outcome crumbly and brittle around the edges, 175⁰c was the appropriate heat setting, 15mins warm up time, 5mins under heat, 5mins cooling. For the material to have a glossy or matte finish was possible by the use of a clear melamine sheet on the steel plate before applying the polymers, or a sheet that has a textured surface which produced a matte appearance.

Testing for recycling the made tile took place with samples on (p.160). Top right the tile had been recycled with pleasing results, bottom right recycled for a third time. For best results applied virgin woven material first to the steel plate, then the recycled regrind layer, thus creating a more define image on the surface.

Smudging, drawing, applying by free hand. When applying the different compounds almost drawing with the regrind, finding a pleasure of working with the hand before proceeding with the industrial process. As time went by the hand could tell the weight just by feel alone.

Thermoset samples (p.163)

Samples of plates and dishes which were a blend of synthetic and natural polymers.

Rubber, (pp.164-166)

Extensive development tests were carried out with recycled rubber, temp setting of 260⁰c -225⁰c, the material would not bond even at the highest degree, and tile remand very crumbly, soft, and malleable. Methods to which compounds mix of rubber and HDPE were worked together until bonding was accomplished at 225⁰c.

PET/HDPE/GPPS, (pp.167-169)

Tessera sized samples combining different polymer mixes, silk threads, plastic woven fragments, drawing, smudging, overheating, under heating, lots of methods were followed. Some of the tiles were left with the flash around to show the process of making. The excess flash is used again in the recycling process so there is no waste.

Mixed samples, (p. 170)

A range of tiles process bottom left; smudging, bottom right; bubbling, middle left; compound mix of PET/GPPS the white specks are the PET granules, middle right; encapsulation jazz (coloured PET) blended with GPPS.

GPPS (pp.171-179)

Temperature settings started with early samples at 260⁰c, and then after several tests found I could produce a good sample with a setting of 170⁰c. Being careful not to add more of the woven fragments than the woven plastic, as it seems to disappear within the compound, and will also affect the bonding of materials.

With the temperature settings 170⁰c , heat pressure 10mins, cooling time of 5mins. Encapsulating silk fragments, threads, and illuminescence, followed with recycling of tiles,(middle right p.171) sample showing the process of recycling after a third time, (bottom left p.171) recycling following two processes. For the thicker tiles by reducing temperature setting 10⁰c the polymer crystallise leaving a mysterious mist over the surface. PP was added to the blending process, (samples p.174, plus top row p.175).

Blending illuminescence (pp.177-179)

When the illuminescence is added to the surface of the material the colour becomes clearer, it was also noted that if the silk waste was positioned with a concaved structure then covered with regrid material it created bubbles within the tile, this was a process that could be repeated.

A variety of mixed samples (p.180)**Encapsulating the hand work of the residents at Alexandra House Care Home (pp.174-185 excluding the bottom row off p.185)**

Encapsulation of hand work that was produced by residents, carers, and family member. The HDPE samples had a heat temperature setting of 170⁰c, under heat pressure for 10mins and a cooling time of 5mins. A 150⁰c setting was tried but unsuccessfully, turned the temp back up to 170⁰c. The GPPS samples heat temperature setting was 200⁰c, 20mins under heat pressure, 5mins cooling. Fragments of textile were cut, scratch, frayed, sewn together, pulled apart, buttons added, taken away. We crocheted, knitted, embroidered, weaved, constructed and de-constructed, threads, loss ends, picked, unpicked all of which were encapsulated to tell their story.

Micro-encapsulation of μ -Sq beads, with GPPS, HDPE, and silk fragments, threads (pp.187-188)

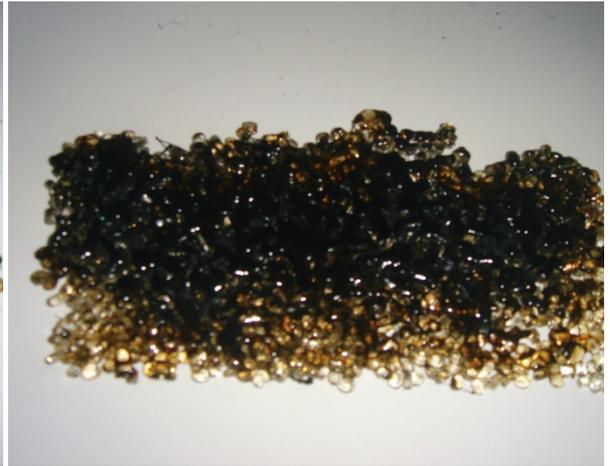
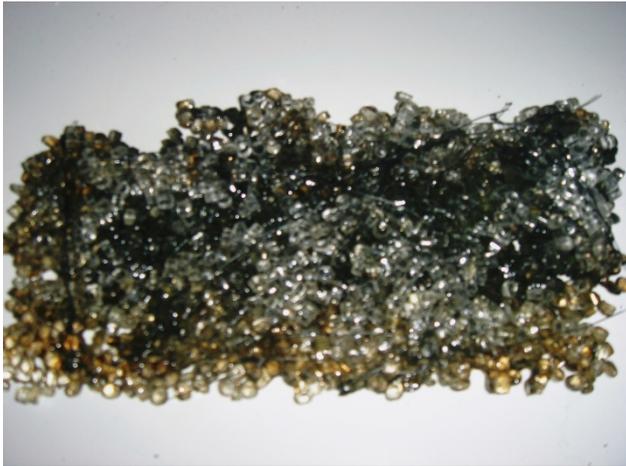
Encapsulation of the μ -Sq beads lead to a new understanding of the particles for Exilica and I. The smell was stronger in the grey one although the smell of the black one was good also; this was due to the different polymer types and heat setting, as mentioned above in notes for GPPS and HDPE.

The questions Exilica asked " what the blocks are made of (in general thermoplastic terms) and also the temperature you moulded them at"?

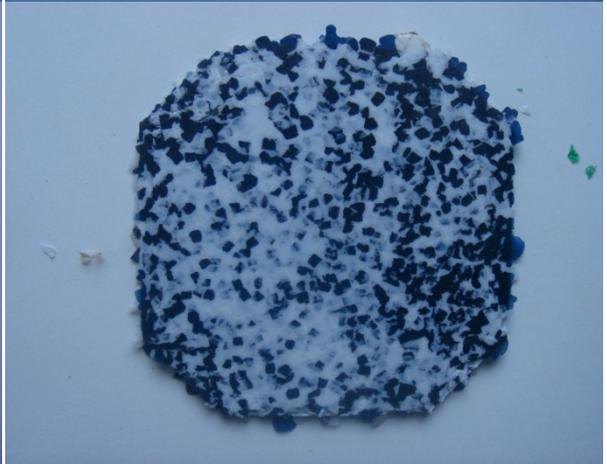
Explaining, " these are important to us in understanding what our particles are capable of". With the question of" would you like some more with a different fragrance"? Future work to continue.

APPENDICES 3

Samples of work carried out in the lab

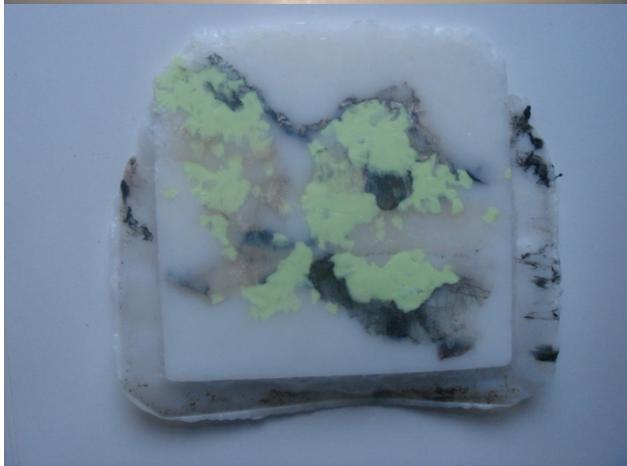


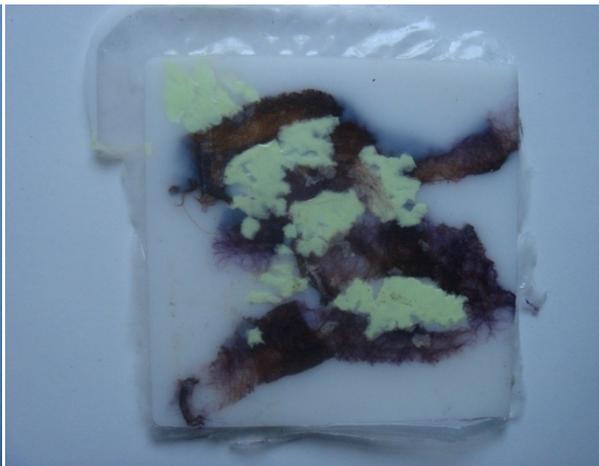
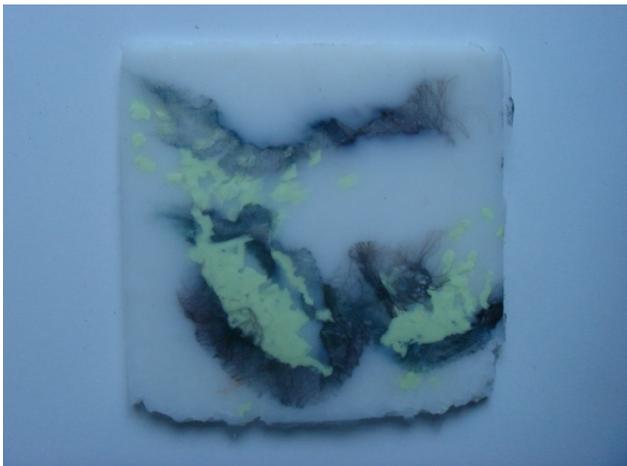


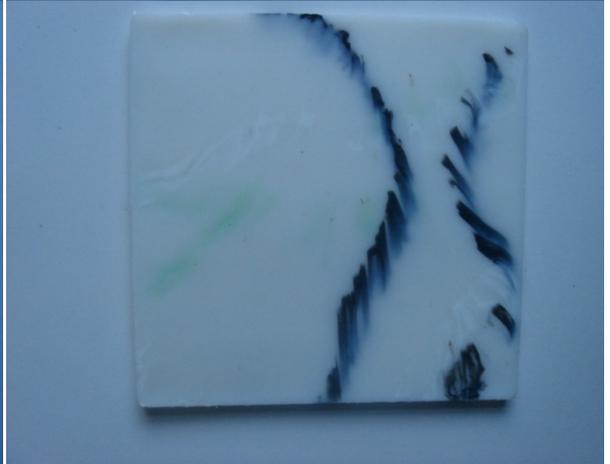








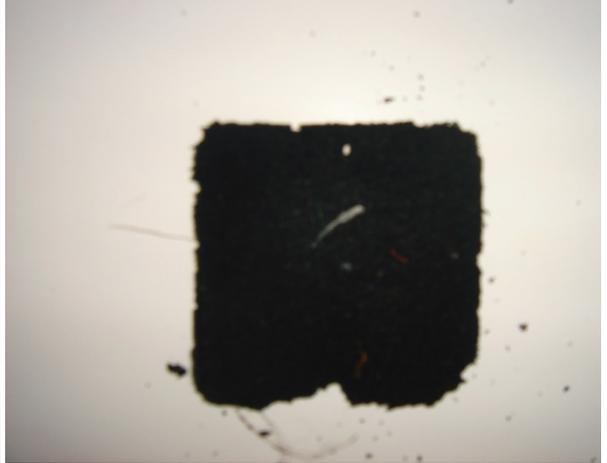










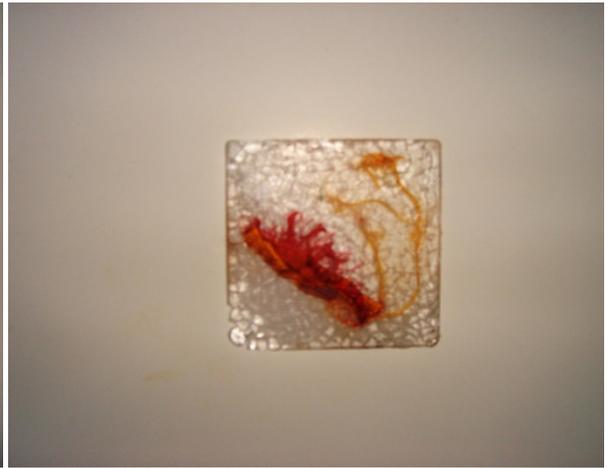


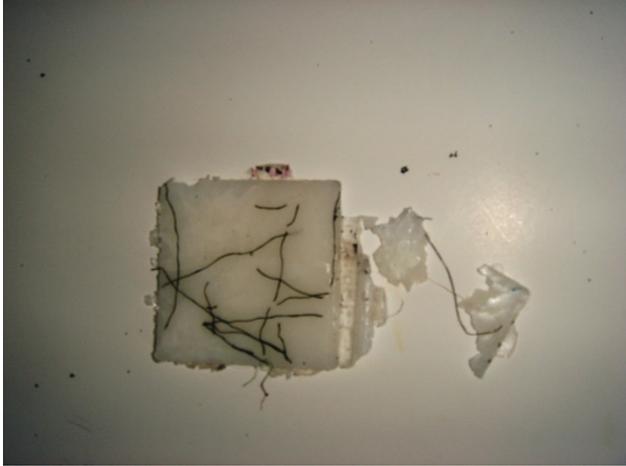
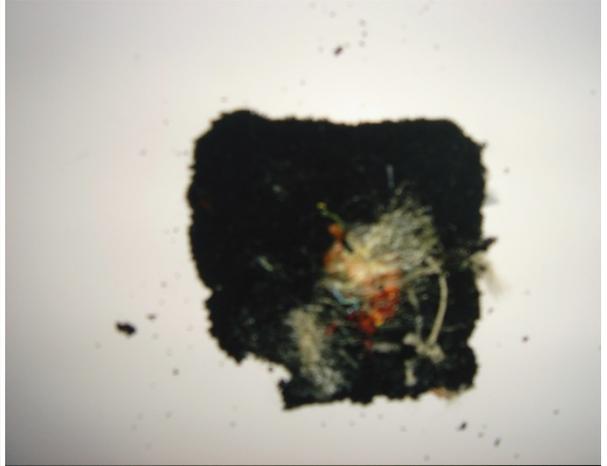
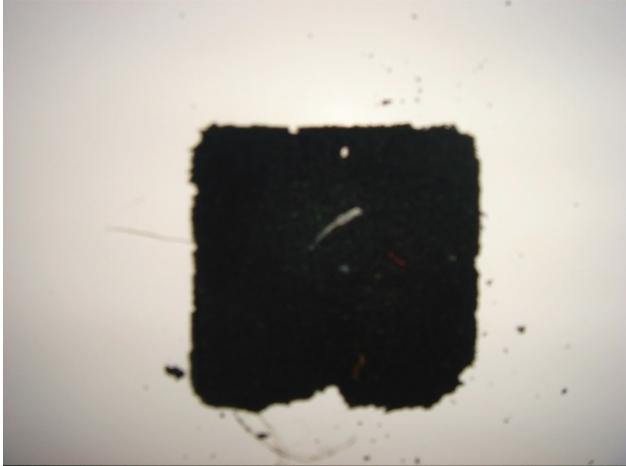
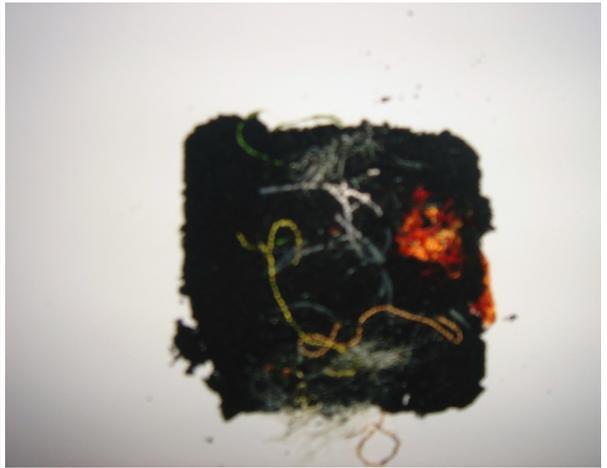
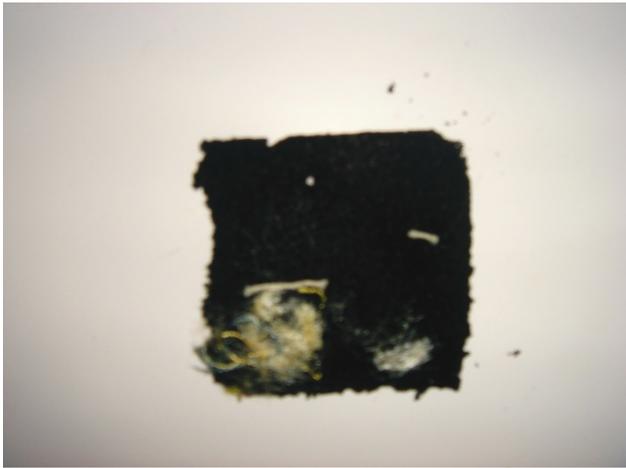


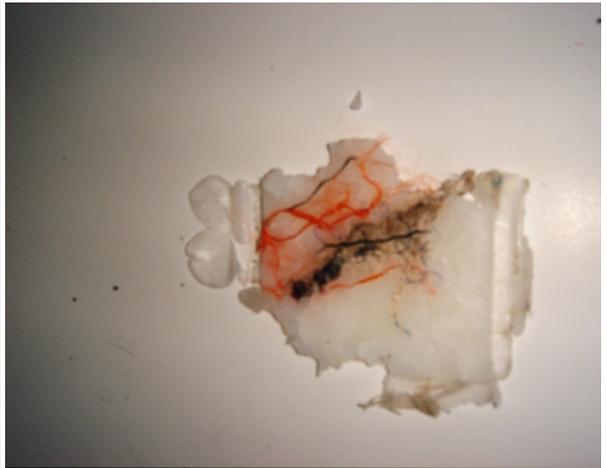












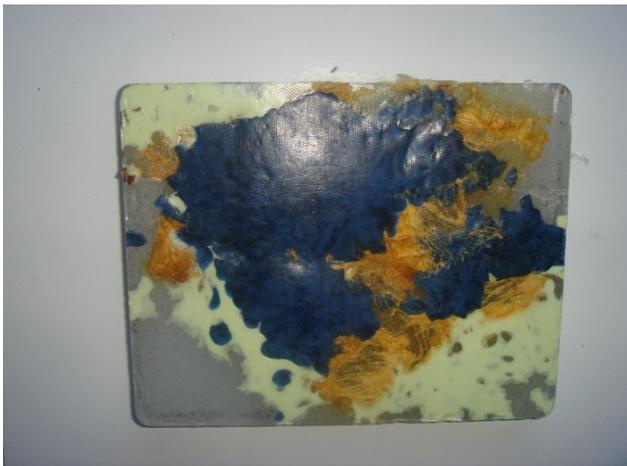


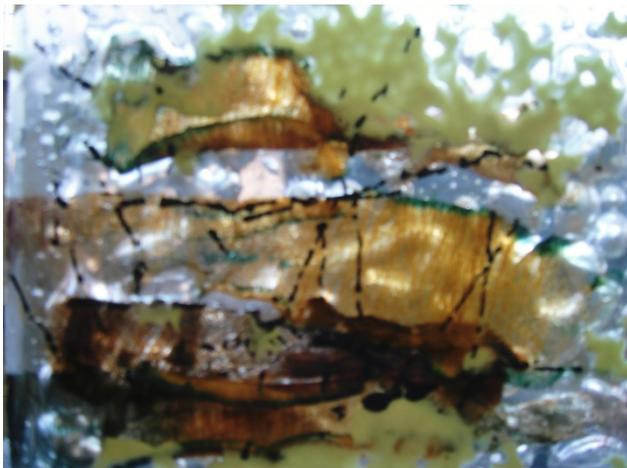






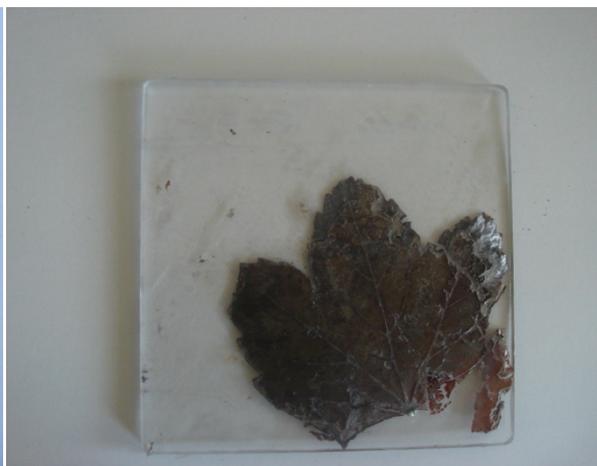
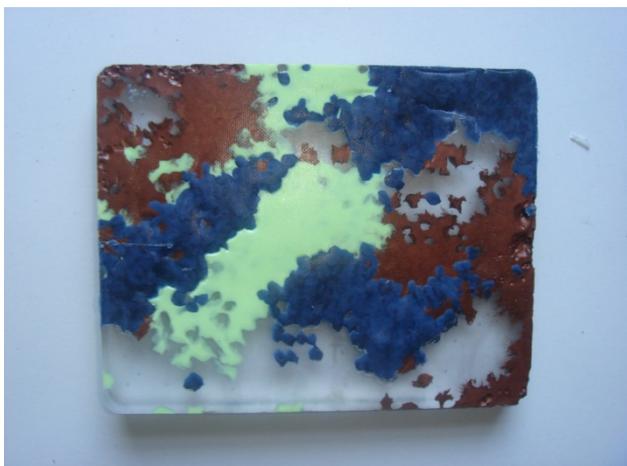
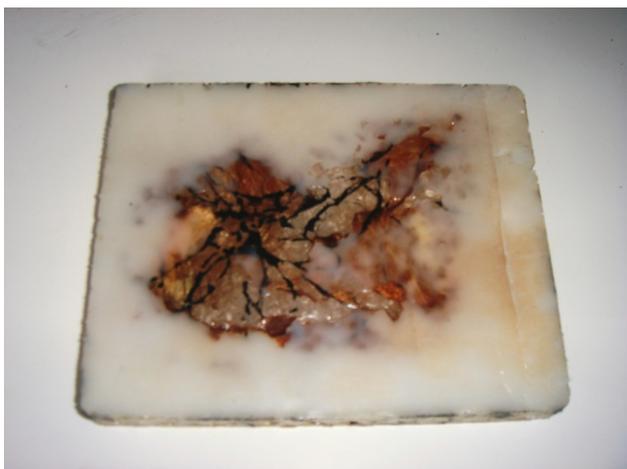


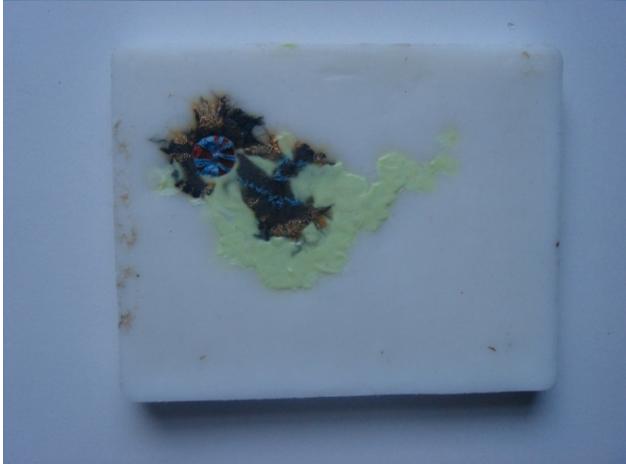
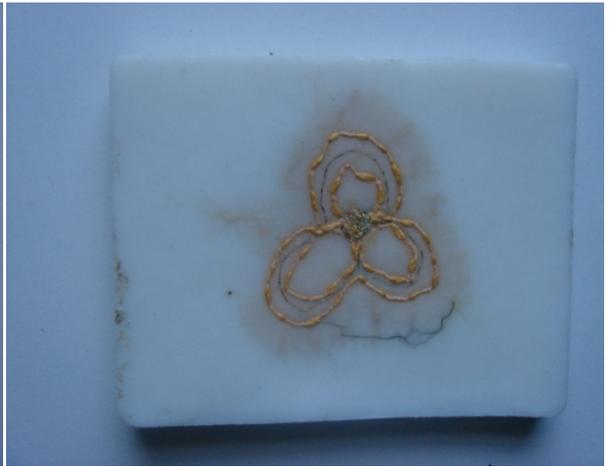
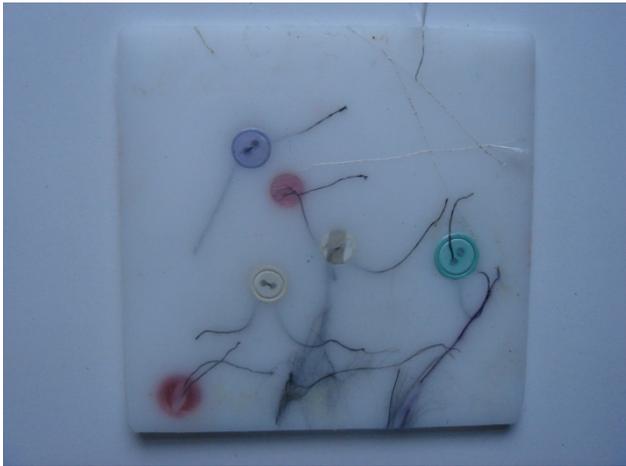










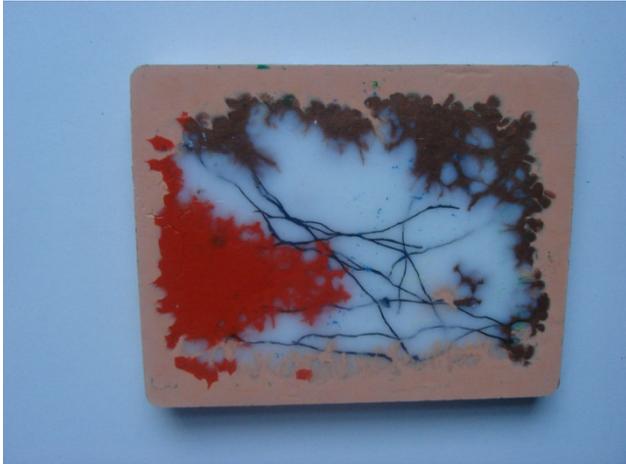
















APPENDICES 4

Statistics from the Alzheimer's Society

Dementia is a disease that affects memory loss, mood swings, and general lack of understanding and difficulty with reasoning and communication. Many actually have Alzheimer's but go undiagnosed.

Below is the statistic sheet from the Alzheimer's Society:

- *There are currently 800,000 people with dementia in the UK.*
- *There are over 17,000 younger people with dementia in the UK.*
- *There are over 11,500 people with dementia from black and minority ethnic groups in the UK.*
- *There will be over a million people with dementia by 2021.*
- *Two thirds of people with dementia are women.*
- *The proportion of people with dementia doubles for every 5 year age group.*
- *One third of people over 95 have dementia.*
- *60,000 deaths a year are directly attributable to dementia.*
- *Delaying the onset of dementia by 5 years would reduce deaths directly attributable to dementia by 30,000 a year.*
- *The financial cost of dementia to the UK will be over £23 billion in 2012.*
- *There are 670,000 carers of people with dementia in the UK*
- *Family carers of people with dementia save the UK over £8 billion a year.*
- *64% of people living in care homes have a form of dementia.*
- *Two thirds of people with dementia live in the community while one third live in a care home.*
- *Only 43% of people with dementia in the UK receive a diagnosis*

APPENDICES 5

Form RE1 Research Ethics Checklist and Consent



RESEARCH RCA

For further information

Supervisor: Anne Toomey

16.06.2011

anne.toomey@rca.ac.uk

Recycling High Density Polyethylene to make matter with new functionality and new aesthetics

Survey Information Sheet

Dear Potential Participant,

I am Julie Behseta a PhD research by practise student in the textile department. As part of my project **Recycling HDPE to make matter with new functionality and new aesthetics** it would be of great relevance and appreciation for Alexander Care Home to agree participation as an end user group.

The project combines textiles and plastics using recycled and virgin material, creating a tactile/haptic visual that gives an ambient glow at lights out time.

It uses no batteries or electric, it collects energy from the daytime, stores it and then emits at night.

The need for Alexander care home to participate as an end user group would be very beneficial to the inclusive design outcome.

If you consent to participate, this will involve:

- voluntary visits of Julie Behseta on a regular basis until research is complete,
- participation between residents and visitors with respect to user outcome,
- video or photographs for documentation of project.

All data collection will be confidential and only used in the public domain with Alexander care home consent.

Participation is voluntary, and withdrawal from participation in the project may take place at any time.

Thanking you for your interest,

This project will be conducted in compliance with the Research Ethics Code of the Royal College of Art, **Research Office** Royal College of Art Kensington Gore London SW7 2EUT+44(0)20 7590 4126 f+44(0)20 7590 4542 research@rca.ac.uk www.rca.ac.uk/research



RESEARCH

RCA

Supervisor: Anne Toomey

16.06.2011

anne.toomey@rca.ac.uk

Recycling High Density Polyethylene to make matter with new functionality and new aesthetics

Survey Consent Form

I (please print)..Peter Brooker..have read the information on the research project Recycling High Density Polyethylene to make matter with new functionality and new aesthetics which is to be conducted by Julie Behseta from the Royal College of Art, and all queries have been answered to my satisfaction.

Agreement is made for voluntary participation in this research and gives consent freely, I understand that the project will be conducted in accordance with the Information Sheet, a copy of which I have retained.

I understand that withdrawal from the project can take place at any time, without any reason given.

I consent to:

- voluntary visits of Julie Behseta on a regular basis until research is complete,
- participation between residents and visitors with respect to user outcome,
- video or photographs for documentation of project.

It is understood that any information, video or photographs gathered from the project will be stored securely and will be used in public domain only with my consent.

Print Name Mr P Brooker (Care Home Manager).....

Signature

Date 16.06.2011.....

This project will be conducted in compliance with the Research Ethics Code of the Royal College of Art

Research Office Royal College of Art Kensington Gore London SW7 2EU

T+44(0)20 7590 4126 f+44(0)20 7590 4542 research@rca.ac.ukwww.rca.ac.uk/research

APPENDICES 6**ALEXANDAR HOUSE CARE HOME**

Owner: Runwood Homes plc

Person in charge: Peter Brooker

Local Authority / Social Services: Essex County Council

Type of Service: Care Home with nursing - Privately Owned , 106 residents

Specialist Care Category: Alzheimer's

Single Rooms: 106 Rooms with ensuite WC: 106

WORKSHOP:**SUSTAINABLE
EXTENDING LIFE OF WASTE MATERIAL**

Julie Behseta
PhD (practise as research) Candidate

Department of Textiles, Royal College of Art
Kensington Gore, London SW7 2EU, United Kingdom
julie.behseta@network.rca.ac.uk

Extending life textiles

A series of workshops sewing, knitting, crochet, painting, learning, developing ideas and having fun.

All materials are supplied.
You're welcome to bring along your own fabrics for re-use, recycling, upcycling and sharing.

The general idea is the promotion of waste minimization, participation within the design process, through social activity

To include Slow, Inclusive, Co-design & engage in a design process as end users

Introduction

The idea of recycling and slow movement is gradually becoming a representation of a whole new way of thinking and response, which is a reaction to the ready made fast-paced, disconnected world we live in today with the throw away disposable society which is fast outgrowing the resources available.

Its core values are one of morals, respect for nature, tradition and an understanding of the value of where and how an object is made.

Creating new pieces which explores the reuse of otherwise waste material, and results in creating new/value from the old/waste and disregarded.

The Sustainability Content

Contributions that will be made towards sustainability

- Share and demonstrate skills, knowledge, insights and connections
- A development from old to new (waste minimization)
- Communal thinking, collective learning
- Deter waste from landfill
- Development in emotionally durable design

Taking inspiration from designers such as William Morris whose work involved the production of stained glass, ceramics, metalwork, furniture, wallpapers and textiles and much more.

Next Page illustrations from present day:

'The Firm'

William Morris (1834–1896) was the single most influential designer of the nineteenth century. Morris was a political theorist, scholar, translator and publisher, an environmental campaigner, writer and poet as well as an outstanding designer. Under his direction Morris & Co. grew into a flourishing and fashionable decorating firm renowned for its wallpapers and textiles.





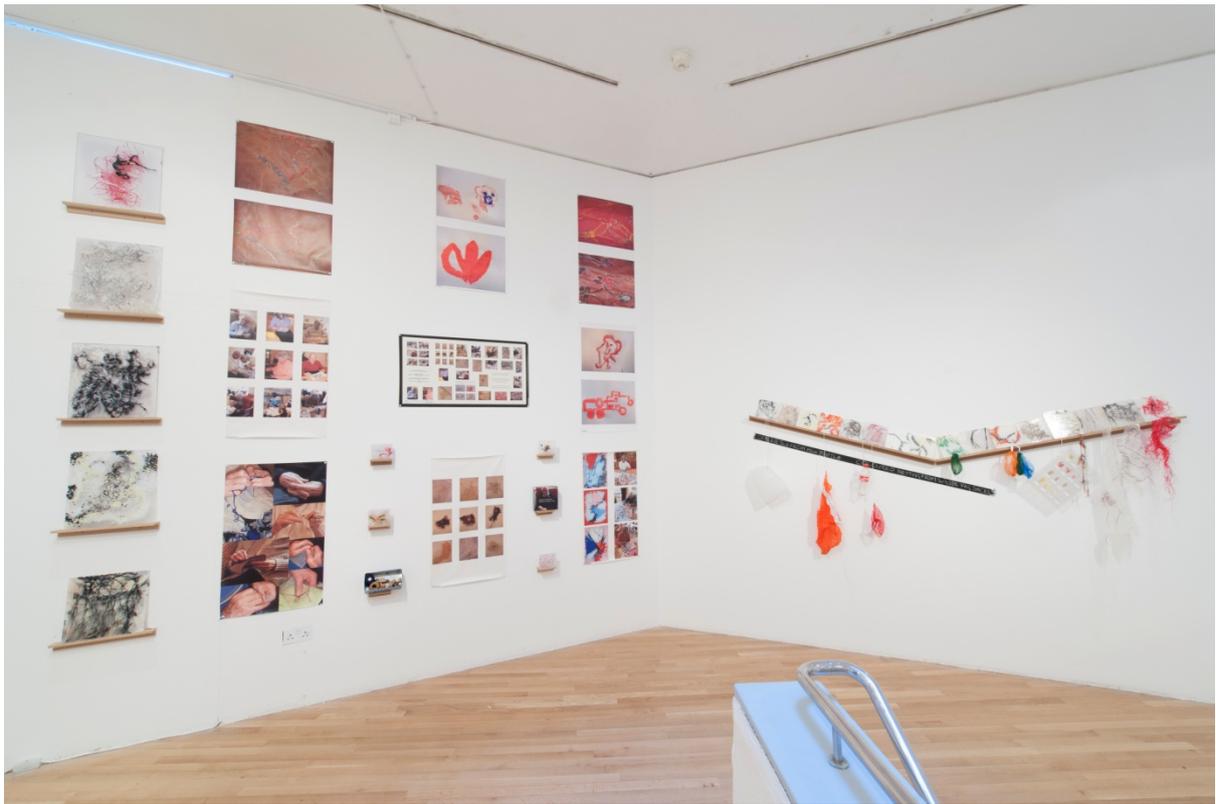
Practical Content

- Select a printout photocopy of chosen design
- ‘Drawing’ by means of stitch, knit, crochet, to include hand painting if desired (optional)
- Appliqué (sewing or fusing one fabric on top of another)

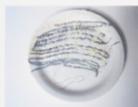
APPENDICES 7 Synthetic and Natural Polymers Exhibition.

Photographed by Dominic Tschudin, 26 April 2013, p201-244





Abstract. This practice led research investigates the design potential of combining traditional craft, industrial technology and having first sensory ethics. Working with textiles and polymers from post-consumer and industrial waste, using virgin and recycled material, to create new materials, and new meanings with a range of functional and aesthetic uses. Through the manipulation of magnetic and application of polymers, to create a visually tactile aesthetic within the new plastic. The traces of unweaved fibres, yarns, and woven fabric and cloth fragments as these become erased within the transparent or translucent plastic medium generates a specific aesthetic and meaning, a beauty of the old and discarded incorporated within the new and functional material.



Open/Closed Loop Recycling

Recycling of a product can lead to the same product (back to barrel) or to other products, the first process is called closed loop recycling and poses little if not any methodological problems, whereas the second open-loop recycling refers to a situation in which a product A, after being used, serves for the production of another product B.



Fig (1)

HDPE

Recycled HDPE Fig (1). The concept of designing for a continuous life process and using HDPE a full 'recycled closed loop' will become apparent.

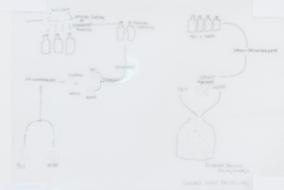
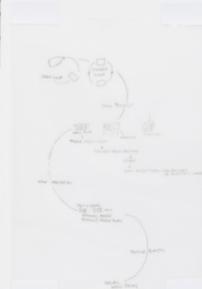


Fig (2)

GPPS

GPPS allows for a good transmittance of light, Fig (2) enabling light to travel between the layers of threads, woven and unweaved fabric, creating depth not only visual but physical enabling the viewer to engage with their own narrative, relating to one's own fact knowledge.

The thermodynamic process contributes to unravelling of the waste and loose threads interlacing, the plastic chemical reaction in relation to the material can lead to a unique outcome.

Through the manipulation of material layer fabric a sense of visual tactility can evolve, which could suggest a connection with familiarity and comfort.



Through the practice of studio and lab work the development of a closed loop scenario may become apparent. The dissolvability of the HDPE material will be ongoing. Dissolvable/reversible, completing a full recyclable life cycle. Plastic can speak to our concerns for the environment, as plastics that are dissolvable to degrade in traditional methods while the 'loop recycling' system proposed offers an alternative to landfill. The project looks at sustainability using a 'recycled closed loop' method, and the potential of attachment through aesthetic qualities, where hand manipulation of materials could lead through, woven fabrics, plastic to a sense of comfort and familiarity, harmonising an industrial process could allow for more connection between thought, hand technology and material, beyond new developments available.



RESEARCH
RCA

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POLYMER BLENDING ↓



Processing Post Consume Waste and Industrial Waste

- Collection

Sorting

- High Density Polyethylene (HDPE)
- Poly ethylene terephalate (PET)
- Polypropylene (PP)
- General Purpose Polystyrene (GPPS)

Decontamination

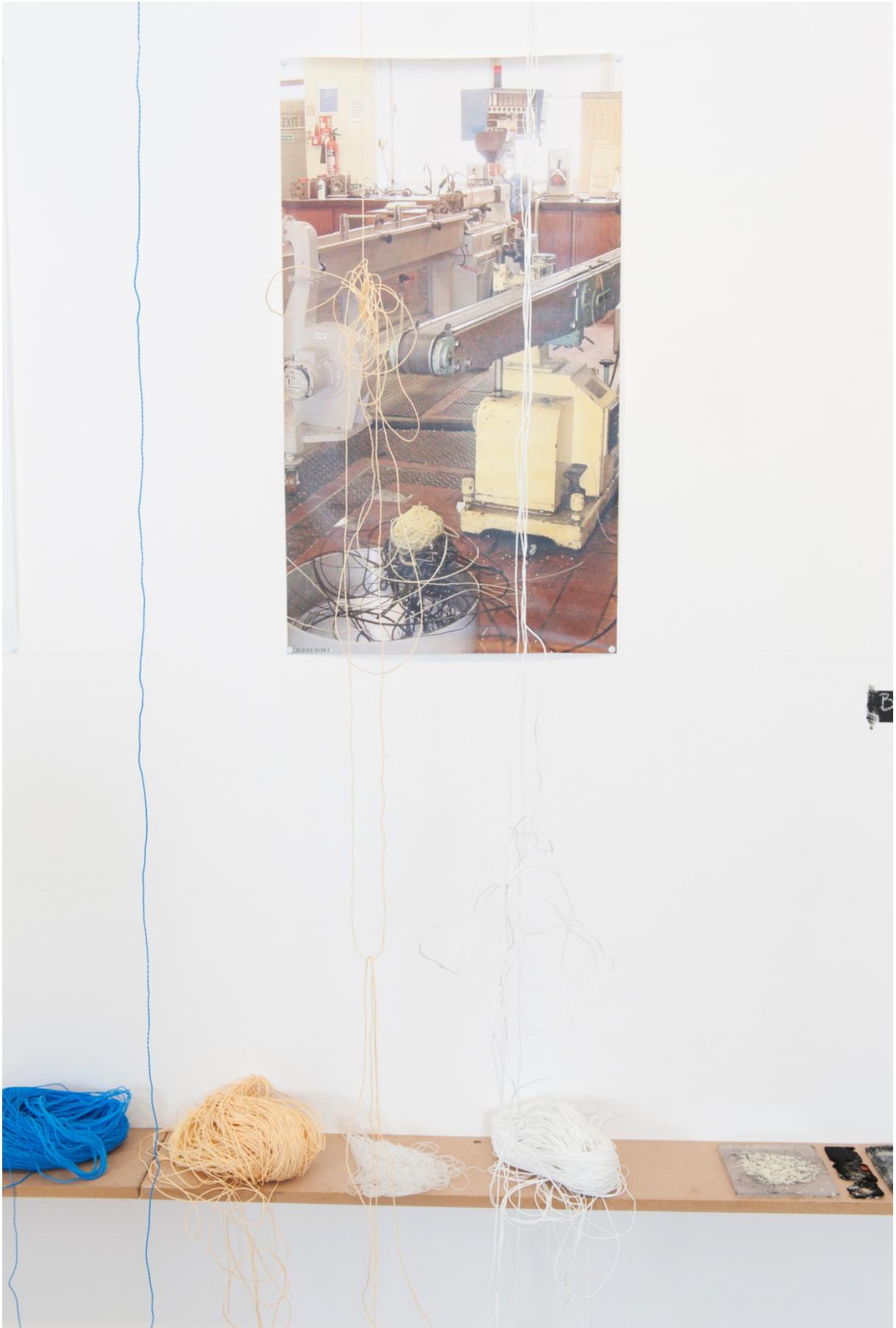
- Washing
- Cleaning
- Removing any unwanted labelling
- Drying



ART + INDUSTRY ↓









BLENDING OF RUBBER/POLYMERS FOR CHILDREN'S PLAYGROUND SURFACE



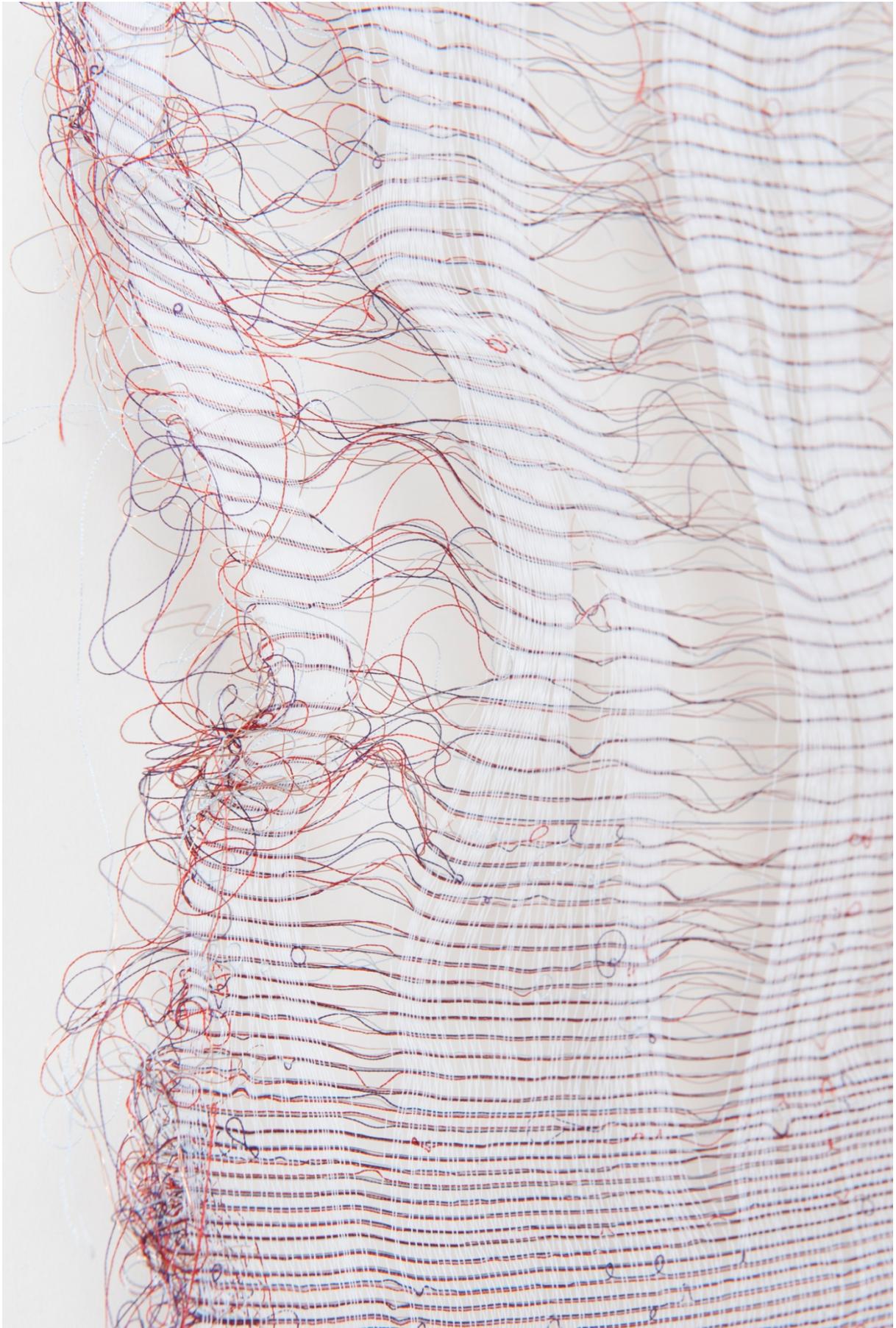


SUSTAINABLE RECYCLE PROCESS





























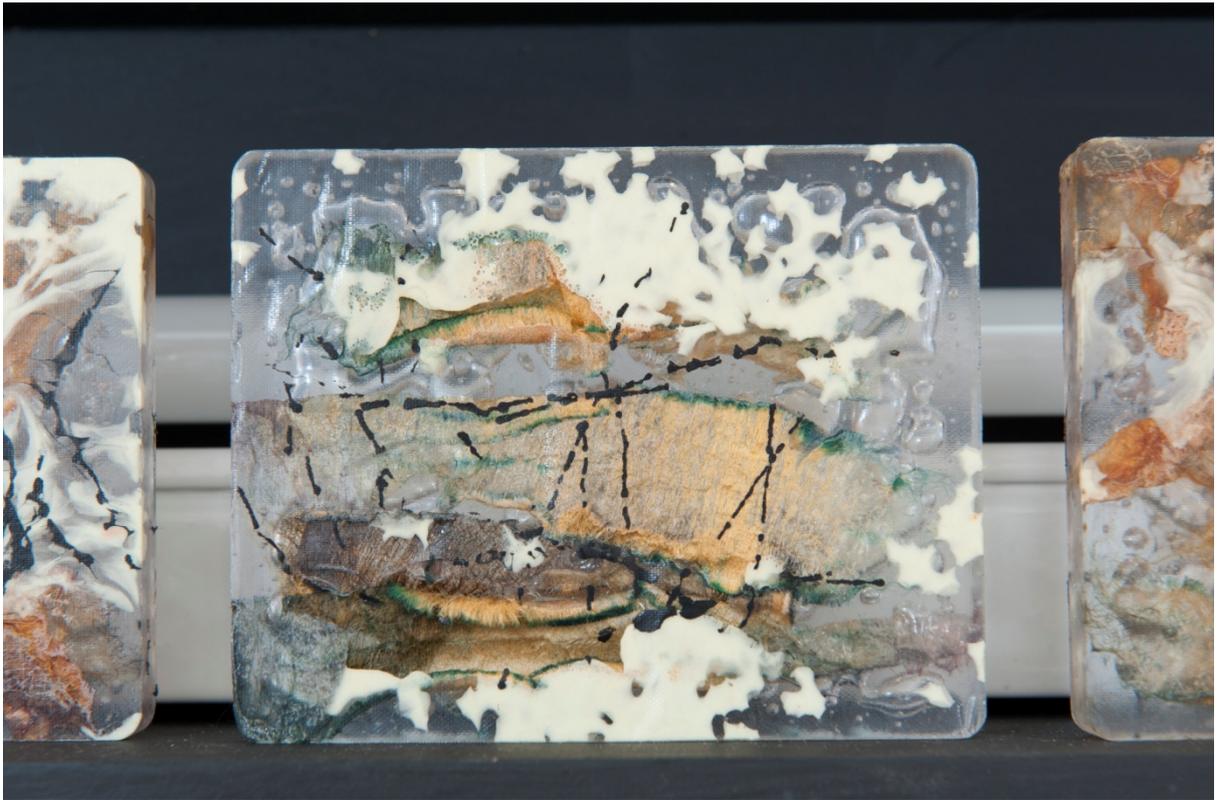






LUMINESCENT PIGMENT EMITS LIGHT ↑



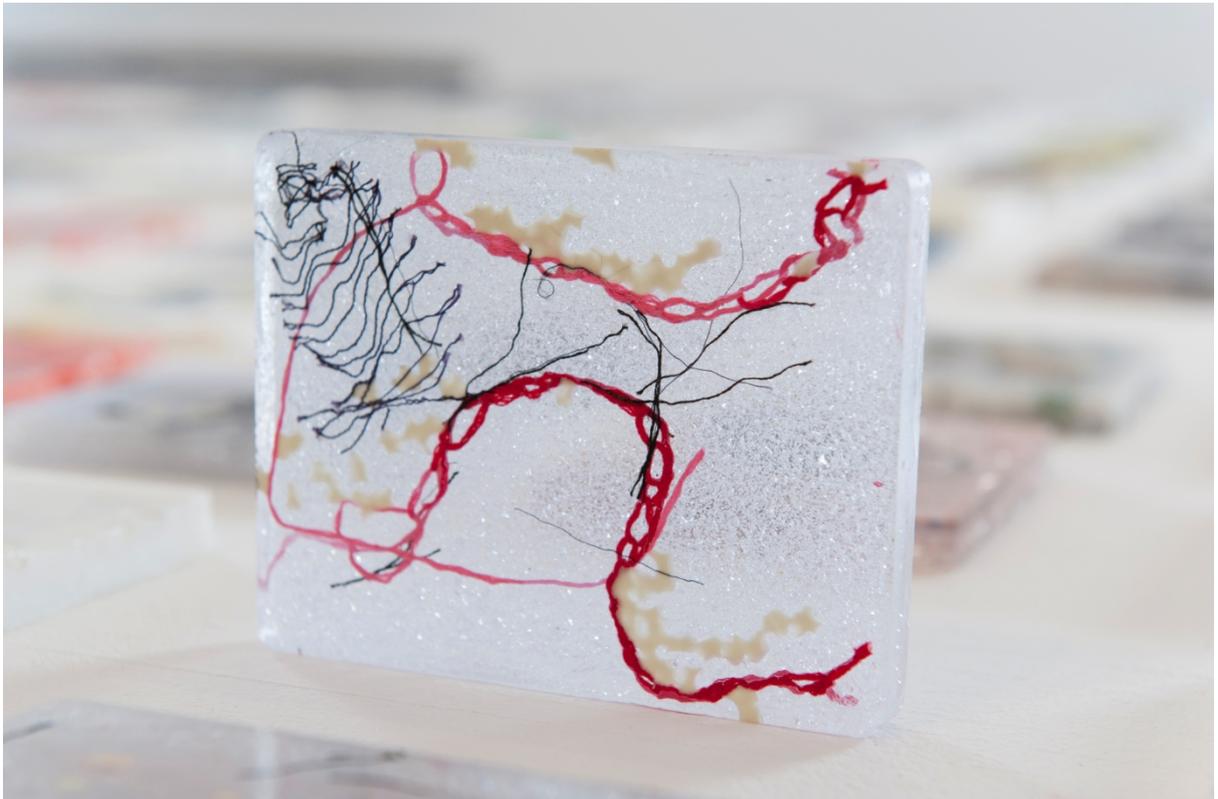






















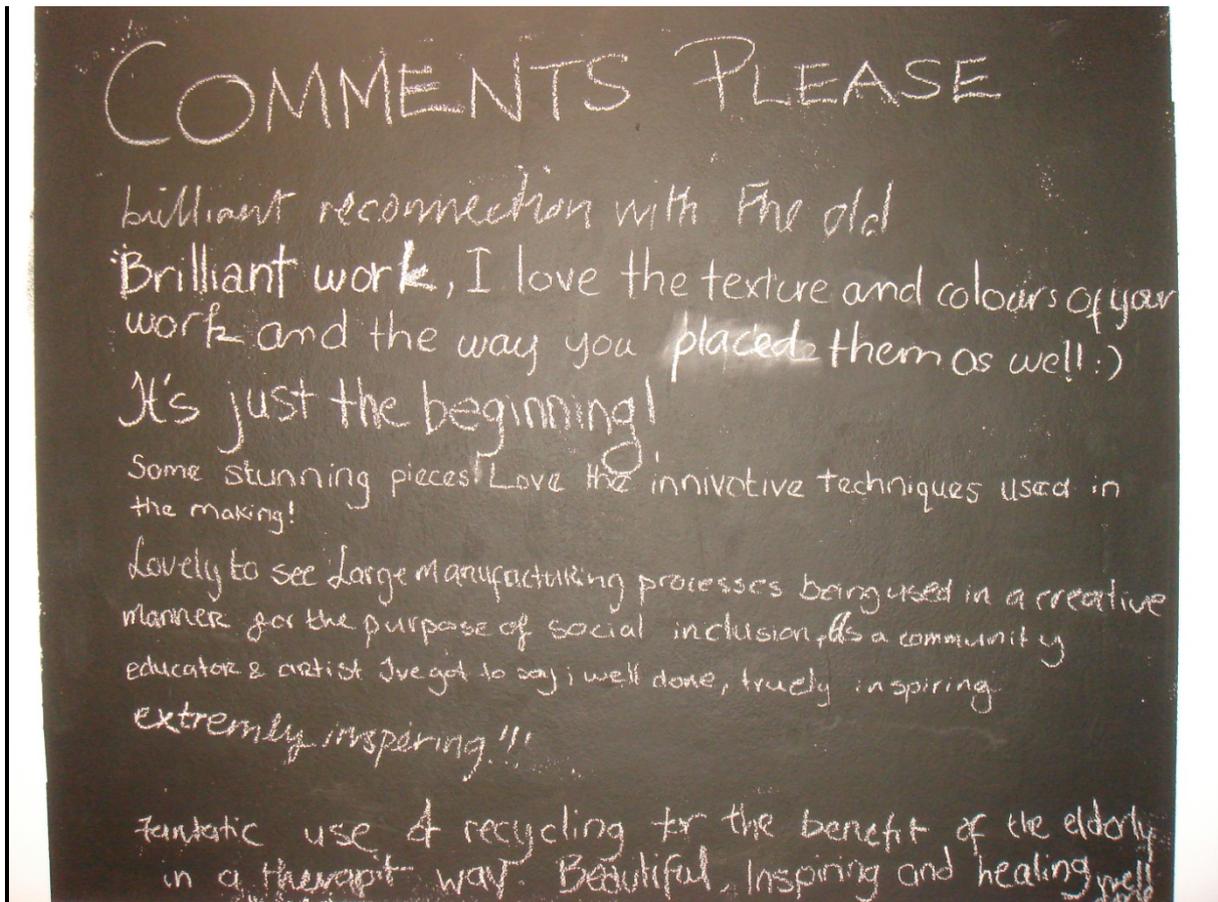
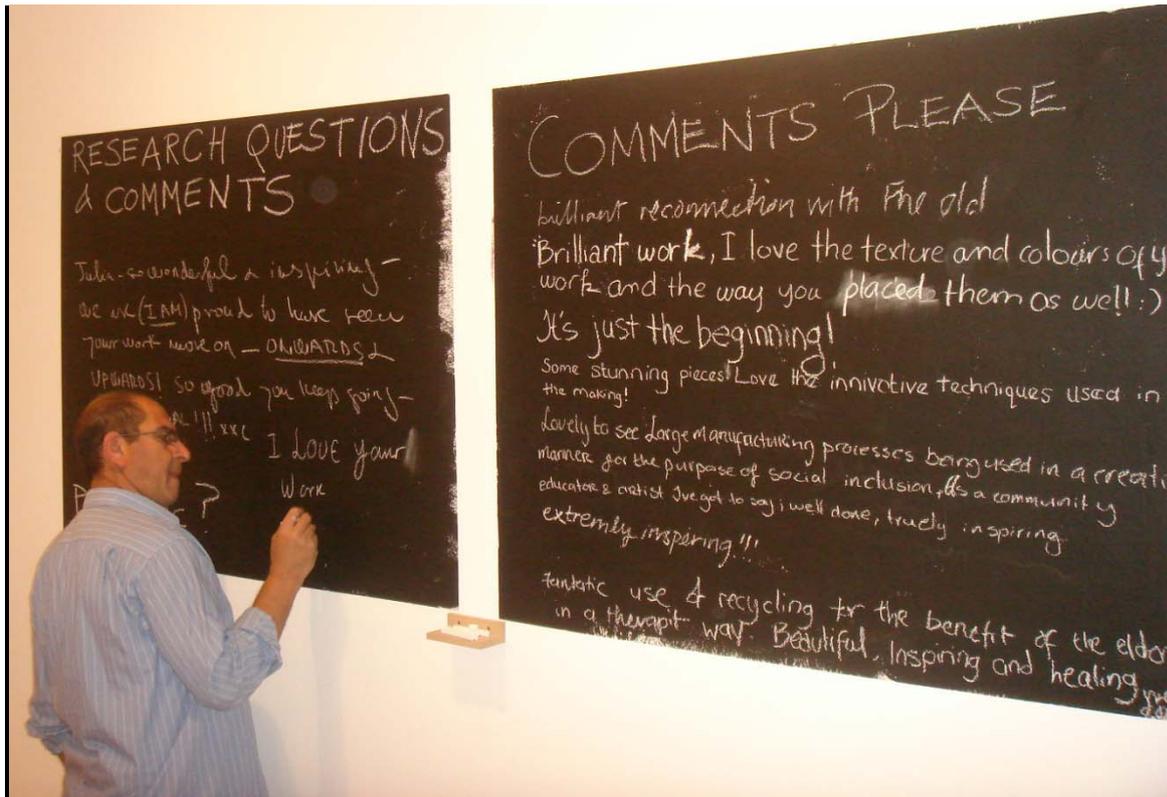












Top and Bottom Photographed by Author April 2013

RESEARCH QUESTIONS
 & COMMENTS

Julia - so wonderful & inspiring -
 we are (I AM) proud to have seen
 your work move on - ONWARDS &
UPWARDS! so good you keep going -
 INSPIRATIONAL!!! xxc I LOVE your
 work!
 Post Doc? Magical Moments.

Photographed by Author April 2013

APPENDICES 7

Dissemination of work;

Date	Location / Organisers	Title
27.09. 2009	Intertech and Pira, Dresden, Germany	5 th Global Plastic Electronic Conference 2009 [poster presentation]
2010	Royal College of Art, South Kensington, London	WIP (Work in progress) [exhibition]
2010	Hockney Gallery, Royal College of Art	John Norris Wood, 'Natural Forms'. [exhibition]
2011	Royal College of Art, South Kensington, London	WIP (Work in progress) [exhibition]
2011	The Association of Fashion & Textiles Course	Research Event, [oral presentation]
2011	Jays Mews Entrance Gallery, RCA	'The Lion and the Unicorn', [exhibition]
2011	House of Commons, Upper Waiting Hall, London	'Materials for Living', [exhibition]
2012	MoDIP (Museum of Design in Plastic. The Arts University College at Bournemouth	'Future Proof Plastics' symposium, [paper & presentation]
2012	Royal College of Art, South Kensington, London	'Off the Wall', [exhibition]
2013	Royal College of Art, South Kensington, London	'Rethinking Punctuation', [exhibition]

GLOSSARY

Addition polymer

Polymers formed when the individual units are joined together without the gain or loss of any atoms.

Catalyst

(Chemistry) a substance that increases the rate of a chemical reaction without itself suffering any permanent chemical change

Closed Loop

Production system in which the waste or by product of one process or product is used in making another product.

Condensation polymer

Polymers formed when the individual units are joined together with the splitting off of a small molecule by-product

Copolymer

Polymers formed from two or more different monomers.

GPPS

General Purpose Polystyrene

HDPE

High Density Polyethylene

Hopper

The container that holds the resin before it enters the extruder feed zone.

Master Batch

Colour pigments in pellet form

Melt Blockage

The sudden drop of output rate of an extruder due to insufficient forward transport of the solid packed bed in the feeding zone of the machine.

Monomer

(mono = one) Single use of one type of polymer

Open Loop Recycling

The conversion of material from one or more products into a new product, involving a change in the inherent properties of material itself.

Plastic

(the adjective) a material that can flow or be moulded

Plastic

(the noun) any simple definition will exclude materials which everyone would agree should be included, therefore turning to the scientific term that plastics are all polymers (poly = many)

PET

Polyethylene Terephthalate

Polymer

Simply a very large molecule made up of many smaller units joined together, generally end to end, to create a long chain.

PP

Polypropylene

Purging

Cleaning of one type of material or colour from an extruder by forcing it out with the new material or colour or by using special purging substances. Purging is more efficient when the purging material is more viscous than the material being replaced.

Regrind

Waste material that has been reclaimed by shredding or granulating.

Sharkskin (also known as Surface Mattness)

The failure of an extrudate to exhibit smooth and glossy appearance. The surface usually exhibits a repetitive wavy or ridged surface pattern perpendicular to the flow direction.

Thermoplastics

Those plastics which, once formed, can be heated and reformed over and over again. This property allows for easy processing and facilitates recycling.

Thermoset

Those that cannot be reformed or remoulded; a hard and brittle material.

References

Primary: exhibitions, lectures, conferences, symposia, workshops

‘Amplifying social wellbeing’ [symposium], The Finnish Institute, London, 25 November 2011

‘Futureproof Plastics’ [symposium], Conference Centre, MoDip, Museum of design in plastics, Arts University College at Bournemouth.(18 May 2011)

Bowles, Melanie and Emma Neuberg, ‘The People’s Print’ workshop, London: Victoria & Albert Museum, 2011.

Centre for Invention and Social Process, [et al.], ‘Accumulation: the Material Ecologies and Economies of Plastic’ [conference], Goldsmiths College, London, 21 June 2011.

Dirt: The Filthy Reality of Everyday Life [exhibition], Wellcome Collection, London, 24 March – 31 August 2011

Eco-Build [exhibition], Earls Court exhibition centre, London, 4 March 2010

‘Eco Innovation Forum: Towards Green Investment and a Sustainable Future’ [seminar] Central Hall Westminster, London, 25 November, 2010

EBW UK, ‘Energy from Waste’, [exhibition & conference] Royal Horticultural Halls & Conference Centre London, Jan 25-26, 2011

FP7 Nano-CT coordination Action, ‘FET Workshop on Towards Zero Power ICT’ [symposium], 23 June 2009, Brussels, Belgium

The Institute of Materials, Minerals & Mining, London, Seprg Technical, [lecture], *Polymer Failures in Construction Applications*, 4 November 2009

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